British Lower Jurassic Stratigraphy

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References

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

Agassiz, J.L.R. (1832) Untersuchungen über die fossilien Fishe der Lias Formationen. *Neues Jahrbuch für Mineralogie, Geologie und Paläontologie*, **1832**, 139–49.

Agassiz, J.L.R. (1833–1845) *Recherches sur les Poissons Fossiles*, Imprimerie Petitpierre, Neuchatel, 5 volumes and Atlas, 1420 pp.

Ager, D.V. (1954) The genus *Gibbirhynchia* in the British Domerian. *Proceedings of the Geologists' Association*, **65**, 25–51.

Ager, D.V. (1955) Field meeting in the Central Cotswolds. *Proceedings of the Geologists' Association*, **66**, 356–65.

Ager, D.V. (1956a) The geographical distribution of brachiopods in the British Middle Lias. *Quarterly Journal of the Geological Society of London*, **112**, 157–88.

Ager, D.V. (1956b) Some new Liassic terebratuloids. *Proceedings of the Geologists' Association*, **67**, 1–14.

Ager, D.V. (1956–1967) *A Monograph of the British Liassic Rhynchonellidae*, Monograph of the Palaeontographical Society, Palaeontographical Society, London, 4 parts, 172 pp.

Ager, D.V. (1978) The stratigraphical distribution of Jurassic Brachiopoda. *Recent Researches in Geology*, **4**, 6–21.

Ager, D.V. (1986a) A reinterpretation of the basal 'Littoral Lias' of the Vale of Glamorgan. *Proceedings of the Geologists' Association*, **97**, 29–35.

Ager, D.V. (1986b) Reply [to Fletcher *et al.*, 1986]. *Proceedings of the Geologists' Association*, **97**, 384.

Ager, D.V. (1990) *British Liassic Terebratulida (Brachiopoda): Part 1*, Monograph of the Palaeontographical Society, Palaeontographical Society, London, 40 pp.

Ager, D.V., Donovan, D.T., Kennedy, W.J., McKerrow, W.S., Mudge, D.C. and Sellwood, B.W. (1973) *The Cotswold Hills*, Geologists' Association Guide, No. **36**, Benham and Co., Colchester, 34 pp.

Ainsworth, N.R., Braham, W., Gregory, F.J., Johnson, B. and King, C. (1998a) A proposed latest Triassic to earliest Cretaceous microfossil biozonation for the English Channel and its adjacent areas. In *Development, Evolution and Petroleum Geology of the Wessex Basin* (ed. J.R. Underhill), *Geological Society Special Publication*, No. **133**, Geological Society, London, pp. 87–102.

References

Ainsworth, N.R., Braham, W., Gregory, F.J., Johnson, B. and King, C. (1998b) The lithostratigraphy of the latest Triassic to earliest Cretaceous of the English Channel and its adjacent areas. In *Development, Evolution and Petroleum Geology of the Wessex Basin* (ed. J.R. Underhill), *Geological Society Special Publication*, No. **133**, Geological Society, London, pp. 103–64.

Alexander, J. (1986) Idealized flow models to predict alluvial sandstone body distribution in the Middle Jurassic Yorkshire Basin. *Marine and Petroleum Geology*, **3**, 298–305.

Alméras, Y., Boullier, A. and Laurin, B. (1997) Brachiopodes. In *Biostratigraphie du Jurassique Ouest-Européen et Méditerranéen: Zonations Parallèles et Distribution des Invertebrés et Microfossiles* (eds E. Cariou and P. Hantzpergue), *Bulletin de la Centre Recherches d'Elf Exploration Production, Memoires*, No. **17**, Elf Exploration Production, Pau, pp. 170–95.

Ambrose, K. (2001) The lithostratigraphy of the Blue Lias Formation (Late Rhaetian–Early Sinemurian) in the southern part of the English Midlands. *Proceedings of the Geologists' Association*, **112**, 97–110.

Amiri-Garoussi, K. (1977) Origin of montmorillonite in early Jurassic shales of N.W. Scotland. *Geological Magazine*, **114**, 281–90.

Amiri-Garoussi, K. (1978) Sedimentological and palaeoenvironmental studies in the Broadford Beds (Hettangian–Sinemurian) of north west Scotland. Unpublished DPhil thesis, University of Oxford.

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 sheets 90, 81 and 91 (Scotland), HMSO, Edinburgh, 216 pp.

Arkell, W.J. (1933) *The Jurassic System in Great Britain*, Oxford University Press, 681 pp.

Arkell, W.J. (1947) *The Geology of Oxford*, Clarendon Press, Oxford, 267 pp.

Bairstow, L. (1969) Lower Lias. In *Guide for North East Yorkshire* (eds J.E. Hemingway, J.K. Wright and H.S. Torrens), International Field Symposium on the British Jurassic, Excursion No. **3**, Department of Geology, University of Keele, Keele, pp. C24–C37.

Bairstow, L. and Hemingway, J.E. (1961) Robin Hood's Bay. *Proceedings of the Yorkshire Geological Society*, **33**, 41–5.

Barnard, T. (1950) Foraminifera from the Lower Lias of the Dorset coast. *Quarterly Journal of the Geological Society of London*, **105**, 347–88.

Barron, A.J.M., Sumbler, M.G. and Morigi, A.N. (1997) A revised lithostratigraphy for the Inferior Oolite Group (Middle Jurassic) of the Cotswolds, England. *Proceedings of the Geologists' Association*, **108**, 269–85.

Barrow, G. (1888) *The Geology of North Cleveland*, Memoir of the Geological Survey of the United Kingdom, Sheet 104S (England and Wales), HMSO, London, 101 pp.

Bartenstein, H. and Brand, E. (1937) *Micropaläontologische Untersuchungen zur Stratigraphie des nordwestdeutschen Lias und Doggers, Abhandlungen der Senckenbergischen Naturforschenden Gessellschaft*, No. **439**, Waldemar Kramer, Frankfurt, 224 pp.

Bate, R.H. and Coleman, B.E. (1975) Upper Lias Ostracoda from Rutland and Huntingdonshire. *Bulletin of the Geological Survey of Great Britain*, **55**, 1–42.

Batten, D.J. (1996a) Chapter 26 – Palynofacies. In *Palynology: Principles and Applications, Volume 2: Applications* (eds J. Jansonius and D.C. McGregor), American Association of Stratigraphic Palynologists Foundation, College Station, pp. 1011–64.

Batten, D.J. (1996b) Chapter 20 – Mesozoic–Tertiary spores and pollen: Introduction. In *Palynology: Principles and Applications, Volume 2: Applications* (eds J. Jansonius and D.C. McGregor), American Association of Stratigraphic Palynologists Foundation, College Station, pp. 751–3.

Batten, D.J., Trewin, N.H. and Tudope, A.W. (1986) The Triassic–Jurassic junction at Golspie, Inner Moray Firth Basin. *Scottish Journal of Geology*, **22**, 85–98.

Beauvais, L. (1976) Madréporaires du Jurassique, II. Révision des Madréporaires liasiques décrits par Duncan (1867). *Mémoires de la Société Géologique de France, Nouvelle Série*, **126**, 43–80.

Benton, M.J. and Spencer, P.S. (1995) *Fossil Reptiles of Great Britain*, Geological Conservation Review Series, No. **10**, Chapman and Hall, London, 386 pp.

Benton, M.J. and Taylor, M.A. (1984) Marine reptiles from the Upper Lias (Lower Toarcian, Lower Jurassic) of the Yorkshire coast. *Proceedings of the Yorkshire Geological Society*, **44**, 399–429.

References

Benton, M.J., Cook, E. and Turner, P. (2002) *Permian and Triassic Red Beds and the Penarth Group of Great Britain*, Geological Conservation Review Series, No. 24, Joint Nature Conservation Committee, Peterborough, 337 pp.

Berridge, N.G. and Ivimey-Cook, H.C. (1967) The geology of a Geological Survey borehole at Lossiemouth, Morayshire. *Bulletin of the Geological Survey of Great Britain*, **27**, 155–69.

Bessa, J.L. and Hesselbo, S.P. (1997) Gamma-ray character and correlation of the Lower Lias. *Proceedings of the Geologists' Association*, **108**, 113–29.

Blake, J.F. (1891) The geology of the country between Redcar and Bridlington. *Proceedings of the Geologists' Association*, **12**, 115–44.

Blake, J.F., Lamplugh, G.W. and Cole, E.M. (1891) Excursion to the east coast of Yorkshire. *Proceedings of the Geologists' Association*, **12**, 207–22.

Blau, J. and Meister, C. (2000) Upper Sinemurian ammonite successions based on 41 faunal horizons: an attempt at worldwide correlation. In *Advances in Jurassic Research 2000, Proceedings of the Fifth International Symposium on the Jurassic System, held in Vancouver, Canada, August 12–25, 1998* (eds R.L. Hall and P.L. Smith), GeoResearch Forum, No. 6, Trans Tech Publications, Zürich, pp. 3–12.

Bloos, G. (1979) Über den Jura am Grossen Haüberg (Unterfrauken, N-Bayern) mit Bemerkungen zum Rät. *Stuttgarter Beiträge zur Naturkunde, Serie B*, **44**, 53 pp.

Bloos, G. (1983) The zone of *Schlotheimia marmorea* (Lower Lias) – Hettangian or Sinemurian? *Newsletters on Stratigraphy*, **12**, 123–31.

Bloos, G. (1997) Sinemurian Boundary Working Group. *International Subcommission on Jurassic Stratigraphy Newsletter*, **24**, 32–40.

Bloos, G. and Page, K.N. (2000a) The basal Jurassic ammonite succession in the North-west European Province – Review and new results. In *Advances in Jurassic Research 2000, Proceedings of the Fifth International Symposium on the Jurassic System, held in Vancouver, Canada, August 12–25, 1998* (eds R.L. Hall and P.L. Smith), GeoResearch Forum, No. 6, Trans Tech Publications, Zürich, pp. 27–40.

Bloos, G. and Page, K.N. (2000b) The proposed GSSP for the base of the Sinemurian Stage near East Quantoxhead, West Somerset (SW England) – the ammonite sequence. In *Advances in Jurassic Research 2000, Proceedings of the Fifth International Symposium on the Jurassic System, held in Vancouver, Canada, August 12–25, 1998* (eds R.L. Hall and P.L. Smith), GeoResearch Forum, No. 6, Trans Tech Publications, Zürich, pp. 13–26.

Bloos, G. and Page, K.N. (2002) Global Stratotype Section and Point for base of the Sinemurian Stage (Lower Jurassic). *Episodes*, **25**, 22–8.

Bonarelli, G. (1894) Contribuzione alla conoscenza del Giura-Lias lombardo. *Atti della Reale Accademia delle Scienze di Torino*, **30**, 63–78.

Boomer, I.D. (1991) Lower Jurassic ostracod biozonation of the Mochras Borehole. *Journal of Micropalaeontology*, **9**, 205–18.

Boomer, I.D. (1992) Lower Jurassic ostracods from Ilminster, Somerset, England. *Journal of Micropalaeontology*, **11**, 47–57.

Boomer, I.D. and Whatley, R. (1992) Ostracoda and dysaerobia in the Lower Jurassic of Wales: the reconstruction of past oxygen levels. *Palaeogeography, Palaeoclimatology, Palaeoecology*, **99**, 373–9.

Boswell, P.G.H. (1924) The petrography of the Sands of the Upper Lias and Lower Inferior Oolite in the West of England. *Geological Magazine*, **61**, 246–64.

Bott, M.H.P., Robinson, J. and Kohnstamm, M.A. (1978) Granite beneath Market Weighton, East Yorkshire. *Journal of the Geological Society*, **135**, 535–43.

Bottrell, S. and Raiswell, R. (1989) Primary versus diagenetic origin of the Blue Lias rhythms (Dorset, UK): evidence from sulphur geochemistry. *Terra Nova*, **1**, 451–6.

Boué, A. (1820) *Essai Géologique sur l'Écosse*, Ve Courcier, Paris, 519 pp.

Bown, P.R. (1987) *Taxonomy, evolution, and biostratigraphy of late Triassic–early Jurassic calcareous nannofossils, Special Papers in Palaeontology*, No. **38**, Palaeontological Association, London, 118 pp.

Bradshaw, M.J. and Fenton, J.P.G. (1982) The Bajocian 'Cornbrash' of Raasay, Inner Hebrides: palynology, facies analysis and a revised geological map. *Scottish Journal of Geology*, **18**, 131–45.

References

Bradshaw, M.J., Cope, J.C.W., Cripps, D.W., Donovan, D.T., Howarth, M.K., Rawson, P.F., West, I.M. and Wimbledon, W.A. (1992) Jurassic. In *Atlas of Palaeogeography and Lithofacies* (eds J.C.W. Cope, J.K. Ingham and P.F. Rawson), *Geological Society Memoir*, No. **13**, Geological Society, London, pp. 107–29.

Brandon, A., Sumbler, M.G. and Ivimey-Cook, H.C. (1990) A revised lithostratigraphy for the Lower and Middle Lias (Lower Jurassic) east of Nottingham, England. *Proceedings of the Yorkshire Geological Society*, **48**, 121–41.

Brenchley, P.J., Howard, A. and Lees, G. (1991) *Field Guide to Shelf Sediments in the Carboniferous of Northumberland and the Jurassic of Yorkshire*, Field Guide (13th International Sedimentological Congress), No. **13**, British Sedimentological Research Group, Cambridge, 57 pp.

Bristow, C.R. and Westhead, R.K. (1993) Geology of the Evercreech–Batcombe district (Somerset). *British Geological Survey, Onshore Geology Series, Technical Report*, **WA/93/89**.

Bristow, H.W. (1867) On the Lower Lias or Lias-Conglomerate of a part of Glamorganshire. *Quarterly Journal of the Geological Society of London*, **23**, 199–207.

Bristow, H.W. and Etheridge, R. (1873) *Vertical sections of the Lower Lias and Rhaetic or Penarth Beds of Glamorgan, Somerset and Gloucester-shires*. Geological Survey of England and Wales, Vertical Sections, Sheet 47.

Broadhurst, F.M. and Duffy, L. (1970) A plesiosaur in the Geology Department, University of Manchester. *Museums Journal*, **70**, 30–1.

Brodie, P.B. (1845) *A History of the Fossil Insects in the Secondary Rocks of England*, John van Voorst, London, 130 pp.

Brodie, P.B. (1849) Notice on the discovery of a Dragon-fly and a new species of *Leptolepis* in the Upper Lias near Cheltenham, with a few remarks on that formation in Gloucestershire. *Proceedings of the Geological Society of London*, **5**, 31–7.

Brodie, P.B. (1853) Remarks on the Lias at Fretherne near Newnham, and Purton near Sharpness; with an account of some new Foraminifera discovered there; and on certain Pleistocene deposits in the Vale of Gloucester. *Proceedings of the Cotteswold Naturalists' Field Club*, **1**, 241–5.

Brodie, P.B. (1857) Remarks on the Lias of Barrow in Leicestershire compared with the lower part of the formation in Gloucestershire, Worcestershire and Warwickshire. *Annals and Magazine of Natural History, Second Series*, **20**, 190–2.

Brodie, P.B. (1858) Contributions to the geology of Gloucestershire. *Geologist*, **1**, 230.

Brodie, P.B. (1860a) Remarks on the Inferior Oolite and Lias in parts of Northamptonshire, compared with the same formations in Gloucesterhire. *Proceedings of the Cotteswold Naturalists' Field Club*, **2**, 133–4.

Brodie, P.B. (1860b) Remarks on the Lias of Barrow in Leicestershire, compared with the lower part of that formation in Gloucestershire, Worcestershire and Warwickshire. *Proceedings of the Cotteswold Naturalists' Field Club*, **2**, 139–41.

Brodie, P.B. (1861) On the distribution of the corals in the Lias (abstract). *Quarterly Journal of the Geological Society of London*, **17**, 151–2.

Brodie, P.B. (1868) A sketch of the Lias generally in England and of the 'Insect and Saurian Beds' especially in the counties of Warwick, Worcester and Gloucester, with a particular account of the fossils which characterise them. *Proceedings of the Warwickshire Naturalists' and Archeologists' Field Club*, 1–24.

Brodie, P.B. (1887) On the range and extent and fossils of the Rhaetic Formation in Warwickshire. *Proceedings of the Warwickshire Naturalists' and Archeologists' Field Club*, 21–2.

Brodie, P.B. (1897) ... a section and certain fossils from the Lias quarries at Wilmcote. *Proceedings of the Warwickshire Naturalists' and Archeologists' Field Club*, 103–5.

Brongniart, A. (1829) *Tableau des Terrains qui Composent l'écorce du Globe, ou Essai sur la Structure de la Partie Connue de la Terre*, Chez F.G. Levrault, Paris and Strasbourg, viii and 435 pp.

Brookes, N.J. (1989) Stratigraphic study of the Toarcian formations on the Isles of Skye and Raasay. Unpublished MSc thesis, Birkbeck College, University of London.

Brooks, M., Trayner, P.M. and Trimble, T.J. (1988) Mesozoic reactivation of Variscan thrusting in the Bristol Channel area. *Journal of the Geological Society*, **145**, 439–44.

Broumer, J. (1969) Foraminiferal assemblages from the Lias of North-western Europe, *Verhandlungen der Koninklijke Nedertaugh Akademie Van Weterschappen, Afdeling Natuurkunde, Eerste Reeks*, No. **25**, North-Holland, Amsterdam, 64 pp.

References

Bryce, J. (1873) On the Jurassic rocks of Skye and Raasay, with a palaeontological appendix by Ralph Tait, Esq. *Quarterly Journal of the Geological Society of London*, **29**, 317–51.

Bryant, I.D., Kantorowicz, J.D. and Love, C.F. (1988) The origin and recognition of laterally continuous carbonate-cemented horizons in the Upper Lias Sands of southern England. *Marine and Petroleum Geology*, **5**, 108–33.

Buckman, J. (1848) Notice on the discovery of the remains of insects in the Lias of Gloucestershire. *Proceedings of the Geological Society of London*, **4**, 14–16.

Buckman, J. (1850) On some fossil plants from the Lower Lias. *Quarterly Journal of the Geological Society of London*, **6**, 413–18.

Buckman, J. (1853) Remarks on *Libellula brodei* (Buckman), a fossil insect from the Upper Lias of Dumbleton, Gloucestershire. *Proceedings of the Cotteswold Naturalists' Field Club*, **1**, 268–70.

Buckman, J. (1874) On the Cephalopoda Bed and Oolite Sands of Dorset and part of Somerset. *Proceedings of the Somerset Archaeological and Natural History Society*, **20**, 140–64.

Buckman, J. (1877) The Cephalopoda-beds of Gloucester, Dorset and Somerset. *Quarterly Journal of the Geological Society of London*, **33**, 1–9.

Buckman, J. (1879) On the so-called Midford Sands. *Quarterly Journal of the Geological Society of London*, **35**, 736–43.

Buckman, S.S. (1887–1907) *A Monograph of the Ammonites of the 'Inferior Oolite Series'*, Monograph of the Palaeontographical Society, Palaeontographical Society, London, 9 parts and 5 supplements.

Buckman, S.S. (1889) The Cotteswold, Midford and Yeovil Sands and the division between Lias and Oolite. *Quarterly Journal of the Geological Society of London*, **45**, 440–74.

Buckman, S.S. (1898) On the grouping of some divisions of so-called "Jurassic Time". *Quarterly Journal of the Geological Society of London*, **54**, 442–62.

Buckman, S.S. (1901) Bajocian and contiguous deposits in the north Cotteswolds: the main hillmass. *Quarterly Journal of the Geological Society of London*, **57**, 126–54.

Buckman, S.S. (1902) The term 'hemera'. *Geological Magazine*, **39**, 554–7.

Buckman, S.S. (1903) The Toarcian of Bredon Hill and a comparison with deposits elsewhere. *Quarterly Journal of the Geological Society of London*, **59**, 445–58.

Buckman, S.S. (1909–1930) *Type Ammonites*, Published by the author, London and Thame, 7 volumes, 790 pls., 78 pp.

Buckman, S.S. (1910) Certain Jurassic (Lias–Oolite) strata of south Dorset. *Quarterly Journal of the Geological Society of London*, **66**, 52–89.

Buckman, S.S. (1915) A palaeontological classification of the Jurassic rocks of the Whitby district, with a zonal table of Liassic ammonites. In *The Geology of the Country between Whitby and Scarborough*, 2nd edn (C. Fox-Strangways and G. Barrow), Memoir of the Geological Survey of Great Britain, sheets 35 and 44 (England and Wales), HMSO, London, pp. 59–102.

Buckman, S.S. (1922) Jurassic Chronology II – Preliminary studies: Certain Jurassic strata near Eypesmouth (Dorset); the Junction Bed of Watton Cliff and associated rocks. *Quarterly Journal of the Geological Society of London*, **78**, 378–430.

Bull, P.A. (1981) Some fine grained sedimentation phenomena in caves. *Earth Surface Processes and Landforms*, **6**, 11–22.

Burkhalter, R.T. (1995) Ooidal ironstones and ferruginous microbialites: origin and relation to sequence stratigraphy (Aalenian and Bajocian, Swiss Jura Mountains). *Sedimentology*, **42**, 57–74.

Callomon, J.H. (1963) Sexual dimorphism in Jurassic ammonites. *Transactions of the Leicester Literary and Philosophical Society*, **57**, 21–56.

Callomon, J.H. (1965) Notes on Jurassic stratigraphical nomenclature. In *Doklady: Proceedings of the Carpatho-Balkan Geological Association, VII Congress, 1–16 September, 1965, Sofia*, Izdatelstvo Bulgarskoi Academii nauk, Sofia, Part **2**(1), pp. 81–5.

Callomon, J.H. (1985a) The evolution of the Jurassic ammonite family Cardioceratidae. In *Evolutionary Case Histories from the Fossil Record* (eds J.C.W. Cope and P.W. Skelton), *Special Papers in Palaeontology*, No. **33**, Palaeontological Association, London, pp. 49–90.

Callomon, J.H. (1985b) Biostratigraphy, chronostratigraphy and all that – again! *In International Symposium on Jurassic Stratigraphy, Erlangen, 1–8 September, 1984* (eds O. Michelsen and A. Zeiss), Geological Survey of Denmark, Copenhagen, Volume 3, pp. 611–24.

References

Callomon, J.H. (1995). Time from fossils: S.S. Buckman and Jurassic high-resolution geochronology. In *Milestones in Geology* (ed. M.J. Le Bas), *Geological Society Memoir*, No. **16**, Geological Society, London, pp. 127–50.

Callomon, J.H. and Cope, J.C.W. (1995) The Jurassic geology of Dorset. In *Field Geology of the British Jurassic* (ed. P.D. Taylor), Geological Society, London, pp. 51–103.

Callomon, J.C. and Donovan, D.T. (1974) A code of Mesozoic Stratigraphic Nomenclature. In *Colloque du Jurassique à Luxembourg, 1967* (ed. P.-L. Maubeuge), *Mémoires du Bureau de Recherches Géologiques et Minières*, No. **75**, Éditions du Bureau de Recherches Géologiques et Minières, Paris, pp. 75–81.

Callomon, J.H. and Oates, M.J. (1993) Day Excursion B: Jurassic of Oxfordshire and the Cotswolds. *Arkell International Symposium on Jurassic Geology, Geological Society of London.*

Cariou, E. and Hantzpergue, P. (1997) *Biostratigraphie du Jurassique Ouest-Européen et Méditerranéen: Zonations Parallèles et Distribution des Invertebrés et Microfossiles, Bulletin de la Centre Recherches d'Elf Exploration Production, Memoires*, No. **17**, Elf Exploration Production, Pau, 422 pp.

Carte, A. and Baily, W.H. (1863) Description of a new species of *Plesiosaurus*, from the Lias, near Whitby, Yorkshire. *Journal of the Royal Dublin Society*, **4**, 160–70.

Catt, J.A., Gad, M.A., LeRiche, H.H. and Lord, A.R. (1971) Geochemistry, micropalaeontology and origin of the Middle Lias ironstones in northeast Yorkshire (Great Britain). *Chemical Geology*, **8**, 61–76.

Cave, R. (1977) *Geology of the Malmesbury District*, Memoir of the Geological Survey of Great Britain, Sheet 251 (England and Wales), HMSO, London, 343 pp.

Chadwick, R.A. (1985) Seismic reflection investigations into the stratigraphy and structural evolution of the Worcester Basin. *Journal of the Geological Society*, **142**, 187–202.

Chadwick, R.A. (1986) Extension tectonics in the Wessex Basin, southern England. *Journal of the Geological Society*, **143**, 465–88.

Chadwick, R.A. (1993) Aspects of basin inversion in southern Britain. *Journal of the Geological Society*, **150**, 311–22.

Chadwick, R.A., Kenolty, N. and Whittaker, A. (1983) Crustal structure beneath southern England from deep seismic reflection profiles. *Journal of the Geological Society*, **140**, 893–911.

Chandler, M.A., Rind, D. and Ruedy, R. (1992) Pangean climate during the Early Jurassic: GCM simulations and the sedimentary record of paleoclimate. *Bulletin of the Geological Society of America*, **104**, 543–59.

Chandler, R.B. and Sole, D.T.C. (1996) The Inferior Oolite at East Hill Quarry, Bradford Abbas, Dorset. *Proceedings of the Dorset Natural History and Archaeological Society*, **117**, 101–8.

Channon, P.J. (1950) New and enlarged Jurassic sections in the Cotswolds. *Proceedings of the Geologists' Association*, **61**, 242–60.

Chapman, W. (1758) An account of the fossil bones of an alligator, found on the sea-shore near Whitby in Yorkshire. *Philosophical Transactions of the Royal Society of London*, **50**, 688–91.

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**.

Chidlaw, N. (1987) The sedimentology of the Marlstone Rock Bed and Dyrham Silt formations (Pliensbachian, Lower Jurassic) of the Cotswold Hills. Unpublished PhD thesis, St Paul and St Mary College, Cheltenham and University of Bristol.

Chidlaw, N. and Campbell, M.J.A. (1988) Sedimentation patterns in the Cornbrash Limestone Formation of the Cotswold Hills. *Proceedings of the Geologists' Association*, **99**, 27–42.

Chowns, T.M. (1968) Depositional environment of the Cleveland Ironstone Series. *Nature*, **211**, 1286–7.

Clark, A.R. (1970) The Ostracoda of the Scottish Lias. Unpublished PhD thesis, Sir John Cass College, London.

Clements, R.G. (ed.) (1975) The Geology of Long Itchington Quarry. Unpublished Report, University of Leicester, 30 pp.

Clements, R.G. (ed.) (1977) The Geology of Parkfield Road Quarry, Rugby. Unpublished Report, University of Leicester, 54 pp.

Coe, A.L. and Hesselbo, S.P. (2000) Comment on 'Evidence of sea-level fall in sequence stratigraphy: examples from the Jurassic' by A. Hallam. *Geology*, **28**, 95.

References

Cole, D.C. and Harding, I.C. (1998) Use of palynofacies analysis to define Lower Jurassic (Sinemurian to Pliensbachian) genetic stratigraphic sequences in the Wessex Basin, England. In *Development, Evolution and Petroleum Geology of the Wessex Basin* (ed. J.R. Underhill), *Geological Society Special Publication*, No. **133**, Geological Society, London, pp. 165–85.

Coleman, M.L. and Raiswell, R. (1981) Carbon, oxygen and sulphur isotope variations in concretions from the Upper Lias of N.E. England. *Geochimica et Cosmochimica Acta*, **45**, 329–40.

Collenot, J.-J. (1869) *Description Géologique de l'Auxois*, Imprimerie et Librarie Verdot, Semur.

Colter, L.V. and Havard, D.I. (1981) The Wytch Farm oilfield, Dorset. In *Petroleum Geology of the Continental Shelf of North-west Europe: Proceedings of the Second Conference, 4–6 March, 1980, London* (eds L.V. Illing and G.D. Hobson), Heyden on behalf of the Institute of Petroleum, London, pp. 494–503.

Combémorel, R. (1997) Bélemnites. In *Biostratigraphie du Jurassique Ouest-Européen et Méditerranéen: Zonations Parallèles et Distribution des Invertebrés et Microfossiles* (eds E. Cariou and P. Hantzpergue), *Bulletin de la Centre Recherches d'Elf Exploration Production, Memoires*, No. **17**, Elf Exploration Production, Pau, pp. 157–67.

Constable, B. (1992) Stratigraphy of the Upper Liassic Junction Bed in Dorset and Somerset. Unpublished MSc thesis, Birkbeck College, University of London.

Conybeare, W.D. and Phillips, W. (1822) *Outlines of the Geology of England and Wales*, Part 1, William Phillips, London, 470 pp.

Cope, J.C.W. (1971) Mesozoic rocks of the southern part of the Vale of Glamorgan. In *Geological Excursions in South Wales and the Forest of Dean* (eds D.A. Bassett and M.A. Bassett), Geologists' Association (South Wales Group), Cardiff, pp. 114–24.

Cope, J.C.W. (1990) Discussion on correlation of the Triassic–Jurassic boundary in England and Austria. *Journal of the Geological Society*, **148**, 420–1.

Cope, J.C.W., Getty, T.A., Howarth, M.K., Morton, N. and Torrens, H.S. (1980a) *A Correlation of Jurassic Rocks in the British Isles. Part 1: Introduction and Lower Jurassic, Geological Society Special Report*, No. **14**, Blackwell Scientific Publications, Oxford, 73 pp.

Cope, J.C.W., Duff, K.L., Parson, C.F., Torrens, H.S., Wimbledon, W.A. and Wright, J.K. (1980b) *A Correlation of Jurassic Rocks in the British Isles. Part 2: Middle and Upper Jurassic, Geological Society Special Report*, No. **15**, Blackwell Scientific Publications, Oxford, 109 pp.

Copestake, P. (1982) Lower Sinemurian foraminifera and Ostracoda from two fissure deposits in the Eastern Mendips (Somerset, England). *Journal of Micropalaeontology*, **1**, 149–53.

Copestake, P. (1986) *Haplophragmoides lincolnensis* sp. nov., a widespread foraminiferal index species in the Pliensbachian (early Jurassic) of Europe. *Revista Espanola de Micropaleontología*, **17**, 403–11.

Copestake, P. (1989) Triassic. In *Stratigraphical Atlas of Fossil Foraminifera*, 2nd edn (eds D.G. Jenkins and J.W. Murray), Ellis Horwood, Chichester, pp. 97–124.

Copestake, P. and Johnson, B. (1989) The Hettangian to Toarcian (Lower Jurassic). In *Stratigraphical Atlas of Fossil Foraminifera*, 2nd edn (eds D.G. Jenkins and J.W. Murray), Ellis Horwood, Chichester, pp. 129–88.

Corbin, S.G. (1980) A facies analysis of the Lower–Middle Jurassic boundary beds of north-west Europe. Unpublished PhD thesis, University of Birmingham.

Corna, M. (1987) Les Horizons Sinemurien du Calcaire à Gryphées du Jura Méridional Français (Zone à Conybeari–Zone à Obtusum). *Geobios*, **20**, 531–6.

Corna, M., Dommergues, J.-L., Meister, C., Mouterde, R. and Bloos, G. (1997) Sinémurien. In *Biostratigraphie du Jurassique Ouest-Européen et Méditerranéen: Zonations Parallèles et Distribution des Invertebrés et Microfossiles* (eds E. Cariou and P. Hantzpergue), *Bulletin de la Centre Recherches d'Elf Exploration Production, Memoires*, No. **17**, Elf Exploration Production, Pau, pp. 9–14.

Cornford, C. (1986) The Bristol Channel Graben: organic geochemical limits on subsidence and speculation on the origin of inversion. *Proceedings of the Ussher Society*, **6**, 360–7.

Cox, B.M. (1990) A review of Jurassic chronostratigraphy and age indicators for the UK. In *Tectonic Events Responsible for Britain's Oil and Gas Reserves* (eds R.F.P. Hardman and J. Brooks), *Geological Society Special Publication*, No. **55**, Geological Society, London, pp. 169–90.

References

Cox, B.M. and Sumbler, M.G. (2002) *British Middle Jurassic Stratigraphy*, Geological Conservation Review Series, No. **26**, Joint Nature Conservation Committee, Peterborough, 508 pp.

Cox, B.M., Sumbler, M.G. and Ivimey-Cook, H.C. (1999) A formational framework for the Lower Jurassic of England and Wales (onshore area). *British Geological Survey, Research Report*, **RR/99/01**.

Cox, L.R. (1936) The gastropoda and lamellibranchia of the Green Ammonite Beds of Dorset. *Quarterly Journal of the Geological Society of London*, **92**, 456–71.

Cox, L.R. (1963) The Rhaetic–Hettangian bivalve genus *Pteromya* Moore. *Palaeontology*, **6**, 582–95.

Craig, G.Y. (ed.) (1983) *Geology of Scotland*, 2nd edn, Scottish Academic Press, Edinburgh, 472 pp.

Crick, G.C. (1896) On the proostracum of a belemnite from the Upper Lias of Alderton, Gloucestershire. *Proceedings of the Malacological Society of London*, **2**, 117–19.

Crick, G.C. (1922) On some dibranchiate cephalopoda from the Upper Lias of Gloucestershire. *Proceedings of the Cotteswold Naturalists' Field Club*, **20**, 249–56.

Cross, J.E. (1875) The geology of north-west Lincolnshire; with an appendix by R. Etheridge. *Quarterly Journal of the Geological Society of London*, **31**, 115–29.

Cruickshank, A.R.I. (1994) Cranial anatomy of the Lower Jurassic pliosaur *Rhomaleosaurus megacephalus* (Stutchbury) (Reptilia: Plesiosauria). *Philosophical Transactions of the Royal Society of London, Series B*, **343**, 247–60.

Cumberland, G. (1822) Remarks on the strata at Stinchcombe, near Dursley in Gloucestershire. *Transactions of the Geological Society, Series 2*, **1**, 369–70.

Curtis, C.D. (1995) Post-depositional evolution of mudstones 1: early days and parental influences. *Journal of the Geological Society*, **152**, 577–86.

Davidson, T. (1851–1852) *A Monograph of the British Fossil Brachiopoda. Volume I Part III: The Oolitic and Liassic Brachiopoda*, Monograph of the Palaeontographical Society, Palaeontographical Society, London.

Davidson, T. (1876–1878) *A Monograph of the British Fossil Brachiopoda. Volume IV Part II: Supplement to the Jurassic and Triassic species*, Monograph of the Palaeontographical Society, Palaeontographical Society, London.

Davies, D.K. (1967) Origin of friable sandstone–calcareous sandstone rhythms in the Upper Lias of England. *Journal of Sedimentary Petrology*, **39**, 1179–88.

Davies, D.K. (1969) Shelf sedimentation: an example from the Jurassic of Britain. *Journal of Sedimentary Petrology*, **39**, 1344–70.

Davies, W. and Dixie, R.J.M. (1951) Recent work on the Frodingham Ironstone. *Proceedings of the Yorkshire Geological Society*, **28**, 85–96.

Dawkins, B. (1864) On the Rhaetic and White Lias of western and central Somerset; and on the discovery of a new fossil mammal in the Grey Marlstones beneath the Bone-Bed. *Quarterly Journal of the Geological Society of London*, **20**, 396–412.

Day, E.C.H. (1863) On the Middle and Upper Lias of the Dorsetshire Coast. *Quarterly Journal of the Geological Society of London*, **19**, 278–97.

Dean, W.T. (1954) Notes on part of the Upper Lias succession at Blea Wyke, Yorkshire. *Proceedings of the Yorkshire Geological Society*, **29**, 161–79.

Dean, W.T., Donovan, D.T. and Howarth, M.K. (1961) The Liassic Ammonite Zones and Subzones of the North-West European Province. *Bulletin of the British Museum (Natural History): Geology*, **4**, 435–505.

Deeming, C.D., Halstead, L.B., Manabe, M. and Unwin, D.M. (1993) An ichthyosaur embryo from the Lower Lias (Jurassic: Hettangian) of Somerset, England, with comments on the reproductive biology of ichthyosaurs. *Modern Geology*, **18**, 432–42.

De la Beche, H.T. (1822) Remarks on the geology of the south coast of England from Bridport Harbour, Dorset, to Babbacombe Bay, Devon. *Transactions of the Geological Society of London, Series 2*, **1**, 40–7.

De la Beche, H.T. (1826) On the Lias of the coast in the vicinity of Lyme Regis, Dorset. *Transactions of the Geological Society of London, Series 2*, **2**, 21–30.

De la Beche, H.T. (1846) *On the Formation of the Rocks of South Wales and South-western England*, Memoir of the Geological Survey of the United Kingdom, No. 1, HMSO, London, 531 pp.

De Luc, J.A. (1805) *Geological Travels*, Volume 1, London.

References

Dineley, D.L. and Metcalf, S.J. (1999) *Fossil Fishes of Great Britain*, Geological Conservation Review Series, No. **16**, Joint Nature Conservation Committee, Peterborough, 675 pp.

Dommergues, J.-L. (1979) Le Carixien Bourguignon. Unpublished thesis, L'Université de Dijon, France, 195 pp.

Dommergues, J.-L. (1993). Les ammonites du Sinemurien supérieur de Bourgogne (France): biostratigraphie et remarques paléontologiques. *Révue de Paléobiologie*, **12**, 67–173.

Dommergues, J.-L. (1997) Synthèses biochronologiques: le Jurassiques Inférieur. In *Biostratigraphie du Jurassique Ouest-Européen et Méditerranéen: Zonations Parallèles et Distribution des Invertebrés et Microfossiles* (eds E. Cariou and P. Hantzpergue), *Bulletin de la Centre Recherches d'Elf Exploration Production, Memoires*, No. **17**, Elf Exploration Production, Pau, pp. 347–53.

Dommergues, J.-L. and Meister, C. (1992) Late Sinemurian and Early Carixian ammonites in Europe with cladistic analysis of sutural characters. *Neues Jahrbuch für Geologie und Paläontologie*, **185**, 211–37.

Dommergues, J.-L. and Mouterde, R. (1987) The endemic trends of Liassic ammonite faunas of Portugal as the result of the opening up of a narrow epicontinental basin. *Palaeogeography, Palaeoclimatology, Palaeoecology*, **58**, 129–37.

Dommergues, J.-L., Meister, C. and Mouterde, R. (1991) Pliensbachian. *3rd International Symposium on Jurassic Stratigraphy, Poitiers 1991*, p. 126 (abstract only).

Dommergues, J.-L., Page, K.N. and Meister, C. (1994) A detailed correlation of Upper Sinemurian (Lower Jurassic) ammonite Biohorizons between Burgundy (France) and Britain. *Newsletters in Stratigraphy*, **30**, 61–73.

Dommergues, J.-L., Meister, C. and Mouterde, R. (1997) Pliensbachian. In *Biostratigraphie du Jurassique Ouest-Européen et Méditerranéen: Zonations Parallèles et Distribution des invertebrés et Microfossiles* (eds E. Cariou and P. Hantzpergue), *Bulletin de la Centre Recherches d'Elf Exploration Production, Mémoires*, No. **17**, Elf Exploration Production, Pau, 15–24.

Donato, J.A. (1993) A buried granite batholith and the origin of the Sole Pit Basin, UK Southern North Sea. *Journal of the Geological Society*, **150**, 255–8.

Donato, J.A. and Megson, J.B. (1990) A buried granite beneath the East Midland Shelf of the Southern North Sea Basin. *Journal of the Geological Society*, **147**, 133–40.

Donovan, D.T. (1952a) The ammonites of the Blue Lias of the Bristol district. Part I. Psiloceratidae and Schlotheimidae. *Annals and Magazine of Natural History, Series 12*, **5**, 629–55.

Donovan, D.T. (1952b) The ammonites of the Blue Lias of the Bristol district. Part II. Arietitidae. *Annals and Magazine of Natural History, Series 12*, **5**, 717–52.

Donovan, D.T. (1954) *Synoptic supplement to T. Wright's "Monograph on the Lias Ammonites of the British Isles"*, Monograph of the Palaeontographical Society, Palaeontographical Society, London, 54 pp.

Donovan, D.T. (1956) The zonal stratigraphy of the Blue Lias around Keynsham, Somerset. *Proceedings of the Geologists' Association*, **66**, 182–212.

Donovan, D.T. (1958a) Easter Field Meeting: The Lower and Middle Jurassic rocks of the Bristol district. *Proceedings of the Geologists' Association*, **69**, 130–40.

Donovan, D.T. (1958b) The Lower Lias section at Cannard's Grave, Shepton Mallet, Somerset. *Proceedings of the Bristol Naturalists' Society*, **29**, 393–8.

Donovan, D.T. (1967) The geographical distribution of Lower Jurassic ammonites in Europe and adjacent areas. In *Aspects of Tethyan Biogeography* (eds C.G. Adams and D.V. Ager), Systematics Association Publications, No. **7**, Systematics Association, London, pp. 111–34.

Donovan, D.T. (1990) The late Sinemurian ammonite genus *Vicininodiceras* Trueman *Cahiers de l'Université Catholique de Lyon, Série Sciences*, **4**, 29–37.

Donovan, D.T. and Howarth, M.K. (1982) A rare lytoceratid ammonite from the Lower Lias of Radstock. *Palaeontology*, **25**, 439–42.

Donovan, D.T. and Kellaway, G.A. (1984) *Geology of the Bristol District: the Lower Jurassic Rocks*, Memoir of the British Geological Survey, Special Sheet (England and Wales), 69 pp.

Donovan, D.T., Horton, A. and Ivimey-Cook, H.C. (1979) The transgression of the Lower Lias over the northern flank of the London Platform. *Journal of the Geological Society*, **136**, 165–73.

References

Donovan, D.T., Curtis, M.T. and Curtis, S.A. (1989) A psiloceratid ammonite from the supposed Triassic Penarth Group of Avon, England. *Palaeontology*, **32**, 231–5.

d'Orbigny, A. (1842–1849). *Palaeontologie Française, Description Zoologique et Géologique de tous les Animaux Mollusques et Rayonnés fossiles de France*, Victor Masson, Paris.

Douglas, J.A. and Cox, L.R. (1949) An early list of strata by William Smith. *Geological Magazine*, **86**(3), 180–8.

Doyle, P. (1985) Sexual dimorphism in the belemnite *Youngibelus* from the Lower Jurassic of Yorkshire. *Palaeontology*, **28**, 133–46.

Doyle, P. (1987) Lower Jurassic–Lower Cretaceous belemnite biogeography and the development of the Mesozoic Boreal Realm. *Palaeogeography, Palaeoclimatology, Palaeoecology*, **61**, 237–54.

Doyle, P. (1990–1992) *The British Toarcian (Lower Jurassic) Belemnites*, Monograph of the Palaeontographical Society, Palaeontographical Society, London, 2 parts, 79 pp.

Doyle, P. and Bennett, M.R. (1995) Belemnites in biostratigraphy. *Palaeontology*, **38**, 815–29.

Doyle, P. and Macdonald, D.I.M. (1993) Belemnite battlefields. *Lethaia*, **26**, 65–80.

Dreghorn, W. (1967) *Geology Explained in the Severn Vale and Cotswolds*, David and Charles, Newton Abbot, 191 pp.

Duff, K.L., McKirdy, A.P. and Harley, M.J. (eds) (1985) *New Sites for Old: A Students' Guide to the Geology of the East Mendips*, Nature Conservancy Council, Peterborough, 189 pp.

Duncan, P.M. (1867a) *A Monograph of the British Fossil Corals*, Second Series, Monograph of the Palaeontographical Society, Palaeontographical Society, London.

Duncan, P.M. (1867b) On the *Astrocoenia* of the Sutton Stone and other deposits in the Infra-Lias of South Wales. *Quarterly Journal of the Geological Society of London*, **23**, 12–28.

Duncan, P.M. (1886) On the Madreporaria of the Infra-Lias of South Wales (chiefly from the Sutton and Southerndown Series). *Quarterly Journal of the Geological Society of London*, **42**, 101–12.

Edmonds, E.A., Poole, E.G. and Wilson, V. (1965) *Geology of the Country around Banbury and Edge Hill*, Memoir of the Geological Survey of Great Britain, Sheet 201 (England and Wales), HMSO, London, 137 pp.

Edmunds, M., Varah, M. and Bentley, A. (2003) The ammonite biostratigraphy of the Lower Lias 'Armatum Bed' (Upper Sinemurian–Lower Pliensbachian) at St Peter's Field, Radstock, Somerset. *Proceedings of the Geologists' Association*, **114**, 65–96.

Egerton, P. de M.G. (1852) *New Genera and Species of Extinct Fishes*, Palaeontological Memoir of the Geological Survey of the United Kingdom, Decade 6, HMSO for the Geological Survey of the United Kingdom, London, 29 pp.

Ellis, N.V. (ed.), Bowen, D.Q., Campbell, S., Knill, J.L., McKirdy, A.P., Prosser, C.D., Vincent, M.A. and Wilson, R.C.L. (1996) *An Introduction to the Geological Conservation Review*, Geological Conservation Review Series, No. **1**, Joint Nature Conservation Committee, Peterborough, 131 pp.

Elmi, S. (1997) Toarcian BWG. *International Subcommission on Jurassic Stratigraphy Newsletter*, **24**, 42–3.

Elmi, S. and Mouterde, R. (1965) Le Lias inférieur et moyen entre Aubenas et Privas (Ardéche). *Travaux du Laboratoire Géologie de la Faculté des Sciences, l'Université Claude Bernard, Lyon*, **12**, 143–246.

Elmi, S., Gabilly, J., Mouterde, R. and Rulleau, L. (1991) Toarcien. *3rd International Symposium on Jurassic Stratigraphy, Poitiers 1991*, p. 127 (abstract only).

Elmi, S., Gabilly, J., Mouterde, R., Rulleau, L. and Rocha, R.B. (1994) L'étage Toarcien de l'Europe et de la Tethys; divisions et corrélations. In *Proceedings of the 3ème Symposium International de Stratigraphie du Jurassique, Poitiers, France, 22–29 September, 1991* (eds E. Cariou and P. Hantzpergue), *Geobios Mémoire Spécial*, No. **17**, Edition de l'Université Claude Bernard, Lyon, pp. 149–59.

Elmi, S., Rulleau, L., Gabilly, J. and Mouterde, R. (1997) Toarcien. In *Biostratigraphie du Jurassique Ouest-Europeen et Mediterranéen: Zonations Parallèles et Distribution des Invertébrés et Microfossiles* (eds E. Cariou and P. Hantzpergue), *Bulletin de la Centre Recherches d'Elf Exploration Production, Memoires*, No. **17**, Elf Exploration Production, Pau, pp. 25–36.

Engeser, T. and Riedel, F. (1992) Scaphopods from Middle Liassic erratic boulders of northern Germany; with a review on Liassic Scaphopoda. *Scripta Geologica*, **99**, 35–56.

Ensom, P.C. (1985a) Evidence of predation on, and post-morten damage to, ammonites from the Eype Nodule Bed, Middle Lias, Dorset. *Proceedings of the Dorset Natural History and Archaeological Society*, **106**, 161–4.

Ensom, P.C. (1985b) Hiatus concretions with a cemented, pedically and bysally attached fauna from the Eype Nodule Bed, Middle Lias, Dorset. *Proceedings of the Dorset Natural History and Archaeological Society*, **106**, 164.

Ensom, P.C. (1987) Scelidosaur remains from the Lower Lias of Dorset. *Proceedings of the Dorset Natural History and Archaeological Society*, **108**, 203–5.

Ensom, P.C. (1988) Siltstone dykes in the Middle Lias of Dorset. *Proceedings of the Dorset Natural History and Archaeological Society*, **109**, 146.

Ensom, P.C. (1989) New scelidosaur remains from the Lower Lias of Dorset. *Proceedings of the Dorset Natural History and Archaeological Society*, **110**, 166–7.

Etheridge, R. (1872) Notes upon the physical structure of the Watchet area, and the relation of the Secondary Rocks to the Devonian series of west Somerset. *Proceedings of the Cotteswold Naturalists' Field Club*, **6**, 35–48.

Etter, W. and Kuhn, O. (2000) An articulated dragonfly (Insecta, Odonata) from the Upper Liassic Posidonia Shale of northern Switzerland. *Palaeontology*, **43**, 967–77.

Evans, D.J. and Chadwick, R.A. (1994) Basement-cover relationships in the Shaftesbury area of the Wessex Basin, southern England. *Geological Magazine*, **131**, 387–94.

Evans, D.J. and Thompson, M.S. (1979) The geology of the central Bristol Channel and the Lundy area, South Western Approaches, British Isles. *Proceedings of the Geologists' Association*, **90**, 1–14.

Evans, S.E. and Kermack, K.A. (1994) Assemblages of small tetrapods from the Early Jurassic of Britain. In *In the Shadow of the Dinosaurs: Early Mesozoic Tetrapods* (eds N.C. Fraser and H.-D. Sues), Cambridge University Press, Cambridge, pp. 271–83.

Evans, J.W. and Stubblefield, C.J. (1929) *Handbook of the Geology of Great Britain*, T. Murby and Co., London, 556 pp.

Farrer, B. (1994) What is the stratigraphic significance of the Raasay Ironstone within part of the Inner Hebrides Basin. Unpublished MSc thesis, Birkbeck College, University of London.

Farris, M.A., Oates, M.J. and Torrens, H.S. (1999) New evidence on the origin and Jurassic age of palaeokarst and limestone breccias, Loch Slapin, Isle of Skye. *Scottish Journal of Geology*, **34**, 25–9.

Farrow, G.E. (1966) Bathymetric zonation of Jurassic trace fossils from the coast of Yorkshire, England. *Palaeogeography, Palaeoclimatology, Palaeoecology*, **2**, 103–51.

Faujas de Saint-Fond, B. (1797) *Voyage en Angleterre, en Écosse et aux îles Hébrides*, H.J. Jansen, Paris, 2 volumes.

Feldmann, R.M., Crisp, G. and Pirrie, D. (2002) A new species of glypheoid lobster, *Pseudoglyphea foersteri* (Decapoda: Astacidea: Mecochiridae) from the Lower Jurassic (Pliensbachian) of Raasay, Inner Hebrides, UK. *Palaeontology*, **45**, 23–32.

Fenton, J.P.G. and Fisher, M.J. (1978) Regional distribution of marine microplankton in the Bajocian and Bathonian of northwest Europe. In *I Coloquio Internacional de Palinologia, 5–10 Setiembre 1977 Leon* (eds F.H. Kramer, M. del Carmen Rodriguez Diez and M. Gutierrez), *Palinologia Número Extraordinario*, No. **1**, Instituto de Investigaciones Palinologicas, Leon, pp. 233–40.

Fletcher, C.J.N. (1988) Tidal erosion, solution cavities and exhalative mineralization associated with the Jurassic unconformity at Ogmore, South Glamorgan. *Proceedings of the Geologists' Association*, **99**, 1–14.

Fletcher, C.J.N., Davies, J.R., Wilson, D. and Smith, M. (1986) The depositional environment of the basal 'Littoral Lias' in the Vale of Glamorgan – a discussion of the reinterpretation by Ager (1986). *Proceedings of the Geologists' Association*, **97**, 383–4.

Fletcher, C.J.N., Swainbank, I.G. and Colman, T.B. (1993) Metallogenic evolution in Wales: constraints from lead isotope modelling. *Journal of the Geological Society*, **150**, 77–82.

Fox-Strangways, C. (1892) *The Jurassic Rocks of Britain, Volume I: Yorkshire*, Memoir of the Geological Survey of the United Kingdom, HMSO, London, 551 pp.

Fox-Strangways, C. (1903) *The Geology of the Country Near Leicester*, Memoir of the Geological Survey of the United Kingdom, Sheet 156 (England and Wales), HMSO, London, 122 pp.

References

Fox-Strangways, C. and Barrow, G. (1882). *The Geology of the Country between Whitby and Scarborough*, Memoir of the Geological Survey of the United Kingdom, Sheet 95NW (England and Wales), HMSO, London, 60 pp.

Fox-Strangways, C. and Barrow, G. (1915) *The Geology of the Country between Whitby and Scarborough*, 2nd edn, Memoir of the Geological Survey of Great Britain, sheets 35 and 44 (England and Wales), HMSO, London, 146 pp.

Fraser, N.C. (1994) Assemblages of small tetrapods from British Late Triassic fissure deposits. In *In the Shadow of the Dinosaurs: Early Mesozoic Tetrapods* (eds N.C. Fraser and H.-D. Sues), Cambridge University Press, Cambridge, pp. 214–26.

Gabilly, J. (1976) *Le Toarcian à Thouars dans le centre-ouest de la France*, Les Stratotypes Français, Vol. **3**, Éditions du CNRS, Paris, 217 pp.

Gabilly, J., Elmi, S., Mattei, J. and Mouterde, R. (1971) Les zones du Jurassique en France: Toarcien. *Compte rendue sommaire des séances de la Société Géologique de France*, **2**, 82–4.

Gad, M.A. (1966) A geochemical study of the Liassic rocks of the Yorkshire coast. Unpublished PhD thesis, University of London.

Gad, M.A., Catt, S.A. and LeRiche, H.H. (1969) Geochemistry of the Whitbian (Upper Lias) sediments of the Yorkshire coast. *Proceedings of the Yorkshire Geological Society*, **37**, 105–39.

Gaunt, G.D., Fletcher, T.P. and Wood, C.J. (1992) *Geology of the Country around Kingston-upon-Hull and Brigg*, Memoir of the British Geological Survey, sheets 80 and 89 (England and Wales), HMSO, London, 172 pp.

Gavey, G.E. (1853) On the sections of the Lower Lias at Mickleton Tunnel and Aston Magna. *Quarterly Journal of the Geological Society of London*, **9**, 29–37.

Geikie, A. (1858) On the geology of Strath, Skye. *Quarterly Journal of the Geological Society of London*, **14**, 1–37.

Getty, T.A. (1972) Revision of the Jurassic ammonite family Echioceratidae. Unpublished PhD thesis, University of London.

Getty, T.A. (1973) A revision of the generic classification of the family Echioceratidae (Cephalopoda, Ammonoidea) (Lower Jurassic). *University of Kansas Paleontological Contributions*, **63**, 1–32.

Gilliland, P.M. (1992) Holothurians in the Blue Lias of southern Britain. *Palaeontology*, **35**, 159–210.

Gilliland, P.M. (1993) *The Skeletal Morphology, Systematics and Evolutionary History of Holothurians*, *Special Papers in Palaeontology*, No. **47**, Palaeontological Association, London, 147 pp.

Godwin-Austen, R.A.C. (1856) On the possible extension of the Coal Measures beneath the south-eastern part of England. *Quarterly Journal of the Geological Society of London*, **12**, 38–73.

Goldring, R. and Stephenson, D.G. (1972) The depositional environment of three Starfish Beds. *Neues Jahrbuch für Geologie und Paläontologie, Monatshefte*, **10**, 611–24.

Golebiowski, R. (1990) Facies and faunistic changes from Triassic to Jurassic in the Northern Calcareous Alps (Austria). *Cahiers de l'Université Catholique de Lyon, Série Sciences*, **3**, 175–84.

Goy, A. and Ureta, M.S. (1991) The lower boundary of the Aalenian in the Fuentelsaz section (Iberian Range, Spain). In *Proceedings of the Conference on Aalenian and Bajocian Stratigraphy, Isle of Skye, Scotland, 13–20 April, 1991* (ed. N. Morton), Birkbeck College, University of London, London, pp. 33–47.

Greaves, J. (1832) A fossilised fish and Ichthyosaurus found in a stone quarry near Stratford upon Avon. *Magazine of Natural History*, **5**, 549.

Green, G.W. (1992) *British Regional Geology: Bristol and Gloucester Region*, HMSO, London, 188 pp.

Green, G.W. and Melville, R.V. (1956) The stratigraphy of the Stowell Park borehole. *Bulletin of the Geological Survey of Great Britain*, **11**, 1–66.

Green, G.W. and Welch, F.B.A. (1965) *Geology of the Country around Wells and Cheddar*, Memoir of the Geological Survey of Great Britain, Sheet 280 (England and Wales), HMSO, London, 225 pp.

Green, P.F., Thomson, K. and Hudson, J.D. (2001) Recognition of tectonic events in undeformed regions: contrasting results from the Midland Platform and East Midlands Shelf, central England. *Journal of the Geological Society*, **158**, 59–73.

Greensmith, J.T., Rawson, P.F. and Shalaby, S.E. (1980) An association of minor fining-upward cycles and aligned gutter marks in the Middle Lias (Lower Jurassic) of Yorkshire. *Proceedings of the Yorkshire Geological Society*, **42**, 525–38.

Greensmith, J.T., Rawson, P.F. and Shalaby, S.E. (1983) Coarsening-upward cycles in the uppermost Staithes and Cleveland Ironstone Formations (Lower Jurassic) of Yorkshire. *Proceedings of the Geologists' Association*, **94**, 91–3.

Guex, J. (1980) Remarques preliminaires sur la distribution stratigraphique des ammonites Hettangiennes du New York Canyon (Gabbs Valley Range, Nevada). *Bulletin de la Société Vaudoise des Sciences Naturelles (Lausanne)*, **75**, 127–40.

Guex, J. (1982) Relations entre le genre *Psiloceras* et les Phylloceratida au voisinage de la limite Trias–Jurassique. *Bulletin de la Société Vaudoise des Sciences Naturelles (Lausanne)*, **76**, 47–51.

Guex, J., Rakus, M., Taylor, D. and Bucher, H. (1997) Selection of a GSSP candidate for the base of the Jurassic System: Proposal for the New York Canyon area (Gabbs Valley Range, Nevada). *International Subcommission on Jurassic Stratigraphy Newsletter*, **24**, 26–30.

Guise, W.V. (1880) Alderton [report of field meeting on 19-8-1879]. *Proceedings of the Cotteswold Naturalists' Field Club*, **7**, 148–50.

Haggerty, R., Budd, P., Rohl, B. and Gale, N.H. (1996) Pb-isotope evidence for the role of Mesozoic basins in the genesis of Mississippi Valley-type mineralization in Somerset, UK. *Journal of the Geological Society*, **153**, 673–6.

Hallam, A. (1955) The palaeontology and stratigraphy of the Marlstone Rock-bed in Leicestershire. *Transactions of the Leicester Literary and Philosophical Society*, **49**, 17–35.

Hallam, A. (1956) The Rhaetic and Lias beds at Tolcis, near Axminster. *Proceedings of the Dorset Natural History and Archaeological Society*, **78**, 58–63.

Hallam, A. (1957) Primary origin of the limestone–shale rhythm in the British Lower Lias. *Geological Magazine*, **94**, 175–6.

Hallam, A. (1958) The concept of Jurassic axes of uplift. *Science Progress*, **183**, 441–9.

Hallam, A. (1959) Stratigraphy of the Broadford Beds of Skye, Raasay and Applecross. *Proceedings of the Yorkshire Geological Society* **32**, 165–84.

Hallam, A. (1960a) A sedimentary and faunal study of the Blue Lias of Dorset and Glamorgan. *Philosophical Transactions of the Royal Society of London, Series B*, **243**, 1–44.

Hallam, A. (1960b) The White Lias of the Devon Coast. *Proceedings of the Geologists' Association*, **71**, 47–60.

Hallam, A. (1961) Cyclothems, transgressions and faunal change in the Lias of north-west Europe. *Transactions of the Edinburgh Geological Society*, **18**, 124–74.

Hallam, A. (1962a) A band of extraordinary calcareous concretions in the Upper Lias of Yorkshire, England. *Journal of Sedimentary Petrology*, **32**, 840–7.

Hallam, A. (1962b) Brachiopod life assemblages from the Marlstone Rock-bed of Leicestershire. *Palaeontology*, **4**, 653–9.

Hallam, A. (1963) Observations on the palaeoecology and ammonite sequence of the Frodingham ironstone (Lower Jurassic). *Palaeontology*, **6**, 554–74.

Hallam, A. (1964a) Origin of the limestone–shale rhythm in the Blue Lias of England: a composite theory. *Journal of Geology*, **72**, 157–69.

Hallam, A. (1964b) Liassic sedimentary cycles in western Europe and their relationship to changes in sea level. In *Deltaic and Shallow Marine Deposits: Proceedings of the Sixth International Sedimentological Congress, the Netherlands and Belgium, 1963* (ed. L.M.J.U. van Straaten), Developments in Sedimentology, No. **1**, Elsevier, Amsterdam, pp. 157–64.

Hallam, A. (1966) Depositional environment of British Liassic ironstones considered in the context of their facies relationships. *Nature*, **209**, 1306–7.

Hallam, A. (1967a) An environmental study of the Upper Domerian and Lower Toarcian in Great Britain. *Philosophical Transactions of the Royal Society of London, Series B*, **252**, 393–445.

Hallam, A. (1967b) Siderite and calcite-bearing concretionary nodules in the Lias of Yorkshire. *Geological Magazine*, **104**, 222–7.

Hallam, A. (1968a) The Lias. In *The Geology of the East Midlands* (eds P.C. Sylvester-Bradley and T.D. Ford), Leicester University Press, Leicester, pp. 188–210.

Hallam, A. (1968b) Morphology, palaeocology and evolution of the genus *Gryphaea* in the British Lias. *Philosophical Transactions of the Royal Society of London, Series B*, **254**, 91–128.

Hallam, A. (1969) A pyritised limestone hardground in the Lower Jurassic of Dorset (England). *Sedimentology*, **12**, 231–40.

Hallam, A. (1975) *Jurassic Environments*, Cambridge Earth Science Series, Cambridge University Press, Cambridge, 269 pp.

Hallam, A. (1978) Eustatic cycles in the Jurassic. *Palaeogeography, Palaeoclimatology, Palaeoecology*, **23**, 1–32.

Hallam, A. (1981) A revised sea-level curve for the early Jurassic. *Journal of the Geological Society*, **138**, 735–43.

Hallam, A. (1982) Patterns of speciation in Jurassic *Gryphaea*. *Paleobiology*, **8**, 354–66.

Hallam, A. (1984) Pre-Quaternary sea-level changes. *Annual Reviews of Earth and Planetary Science*, **12**, 205–43.

Hallam, A. (1985) A review of Mesozoic climates. *Journal of the Geological Society*, **142**, 433–45.

Hallam, A. (1986) Origin of minor limestone–shale cycles: Climatically induced or diagenetic? *Geology*, **14**, 609–12.

Hallam, A. (1987a) Radiations and extinctions in relation to environmental change in the marine Lower Jurassic of northwest Europe. *Paleobiology*, **13**, 152–68.

Hallam, A. (1987b) Mesozoic marine organic-rich shales. In *Marine Petroleum Source Rocks* (eds J. Brooks and A.J. Fleet), *Geological Society Special Publication*, No. **26**, Blackwell Scientific Publications for the Geological Society, Oxford, pp. 251–61.

Hallam, A. (1988) A re-evaluation of Jurassic eustasy in the light of new data and the revised Exxon curve. In *Sea-level changes: an integrated approach* (eds C.K. Wilgus, B.S. Hastings, G.St.C. Kendall, H.W. Posamentier, C.A. Ross and J.C. van Wagoner), *Society of Economic and Petroleum Palaeontologists and Mineralogists Special Publication*, No. **42**, Society of Economic and Petroleum Palaeontologists and Mineralogists (SEPM), Tulsa, pp. 261–73.

Hallam, A. (1990a) The end-Triassic mass extinction event. In *Global Catastrophes in Earth History: an Interdisciplinary Conference on Impacts, Volcanism and Mass Mortality* (eds V.L. Sharpton and P.D. Ward), *Geological Society of America Special Paper*, No. **247**, Geological Society of America, Boulder, pp. 577–83.

Hallam, A. (1990b) Correlation of the Triassic–Jurassic boundary in England and Austria. *Journal of the Geological Society*, **147**, 421–4.

Hallam, A. (1990c) Discussion on correlation of the Triassic–Jurassic boundary in England and Austria. *Journal of the Geological Society*, **148**, 421–2.

Hallam, A. (1991) Jurassic, Cretaceous and Tertiary sediments. In *Geology of Scotland*, 3rd edn (ed. G.Y. Craig), Geological Society, London, pp. 439–53.

Hallam, A. (1992a) *Phanerozoic Sea-level Changes*, Columbia University Press, New York, 266 pp.

Hallam, A. (1992b) Jurassic. In *Geology of England and Wales* (eds P.McL.D. Duff and A.J. Smith), Geological Society, London, pp. 325–54.

Hallam, A. (1994) Jurassic climates as inferred from the sedimentary and fossil record. *Philosophical Transactions of the Royal Society of London, Series B*, **341**, 287–96.

Hallam, A. (1996) Recovery of the marine fauna in Europe after the end-Triassic and early Toarcian mass extinctions. In *Biotic Recovery from Mass Extinction Events* (ed. M.B. Hart), *Geological Society Special Publication*, No. **102**, Geological Society, London, pp. 231–6.

Hallam, A. (1997) Estimates of the amount and rate of sea-level change across the Rhaetian–Hettangian and Pliensbachian–Toarcian boundaries (latest Triassic to early Jurassic). *Journal of the Geological Society*, **154**, 773–9.

Hallam, A. (1999) Evidence of sea-level fall in sequence stratigraphy: Examples from the Jurassic. *Geology*, **27**, 343–6.

Hallam, A. (2001) A review of the broad pattern of Jurassic sea-level changes and their possible causes in the light of current knowledge. *Palaeogeography, Palaeoclimatology, Palaeoecology*, **167**, 23–37.

Hallimond, A.F. (1925) *Iron Ores: Bedded Ores of England and Wales: Petrography and Chemistry*, Special Report of the Mineral Resources of Great Britain, Memoir of the Geological Survey of Great Britain, Vol. **29**, HMSO, London, 139 pp.

Hamilton, D. and Whittaker, A. (1977) Coastal exposures near Blue Anchor, Watchet and St Audrie's Bay, north Somerset. In *Geological Excursions in the Bristol District* (ed. R.J.G. Savage), University of Bristol, Bristol, pp. 101–9.

Hamilton, G.B. (1982) Triassic and Jurassic calcareous nannofossils. In *A Stratigraphical Index of Calcareous Nannofossils* (ed. A.R. Lord), British Micropalaeontological Society Publication Series, Ellis Horwood, Chichester, pp. 17–39.

Hamlet, J. (1922) On sections in the Lias exposed in two quarries at Barrington. *Proceedings of the Somerset Archaeological and Natural History Society*, **67**, 72–5.

Haq, B.U., Hardenbol, J. and Vail, P.R. (1987) The chronology of fluctuating sea level since the Triassic. *Science*, **235**, 1156–67.

Haq, B.U., Hardenbol, J. and Vail, P.R. (1988) Mesozoic and Cenozoic chronostratigraphy and eustatic cycles. In *Sea-level Changes: an Integrated Approach* (eds C.K. Wilgus, B.S. Hastings, G.St.C. Kendall, H.W. Posamentier, C.A. Ross and J.C. van Wagoner), *Society of Economic and Petroleum Paleontologists and Mineralogists Special Publication*, No. **42**, SEPM, Tulsa, pp. 71–108.

Harland, W.B., Armstrong, R.L., Cox, A.V., Craig, L.E., Smith, A.G. and Smith, D.G. (1990) *A Geologic Time Scale 1989*, Cambridge University Press, Cambridge, 263 pp.

Harper, E.M., Forsythe, G.T.W. and Palmer, T. (1998) Taphonomy and the Mesozoic marine revolution: Preservation state masks the importance of boring predators. *Palaios*, **13**, 352–60.

Harris, T.M. (1957) A Liasso–Rhaetic flora in South Wales. *Proceedings of the Royal Society, Series B*, **147**, 289–308.

Hart, M.B., Prudden, H. and Edwards, S. (1992) New observations on the Ham Hill Stone (Lower Jurassic). *Proceedings of the Ussher Society*, **6**, 73.

Hauff, B. and Hauff, R.B. (1981) *Das Holzmadenbuch*, Pleidelsheim, 136 pp.

Hedberg, H.D. (1976) *International Stratigraphic Guide: a Guide to Stratigraphic Classification, Terminology and Procedure*, Wiley-Interscience, New York, 200 pp.

Hemingway, J.E. (1974) Jurassic. In *The Geology and Mineral Resources of Yorkshire* (eds D.H. Rayner and J.E. Hemingway), *Yorkshire Geological Society Occasional Publication*, No. **2**, Yorkshire Geological Society, Leeds, pp. 161–223.

Hemingway, J.E., Wright, J.K. and Torrens, H.S. (eds) (1969) *Excursion No. 1: Guide for Dorset and south Somerset; Excursion No. 2: Guide for north Somerset and Gloucestershire; Excursion No. 3: Guide for north-east Yorkshire; Excursion No. 4: Guide for western Scotland*, International Field Symposium on the British Jurassic, Department of Geology, University of Keele.

Henderson, I.J. (1934) The Lower Lias at Hock Cliff, Fretherne. *Proceedings of the Bristol Naturalists' Society, Fourth Series*, **7**, 549–64.

Herries, R.S. (1906a) The geology of the Yorkshire coast betwen Redcar and Robin Hood's Bay. *Proceedings of the Geologists' Association*, **19**, 410–45.

Herries, R.S. (1906b) Long excursion to the Yorkshire coast. *Proceedings of the Geologists' Association*, **19**, 464–77.

Hess, H. (1960) *Ophioderma escheri* Heer aus dem unteren Lias der Schambelen (Kt. Aargau) und verwandte Lias-Ophiuren aus England und Deutschland. *Eclogae Geologicae Helvetiae*, **53**, 757–93.

Hess, H. (1962) Mikropaläontologische Untersuchungen an Ophiuren. *Eclogae Geologicae Helvetiae*, **55**, 595–656.

Hess, H. (1964) Die Ophiuren des englischen Jura. *Eclogae Geologicae Helvetiae*, **57**, 755–802.

Hesselbo, S.P. (1997) Discussion on a sequence-stratigraphic interpretation of a mudstone-dominated succession: the Lower Jurassic Cleveland Ironstone Formation, UK. *Journal of the Geological Society*, **154**, 913.

Hesselbo, S.P. and Coe, A.L. (2000) Jurassic sequences of the Hebrides Basin, Isle of Skye, Scotland. In *International Association of Sedimentologists Dublin September 2000: Field Trip Guidebook* (eds J.R. Graham and A. Ryan), Trinity College, Dublin, pp. 41–58.

Hesselbo, S.P. and Jenkyns, H.C. (1995) A comparison of the Hettangian to Bajocian successions of Dorset and Yorkshire. In *Field Geology of the British Jurassic* (ed. P.D. Taylor), Geological Society, London, pp. 105–50.

Hesselbo, S.P. and Jenkyns, H.C. (1998) British Lower Jurassic sequence stratigraphy. In *Mesozoic and Cenozoic Sequence Stratigraphy of European Basins* (eds P.C. Graciansky, J. Hardenbol, T. Jacquin and P.R. Vail), *Society for Sedimentary Geology Special Publication*, No. **60**, Society for Sedimentary Geology (SEPM), Tulsa, pp. 561–81.

Hesselbo, S.P. and Palmer, T.J. (1992) Reworked early diagenetic concretions and the bioerosional origin of a regional discontinuity within British Jurassic marine mudstones. *Sedimentology*, **39**, 1045–65.

Hesselbo, S.P., Oates, M.J. and Jenkyns, H.C. (1998) The Lower Lias Group of the Hebrides Basin. *Scottish Journal of Geology*, **34**, 23–60.

Hesselbo, S.P., Oates, M.J. and Jenkyns, H.C. (1999) The lower Lias Group of the Hebrides Basin: Reply [to comment by N. Morton]. *Scottish Journal of Geology*, **35**, 87–8.

Hesselbo, S.P., Meister, C. and Gröcke, D.R. (2000) A potential global stratotype for the Sinemurian–Pliensbachian boundary (Lower Jurassic), Robin Hood's Bay, UK: ammonite faunas and isotope stratigraphy. *Geological Magazine*, **137**, 601–7.

Hesselbo, S.P., Robinson, S.A., Surlyk, F. and Piasecki, S. (2002) Terrestrial and marine extinction at the Triassic–Jurassic boundary synchronized with major carbon-cycle perturbation: A link to initiation of massive volcanism? *Geology*, **30**, 251–4.

Hewitt, R.A. (1980a) Microstructural contrasts between some sedimentary francolites. *Journal of the Geological Society*, **137**, 661–67.

Hewitt, R.A. (1980b) Quantitative studies on some Jurassic belemnite assemblages. *Geobios*, **13**, 173–97.

Hewitt, R.A. (1989) Recent growth of nautiloid and ammonite taxonomy. *Paläontologie Zeitschrift*, **63**, 281–96.

Hewitt, R.A. (1996) Architecture and strength of the ammonite shell. In *Ammonoid Paleobiology* (eds N.H. Landman, K. Tanabe and R.A. Davis), Topics in Geobiology, No. **13**, Plenum Press, New York, pp. 297–339.

Hewitt, R.A. and Hurst, J.M. (1977) Size changes in Jurassic liparoceratid ammonites and their stratigraphical and ecological significance. *Lethaia*, **10**, 287–301.

Hodges, P. (1986) The Lower Lias (Lower Jurassic) of the Bridgend area, South Wales. *Proceedings of the Geologists' Association*, **97**, 237–42.

Hodges, P. (1994) The base of the Jurassic System: new data on the first appearance of *Psiloceras planorbis* in southwest Britain. *Geological Magazine*, **131**, 841–4.

Hodges, P. (2000) *The Early Jurassic Bivalvia from the Hettangian and Lower Sinemurian of south-west Britain*, Part 1, Monograph of the Palaeontographical Society, Palaeontographical Society, London, 64 pp.

Hodych, J.P. and Dunning, G.R. (1992) Did the Manicouagan impact trigger end-of-Triassic mass extinction? *Geology*, **20**, 51–4.

Hollingworth, N.T.J., Ward, D.J., Simms, M.J. and Clothier, P. (1990) A temporary exposure of Lower Lias (Late Sinemurian) at Dimmer Camp, Castle Cary, Somerset, south-west England. *Mesozoic Research*, **2**, 163–80.

Holloway, S. and Chadwick, R.A. (1984) The IGS Bruton Borehole (Somerset, England) and its regional structural significance. *Proceedings of the Geologists' Association*, **95**, 165–74.

Horner, L. (1816) Sketch of the geology of the south-western part of Somersetshire. *Transactions of the Geological Society*, **3**, 338–84.

Horton, A. and Poole, E.G. (1977) The lithostratigraphy of three geophysical marker horizons in the Lower Lias of Oxfordshire. *Bulletin of the Geological Survey of Great Britain*, **62**, 13–24.

Hounslow, M.H. (1987) Magnetic fabric characteristics of bioturbated wave-produced grain orientation in the Bridport–Yeovil Sands (Lower Jurassic) of southern England. *Sedimentology*, **34**, 117–28.

House, M.R. (1985) A new approach to an absolute time scale from measurements of orbital cycles and sedimentary microrhythms. *Nature*, **316**, 721–5.

House, M.R. (1986) Are Jurassic sedimentary microrhythms due to orbital forcing? *Proceedings of the Ussher Society*, **6**, 299–311.

House, M.R. (1989) *Geology of the Dorset Coast*, Geologists' Association Guide, No. **22**, Geologists' Association, London, 162 pp.

Howard, A.S. (1985) Lithostratigraphy of the Staithes Sandstone and Cleveland Ironstone Formations (Lower Jurassic) of north-east Yorkshire. *Proceedings of the Yorkshire Geological Society*, **45**, 261–75.

Howarth, M.K. (1955) Domerian of the Yorkshire Coast. *Proceedings of the Yorkshire Geological Society*, **30**, 147–75.

Howarth, M.K. (1956) The Scalpa Sandstone of the Isle of Raasay. *Proceedings of the Yorkshire Geological Society*, **30**, 353–70.

Howarth, M.K. (1957) The Middle Lias of the Dorset coast. *Quarterly Journal of the Geological Society of London*, **113**, 185–204.

Howarth, M.K. (1958) *A Monograph of the Ammonites of the Liassic Family Amaltheidae in Britain*, Monograph of the Palaeontographical Society, Palaeontographical Society, London, 53 pp.

Howarth, M.K. (1962a) The Jet Rock Series and the Alum Shale Series of the Yorkshire coast. *Proceedings of the Yorkshire Geological Society*, **33**, 381–422.

Howarth, M.K. (1962b) The Yorkshire type ammonites and nautiloids of Young and Bird, Phillips, and Martin Simpson. *Palaeontology*, **5**, 93–136.

Howarth, M.K. (1973) The stratigraphy and ammonite fauna of the Upper Liassic Grey Shales of the Yorkshire coast. *Bulletin of the British Museum (Natural History): Geology*, **24**, 237–77.

Howarth, M.K. (1976) An occurrence of the Tethyan ammonite *Meneghiniceras* in the Upper Lias of the Yorkshire coast. *Palaeontology*, **19**, 773–7.

Howarth, M.K. (1978) The stratigraphy and ammonite fauna of the Upper Lias of Northamptonshire. *Bulletin of the British Museum (Natural History): Geology*, **29**, 235–88.

Howarth, M.K. (1980) The Toarcian age of the upper part of the Marlstone Rock Bed of England. *Palaeontology*, **23**, 637–56.

Howarth, M.K. (1992) *The ammonite family Hildoceratidae in the Lower Jurassic of Britain*. Monograph of the Palaeontographical Society, Palaeontographical Society, London, 200 pp.

Howarth, M.K. (2002) The Lower Lias of Robin Hood's Bay, Yorkshire, and the work of Leslie Bairstow. *Bulletin of the British Museum (Natural History): Geology*, **28**, 81–152.

Howarth, M.K. and Donovan, D.T. (1964) Ammonites of the Liassic Family Juraphyllitidae in Britain. *Palaeontology*, **7**, 286–305.

Hudleston, W.H. (1874) The Yorkshire Oolites, Part I. *Proceedings of the Geologists' Association*, **3**, 283–333.

Hudleston, W.H. and Wilson, E. (1892) *A Catalogue of British Jurassic Gasteropoda: Comprising the Genera and Species hitherto Described, with References to their Geological Distribution and to the Localities in which they have been found*, Published by the Authors and Dulau and Co., London, 147 pp.

Hudson, J.D. (1976) Discussion of basins and swells in the British Jurassic. *Journal of the Geological Society*, **132**, 227–32.

Hudson, J.D. (1983) Mesozoic sedimentation and sedimentary rocks in the Inner Hebrides. *Proceedings of the Royal Society of Edinburgh, Series B*, **83**, 47–63.

Hull, E. (1857) *The Geology of the Country around Cheltenham*, Memoir of the Geological Survey of the United Kingdom, Sheet 44 (England and Wales), HMSO, London, 104 pp.

Hunton, L. (1836) Remarks on a section of the Upper Lias and Marlstone of Yorkshire, showing the limited vertical range of the species of ammonites, and other Testacea, with their value as geological tests. *Transactions of the Geological Society of London, Series 2*, **5**, 215–21.

Hurst, A. (1985) The implications of clay mineralogy to palaeoclimate and provenance during the Jurassic in N.E. Scotland. *Scottish Journal of Geology*, **21**, 143–60.

Hyatt, A. (1889) *Genesis of the Arietidae*, Smithsonian Contributions to Knowledge, No. **673**, Smithsonian Institution, Washington DC, 283 pp.

Hylton, M.D. (1998) A preliminary analysis of the Foraminifera from the Hettangian–Sinemurian boundary of East Quantoxhead, west Somerset. *Geoscience in South-west England*, **9**, 203–8.

Hylton, M.D. and Hart, M.B. (2000) Benthic foraminiferal response to Pliensbachian–Toarcian (Lower Jurassic) sea-level change and oceanic anoxia in NW Europe. In *Advances in Jurassic Research 2000, Proceedings of the Fifth International Symposium on the Jurassic System, held in Vancouver, Canada, August 12–25, 1998* (eds R.L. Hall and P.L. Smith), GeoResearch Forum, No. **6**, Trans Tech Publications, Zürich, pp. 455–62.

Ivimey-Cook, H.C. (1978) Stratigraphy of the Jurassic of the Elton Farm Borehole near Dundry, Avon. *Bulletin of the Geological Survey of Great Britain*, **69**, 1–9.

Ivimey-Cook, H.C. (1982) Biostratigraphy of the Lower Jurassic and Upper Triassic (Rhaetian) rocks of the Winterborne Kingston borehole, Dorset. *Report of the Institute of Geological Sciences* , **81/3**, 97–106.

References

Ivimey-Cook, H.C. and Donovan, D.T. (1983) Appendix 3. The fauna of the Lower Jurassic. In *Geology of the country around Weston-super-Mare* (eds A. Whittaker and G.W. Green), Memoir of the Geological Survey of Great Britain, Sheet 279 and parts of 263 and 295 (England and Wales), HMSO, London, pp. 126–30.

Ivimey-Cook, H.C. and Powell, J.H. (1991) Late Triassic and early Jurassic biostratigraphy of the Felixkirk Borehole, north Yorkshire. *Proceedings of the Yorkshire Geological Society*, **48**, 367–74.

Ivimey-Cook, H.C., Gaunt, G.D., Green, G.W., Horton, A., Warrington, G. and Whittaker, A. (1980) The Triassic–Jurassic boundary in Great Britain. *Geological Magazine*, **117**, 617–18.

Jackson, J.F. (1922) Sections of the Junction Bed and contiguous deposits. *Quarterly Journal of the Geological Society of London*, **78**, 436–48.

Jackson, J.F. (1926) The Junction Bed of the Middle and Upper Lias on the Dorset coast. *Quarterly Journal of the Geological Society of London*, **82**, 490–525.

Jenkins, D.G., Copestake, P., van Calsteren, P. and McDermott, F. (1990) Correlation of lead isotopes in Lower Jurassic rocks of South Wales. *Proceedings of the Geologists' Association*, **101**, 341–3.

Jenkyns, H.C. (1988) The early Toarcian (Jurassic) anoxic event: stratigraphic, sedimentary and geochemical evidence. *American Journal of Science*, **288**, 101–51.

Jenkyns, H.C. and Senior, J.R. (1977) A Liassic palaeofault from Dorset. *Geological Magazine*, **114**, 47–52.

Jenkyns, H.C. and Senior, J.R. (1991) Geological evidence for intra-Jurassic faulting in the Wessex Basin and its margins. *Journal of the Geological Society*, **148**, 245–60.

Johnson, A.L.A. (1984) The palaeobiology of the bivalve families Pectinidae and Propeamussidae in the Jurassic of Europe. *Zitteliana*, **11**, 235.

Johnson, A.L.A. (1993) Punctuated equilibria versus phyletic gradualism in European Jurassic *Gryphaea* evolution. *Proceedings of the Geologists' Association*, **104**, 209–22.

Johnson, A.L.A. (1994) Evolution of European Lower Jurassic *Gryphaea* (*Gryphaea*) and contemporaneous bivalves. *Historical Biology*, **7**, 167–86.

Johnson, M.E. and McKerrow, W.S. (1995) The Sutton Stone: An early Jurasic rocky shore deposit in South Wales. *Palaeontology*, **38**, 529–41.

Jones, T.R. (1862) *A Monograph of the Fossil Estheriae*, Monograph of the Palaeontographical Society, Palaeontographical Society, London, 132 pp.

Jones, C.E., Jenkyns, H.C. and Hesselbo, S.P. (1994) Strontium isotopes in Early Jurassic seawater. *Geochimica et Cosmochimica Acta*, **58**, 1285–301.

Jones, D.S. and Gould, S.J. (1999) Direct measurement of age in fossil *Gryphaea*: the solution to a classic problem in heterochrony. *Paleobiology*, **25**, 158–87.

Joss, K.L. (1980) The ammonite *Eparietites undaries* (Quenstedt) in the Lower Jurasic (Sinemurian) of Britain. *Mercian Geologist*, **8**, 63–8.

Judd, J.W. (1873) The secondary rocks of Scotland. *Quarterly Journal of the Geological Society of London*, **29**, 97–195.

Judd, J.W. (1875) *The Geology of Rutland, and the parts of Lincoln, Leicester, Northampton, Huntingdon and Cambridge*, Memoir of the Geological Survey of the United Kingdom, Sheet 64 (England and Wales), HMSO, London, 320 pp.

Judd, J.W. (1878) The Secondary rocks of Scotland. Third Paper. The strata of the Western Coast and Islands. *Quarterly Journal of the Geological Society of London*, **34**, 660–743.

Kamerling, P. (1979) The geology and hydrocarbon habitat of the Bristol Channel Basin. *Journal of Petroleum Geology*, **2**, 75–93.

Kear, A.J., Briggs, D.E.G. and Donovan, D.T. (1995) Decay and fossilisation of non-mineralised tisue in coleoid cephalopods. *Palaeontology*, **38**, 105–31.

Kellaway, G.A. and Wilson, V. (1941a) An outline of the geology of Yeovil, Sherbourne and Sparkford Vale. *Proceedings of the Geologists' Association*, **52**, 131–74.

Kellaway, G.A. and Wilson, V. (1941b) Whitsun field meeting in the Yeovil district. *Proceedings of the Geologists' Association*, **52**, 175–82.

Kendall, P.F. (1905) Sub-report on the concealed portion of the coalfield of Yorkshire, Derbyshire and Nottinghamshire. Appendix III. In *Final Report of the Royal Commission on Coal Supplies*, Part 9, HMSO, London, pp. 18–35.

References

Kent, P.E. (1955) The Market Weighton Structure. *Proceedings of the Yorkshire Geological Society*, **30**, 197–227.

Kent, P. (1976) Discussion of basins and structural highs in the British Jurassic. *Journal of the Geological Society*, **132**, 685–6.

Kent, P.E. (1980) Subsidence and uplift in east Yorkshire and Lincolnshire: a double inversion. *Proceedings of the Yorkshire Geological Society*, **42**, 505–24.

Kermack, D.M., Kermack, K.A. and Mussett, F. (1968) The Welsh Pantothere *Kuehneotherium praecursoris*. *Journal of the Linnaean Society (Zoology)*, **47**, 407–23.

Knell, S.J. (1988) *The Natural History of the Frodingham Ironstone*, Scunthorpe Borough Museum and Art Gallery, Scunthorpe, 24 pp.

Knell, S.J. (1990) The end for the Frodingham Ironstone? *Geology Today*, **6**, 125–8.

Knox, R.W.O'B. (1984) Lithostratigraphy and depositional history of the late Toarcian sequence at Ravenscar, Yorkshire. *Proceedings of the Yorkshire Geological Society*, **45**, 99–108.

Knox, R.W.O'B., Morton, A.C. and Lott, G.K. (1982) Petrology of the Bridport Sands in the Winterborne Kingston borehole. *Report of the Institute of Geological Sciences*, **81/3**, 107–121.

Knox, R.W.O'B., Howard, A.S., Powell, J.H. and van Buchem, F.S.P. (1990) *Lower and Middle Jurassic Sediments of the Cleveland Basin, N.E. England: Shallow Marine and Paralic Facies seen in their Sequence Stratigraphic Context*, Field Guide (13th International Sedimentological Congress), No. **5**, British Sedimentological Research Group, Cambridge, 68 pp.

Koppelhus, E.B. and Batten, D.J. (1996) Application of a palynomorph zonation to a series of short borehole sections. Lower to Middle Jurassic, Øresund, Denmark. In *Palynology: Principles and Applications, Volume 2: Applications* (eds J. Jansonius and D.C. McGregor), American Association of Stratigraphic Palynologists Foundation, College Station, pp. 779–93.

Kühne, W.G. (1947) The geology of the fissure-filling 'Holwell 2'; the age determination of the mammalian teeth therein; and a report on the technique employed when collecting the teeth of *Eozostrodon* and Microcleptidae. *Proceedings of the Zoological Society, London*, **116**, 729–33.

Kühne, W.G. (1956) *The Liassic therapsid Oligokyphus*, British Museum (Natural History), London, 149 pp.

Küspert, W. (1982) Environmental changes during oil-shale deposition as deduced from stable isotope ratios. In *Cyclic and Event Stratification* (eds G. Einsele and A. Seilacher), Springer-Verlag, Berlin, pp. 482–501.

Lake, S.D. and Karner, G.D. (1987) The structure and evolution of the Wessex Basin, southern England: an example of inversion tectonics. *Tectonophysics*, **137**, 347–78.

Lam, K. and Porter, R. (1977) The distribution of palynomorphs in the Jurassic rocks of the Brora Outlier, N.E. Scotland. *Journal of the Geological Society*, **134**, 45–55.

Lamplugh, G.W., Wedd, C.B. and Pringle, J. (1920) *Bedded Ores of the Lias, Oolites and later Formations in England*, Special Report on the Mineral Resources of Great Britain, Memoir of the Geological Survey of Great Britain, Vol. **12**, HMSO, London, 240 pp

Lang, W.D. (1914) The geology of the Charmouth cliffs, beach and foreshore. *Proceedings of the Geologists' Association*, **25**, 293–360.

Lang, W.D. (1917) The Ibex-zone of Charmouth, and its relation to the zones near it. *Proceedings of the Geologists' Association*, **28**, 31–6.

Lang, W.D. (1924) The Blue Lias of the Devon and Dorset coasts. *Proceedings of the Geologists' Association*, **35**, 169–85.

Lang, W.D. (1932) The Lower Lias of Charmouth and the Vale of Marshwood. *Proceedings of the Geologists' Association*, **43**, 97–126.

Lang, W.D. (1936) The Green Ammonite Beds of the Dorset Lias. *Quarterly Journal of the Geological Society of London*, **92**, 423–55.

Lang, W.D. (1939) Mary Anning and the pioneer geologists of Lyme. *Proceedings of the Dorset Natural History and Archaeological Society*, **60**, 142–64.

Lang, W.D. (1945) The Coinstone of the Charmouth Lias. *Proceedings of the Dorset Natural History and Archaeological Society*, **67**, 145–9.

Lang, W.D. and Spath, L.F. (1926) The Black Marl of Black Ven and Stonebarrow, in the Lias of the Dorset coast. With notes on the Lamellibranchia by L.R. Cox; on the Brachiopoda by H.M. Muir Wood; on certain Echioceratidae by A.E. Trueman and D.M. Williams. *Quarterly Journal of the Geological Society of London*, **82**, 144–87.

Lang, W.D., Spath, L.F. and Richardson, W.A. (1923) Shales-with-'Beef', a sequence in the Lower Lias of the Dorset coast. *Quarterly Journal of the Geological Society of London*, **79**, 47–99.

Lang, W.D, Spath, L.F., Cox, L.R. and Muir-Wood, H.M. (1928) The Belemnite Marls of Charmouth, a series in the Lias of the Dorset coast. *Quarterly Journal of the Geological Society of London*, **84**, 179–257.

Lee, G.W. (1920) *The Mesozoic Rocks of Applecross, Raasay and North-East Skye (with Contributions and Appendix by S.S. Buckman)*, Memoir of the Geological Survey of Great Britain, sheets 81 and 71 (Scotland), HMSO, Edinburgh, 93 pp.

Lee, G.W. (1925) Mesozoic rocks of East Sutherland and Ross. In *The Geology of the Country around Golspie, Sutherland (Strath Fleet, Strath Brora and Glenloth)* (H.H. Read, G. Ross and J. Phemister), Memoir of the Geological Survey of Great Britain, Sheet 103 (Scotland), HMSO, Edinburgh, pp. 65–115.

Lee, G.W. and Bailey, E.B. (1925) *The pre-Tertiary Geology of Mull, Loch Aline, and Oban*, Memoir of the Geological Survey of Great Britain, parts of sheets 35, 44, 45 and 52 (Scotland), HMSO, Edinburgh.

Lee, G.W. and Pringle, J. (1932) A synopsis of the Mesozoic rocks of Scotland. *Transactions of the Geological Society of Glasgow*, **19**, 158–224.

Lewarne, G. and Pallot, G.M. (1957) Mesozoic plants from fissures in the Carboniferous Limestone of south Wales. *Annals and Magazine of Natural History, Series 12*, **10**, 72–9.

Lewis, C.E., Carter, A. and Hurford, A.J. (1992) Low-temperature effects of the Skye Tertiary intrusions on Mesozoic sediments in the Sea of the Hebrides Basin. In *Basins on the Atlantic Seaboard: Petroleum Geology, Sedimentology and Basin Evolution* (ed. J. Parnell), *Geological Society Special Publication*, No. **62**, Geological Society, London, pp. 175–88.

Linsley, P.N., Potter, H.C., McNab, G. and Racher, D. (1980) The Beatrice field, Inner Moray Firth, U.K. North Sea. In *Giant Oil and Gas Fields of the Decade 1968–1978* (ed. M.T. Halbouty), *Memoir of the American Association of Petroleum Geologists*, No. **30**, American Association of Petroleum Geologists (AAPG), Tulsa, pp. 117–29.

Little, C.T.S. (1996) The Pliensbachian–Toarcian (Lower Jurassic) extinction event. In *The Cretaceous–Tertiary Event and Other Catastrophes in Earth History* (eds G. Ryder, D. Fastovsky and S. Gartner), *Geological Society of America Special Paper*, No. **307**, Geological Society of America, Boulder, pp. 505–12.

Little, C.T.S. and Benton, M.J. (1995) Early Jurassic mass extinction: a global long-term event. *Geology*, **23**, 495–8.

Lloyd, A.J., Savage, R.J.G., Stride, A.H. and Donovan, D.T. (1973) The geology of the Bristol Channel floor. *Philosophical Transactions of the Royal Society of London*, **274**, 595–626.

Lord, A. (1971) Revision of some Lower Lias Ostracoda from Yorkshire. *Palaeontology*, **14**, 642–65.

Lord, A. (1972) *Wicherella* and *Gramannella*, two new genera of Lower Jurassic Ostracoda from England. *Palaeontology*, **15**, 187–96.

Lord, A. (1974) Ostracods from the Domerian and Toarcian of England. *Palaeontology*, **17**, 599–622.

Lord, A.R. and Boomer, I.D. (1990) The occurrence of ostracods in the Triassic/Jurassic boundary interval. *Cahiers de l'Université Catholique de Lyon, Série Sciences*, **3**, 119–26.

Lucy, W.C. (1883) Hock Crib, Fretherne. *Proceedings of the Cotteswold Naturalists' Field Club*, **8**, 131–3.

Lycett, J. (1857) On the sands intermediate the Inferior Oolite and Lias of the Cotteswold Hills, compared with a similar deposit upon the coast of Yorkshire. *Proceedings of the Cotteswold Naturalists' Field Club*, **2**, 142–9 (also in *Annals and Magazine of Natural History*, **20**, 170–7).

McCallum, J.A.A. (1971) Sedimentation of Middle Liassic rocks in the Inner Hebrides of Scotland. Unpublished PhD thesis, University of Glasgow.

Macculloch, J. (1819) *A Description of the Western Isles of Scotland, including the Isle of Man: Comprising an Account of their Geological Structure; with remarks on their Agriculture, Scenery and Antiquities*, 3 volumes, Printed for Hurst, Robinson and Co., London.

MacFadyen, C.C.J. (2001) A future for fossils in Scotland. In *A Future for Fossils* (eds M.G. Bassett, A.H. King, J.G. Larwood, N.A. Parkinson and V.K. Deisler), National Museum of Wales Geological Series, No. **19**, National Museums of Wales and Galleries of Wales, Cardiff, pp. 36–9.

References

Macfadyen, W.A. (1941) Foraminifera from the Green Ammonite Beds, Lower Lias, of Dorset. *Philosophical Transactions of the Royal Society*, **231**, B576, 1–73.

Macfadyen, W.A. (1970) *Geological Highlights of the West Country: a Nature Conservancy Handbook*, Butterworths, London, 296 pp.

MacKinnon, D.I. (1974) The shell structure of Spiriferide Brachiopoda. *Bulletin of the British Museum (Natural History): Geology*, **25**, 189–261.

MacLennan, R.M. (1954) The Liassic sequence in Morvern. *Transactions of the Geological Society of Glasgow*, **21**, 447–55.

MacLennan, R.M. and Trueman, A.R. (1942) Variation in *Gryphaea incurva* (Sow.) from the Lower Lias of Loch Aline, Argyll. *Proceedings of the Royal Society of Edinburgh, B*, 61, 211–32.

Macquaker, J.H.S. and Taylor, K.G. (1996) A sequence-stratigraphic interpretation of a mudstone-dominated succession: the Lower Jurassic Cleveland Ironstone Formation, UK. *Journal of the Geological Society*, **153**, 759–70.

Macquaker, J.H.S. and Taylor, K.G. (1997) Reply [to Hesselbo 1996]. *Journal of the Geological Society*, **154**, 913–16.

Madon, M.B.H.J. (1992) Depositional setting and origin of berthierine oolitic ironstones in the Lower Miocene Terengganu Shale, Tenggol Arch, offshore peninsular Malaysia. *Journal of Sedimentary Petrology*, **62**, 899–916.

Malz, H. and Lord, A. (1976) *Gammacythere* n.g. (Ostracoda) and its occurrence in the Lower Jurassic of N.W. Europe. *Senckenbergiana Lethaea*, **57**, 249–63.

Marshall, J.D. (1982) Isotopic composition of displacive fibrous calcite veins: reversals in porewater composition trends during burial diagenesis. *Journal of Sedimentary Petrology*, **52**, 615–30.

Martill, D.M. (1991) Organically preserved dinosaur skin: taphonomic and biological implications. *Modern Geology*, **16**, 61–8.

Martill, D.M. (1995) An ichthyosaur with preserved soft tissue from the Sinemurian of southern England. *Palaeontology*, **38**, 897–903.

Martill, D.M., Batten, D.J. and Loydell, D.K. (2000) A new specimen of the thyreophoran dinosaur cf. *Scelidosaurus* with soft tissue preservation. *Palaeontology*, **43**, 549–59.

Maton, W.G. (1797) *Observations Relative Chiefly to the Natural History, Picturesque Scenery, and Antiquities of the Western Counties of England Made in the Years 1794 and 1796*, J. Easton, Salisbury, 2 volumes.

Maubeuge, P.L. (1964) Resolutions du Colloque. In *Colloque du Jurassique à Luxembourg, 1962* (ed. P.L. Maubeuge), L'institut Grand-Ducal, Section des Sciences naturelles, Luxembourg, pp. 77–80.

Mayall, M.J. (1983) An earthquake origin for synsedimentary deformation in a late Triassic (Rhaetian) lagoonal sequence, southwest Britain. *Geological Magazine*, **120**, 613–22.

Mayer-Eymar, C.D.W. (1864) *Tableau Synchronistique des Terrains Jurassique*, Folding sheet, Zurich.

McDonald, A.I. and Trueman, A.E. (1921) The evolution of certain Liassic gastropods, with special reference to their use in stratigraphy. *Quarterly Journal of the Geological Society of London*, **77**, 297–344.

McGowan, C. (1993) A new species of large, long-snouted ichthyosaur from the English Lower Lias. *Canadian Journal of Earth Science*, **30**, 1197–204.

McGowan, C. and Milner, A.C. (1999) A new Pliensbachian ichthyosaur from Dorset, England. *Palaeontology*, **42**, 761–8.

McQuillin, R., Donato, J.A. and Tulstrup, J. (1982) Development of basins in the Inner Moray Firth and the North Sea by crustal extension and dextral displacement of the Great Glen Fault. *Earth and Planetary Science Letters*, **60**, 127–39.

Meister, C. (1988) Ontogenèse et Èvolution des Amaltheidae. *Eclogae Geologicae Helvetica*, **81**, 763–841.

Meister, C., Blau, J., Dommergues, J.-L., Feist-Burkhardt, S., Hart, M., Hesselbo, S.P., Hylton, M, Page, K. and Price, G. (2003) A proposal for the Global Boundary Stratotype Section and Point (GSSP) for the base of the Pliensbachian Stage (Lower Jurassic). *Eclogae Geologicae Helvetica*, **96**, 275–97.

Melmore, S. (1930) A description of the type-specimen of *Ichthyosaurus crassimanus*, Blake. *Annals and Magazine of Natural History, Series 10*, **6**, 615–19.

Melville, R.V. (1956) Stratigraphical palaeontology, ammonites excluded, of the Stowell Park borehole. *Bulletin of the Geological Survey of Great Britain*, **11**, 67–139.

Michelsen, O. (1975) Lower Jurassic biostratigraphy and ostracods of the Danish Embayment. *Danmarks Geologiske Undersogelse*, **104**, 1–289.

Miliorizos, M. and Ruffell, A. (1998) Kinematics of the Watchet–Cothelstone–Hatch Fault System: implications for the fault history of the Wessex Basin and adjacent areas. In *Development, Evolution and Petroleum Geology of the Wessex Basin* (ed. J.R. Underhill), *Geological Society Special Publication*, No. **133**, Geological Society, London, pp. 311–30.

Miller, H. (1858) *The Cruise of the Betsy, or, a Summer Ramble among the Fossiliferous Deposits of the Hebrides, with Rambles of a Geologist; or Ten Thousand Miles over the Fossiliferous Deposits of Scotland*, Constable, Edinburgh, 486 pp.

Milsom, J. and Rawson, P.F. (1989) The Peak Trough – a major control on the geology of the North Yorkshire coast. *Geological Magazine*, **126**, 699–705.

Moghadam, H.V. and Paul, C.R.C. (2000) Trace fossils of the Jurassic, Blue Lias, Lyme Regis, southern England. *Ichnos*, **8**, 1–24.

Moore, C. (1862) On the palaeontology of mineral veins. *Mining Journal*, **32**, 735.

Moore, C. (1867a) On abnormal conditions of secondary deposits when connected with the Somersetshire and South Wales Coal-Basins, and on the age of the Sutton and Southerndown Series. *Quarterly Journal of the Geological Society of London*, **23**, 449–568.

Moore, C. (1867b) On the Middle and Upper Lias of the south west of England. *Proceedings of the Somerset Archaeological and Natural History Society*, **13**, 119–244.

Morgans, H.S. (1999) Lower and Middle Jurassic woods of the Cleveland basin (North Yorkshire), England. *Palaeontology*, **42**, 303–28.

Morris, K.A. (1979) A classification of Jurassic marine shale sequences: an example from the Toarcian (Lower Jurassic) of Great Britain. *Palaeogeography, Palaeoclimatology, Palaeoecology*, **26**, 117–26.

Morton, N. (1965) The Bearreraig Sandstone Series (Middle Jurassic) of Skye and Raasay. *Scottish Journal of Geology*, **1**, 189–216.

Morton, N. (ed.) (1971) The definition of standard Jurassic stages. *Mémoires du Bureau de Recherches Géologiques et Minieres*, **75**, 83–93.

Morton, N. (1983) Palaeocurrents and palaeoenvironment of part of the Bearreraig Sandstone (Middle Jurassic) of Skye and Raasay, Inner Hebrides. *Scottish Journal of Geology*, **19**, 87–95.

Morton, N. (1987) Jurassic subsidence history in the Hebrides, N.W. Scotland. *Marine and Petroleum Geology*, **4**, 226–42.

Morton, N. (1989) Jurassic sequence stratigraphy in the Hebrides Basin, NW Scotland. *Marine and Petroleum Geology*, **6**, 243–60.

Morton, N. (1990) The Lias of the Hebrides. *Cahiers de l'Université Catholique de Lyon, Série Sciences*, **4**, 107–119.

Morton, N. (1992a) Late Triassic to Middle Jurassic stratigraphy, palaeogeography and tectonics west of the British Isles. In *Basins on the Atlantic Seaboard: Petroleum Geology, Sedimentology and Basin Evolution* (ed. J. Parnell), *Geological Society Special Publication*, No. **62**, Geological Society, London, pp. 53–68.

Morton, N. (1992b) Dynamic stratigraphy of the Triassic and Jurassic of the Hebrides Basin, NW Scotland. In *Basins on the Atlantic Seaboard: Petroleum Geology, Sedimentology and Basin Evolution* (ed. J. Parnell), *Geological Society Special Publication*, No. **62**, Geological Society, London, pp. 97–110.

Morton, N. (1993) Potential reservoir and source rocks in relation to Upper Triassic to Middle Jurassic sequence stratigraphy, Atlantic margin basins of the British Isles. In *Petroleum Geology of Northwest Europe: Proceedings of the 4th Conference held at the Barbican Centre, London, 29 March–1 April, 1992* (ed. J.R. Parker), Geological Society, London, pp. 285–97.

Morton, N. (1999a) The lower Lias Group of the Hebrides Basin: Comment. *Scottish Journal of Geology*, **35**, 85–7.

Morton, N. (1999b) Middle Hettangian (Lower Jurassic) ammonites from Isle of Raasay, Inner Hebrides, and correlation of the Hettangian–lowermost Sinemurian Breakish Formation in the Skye area, NW Scotland. *Scottish Journal of Geology*, **35**, 119–30.

Morton, N. and Hudson, J.D. (1995) Field guide to the Jurassic of the Isles of Raasay and Skye, Inner Hebrides, NW Scotland. In *Field Geology of the British Jurassic* (ed. P.D. Taylor), Geological Society, London, pp. 209–80.

Mouterde, R. and Corna, M. (1991) Hettangien. *3rd International Symposium on Jurassic Stratigraphy, p. 1991*, 124 (abstract only).

Mouterde, R. and Corna, M. (1997) Hettangien. In *Biostratigraphie du Jurassique Ouest-Européen et Méditerranéen: Zonations Parallèles et Distribution des Invertebrés et Microfossiles* (eds E. Cariou and P. Hantzpergue), *Bulletin de la Centre Recherches d'Elf Exploration Production, Memoires*, No. **17**, Elf Exploration Production, Pau, pp. 7–8.

Moxon, C. (1841) *Illustrations of the Characteristic Fossils of British Strata*, H. Baillière, London, 46 pp., 43 pls.

Mudge, D.C. (1978) Stratigraphy and sedimentation of the Lower Inferior Oolite of the Cotswolds. *Quarterly Journal of the Geological Society of London*, **135**, 611–27.

Mudge, D.C. (1995) The Middle Jurassic of the Cotswolds. In *Field Geology of the British Jurassic* (ed. P.D. Taylor), Geological Society, London, pp. 31–50.

Muir-Wood, H.M. (1936) Brachiopoda from the Lower Lias, Green Ammonite Beds, of Dorset. *Quarterly Journal of the Geological Society of London*, **92**, 472–85.

Murchison, R.I. (1829) Supplementary remarks on the strata of the Oolitic Series, and the rocks associated with them in the Counties of Sutherland and Ross, and in the Hebrides. *Transactions of the Geological Society of London*, **2**, 353–68.

Murchison, R.I. (1845) *The Geology of the Neighbourhood of Cheltenham*, 2nd edn (revised by J. Buckman and H.E. Strickland), John Murray, Cheltenham, 109 pp.

Myers, K.J. (1989) The origin of the Lower Jurassic Cleveland Ironstone Formation of north-east England: evidence from portable gamma ray spectrometry. In *Phanerozoic Ironstones* (eds T.P. Young and W.E.G. Taylor), *Geological Society Special Publication*, No. **46**, Geological Society, London, pp. 221–8.

Myers, K.J. and Wignall, P.B. (1987) Understanding Jurassic organic-rich mudrocks – New concepts using Gamma-ray spectrometry and palaeoecology: Examples from the Kimmeridge Clay of Dorset and Jet Rock of Yorkshire. In *Marine Clastic Sedimentology: concepts and case studies: a volume in memory of C. Tarquin Teale* (eds J.K. Leggett and G.G. Zuffa), Graham and Trotman, London, pp. 172–89.

Neaverson, E. (1955) *Stratigraphical Palaeontology*, 2nd edn, Clarendon Press, Oxford, 806 pp.

Necker de Saussure, L.A. (1821) *Voyage en Écosse et aux iles Hebrides*, Paschoud, Geneva.

Negus, P.E. (1983) Distribution of the British Jurassic corals. *Proceedings of the Geologists' Association*, **94**, 251–7.

Negus, P.E. (1991) Stratigraphical table of scleractinian coral genera and species occurring in the British Jurassic corals. *Proceedings of the Geologists' Association*, **102**, 251–9.

Neves, R. and Selley, R.C. (1975) A review of the Jurassic rocks of North-East Scotland. In *Proceedings of the Jurassic Northern North Sea Symposium (JNNSS-75), Stavanger, 28–30 September, 1975* (eds K.G. Finstad and R.C. Selley), Norsk Petroleumsforening, Oslo, pp. 1–29.

Newton, E.T. (1888) On the skull, brain and auditory organ of a new species of pterosaurian (*Scaphognathus purdoni*), from the Upper Lias near Whitby, Yorkshire. *Philosophical Transactions of the Royal Society of London, Series B*, **179**, 503–37.

Nicholson, R. (1978) The Camas Malag Formation: an interbedded rhythmite/conglomerate sequence of probable Triassic age, Loch Slapin, Isle of Skye. *Scottish Journal of Geology*, **14**, 301–9.

Norling, E. (1972) *Jurassic Stratigraphy and Foraminifera of Western Scania, Southern Sweden, Sveriges Geologiska Undersökning Avhandlingar och Uppsatser, Series Ca*, No. **47**, Sveriges Geologiska Undersökning, Stockholm, 120 pp.

Oates, M.J. (1976) The Lower Lias of Western Scotland. Unpublished PhD thesis, University of London.

Oates, M.J. (1978) A revised stratigraphy for the western Scottish Lower Lias. *Proceedings of the Yorkshire Geological Society*, **42**, 143–56.

O'Brien, N.R. (1990) Significance of lamination in Toarcian (Lower Jurassic) shales from Yorkshire, Great Britain. *Sedimentary Geology*, **67**, 25–34.

Old, R.A., Sumbler, M.G. and Ambrose, K. (1987) *Geology of the Country around Warwick*, Memoir of the British Geological Survey, Sheet 184 (England and Wales), HMSO, London, 93 pp.

Old, R.A., Hamblin, R.J.O., Ambrose, K. and Warrington, G. (1991) *Geology of the Country around Redditch*, Memoir of the British Geological Survey, Sheet 183 (England and Wales), HMSO, London, 83 pp.

Olsen, P.E., Shubin, N.H. and Anders, M.H. (1987) New Early Jurassic tetrapod assemblages constrain Triassic/Jurassic tetrapod extinction event. *Science*, **237**, 1025–9.

References

Olsen, P.E., Kent, D.V., Sues, H.-D., Koeberl, C., Huber, H., Montanari, A., Rainforth, E.C., Fowell, S.J., Szajna, M.J. and Hartline, B.W. (2002) Ascent of dinosaurs linked to an Iridium anomaly at the Triassic–Jurassic boundary. *Science*, **295**, 1305–8.

Oppel, A. (1856–1858) *Die Juraformation: Englands, Frankreichs und des Südwestlichen Deutschlands*, Verlag von Ebner and Seubert, Stuttgart, 857 pp.

Owen, J.S. (1985) Staithes and Port Mulgrave Ironstone. *The Cleveland Industrial Archaeological Research Report*, **4**, 41 pp.

Page, K.N. (1992) The sequence of ammonite correlated horizons in the British Sinemurian (Lower Jurassic). *Newsletters in Stratigraphy*, **27**, 129–56.

Page, K.N. (1994a) Preliminary observations on the ammonite faunas of the basal Jurassic in Somerset and their global context. *Proceedings of the Ussher Society*, **8**, 341–4.

Page, K.N. (1994b) New observations on the ammonite faunas across the Hettangian–Sinemurian boundary in south west Britain: result of an excursion of the Sinemurian Working Group. *International Subcommission on Jurassic Stratigraphy Newsletter*, **22**, 14–21.

Page, K.N. (1994c) East Quantoxhead, Somerset, England; a potential Global Stratotype Section and Point (GSSP) for the base of the Sinemurian Stage (Lower Jurassic). *Proceedings of the Ussher Society*, **8**, 446–50.

Page, K.N. (1995) Biohorizons and zonules: intra-subzonal units in Jurassic ammonite stratigraphy. *Palaeontology*, **38**, 801–14.

Page, K.N. (1996) Mesozoic ammonoids in space and time. In *Ammonoid Paleobiology* (eds N.H. Landman, K. Tanabe and R.A. Davis), Topics in Geobiology, No. **13**, pp. 755–94.

Page, K.N. (2001) Golden spiked! The UKs first Global Stratotype Section and Point for a Jurassic Stage boundary, in Somerset. *Geoscience in south-west England*, **10**, 177–82.

Page, K.N. (2002) A review of the ammonite faunas and standard zonation of the Hettangian and Lower Sinemurian succession (Lower Jurassic) of the east Devon coast (south-west England). *Geoscience in south-west England*, **10**, 293–303.

Page, K.N. (2003) The Lower Jurassic of Europe – its subdivision and correlation. In *The Jurassic of Denmark and Greenland* (eds J.R. Ineson and F. Surlyk), Geological Survey of Denmark and Greenland Bulletin, No. **1**, pp. 23–59.

Page, K.N. and Bloos, G. (1998) The base of the Jurassic System in west Somerset, south-west England – New observations on the succession of ammonite faunas of the lowest Hettangian Stage. *Geoscience in south-west England*, **9**, 231–5.

Page, K.N., King, A.H. and Gilbertson, D.D. (1994) Field excursion to examine the Triassic–Jurassic transition in west Somerset and the Quaternary deposits of Doniford Bay, Watchet. *Proceedings of the Ussher Society*, **8**, 338–41.

Page, K.N., Bloos, G., Bessa, J.L., Fitzpatrick, M, Hart, M., Hesselbo, S.P., Hylton, M.D., Morris, A. and Randall, D.E. (2000) East Quantoxhead, Somerset: a candidate Global Stratotype Section and point for the base of the Sinemurian Stage (Lower Jurassic). In *Advances in Jurassic Research 2000, Proceedings of the Fifth International Symposium on the Jurassic System, held in Vancouver, Canada, August 12–25, 1998* (eds R.L. Hall and P.L. Smith), GeoResearch Forum, No. **6**, Trans Tech Publications, Zürich, pp. 163–72.

Pálfy, J. and Smith, P.L. (2000) Synchrony between Early Jurassic extinction, oceanic anoxic event and the Karoo-Ferrar flood basalt volcanism. *Geology*, **28**, 747–50.

Pálfy, J., Mortensen, J.K., Carter, E.S., Smith, P.L., Friedman, R.M. and Tipper, H.W. (2000a) Timing the end-Triassic mass extinction: First on land, then in the sea? *Geology*, **28**, 39–42.

Pálfy, J., Mortensen, J.K., Smith, P.L., Friedman, R.M., McNicoll, V. and Villeneuve, M. (2000b) New U-Pb zircon ages integrated with ammonite biochronology from the Jurassic of the Canadian Cordillera. *Canadian Journal of Earth Sciences*, **37**, 549–67.

Pálfy, J. Smith, P.L. and Mortensen, J.K. (2000c) A U-Pb and 40Ar/39Ar timescale for the Jurassic. *Canadian Journal of Earth Sciences*, **37**, 923–44.

Palmer, C.P. (1966) The fauna of Day's Shell Bed in the Middle Lias of the Dorset coast. *Proceedings of the Dorset Natural History and Archaeological Society*, **87**, 69–80.

Palmer, C.P. (1971) The stratigraphy of the Stonehouse and Tuffley claypits in Gloucestershire. *Proceedings of the Bristol Naturalists' Society*, **32**, 58–68.

Palmer, C.P. (1972) The Lower Lias between Watchet and Lilstock in North Somerset. *Newsletters in Stratigraphy*, **2**, 1–30.

Palmer, C.P. (1973) The palaeontology of the Liassic (Lower Jurassic) clay pits at Stonehouse and Tuffley in Gloucestershire. *Geological Magazine*, **110**, 249–63.

Palmer, C.P. (1975) The British Lower Jurassic species of the bivalve genus *Cardinia*. *Bulletin of the British Museum (Natural History): Geology*, **26**, 1–44.

Palmer, C.P. (2001) *Dentalium giganteum* Phillips: a serpulid worm tube. *Proceedings of the Yorkshire Geological Society*, **53**, 253–5.

Paris, E.T. (1908) Notes on some echinoids from the Lias of Worcestershire, Gloucestershire and Somerset. *Proceedings of the Cotteswold Naturalists' Field Club*, **16**, 143–50.

Park, S.-M. (1987) The ostracod zones and subzones of the Lower Jurassic in the southern North Sea Basin. *Journal of the Palaeontological Society of Korea*, **3**, 44–70.

Parkinson, D.N. (1996) Gamma-ray spectrometry as a tool for stratigraphical interpretation: examples from the western European Lower Jurassic. In *Sequence Stratigraphy in British Geology* (eds S.P. Hesselbo and D.N. Parkinson), *Geological Society Special Publication*, No. **103**, Geological Society, London, pp. 231–55.

Parsons, C.F. (1979) A stratigraphic revision of the Inferior Oolite of Dundry Hill, Bristol. *Proceedings of the Geologists' Association*, **90**, 133–51.

Peach, B.N., Horne, J., Woodward, H.B., Clough, C.T., Harker, A. and Wedd, C.B. (1910) *The Geology of Glenelg, Lochalsh and South-east part of Skye*, Memoir of the Geological Survey of Great Britain, Sheet 71 (Scotland), HMSO, Edinburgh, 206 pp.

Peach, B.N., Horne, J., Gunn, W., Clough, C.T. and Greenly, E. (1913) *The Geology of the Fannich Mountains and the Country around Upper Loch Maree and Strath Broom*, Memoir of the Geological Survey of Great Britain, Sheet 92 (Scotland), HMSO, Edinburgh, 127 pp.

Peacock, D.C.P. and Sanderson, D.J. (1999) Deformation history and basin-controlling faults in the Mesozoic sedimentary rocks of the Somerset coast. *Proceedings of the Geologists' Association*, **110**, 41–52.

Penn, I.E. and Merriman, R.J. (1978) Jurassic (Toarcian to ? Bajocian) ammonites of the Shiant Isles, outer Hebrides. *Scottish Journal of Geology*, **14**, 45–53.

Pennant, T. (1774) *Tour in Scotland and Voyage to the Hebrides, MDCCLXXII*, 3rd edn, J. Monk, London.

Phelps, M.C. (1982) A facies and faunal analysis of the Carixian–Domerian boundary beds in North-west Europe. Unpublished PhD thesis, University of Birmingham.

Phelps, M.C. (1985) A refined ammonite biostratigraphy for the middle and upper Carixian (Ibex and Davoei zones, Lower Jurassic) in North-west Europe and stratigraphical details of the Carixian–Domerian boundary. *Geobios*, **18**, 321–62.

Phillips, J. (1829) *Illustrations of the Geology of Yorkshire: or, a Description of the Strata and Organic Remains, Part I: The Yorkshire Coast*, John Murray, London.

Phillips, J. (1835) *Illustrations of the Geology of Yorkshire: or, a Description of the Strata and Organic Remains, Part I: The Yorkshire Coast*, 2nd edn, John Murray, London.

Phillips, J. (1865–1909) *A Monograph of British Jurassic Belemnitidae*, Monograph of the Palaeontographical Society, Palaeontographical Society, London.

Phillips, J. (1875) *Illustrations of the Geology of Yorkshire: or, a Description of the Strata and Organic Remains, Part I: The Yorkshire Coast*, 3rd edn, John Murray, London.

Pickering, K.T. (1995) Are enigmatic erosional sandy wave-like bedforms in Jurassic Bridport Sands, Dorset, due to standing waves? *Journal of the Geological Society*, **152**, 481–5.

Poole, E.G. (1979) The Triassic–Jurassic boundary in Great Britain. *Geological Magazine*, **116**, 303–11.

Poole, E.G. (1980) The Triassic–Jurassic boundary in Great Britain [further discussion following correspondence from H.C. Ivimey-Cook *et al.* and D.T. Donovan]. *Geological Magazine*, **117**, 617–20.

Poole, E.G. (1991) Further discussion on the correlation of the Triassic–Jurassic boundary in England and Austria. *Journal of the Geological Society*, **148**, 943–4.

Poole, E.G. and Whiteman, A.J. (1966) *Geology of the Country around Nantwich and Whitchurch*, Memoir of the Geological Survey of Great Britain, Sheet 122 (England and Wales), HMSO, London, 154 pp.

Pringle, J. and Templeman, A. (1922) Two new sections in the Middle and Upper Lias at Barrington, Somerset. *Quarterly Journal of the Geological Society of London*, **78**, 450–1.

References

Powell, J.H. (1984) Lithostratigraphical nomenclature of the Lias Group in the Yorkshire Basin. *Proceedings of the Yorkshire Geological Society*, **45**, 51–7.

Powell, J.H. and Wilby, P. (compilers) (1998) *Guisborough*, Solid and Drift Edition, British Geological Survey 1:50 000 Provisional Series, Sheet 34 (England and Wales), British Geological Survey, Keyworth.

Prudden, H.C. (1966) Excavations in the Yeovil Sands at Yew Tree Close, Yeovil. *Proceedings of the Dorset Natural History and Archaeological Society*, **81**, 42–3.

Prudden, H.C. (1995) *Ham Hill: The Rocks and Quarries*, South Somerset District Council, Yeovil, 16 pp.

Pye, K. and Krinsley, D.H. (1986) Microfabric, mineralogy and early diagenetic history of the Whitby Mudstone Formation (Toarcian), Cleveland basin, U.K. *Geological Magazine*, **123**, 191–203.

Quenstedt, F.A. (1856–1858) *Der Jura*, Laupp'she Buchandlung, Tubingen, 842 pp, 99 pls.

Raiswell, R. (1971) The growth of Cambrian and Liassic concretions. *Sedimentology*, **17**, 147–71.

Raiswell, R. (1976) The microbiological formation of carbonate concretions in the Upper Lias of N.E. England. *Chemical Geology*, **18**, 227–44.

Raiswell, R. and Berner, R.A. (1985) Pyrite formation in euxinic and semi-euxinic sediments. *American Journal of Science*, **285**, 710–24.

Raiswell, R. and Plant, J. (1980) The incorporation of trace elements into pyrite during diagenesis of black shales, Yorkshire. *Economic Geology*, **75**, 684–99.

Raiswell, R. and White, N.J.M. (1978) Spatial aspects of concretionary growth in the Upper Lias of N.E. England. *Sedimentary Geology*, **20**, 291–300.

Rastall, R.H. (1905) The Blea Wyke Beds and Dogger in north-east Yorkshire. *Quarterly Journal of the Geological Society of London*, **61**, 441–60.

Rastall, R.H. and Hemingway, J.E. (1939) The Blea Wyke Beds and the Dogger at Peak, Yorkshire. *Geological Magazine*, **76**, 362–72.

Rawson, P.F. and Wright, J.K. (1992) *The Yorkshire Coast*, Geologists' Association Guide, No. **34**, Geologists' Association, London, 117 pp.

Rawson, P.F. and Wright, J.K. (1995) Jurassic of the Cleveland Basin, North Yorkshire. In *Field Geology of the British Jurassic* (ed. P.D. Taylor), Geological Society, London, pp. 173–208.

Rawson, P.F., Greensmith, J.T. and Shalaby, S.E. (1983) Coarsening-upward cycles in the uppermost Staithes and Cleveland Ironstone Formations (Lower Jurassic) of the Yorkshire coast, England. *Proceedings of the Geologists' Association*, **94**, 91–3.

Remane, J., Bassett, M.G., Cowie, J.W., Gohrbandt, K.H, Lane, R.H., Michelsen, O. and Naiwen, W. (1996) Revised guidelines for the establishment of global chronostratigraphic standards by the International Commision on Stratigraphy (ICS). *Episodes*, **19/3**, 77–81.

Renevier, E. (1864) Notices géologiques et paléontologiques sur les Alpes Vaudoises, et les régions environnantes. I. Infralias et Zone à Avicula contorta (Étage Rhaetian) des Alpes Vaudoises. *Bulletin de la Société Vaudoise des Sciences Naturelles (Lausanne)*, **8**, 39–97.

Renevier, E. (1874) Tableau des Terrains sédimentaires qui représentent les Époques de la Phase organique. *Bulletin de la Société Vaudoise des Sciences Naturelles (Lausanne)*, **13**, 218–52.

Revert, J. and Tchoumatchenco, P. (1973) Les zones de brachiopodes du Lias en Bulgarie et dans le sud de la France (bassin des Causses): essai de correlation. *Notes et Memoires, Laboratoire de Geologique, Faculte des Sciences, Lyon*, **56**, 181–91.

Reynolds, S.H. (1912) *A Geological Excursion Handbook for the Bristol District*, J.W. Arrowsmith, Bristol, 224 pp.

Reynolds, S.H. (1921) *A Geological Excursion Handbook for the Bristol District*, 2nd edn, J.W. Arrowsmith, Bristol, 224 pp.

Richards, P.C., Lott, G.K., Johnson, H., Knox, R.W.O'B. and Riding, J.B. (1993) Part 3: Jurassic of the Central and Northern North Sea. In *Lithostratigraphic Nomenclature of the UK North Sea* (eds R.W.O'B. Knox and W.G. Cordey), British Geological Survey for the UK Offshore Operators Association, Keyworth, 219 pp.

Richardson, L. (1904) *A Handbook to the Geology of Cheltenham and Neighbourhood*, Norman, Sawyer and Co., Cheltenham, 303 pp.

Richardson, L. (1905) The Rhaetic and contiguous deposits of Glamorgan. *Quarterly Journal of the Geological Society of London*, **61**, 385–422.

Richardson, L. (1906a) Liassic Dentaliidae. *Quarterly Journal of the Geological Society of London*, **62**, 573–96.

Richardson, L. (1906b) On a section of Middle and Upper Lias rocks near Evercreech, Somerset. *Geological Magazine, Decade 5*, **3**, 368–9.

Richardson, L. (1906c) On a section of Lower Lias rocks at Maisemore, near Gloucester. *Proceedings of the Cotteswold Naturalists' Field Club*, **15**, 259–62.

Richardson, L. (1908) On the section of Lower Lias at Hock Cliff, Fretherne, Gloucestershire. *Proceedings of the Cotteswold Naturalists' Field Club*, **16**, 135–42.

Richardson, L. (1909) Excursion to Shepton Mallet and Frome districts. *Proceedings of the Cotteswold Naturalists' Field Club*, **16**, 223–30.

Richardson, L. (1910a) The Neozoic rocks of Gloucestershire and Somerset. In *Geology in the Field* (eds H.W. Monckton and R.S. Herries), *the Jubilee Volume of the Geologists' Association*, Edward Stanford, London, pp. 329–64.

Richardson, L. (1910b) The Inferior Oolite and contiguous deposits of the South Cotteswolds. *Proceedings of the Cotteswold Naturalists' Field Club*, **17**, 63–136.

Richardson, L. (1911) The Rhaetic and contiguous deposits of west, mid and part of east Somerset. *Quarterly Journal of the Geological Society of London*, **67**, 1–72.

Richardson, L. (1915) Report of an excursion to Bridport, Beaminster and Crewkerne. *Proceedings of the Geologists' Association*, **26**, 47–78.

Richardson, L. (1918) The Geology (Lias and Superficial deposits) of the Cheltenham–Stratford-on-Avon Railway (G.W.R.). *Transactions of the Woolhope Naturalists' Field Club*, 3–19.

Richardson, L. (1928) The Inferior Oolite and contiguous deposits of the Burton Bradstock–Broadwater district, Dorset. *Proceedings of the Cotteswold Naturalists' Field Club*, **23**, 35–68.

Richardson, L. (1929a) The Inferior Oolite and contiguous deposits of the Burton Bradstock–Broadwindsor district, Dorset. *Proceedings of the Cotteswold Naturalists' Field Club*, **23**, 149–85.

Richardson, L. (1929b) *The Country around Moreton-in-Marsh*, Memoir of the Geological Survey of Great Britain, Sheet 217 (England and Wales), 162 pp.

Richardson, L. (1930) The Inferior Oolite and contiguous deposits of the Burton Bradstock–Broadwindsor district, Dorset. *Proceedings of the Cotteswold Naturalists' Field Club*, **23**, 253–64.

Richardson, L. and Butt, W. (1912) Excursion to Bridport, Dorset. *Proceedings of the Cotteswold Naturalists' Field Club*, **18**, 31–8.

Richardson, L., Ussher, W.A.E., Whitaker, W. and Winwood, H.H. (1911) Excursion to Dunball, Burlescombe, Ilminster, Chard, Ham Hill, and Bradford Abbas. *Proceedings of the Geologists' Association*, **22**, 246–63.

Richey, J.E. and Thomas, H.H. (1930) *The Geology of Ardnamurchan, north-west Mull and Coll*, Memoir of the Geological Survey of Great Britain, Sheet 51 and part of Sheet 52 (Scotland), HMSO, Edinburgh, 393 pp.

Riding, J.B. (1984a) Dinoflagellate cyst range-top biostratigraphy of the uppermost Triassic to lowermost Cretaceous of northwest Europe. *Palynology*, **8**, 195–210.

Riding, J.B. (1984b) A palynological investigation of Toarcian to early Aalenian strata from the Blea Wyke area, Ravenscar, North Yorkshire. *Proceedings of the Yorkshire Geological Society*, **45**, 109–22.

Riding, J.B. and Thomas, J.E. (1992) Dinoflagellate cysts of the Jurassic System. In *A Stratigraphic Index of Dinoflagellate Cysts* (ed. A.J. Powell), British Micropalaeontological Society Publication Series, Chapman and Hall, London, pp. 7–98.

Rioult, M. (1961) Les sclérites d'holothuries fossiles du Lias. *Mémoires du Bureau de Recherches Géologiques et Minières*, **4**, 121–53.

Rioult, M. (1974) Alcide d'Orbigny et les Ètages du Jurassiques. Colloque du Jurassique: Luxembourg 1967. *Memoires du Bureau de Recherches Géologiques et Minières*, **75**, 1733.

Robinson, P.L. (1957) The Mesozoic fissures of the Bristol Channel area and their vertebrate faunas. *Zoological Journal of the Linnean Society*, **43**, 260–82.

Salvador, A.L. (ed.) (1994) *International Stratigraphic Guide: A Guide to Stratigraphic Classification, Terminology, and Procedure*, 2nd edn, International Union of Geological Sciences and Geological Society of America, Boulder, 214 pp.

Savage, R.J.G. (1971) Tritylodontid incertae sedis. *Proceedings of the Bristol Naturalists' Society*, **32**, 80–3.

Savage, R.J.G. (1977) The Mesozoic strata of the Mendip Hills. In *Geological Excursions in the Bristol District* (ed. R.J.G. Savage), University of Bristol, Bristol, pp. 85–100.

References

Savage, R.J.G. (1993) Vertebrate fissure faunas with special reference to Bristol Channel Mesozoic faunas. *Journal of the Geological Society*, **150**, 1025–34.

Savage, R.J.G. and Waldman, M. (1966) *Oligokyphus* from Holwell Quarry, Somerset. *Proceedings of the Bristol Naturalists' Society*, **31**, 185–92.

Scotese, C.R. (2002) PALEOMAP Project Website. http://www.scotese.com.

Scrutton, C. (ed.) (1996) *Yorkshire Rocks and Landscape: a Field Guide*, Ellenbank Press for the Yorkshire Geological Society, Maryport.

Searl, A. (1989) Sedimentology and early diagenesis of the Lower Jurassic, Applecross, Wester Ross. *Scottish Journal of Geology*, **25**, 45–62.

Searl, A. (1992) Sedimentology and early diagenesis of the Broadford Beds (Lower Jurassic), Skye, north-west Scotland. *Geological Journal*, **27**, 243–70.

Searl, A. (1994) Diagenetic destruction of reservoir potential in shallow marine sandstones of the Broadford Beds (Lower Jurassic), north-west Scotland: depositional versus burial and thermal history controls on porosity destruction. *Marine and Petroleum Geology*, **11**, 131–47.

Seeley, H.G. (1865) On *Plesiosaurus macropterus*, a new species from the Lias of Whitby. *Annals and Magazine of Natural History, Series 3*, **15**, 49–53.

Seilacher, A., Reif, W.-E. and Westphal, F. (1985) Sedimentological, ecological and temporal patterns of fossil Lagerstätten. *Philosophical Transactions of the Royal Society of London, Series B*, **311**, 5–23.

Sellwood, B.W. (1970) The relation of trace fossils to small-scale sedimentary cycles in the British Lias. In *Trace Fossils: Proceedings of an International Conference held at Liverpool University, 6, 7, 8 January, 1970, under the Auspices of the Liverpool Geological Society and Sponsored by the International Union of Geological Sciences* (eds T.P. Crimes and J.C. Harper), *Geological Journal Special Issue*, No. **3**, Seel House Press, Liverpool, pp. 489–504.

Sellwood, B.W. (1971) The genesis of some sideritic beds in the Yorkshire Lias (England). *Journal of Sedimentary Petrology*, **41**, 854–8.

Sellwood, B.W. (1972) Regional environmental changes across a Lower Jurassic stage-boundary in Britain. *Palaeontology*, **15**, 125–57.

Sellwood, B.W. and Jenkyns, H.C. (1975) Basins and swells and the evolution of an epeiric sea (Pliensbachain–Bajocian of Great Britain). *Journal of the Geological Society*, **131**, 373–88.

Sellwood, B.W., Durkin, M.K. and Kennedy, W.J. (1970) Field Meeting on the Jurassic and Cretaceous rocks of Wessex. *Proceedings of the Geologists' Association*, **81**, 715–32.

Sellwood, B.W., Scott, J. and Lunn, G. (1986) Mesozoic basin evolution in southern England. *Proceedings of the Geologists' Association*, **97**, 259–89.

Simms, M.J. (1985) The origin and early evolution of *Balanocrinus* (Crinoidea: Articulata). In *Echinodermata: Proceedings of the Fifth International Echinoderm Conference, Galway, 24–29 September, 1984* (eds B.F. Keegan and B.D.S. O'Connor), A.A. Balkema, Rotterdam, p. 169.

Simms, M.J. (1986) Contrasting lifestyles in Lower Jurassic crinoids: a comparison of benthic and pseudopelagic Isocrinida. *Palaeontology*, **29**, 475–93.

Simms, M.J. (1987) The taxonomy and palaeobiology of Lower Jurassic crinoids. Unpublished PhD thesis, University of Birmingham.

Simms, M.J. (1988) Patterns of evolution among Lower Jurassic crinoids. *Historical Biology*, **1**, 17–44.

Simms, M.J. (1989) *British Lower Jurassic Crinoids*, Monograph of the Palaeontographical Society, Palaeontographical Society, London, 103 pp.

Simms, M.J. (1990a) Upper Pliensbachian stratigraphy in the Severn Basin area: evidence for anomalous structural controls in the Lower and Middle Jurassic. *Proceedings of the Geologists' Association*, **101**, 131–144.

Simms, M.J. (1990b) Triassic palaeokarst in Britain. *Cave Science*, **17**, 93–101.

Simms, M.J. (1990c) Phytokarst and photokarren in Ireland. *Cave Science*, **17**, 131–3.

Simms, M.J. (1997) The geological history of the Mendip Hills and their margins. *Proceedings of the Bristol Naturalists' Society*, **55**, 113–34.

Simms, M.J. (1999) Pentacrinites from the Lower Jurassic of the Dorset coast of southern England. In *Fossil Crinoids* (eds H. Hess, W.I. Ausich, C.E. Brett and M.J. Simms), Cambridge University Press, Cambridge, pp. 177–82.

Simms, M.J. (2003a) Uniquely extensive seismite from the latest Triassic of the UK: evidence for bolide impact? *Geology*, **31**, 557–60.

Simms, M.J. (2003b) The Lower Lias of northern Gloucestershire: new data on Early Jurassic stratigraphy and outcrop patterns from temporary exposures. *Proceedings of the Cotteswold Naturalists' Field Club*, **42**, 191–205.

Simms, M.J., Gale, A.S., Gilliland, P., Rose, E.P.F. and Sevastopulo, G.D. (1993) Echinodermata. In *The Fossil Record 2* (ed. M.J. Benton), Chapman and Hall, London, pp. 491–528.

Simms, M.J., Little, C.T.S. and Rosen, B.R. (2002) Corals not serpulids: mineralized colonial fossils in the Lower Jurassic marginal facies of South Wales. *Proceedings of the Geologists' Association*, **113**, 31–6.

Simpson, M. (1843) *A Monograph of the Ammonites of the Yorkshire Lias*, London, 60 pp.

Simpson, M. (1855) *The Fossils of the Yorkshire Lias Described from Nature*, Whittaker and Co., London, 149 pp.

Simpson, M. (1866) Inferior Oolite–Lias belemnites of the Yorkshire coast. *Geological and Natural History Repertory and Journal of Prehistoric Archaeology and Ethnology*, 215–16.

Simpson, M. (1868) *A Guide to the Geology of the Yorkshire Coast*, 4th edn, Whittaker and Co., London, 64 pp.

Simpson, M. (1884) *The Fossils of the Yorkshire Lias Described from Nature*, 2nd edn, Forth and Son, Whitby, 256 pp.

Simpson, S. (1957) On the trace fossil *Chondrites*. *Quarterly Journal of the Geological Society of London*, **112**, 475–95.

Smart, P.L., Palmer, R.J., Whitaker, F. and Wright, V.P. (1988) Neptunian dikes and fissure fills: An overview and account of some modern examples. In *Paleokarst* (eds N.P. James and P.W. Choquette), Springer-Verlag, New York, pp. 149–63.

Smit, J. (1999) The global stratigraphy of the Cretaceous–Tertiary impact ejecta. *Annual Review of Earth and Planetary Sciences*, **27**, 75–113.

Smith, A.B. (1981) Implications of lantern morphology for the phylogeny of post-Palaeozoic echinoids. *Palaeontology*, **24**, 779–801.

Smith, A.B., Gale, A.S. and Monks, N.E.A. (2001) Sea-level change and rock-record bias in the Cretaceous: a problem for extinction and biodiversity studies. *Paleobiology*, **27**, 241–53.

Smith, C.J. (1996) The Upper Lias of the Hebrides Basin. Unpublished D.Phil thesis, University of Oxford.

Smith, D.G. (1989) Stratigraphic correlation of presumed Milankovitch cycles in the Blue Lias (Hettangian to earliest Sinemurian), England. *Terra Nova*, **1**, 457–60.

Smith, W. (1817) *Stratigraphical System of Organised Fossils with Reference to the Specimens of the Original Geological Collection in the British Museum Explaining their use in Identifying the British Strata*, Printed for E. Williams, London.

Smithe, F. (1865) Geology of Churchdown Hill, Part I. *Proceedings of the Cotteswold Naturalists' Field Club*, **3**, 40–9.

Smithe, F. and Lucy, W.C. (1892) Some remarks on the geology of Alderton, Gretton and Ashton-under-Hill. *Proceedings of the Cotteswold Naturalists' Field Club*, **10**, 202–12.

Sole, D.T.C. (2001) The role of the private collector: two case histories. In *A Future for Fossils* (eds M.G. Bassett, A.H. King, J.G. Larwood, N.A. Parkinson and V.K. Deisler), National Museum of Wales Geological Series, No. **19**, National Museums of Wales and Galleries of Wales, Cardiff, pp. 79–84.

Sowerby, J. de C. (1812–1846) *The Mineral Conchology of Great Britain*, printed by B. Meredith, London.

Spath, L.F. (1922a) Upper Lias succession near Ilminster, Somerset. *Quarterly Journal of the Geological Society of London*, **78**, 449–50.

Spath, L.F. (1922b) On Lower Lias ammonites from Skye. *Geological Magazine*, **59**, 170–6.

Spath, L.F. (1922c) On the Liassic succession of Pabay, Inner Hebrides. *Geological Magazine*, **59**, 548–51.

Spath, L.F. (1924) The ammonites of the Blue Lias. *Proceedings of the Geologists' Association*, **35**, 186–211.

Spath, L.F. (1925a) Notes on Yorkshire Ammonites: I. On the genus *Oxynoticeras*. *Naturalist*, **1925**, 107–12.

Spath, L.F. (1925b) Notes on Yorkshire Ammonites: II. On a new deroceratid. *Naturalist*, **1925**, 137–41.

Spath, L.F. (1925c) Notes on Yorkshire Ammonites: III. On the 'Armatus Zone'. *Naturalist*, **1925**, 167–72.

Spath, L.F. (1925d) Notes on Yorkshire Ammonites: IV. On some Schlotheimidae. *Naturalist*, **1925**, 201–6.

References

Spath, L.F. (1925e) Notes on Yorkshire Ammonites: V. *Arietites*, *Asteroceras* and allied genera. *Naturalist*, **1925**, 263–9.

Spath, L.F. (1925f) Notes on Yorkshire Ammonites: VI. On *Ammonites planicosta*. *Naturalist*, **1925**, 299–306.

Spath, L.F. (1925g) Notes on Yorkshire Ammonites: VII. On *Ammonites semicostatus*. *Naturalist*, **1925**, 327–31.

Spath, L.F. (1925h) Notes on Yorkshire Ammonites: VIII. More Lower Liassic forms. *Naturalist*, **1925**, 359–64.

Spath, L.F. (1926a) Notes on Yorkshire Ammonites: VIII. More Lower Liassic forms (continued). *Naturalist*, **1926**, 45–9.

Spath, L.F. (1926b) Notes on Yorkshire Ammonites: VIII. More Lower Liassic forms. *Naturalist*, **1926**, 169–71.

Spath, L.F. (1926c) Notes on Yorkshire Ammonites: IX. On recent criticisms. *Naturalist*, **1926**, 265–8.

Spath, L.F. (1926d) Notes on Yorkshire Ammonites: X. On some post-Liassic ammonites and a new species of *Bonarellia*. *Naturalist*, **1926**, 321–6.

Spath, L.F. (1938) *A Catalogue of the Ammonites of the Liassic Family Liparoceratidae in the British Museum (Natural History)*, British Museum (Natural History), London, 191 pp., 26 pls.

Spath, L.F. (1942) The ammonite zones of the Lias. *Geological Magazine*, **79**, 264–8.

Spath, L.F. (1956) The Liassic ammonite faunas of the Stowell Park borehole. *Bulletin of the Geological Survey of Great Britain*, **11**, 140–64.

Stanton, W.I. (1991) Grebe Swallet Mine, Charterhouse-on-Mendip, Somerset. *Proceedings of the University of Bristol Speleological Society*, **19**, 43–65.

Steel, R.J. (1974a) New Red Sandstone floodplain and piedmont sedimentation in the Hebridean Province, Scotland. *Journal of Sedimentary Petrology*, **44**, 336–57.

Steel, R.J. (1974b) Cornstone (fossil caliche) – its origin, stratigraphic and sedimentological importance in the New Red Sandstone, western Scotland. *Journal of Geology*, **82**, 351–69.

Steel, R.J. (1977) Triassic rift basins of northwest Scotland – their configuration, infilling and development. In *Mesozoic Northern North Sea Symposium 1977 (MNNSS-77)* (eds F.G. Finstad and R.C. Selley), Norsk Petroleumsforening, Oslo, pp. 1–18.

Steel, R.J. and Wilson, A.C. (1975) Sedimentation and tectonism (?Permo–Triassic) on the margin of the North Minch Basin, Lewis. *Journal of the Geological Society*, **131**, 183–202.

Stephen, K.J., Underhill, J.R., Partington, M.A. and Hedley, R.J. (1993) The genetic sequence stratigraphy of the Hettangian to Oxfordian succession, Inner Moray Firth. In *Petroleum Geology of Northwest Europe: Proceedings of the 4th Conference held at the Barbican Centre, London, 29 March–1 April, 1992* (ed. J.R. Parker), Geological Society, London, pp. 485–505.

Stevens, V. (1991) The Beatrice Field, Block 11/30a, UK North Sea. In *United Kingdom Oil and Gas Fields, 25 years Commemorative Volume* (ed. I.L. Abbotts), *Geological Society Memoir*, No. **14**, Geological Society, London, pp. 245–52.

Stoneley, R. (1982) The structural development of the Wessex Basin. *Journal of the Geological Society*, **139**, 545–52.

Stoneley, R. (1983) Fibrous calcite veins, overpressures and primary oil migration. *Bulletin of the American Association of Petroleum Geologists*, **67**, 1427–8.

Storetvedt, K.M. and Steel, R.J. (1977) Palaeomagnetic evidence for the age of the Stornoway Formation. *Scottish Journal of Geology*, **13**, 263–9.

Stoyanova-Vergilova, M. (1977) An attempt for zonal subdivision of the Lower Jurassic sediments in Bulgaria. *Godishnik na Sofiiskiya Universitet*, **70**, 161–92 [in Bulgarian with English summary].

Strahan, A. and Cantrill, T.C. (1902) *The Geology of the South Wales Coalfield. Part III. The Country around Cardiff*, Memoir of the Geological Survey of Great Britain, Sheet 263 (England and Wales), HMSO, London, 147 pp.

Strahan, A. and Cantrill, T.C. (1904) *The Geology of the South Wales Coalfield. Part VI. The Country around Bridgend*, Memoir of the Geological Survey of Great Britain, sheets 261 and 262 (England and Wales), HMSO, London, 120 pp.

Strahan, A. and Cantrill, T.C. (1912) *The Geology of the South Wales Coalfield. Part III. The Country around Cardiff*, 2nd Edn, Memoir of the Geological Survey of Great Britain, Sheet 263 (England and Wales), HMSO, London, 157 pp.

Strickland, H.E. (1846) On two species of microscopic shells found in the Lias. *Quarterly Journal of the Geological Society of London*, **2**, 30–1.

Strickland, H.E. (1850) Notes on a section of Leckhampton Hill. *Quarterly Journal of the Geological Society of London*, **6**, 249–51.

Sturesson, U., Dronov, A. and Saadre, T. (1999) Lower Ordovician iron ooids and associated oolitic clays in Russia and Estonia: a clue to the origin of iron oolites? *Sedimentary Geology*, **123**, 63–80.

Stutchbury, S. (1842) On a new genus of fossil bivalve shells. *Annals and Magazine of Natural History*, **8**, 481–5.

Sumbler, M.G., Barron, A.J.M. and Morigi, A.N. (2000) *Geology of the Cirencester District*, Memoir of the British Geological Survey, Sheet 235 (England and Wales), The Stationery Office, London, for the British Geological Survey, 103 pp.

Sylvester-Bradley, P.C. (1953) A stratigraphical guide to the fossil localities of the Scarborough district. *The Natural History of the Scarborough District*, **1**, 19–48.

Tankard, A.J. and Balkwill, H.R. (eds) (1989) *Extensional Tectonics and Stratigraphy of the North Atlantic Margins*, *Memoir of the American Association of Petroleum Geologists*, No. **46**, American Association of Petroleum Geologists (AAPG), Tulsa, 641 pp.

Tappin, D.R., Chadwick, R.A., Jackson, A.A., Wingfield, R.T.D. and Smith, N.J.P. (1994) *The Geology of Cardigan Bay and the Bristol Channel*, *United Kingdom Offshore Regional Report*, No. **8**, HMSO for the British Geological Survey, London, 107 pp.

Tate, R. (1867) On the fossiliferous development of the Zone of *Ammonites angulatus*, Schloth., in Great Britain. *Quarterly Journal of the Geological Society of London*, **23**, 305–14.

Tate, R. (1875) On the Lias about Radstock. *Quarterly Journal of the Geological Society of London*, **31**, 493–510.

Tate, R. and Blake, J.F. (1876) *The Yorkshire Lias*, John van Voorst, London, 475 pp.

Tawney, E.B. (1866) On the western limit of the Rhaetic Beds in south Wales and on the position of the 'Sutton Stone'. With a note on the corals by P.M. Duncan. *Quarterly Journal of the Geological Society of London*, **22**, 69–93.

Tawney, E.B. (1875) Notes on the Lias in the neighbourhood of Radstock. *Proceedings of the Bristol Naturalists' Society*, *New Series*, **1**, 167–89.

Tawney, E.B. (1878) On the supposed Inferior Oolite at Branch Huish. *Proceedings of the Bristol Naturalists' Society*, *New Series*, **2**, 175–8.

Taylor, D., Boelling, K. and Guex, J. (1999) The Triassic/Jurassic system boundary in the Gabbs Formation, Nevada. In *Advances in Jurassic Research 2000*, *Proceedings of the Fifth International Symposium on the Jurassic System, held in Vancouver, Canada, August 12–25, 1998* (eds R.L. Hall and P.L. Smith), GeoResearch Forum, No. **6**, Trans Tech Publications, Zürich, pp. 225–37.

Taylor, H.P. Jnr. and Forester, R.W. (1971) Low-O18 igneous rocks from the intrusive complexes of Skye, Mull and Ardnamurchan, western Scotland. *Journal of Petrology*, **12**, 465–97.

Taylor, K.G. and Curtis, C.D. (1995) Stability and facies association of early diagenetic mineral assemblages: an example from a Jurassic ironstone-mudstone succession, U.K. *Journal of Sedimentary Research*, *Section A*, **65**(2), 358–68.

Taylor, M.A. (1992) Taxonomy and taphonomy of *Rhomaleosaurus zetlandicus* (Plesiosauria, Reptilia) from the Toarcian (Lower Jurassic) of the Yorkshire coast. *Proceedings of the Yorkshire Geological Society*, **49**, 49–55.

Thierry, J., Clavel, B., Hantzpergue, P., Neraudeau-Rigollet, L. and Vadet, A. (1997) Distribution chronologique et géographique des échinides Jurassiques en France: Essai d'utilisation biostratigraphique. In *Biostratigraphie du Jurassique Ouest-Européen et Méditerranéen: Zonations Parallèles et Distribution des Invertebrés et Microfossiles* (eds E. Cariou and P. Hantzpergue), *Bulletin de la Centre Recherches d'Elf Exploration Production*, *Memoires*, No. **17**, Elf Exploration Production, Pau, pp. 253–71.

Thomas, T.M. (1970) Field notes on the coastal section from Ogmore-by-Sea to Dunraven, Glamorgan (with a note on the Liassic mollusc *Gryphaea* by Michael G. Bassett). *The Welsh Geological Quarterly*, **5**, 46–60.

Thompson, S. (2001) 'Saved from the crusher': the Conesby Quarry case, Scunthorpe. In *A Future for Fossils* (eds M.G. Bassett, A.H. King, J.G. Larwood, N.A. Parkinson and V.K. Deisler), National Museum of Wales Geological Series, No. **19**, National Museums of Wales and Galleries of Wales, Cardiff, pp. 65–7.

Thrasher, J. (1992) Thermal effects of the Tertiary Cuillins Intrusive Complex in the Jurassic of the Hebrides: an organic geochemical study. In *Basins on the Atlantic Seaboard: Petroleum Geology, Sedimentology and Basin Evolution* (ed. J. Parnell), *Geological Society Special Publication*, No. **62**, Geological Society, London, pp. 35–49.

Tillyard, R.J. (1925) *The British Liassic Dragonflies (Odonata)*, Fossil Insects, No. **1**, British Museum, (Natural History), London, 40 pp.

Tillyard, R.J. (1933) *The Panorpoid complex in the British Rhaetic and Lias*, Fossil Insects, No. **3**, British Museum (Natural History), London, 79 pp.

Tomes, R.F. (1878). On the stratigraphical position of corals of the Lias of Midland and Western counties of England and South Wales. *Quarterly Journal of the Geological Society of London*, **34**, 179–95.

Tomes, R.F. (1884) A comparative and critical revision of the madreporia of the White Lias of the middle and western counties of England, and those of the conglomerate at the base of the South Wales Lias. *Quarterly Journal of the Geological Society of London*, **40**, 353–75.

Tomes, R.F. (1886) On the occurrence of two species of Madreporia in the Upper Lias of Gloucestershire. *Geological Magazine, Decade 3*, **3**, 107–11.

Torrens, H.S. (1969) Field meeting in the Sherborne–Yeovil district. *Proceedings of the Geologists' Association*, **80**, 301–24.

Townsend, J. (1813) *The Character of Moses Established for Veracity as an Historian, Recording Events from the Creation to the Deluge*, Longman, London.

Trewin, N.H. (1991) *Jurassic Sedimentation and Tectonics in the Brora–Helmsdale Area, and Old Red Sandstone Fluvial and Lacustrine Facies in N. Scotland*, Field Guide (13th International Sedimentological Congress), No. **8**, British Sedimentological Research Group, Cambridge, 86 pp.

Trewin, N.H. (1993) The Triassic and Lower Jurassic of Golspie. In *Excursion Guide to the Geology of East Sutherland and Caithness* (eds N.H. Trewin and A.R. Hurst), Scottish Academic Press, Edinburgh, pp. 41–7.

Trueblood, S. and Morton, N. (1991) Comparative sequence stratigraphy and structural styles of the Slyne Trough and Hebrides Basin. *Journal of the Geological Society*, **148**, 197–201.

Trueman, A.E. (1918) The evolution of the Liparoceratidae. *Quarterly Journal of the Geological Society of London*, **74**, 247–98.

Trueman, A.E. (1920) The Liassic rocks of the Cardiff district. *Proceedings of the Geologists' Association*, **31**, 93–107.

Trueman, A.E. (1922a) The use of Gryphaea in the correlation of the Lower Lias. *Geological Magazine*, **59**, 256–68.

Trueman, A.E. (1922b) The Liassic rocks of Glamorgan. *Proceedings of the Geologists' Association*, **33**, 245–84.

Trueman, A.E. (1930) The Lower Lias (Bucklandi Zone) of Nash Point, Glamorgan. *Proceedings of the Geologists' Association*, **41**, 148–59.

Trueman, A.E. (1942) A note on the base of the Lias near Broadford, Skye. *Transactions of the Geological Society of Glasgow*, **20**, 205–7.

Tutcher, J.W. (1929) *Dundry and Radstock*. In Excursion to Bristol District (S.H. Reynolds *et al.*). *Proceedings of the Geologists Association*, **40**, pp. 174–6.

Tutcher, J.W. and Trueman, A.E. (1925) The Liassic rocks of the Radstock district (Somerset). *Quarterly Journal of the Geological Society of London*, **81**, 595–666.

Tyrrell, G.W. (1928) *The Geology of Arran*, Memoir of the Geological Survey of Great Britain, sheets 13 and 21 (Scotland), HMSO, Edinburgh, 292 pp.

Underhill, J.R. (1991) Implications of Mesozoic–Recent basin development in the western Inner Moray Firth, UK. *Marine and Petroleum Geology*, **8**, 359–69.

Upton, C. (1906) On a section of the Upper Lias at Stroud. *Proceedings of the Cotteswold Naturalists' Field Club*, **15**, 201–7.

Ussher, W.A.E. (1890) *Geology of Parts of North Lincolnshire and South Yorkshire*, Memoir of the Geological Survey of the United Kingdom, Sheet 86 (England and Wales), HMSO, London, 232 pp.

Vail, P.R., Audemard, F., Bowman, S.A., Eisner, P.N. and Perez-Cruz, C. (1991) The stratigraphic signatures of tectonics, eustacy and sedimentology – an overview. In *Cycles and Events in Stratigraphy* (eds G. Einsele, W. Ricken and A. Seilacher), Springer-Verlag, Berlin, pp. 617–59.

van Buchem, F.S.P. and McCave, I.N. (1989) Cyclic sedimentation patterns in Lower Lias mudstones of Yorkshire (GB). *Terra Nova*, **1**, 461–7.

van Buchem, F.S.P., Melnyk, D.H. and McCave, I.N. (1992) Chemical cyclicity and correlation of Lower Lias mudstones using gamma ray logs, Yorkshire, UK. *Journal of the Geological Society*, **149**, 991–1002.

van Buchem, F.S.P., McCave, I.N. and Weedon, G.P. (1994) Orbitally induced small scale cyclicity in a siliciclastic epicontinental setting (Cleveland basin, Lower Lias, Yorkshire, UK). In *Orbital Forcing and Cyclic Sedimentary Sequences* (eds P.L. de Boer and D.G. Smith), *International Association of Sedimentologists Special Publication*, No. **19**, Blackwell Scientific Publications, Oxford, pp. 345–66.

van Hoorn, B. (1987a) The South Celtic Sea/Bristol Channel Basin: origin, deformation and inversion history. *Tectonophysics*, **137**, 309–34.

van Hoorn, B. (1987b) Structural evolution, timing and tectonic style of the Sole Pit inversion. *Tectonophysics*, **137**, 239–84.

Veevers, J.J. (1989) Middle–Late Triassic (230 ± 5 Ma) singularity in the stratigraphic and magmatic history of the Pangean heat anomaly. *Geology*, **17**, 784–7.

von Hillebrandt, A. (1990) The Triassic/Jurassic boundary in Northern Chile. *Cahiers de l'Université Catholique de Lyon, Série Sciences*, **3**, 27–53.

von Hillebrandt, A. (1994) The Triassic/Jurassic boundary and Hettangian biostratigraphy in the area of the Utcubamba Valley (northern Peru). *Proceedings of the 3ème Symposium International de Stratigraphie du Jurassique, Poitiers, France, 22–29 September, 1991* (eds E. Cariou and P. Hantzpergue), *Geobios Mémoire Spécial*, No. **17**, Edition de l'Université Claude Bernard, Lyon, pp. 297–307.

von Hillebrandt, A. (1997) Selection of a GSSP candidate for the base of the Jurassic system: Proposal for the Utcubamba Valley sections in northern Peru. *International Subcommission on Jurassic Stratigraphy Newsletter*, **24**, 21–5.

von Humbolt, F.W.H.A. (1795) *Über die unterirdischen Gasarten und die Mittel ihren Nachteil zu vermindern. Ein Beytrag zur Physik der praktischen Bergbaukunde*, F. Wiewag, Braunschwieg, 384 pp.

Vörös, A. (2002) Victims of the Early Toarcian anoxic event: the radiation and extinction of Jurassic Koninckinidae (Brachiopoda). *Lethaia*, **35**, 345–57.

Walford, A.E. (1878) On some Middle and Upper Lias beds in the neighbourhood of Banbury. *Proceedings of the Warwickshire Naturalists' and Archaeologists' Field Club*, Supplement for 1878, 1–23.

Walkden, G.M., Fraser, N.C. and Muir, J. (1987) A new specimen of *Steneosaurus* (Mesosuchia, Crocodilia) from the Toarcian of the Yorkshire coast. *Proceedings of the Yorkshire Geological Society*, **46**, 279–87.

Walker, J.F. (1892) On Liassic sections near Bridport, Dorsetshire. *Geological Magazine, New Series, Decade III*, **9**, 437–43.

Wall, D. (1965) Microplankton, pollen and spores from the Lower Jurassic in Britain. *Micropalaeontology*, **11**, 151–90.

Warrington, G. (1983) Appendix 4. Mesozoic micropalaeontological studies. In *Geology of the Country around Weston-super-Mare* (A. Whittaker and G.W. Green), Memoir of the Geological Survey of Great Britain, Sheet 279 with parts of 263 and 295 (England and Wales), HMSO, London, pp. 131–2.

Warrington, G. (1985). Appendix 1. Palynology of the Permo–Triassic and lower Jurassic succession. In *Geology of the Country around Taunton and the Quantock Hills* (E.A. Edmonds and B.J. Williams), Memoir of the British Geological Survey, Sheet 295 (England and Wales), HMSO, London, pp. 84–5.

Warrington, G. and Ivimey-Cook, H.C. (1990) Biostratigraphy of the late Triassic and early Jurassic: a review of type sections in southern Britain. *Cahiers de l'Université Catholique de Lyon, Série Sciences*, **3**, 207–13.

Warrington, G. and Ivimey-Cook, H.C. (1995) The Late Triassic and Early Jurassic of coastal sections in west Somerset and South and Mid-Glamorgan. In *Field Geology of the British Jurassic* (ed. P.D. Taylor), Geological Society, London, pp. 9–30.

Warrington, G., Cope, J.C.W. and Ivimey-Cook, H.C. (1994) St Audrie's Bay, Somerset, England: a candidate Global Stratotype Section and Point for the base of the Jurassic System. *Geological Magazine*, **131**, 191–200.

Waterhouse, H.K. (1999) Orbital forcing of palynofacies in the Jurassic of France and the United Kingdom. *Geology*, **27**, 511–14.

Waters, R.A. and Lawrence, D.J.D. (1987) *The Geology of the South Wales Coalfield. Part III. The Country around Cardiff*, 3rd edn, Memoir of the British Geological Survey, Sheet 263 (England and Wales), HMSO, London, 114 pp.

Watson, D.M.S. (1911) The Upper Liassic Reptilia. Part III. *Microcleidus macropterus* (Seeley) and the limbs of *Microcleidus homalospondylus* (Owen). *Memoir and Proceedings of the Manchester Literary and Philosophical Society*, **55**(17), 1–9.

Watson, J.S. (1982) The occurrence of *Discinisca* on *Dacromya ovum*: an example of commensalism from the Upper Lias of Yorkshire. *Proceedings of the Yorkshire Geological Society*, **44**, 45–51.

Watts, A. (1928) Excursion to Robin's Wood Hill. *Proceedings of the Cotteswold Naturalists' Field Club*, **23**, 137–9.

Weaver, T. (1824) Geological observations on part of Gloucestershire and Somersetshire. *Transactions of the Geological Society of London, Series 2*, **1**, 317–68.

Webber. M. (2001) The sustainability of a threatened fossil resource: Lower Jurassic *Caloceras* Beds of Doniford Bay. In *A Future for Fossils* (eds M.G. Bassett, A.H. King, J.G. Larwood, N.A. Parkinson and V.K. Deisler), National Museum of Wales Geological Series, No. **19**, National Museums of Wales and Galleries of Wales, Cardiff, pp. 108–13.

Weedon, G.P. (1986) Hemipelagic shelf sedimentation and climatic cycles: The basal Jurassic (Blue Lias) of south Britain. *Earth and Planetary Science Letters*, **76**, 321–35.

Weedon, G.P. (1987) Comment on "Origin of minor limestone-shale cycles: Climatically induced or diagenetic". *Geology*, **15**, 92–3.

Weedon, G.P. and Jenkyns, H.C. (1990) Regular and irregular climatic cycles and the Belemnite Marls (Pliensbachian, Lower Jurassic, Wessex Basin). *Journal of the Geological Society*, **147**, 915–18.

Weedon, G.P. and Jenkyns, H.C. (1999) Cyclostratigraphy and the Early Jurassic timescale: Data from the Belemnite Marls, Dorset, southern England. *Bulletin of the Geological Society of America*, **111**, 1823–40.

Weedon, G.P., Jenkyns, H.C., Coe, A.L. and Hesselbo, S.P. (1999) Astronomical calibration of the Jurassic time-scale from cyclostratigraphy in British mudrock formations. *Philosophical Transactions of the Royal Society of London, Series A*, **357**, 1787–813.

Wellnhofer, P. (1978) *Handbuch der Paläoherpetologie, Teil 19: Pterosauria*, Gustav Fischer, Stuttgart, 82 pp.

Whalley, P.E.S. (1985) The systematics and palaeogeography of the Lower Jurassic insects of Dorset, England. *Bulletin of the British Museum (Natural History): Geology Series*, **39/3**, 107–89.

White, H.J.O. (1923) *The Geology of the Country South and West of Shaftesbury*, Memoir of the Geological Survey of Great Britain, Sheet 313 (England and Wales), HMSO, London, 112 pp.

Whitehead, T.H., Anderson, W., Wilson, V. and Wray, D.A. (1952) *The Liassic Ironstones*, Memoir of the Geological Survey of Great Britain, HMSO, London, 211 pp.

Whittaker, A. (1972a) The Watchet Fault – a post-Liassic transcurrent reverse fault. *Bulletin of the Geological Survey of Great Britain*, **41**, 75–80.

Whittaker, A. (1972b) Intra-Liassic structures in the Severn Basin area. *Report of the Institute of Geological Sciences*, **72/3**, 5 pp.

Whittaker, A. (1973) The Central Somerset Basin. *Proceedings of the Ussher Society*, **2**, 585–92.

Whittaker, A. (1975) A postulated post-Hercynian rift valley system in southern Britain. *Geological Magazine*, **112**, 137–49.

Whittaker, A. (1978) The lithostratigraphical correlation of the uppermost Rhaetic and lowermost Liassic strata of the W. Somerset and Glamorgan areas. *Geological Magazine*, **115**, 63–7.

Whittaker, A. (1985) *Atlas of Onshore Sedimentary Basins in England and Wales: Post-Carboniferous Tectonics and Stratigraphy*, Blackie, Glasgow.

Whittaker, A. and Green, G.W. (1983) *Geology of the country around Weston-super-Mare*, Memoir of the Geological Survey of Great Britain, Sheet 279 with parts of sheets 263 and 295 (England and Wales), HMSO, London, 147 pp.

Whittaker, A. and Ivimey-Cook, H.C. (1972) Geology of Bredon Hill, Worcestershire. *Bulletin of the Geological Survey of Great Britain*, **42**, 1–9.

Whittaker, A., Cope, J.C.W., Cowie, J.W., Gibbons, W., Hailwood, E.A., House, M.R., Jenkins, D.G., Rawson, P.F., Rushton, A.W.A., Smith, D.G., Thomas, A.T. and Wimbledon, W.A. (1991) A guide to stratigraphical procedure. *Journal of the Geological Society*, **148**, 813–24.

Wignall, P.B. (1991) Model for transgressive black shales? *Geology*, **19**, 167–70.

Wignall, P.B. (2001) Sedimentology of the Triassic–Jurassic boundary beds in Pinhay Bay (Devon, SW England). *Proceedings of the Geologists' Association*, **112**, 349–60.

Wignall, P.B. and Maynard, J.R. (1993) The sequence stratigraphy of transgressive black shales. In *Source Rocks in a Sequence Stratigraphic Framework* (eds B.J. Katz and L. Pratt), AAPG Studies in Geology, No. **37**, American Association of Petroleum Geologists, Tulsa, pp. 35–47.

Wignall, P.B. and Myers, K.J. (1988) Interpreting benthic oxygen levels in mudrocks: A new approach. *Geology*, **16**, 452–55.

Wignall, P.B. and Pickering, K.T. (1993) Palaeoecology and sedimentology across a Jurassic fault scarp, NE Scotland. *Journal of the Geological Society*, **150**, 323–40.

Williams, B.J. and Whittaker, A. (1974) *Geology of the Country around Stratford-upon-Avon and Evesham*, Memoir of the Geological Survey of Great Britain, Sheet 200 (England and Wales), HMSO, London, 127 pp.

Williams, G.D. and Chapman, T.J. (1986) The Bristol–Mendip foreland thrust belt. *Journal of the Geological Society*, **143**, 63–73.

Wilson, D., Davies, J.R., Fletcher, C.J.N. and Smith, M. (1990) *Geology of the South Wales Coalfield. Part VI. The Country around Bridgend*, Memoir of the British Geological Survey, sheets 261 and 262, HMSO, London, 62 pp.

Wilson, E. and Crick, W.D. (1889) The Liassic Marlstone of Tilton, Leicestershire. *Geological Magazine*, **6**, 296–305, 337–42.

Wilson, H.E. and Manning, P.I. (1978) *Geology of the Causeway Coast*, Memoir of the Geological Survey of Northern Ireland, Sheet 7, HMSO, Belfast.

Wilson, H.E. and Robbie, J.A. (1966) *Geology of the Country around Ballycastle*, Memoir of the Geological Survey of Northern Ireland, Sheet 8, HMSO, Belfast.

Wilson, V. (1948) *British Regional Geology: East Yorkshire and Lincolnshire*, HMSO, London, 94 pp.

Wilson, V., Hemingway, J.E. and Black, M. (1934) A synopsis of the Jurassic rocks of Yorkshire. *Proceedings of the Geologists' Association*, **45**, 265–88.

Wilson, V., Welch, F.B.A., Robbie, J.A. and Green, G.W. (1958) *The Geology of the Country around Bridport and Yeovil*, Memoir of the Geological Survey of Great Britain, sheets 327 and 312 (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 1. *Modern Geology*, **20**, 159–202.

Witton, C.P. (1830) Geology of Awre. *Quarterly Journal of Science, Literature and Arts, New Series*, 69.

Wobber, F.J. (1965) Sedimentology of the Lias (Lower Jurassic) of South Wales. *Journal of Sedimentary Petrology*, **35**, 683–703.

Wobber, F.J. (1966) A study of the depositional area of the Glamorgan Lias. *Proceedings of the Geologists' Association*, **77**, 127–37.

Wobber, F.J. (1968a) A faunal analysis of the Lias (Lower Jurassic) of South Wales (Great Britain). *Palaeogeography, Palaeoclimatology, Palaeoecology*, **5**, 269–308.

Wobber, F.J. (1968b) Microsedimentary analysis of the Lias in South Wales. *Sedimentary Geology*, **2**, 13–49.

Woodland, A. (1971) The Llanbedr (Mochras Farm) Borehole. *Report of the Institute of Geological Sciences*, **71/18**, 116 pp.

Woods, H. (1925–1931) *A Monograph of the fossil macrurous Crustacea of England*, Monograph of the Palaeontographical Society, Palaeontographical Society, London, 122 pp.

Woodward, A.S. (1895) *A Catalogue of of the Fossil Fishes in the British Museum (Natural History), London, Part III*, British Museum (Natural History), London, 534 pp.

Woodward, A.S. (1896) On the fossil fishes of the Upper Lias of Whitby. *Proceedings of the Yorkshire Geological Society*, **13**, 3–4.

Woodward, A.S. (1897) On the fossil fishes of the Upper Lias of Whitby, Part II. *Proceedings of the Yorkshire Geological Society*, **13**, 155–70.

Woodward, A.S. (1898) On the fossil fishes of the Upper Lias of Whitby, Part III. *Proceedings of the Yorkshire Geological Society*, **13**, 325–37.

Woodward, A.S. (1899) On the fossil fishes of the Upper Lias of Whitby, Part IV. *Proceedings of the Yorkshire Geological Society*, **13**, 455–72.

Woodward, A.S. (1911) *Euthynotus*: A fossil fish from the Upper Lias of Dumbleton, Glos. *Proceedings of the Cheltenham Natural Science Society, New Series*, **1**, 322–3.

Woodward, H.B. (1866) Notes on the species of the genus *Eryon*, Desm., from the Lias and Oolite of England and Bavaria. *Quarterly Journal of the Geological Society of London*, **22**, 494–502.

Woodward, H.B. (1876) *Geology of east Somerset and the Bristol Coal-fields*, Memoir of the Geological Survey of the United Kingdom, Sheet 19 and parts of sheets 18, 20, 21 and 35 (England and Wales), HMSO, London, 271 pp.

Woodward, H.B. (1885) Excursion to Bridport, Bothenhampton, Burton Bradstock, Bridport Harbour and Eype. *Proceedings of the Geologists' Association*, **9**, 200–9.

Woodward, H.B. (1887) Note on the Ham Hill Stone. *Proceedings of the Bath Antiquarian Field Club*, **1887**, 182–4.

Woodward, H.B. (1888a) Notes on the Rhaetic beds and Lias of Glamorganshire. *Proceedings of the Geologists' Association*, **10**, 529–38.

Woodward, H.B. (1888b) On a new species of *Aeger* from the Lower Lias of Wilmcote, Warwickshire. *Geological Magazine, New Series, Decade III*, **5**, 385–7.

Woodward, H.B. (1893) *The Jurassic Rocks of Britain, Volume 3: The Lias of England and Wales (Yorkshire excepted)*, Memoir of the Geological Survey of the United Kingdom, HMSO, London, 399 pp.

Woodward, H.B. (1908) Note on a Megalosaurian tibia from the Lower Lias of Wilmcote, Warwickshire. *Annals and Magazine of Natural History, Series 8*, **1**, 257–9.

Woodward, H. (1911) On a new species of *Eryon* from the Upper Lias, Dumbleton Hill. *Geological Magazine, Decade 5*, **8**, 307–11.

Woodward, H.B. (1914) Notes on the geology of Raasay. *Transactions of the Edinburgh Geological Society*, **10**, 164–95.

Woodward, H.B., Ussher, W.A.E. and Jukes-Browne, A.J. (1911) *The Geology of the Country near Sidmouth and Lyme Regis*, 2nd edn, Memoir of the Geological Survey of Great Britain, sheets 326 and 340 (England and Wales), HMSO, London, 102 pp.

Woodward, J. (1728) *An Attempt Towards a Natural History of the Fossils of England: in a Catalogue of the English Fossils in the Collection of J. Woodward*, F. Fayram, London.

Woollam, R. and Riding, J.B. (1983) Dinoflagellate cyst zonation of the English Jurassic. *Report of the Institute of Geological Sciences*, **83/2**, 42 pp.

Wooller, ('Mr') (1758) A description of the fossil skeleton of an animal found in the Alum Rock near Whitby. *Philosophical Transactions of the Royal Society of London*, **50**, 786–90.

Worssam, B.C., Ellison, R.A. and Moorlock, B.S.P. (1989) *Geology of the Country around Tewkesbury*, Memoir of the British Geological Survey, Sheet 216 (England and Wales), HMSO, London, 57 pp.

Wright, T. (1856) On the palaeontological and stratigraphical relations of the so-called 'Sands of the Inferior Oolite'. *Quarterly Journal of the Geological Society of London*, **12**, 292–325.

Wright, T. (1860a) On the zone of *Avicula contorta* and the Lower Lias of the south of England. *Quarterly Journal of the Geological Society of London*, **16**, 374–411.

Wright, T. (1860b) On the subdivisions of the Inferior Oolite in the south of England, compared with the equivalent beds of that formation on the Yorkshire coast. *Quarterly Journal of the Geological Society of London*, **16**, 1–48.

Wright, T. (1863) Report on Miss Holland's collection of Lias fossils. *Proceedings of the Cotteswold Naturalists' Field Club*, **3**, 153–6.

Wright, T. (1857–1880) *British Fossil Echinodermata of the Oolitic Formations*, Monograph of the Palaeontographical Society, Palaeontographical Society, London, 2 volumes.

Wright, T. (1857–1878) *British Fossil Echinodermata of the Oolitic Formations, Volume 1: Echinoidea*, Monograph of the Palaeontographical Society, Palaeontographical Society, London, 481 pp.

Wright, T. (1862–1880) *British Fossil Echinodermata of the Oolitic Formations, Volume 2: Asteroidea and Ophiuroidea*, Monograph of the Palaeontographical Society, Palaeontographical Society, London, 187 pp.

Wright, T. (1878–1886) *Monograph on the Lias Ammonites of the British Isles*, Monograph of the Palaeontographical Society, Palaeontographical Society, London.

Young, G. (1817) *A History of Whitby and Streoneshalh Abbey with a Statistical Survey of the Vicinity to a Distance of Twenty Five Miles*, Clark and Medd, Whitby.

Young, G. and Bird, J. (1822) *A Geological Survey of the Yorkshire Coast*, Clark, Whitby, 324 pp.

Young, G. and Bird, J. (1828) *A Geological Survey of the Yorkshire Coast*, 2nd edn, Kirby, Whitby, 368 pp.

Young, T.P. (1989) Phanerozoic Ironstones: an introduction and review. In *Phanerozoic Ironstones* (eds T.P. Young and W.E.G. Taylor), *Geological Society Special Publication*, No. 46, Geological Society, London, pp. ix–xxv.

Young, T.P., Aggett, J.R. and Howard, A.S. (1990a) The Cleveland Ironstone Formation. In *Jurassic and Ordovician Ooidal Ironstones* (ed. T.P. Young), Field Guide (13th International Sedimentological Congress), No. 9, British Sedimentological Research Group, Cambridge, pp. 1–31.

Young, T.P., Parsons, D. and Aggett, J.R. (1990b) The Frodingham Ironstone. In *Jurassic and Ordovician Ooidal Ironstones* (ed. T.P. Young), Field Guide (13th International Sedimentological Congress), No. 9, British Sedimentological Research Group, Cambridge, pp. 1–31.

Zeuner, F.E. (1962) Fossil insects from the Lower Lias of Charmouth, Dorset. *Bulletin of the British Museum (Natural History): Geology Series*, 7/5, 155–71.

Glossary

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

Aalenian Stage: a **chronostratigraphical** subdivision of the **Jurassic System**, comprising the rocks deposited during the Aalenian Age. The first **stage** of the Middle Jurassic Series, it is dated to approximately 178–173.5 Ma (Harland *et al.*, 1990) and is preceded by the Lower Jurassic **Toarcian Stage**.

Abrasion: the process of wearing away parts of **fossils** or rocks by **sediment**-laden water or air. The process produces an increasingly smoothed and rounded outline shape.

Adit: a horizontal tunnel, for access or drainage, mined into a hillside.

Aerobic: an environment is which air (oxygen) is present, or a depositional environment with more than 1 ml of dissolved oxygen per litre of water. *See also* **anaerobic** and **dysaerobic**.

Age: a geological time unit (cf. **chronostratigraphy**), usually taken to be the smallest standard division of geological time.

Ahermatypic: not **hermatypic**, i.e. not **reef**-building.

Algae (sing. **alga**): a large and diverse division of the plant kingdom, consisting of mainly aquatic organisms. Simple plants that have no true stems, roots or leaves, they contain chlorophyll and therefore can **photosynthesize**. They range from microscopic single cells to very large multi-cellular structures.

Allochthonous: descriptive of **fossils** or rocks that lived or formed elsewhere to their current position.

Alluvial: a term applied to the environments, action and products of rivers or streams. Alluvial deposits are composed of **clastic** material deposited on the river floodplain.

Alluvial fan: a cone-shaped deposit made up of water-laid deposits, and also some material transported by **mud** flows.

Ammonite: any ammonoid of the **order** Ammonitida (subclass Ammonidea, **class** Cephalopoda (*see* **cephalopod**), **phylum** Mollusca (*see* **mollusc**). Typically characterized by a coiled, chambered shell, with complex lines between the chamber walls and the outer wall of the shell (sutures), they are an extinct relative of the modern-day squid and cuttlefish.

Ammonoid: any extinct **cephalopod** belonging to the subclass Ammonoidea; they are important zone **fossils** for the **Palaeozoic** and **Mesozoic eras**.

Anaerobic: an environment in which air (oxygen) is absent, or a depositional environment with 0–0.1 ml of dissolved oxygen per litre of water. *See also* **aerobic** and **dysaerobic**.

Annelid: any member of the **phylum** Annelida, a major invertebrate group comprising segmented worms such as modern earthworms

and leeches. In the **fossil** record they are usually preserved as **trace fossils** because they have almost no hard parts.

Anoxic: literally 'without oxygen'; often used to describe an **anaerobic** environment.

Anticline: an arch-shaped upfold of rocks produced by **tectonic** activity with younger **strata** on the outermost part of the arch and older rock in the core (cf. **syncline**).

Aptychus (pl. **aptychi**): a calcitic plate associated with **Mesozoic ammonites** that normally occurs in pairs. Aptychi are shaped like **bivalves** and have an ornamented outer surface. They are believed to be the lower jaws of **ammonoids**.

Aragonite: a form of **calcium carbonate**, distinguished from **calcite** by a different crystal structure. The shells of some molluscs are composed largely of aragonite.

Archipelago: a group of islands.

Arenite (adj. **arenaceous**): a general term for a detrital, **clastic sedimentary rock** made of **sand**-sized particles.

Argillite (adj. **argillaceous**): a general term for a fine-grained, **clay**-rich, **clastic sedimentary rock**.

Arthropod: any member of the **phylum** Arthropoda; the largest and most diverse phylum of the animal kingdom. These invertebrate animals are characterized by a segmented body and paired antennae, wings or legs. Examples include insects, **crustaceans** and arachnids.

Ash (volcanic): an unconsolidated deposit consisting of **pyroclastic** material (glass shards, crystals, etc.) less than 2 mm in size. In consolidated rocks the term is often used to denote the size of individual **volcaniclastic** fragments (e.g coarse-ash and fine-ash grains).

Asteroidea (asteroids): a **class** of the **phylum** Echinodermata (*see* **echinoderm**). Commonly known as 'starfish' they are characterized by their star shape and five 'arms'.

Authigenic: descriptive of materials, such as minerals or **cement**, that formed in place in the **sediment** or rock of which they are a part, during, or soon after, its deposition.

Autochthonous: descriptive of **fossils** or rocks that lived or formed in their current positions.

Basalt: a fine-grained, usually dark-coloured, basic, volcanic (**extrusive**) **igneous rock**. It usually occurs as a lava or **dyke**.

Basement : the oldest rocks recognized in a given area; a complex of **metamorphic** and/or **igneous rocks** that underlies all the sedimentary formations.

Basin: an area of **subsidence**, or depression, usually of considerable size, in which **sediments** accumulate and/or volcanic **strata** may be laid down.

Batholith: a large, irregular mass of **igneous rock** emplaced deep in the Earth's crust.

Bed: in **lithostratigraphy**, a subdivision of either a **member** or a **formation**; the smallest unit within the scheme of formal lithostratigraphical classification. Also used informally to indicate a **stratum** within a **sedimentary rock** succession.

Bedding plane: a planar feature in **sedimentary rocks** representing an original surface of deposition. Conspicuous bedding planes may indicate a short interruption in, or change in character of, **sediment** deposition.

'Beef' calcite: a fibrous form of **calcite** that frequently has the appearance of a series of small-scale 'nested' cones stacked one inside the other.

Belemnite: any member of the proposed extinct marine subclass, or **order**, Belemnoidea (**class** Cephalopoda (*see* **cephalopod**), phylum Mollusca (*see* **mollusc**)). Characterized by a bullet-shaped internal shell of **calcium carbonate**, surrounded by soft body parts, they are similar to a modern-day squid, and became extinct in the Eocene Epoch.

Benthos (adj. **benthic**): aquatic organisms living on or in the sea floor.

Bioclast (adj. **bioclastic**): a **sediment** grain consisting of **comminuted fossil** remains.

Bio-erosion: the **erosion** of consolidated material or a **lithic** substrate by the action of living organisms.

Biofacies: a **facies** defined by its characteristic **fossil** assemblage, and reflecting a specific set of environmental conditions.

Biogenic: produced by living organisms or biological processes.

Biohorizon: a **bed** or series of beds characterized by a particular **fossil** assemblage and within which no further **stratigraphical** refinement, on the basis of that contained fossil **fauna**, can be made.

Biomicrite: a **limestone** containing **bioclasts** in a **carbonate mud matrix**.

Biosparite: a **limestone** containing **bioclasts** in a cementing **matrix** of crystalline **calcite**.

Biostratigraphy: the **stratigraphical** subdivision, classification and **correlation** of **sedimentary rocks** based on their **fossil** content.

Biota: the **flora** and **fauna** of a particular place; or the faunal and floral assemblage of a **bed** or other **stratigraphical** unit.

Bioturbation: the physical disturbance of unconsolidated **sediment**, such as by burrowing and feeding, caused by the organisms living on or in it. These disturbances are often preserved as **trace fossils** in ancient **sediments**.

Biozone: in **biostratigraphy**, a restricted unit of **sedimentary rock** defined by its **fossil** content, most usefully by **species** of narrowly defined temporal, but wide spatial, range, and named after one or more abundant or characteristic species.

Bitumen (adj. **bituminous**): a group of naturally occurring hydrocarbons that are organic-soluble.

Bivalve: any member of the **order** Bivalvia (**phylum** Mollusca (*see* **mollusc**)). These marine invertebrates are characterized by bodies enclosed in two, hinged, often mirror-image, shells (valves). Modern examples include cockles and mussels.

Bolide: a meteorite, typically one that explodes.

Boreal: referring to the north or a cold climate.

Brachiopod: any member of the **phylum** Brachiopoda. These marine invertebrates are superficially similar to **bivalves** but with a different anatomy and two hinged shells that are typically dissimilar.

Brackish: descriptive of water with a salinity intermediate between fresh and marine.

Breccia: a rock composed of angular broken fragments greater than 2 mm in diameter; can be **pyroclastic**, sedimentary or **fault**-related.

Bryozoan: any member of the **phylum** Bryozoa. These very small, moss-like aquatic organisms often form permanent colonies, linked by their box-like skeletons of **calcium carbonate**.

Byssate: descriptive of **bivalves** that are attached to the substrate or some other object by strands of byssus.

Calcarenite: a **limestone** composed mainly of **sand**-sized **calcium carbonate** grains.

Calcareous: containing large quantities, or composed, of **calcium carbonate**.

Calci-: prefix indicating containing/composed of **calcium carbonate**.

Calcilutite: a **limestone** composed mainly of **mud**-sized **calcium carbonate** grains.

Calcite: the most common, rock-forming crystalline form of **calcium carbonate**; the main constituent of **limestone** and the shells of many molluscs, **brachiopods**, **echinoderms** and other invertebrates.

Calcium carbonate ($CaCO_3$): a colourless or white crystal compound, which occurs naturally as **limestone**, marble and **chalk**. *See also* **calcite**.

Calcrete: *see* **caliche**.

Caliche: a soil horizon rich in nodular **carbonate** that forms in seasonally arid environments.

Carbonaceous: containing carbon.

Carbonate: a mineral salt of carbonic acid, usually referring to the common sedimentary form **calcium carbonate** in **limestones** and invertebrate shells, but also encompassing other minerals, notably **dolomite**.

Cement: the mineral 'glue' that holds particles together in **sedimentary rocks**.

Cementstone: **argillaceous limestone** and dolostone.

Cephalopod: any member of the **class** Cephalopoda, the most advanced class of the **phylum** Mollusca (*see* **mollusc**). These marine organisms include the modern-day squid, octopus, and cuttlefish, and the extinct **belemnites** and **ammonites**.

Chalk: poorly **lithified**, porous, white **limestone**.

Chert: microcrystalline silica (**quartz** and chalcedony), which may be of organic or inorganic origin. It occurs as layers or modules in **sedimentary rocks** (mainly **chalk** and **limestone**). An example is flint.

Chronostratigraphy: the subdivision and **correlation** of rock units on the basis of relative age. The hierarchy of principal chronostratigraphical units to which layers of **sedimentary rock** are allocated through the study and interpretation of their **stratigraphy** is erathem, **system**, **series** and **stage**, which are related, respectively to the geological time units of **era**, **period**, **epoch** and **age**. Rocks of the **Jurassic System** (a chronostratigraphical unit) were laid down in the **Jurassic Period** (a geological time unit).

Chronozone: a fine division of geological time based on some recognizable feature preserved in **contemporaneous** sedimentary **strata**.

Clade: a group of organisms that share a common ancestor.

Class: a category used in the taxonomic classification of organisms, which consists of one or several related **orders**. Similar classes are grouped into a **phylum**.

Clast: (adj. **clastic**): a sedimentary particle – a fragment of a pre-existing rock or **fossil** (**bioclast**).

Clay: an extremely fine-grained **sediment** (grain-size less than 0.004 mm) composed of so-called 'clay minerals'.

Coccolith: one of the interlocking **calcite** plates which form the sphere-shaped skeleton (coccosphere) of the coccolithophores (marine, microscopic, single-celled **algae**).

Comminuted: finely divided.

Concretion: a rounded or irregular mass of mineral matter concentrated around a nucleus and formed during **diagenesis** in a **sedimentary rock**.

Conduit: a **dissolutional** void, generally greater than 100 mm in diameter, in **limestone**; larger than a **fissure**, and including cave passages.

Conglomerate: a **sedimentary rock** consisting of rounded pebbles (cf. **breccia**).

Contemporaneous: formed or occurring at the same time.

Contiguous: touching, in contact.

Coquina: a sedimentary deposit largely made of shells or their fragments.

Coral: any member of the **class** Anthozoa (**phylum** Coelenterata). These aquatic animals typically have a **calcium carbonate** external skeleton. They may live as individuals or in large colonies.

Cornstone: a **concretionary limestone** deposit typically developed in **sandstones**, characteristic of arid terrestrial environments (synonymous with **calcrete**).

Correlation: the tracing and identification of a **stratigraphical** unit away from its **type area** by comparing lithologies and/or **fauna**.

Crinoid: any member of the **class** Crinoidea (**phylum** Echinodermata (*see* **echinoderm**)). These marine invertebrates have a flowering plant-like structure and are often called 'sea lilies' or 'feather stars'. They may be sessile (with a stem) or free-floating.

Cross-stratification: subsidiary bedding surfaces oblique to the upper and lower bounding surfaces of a particular **stratum** and representing ripples or dunes formed in the sediment by water currents (or wind). Large-scale features are named 'cross-bedding', small-scale features are known as 'cross-lamination'.

Crustacean: any member of the **class** Crustacea (**phylum** Arthropoda (*see* **arthropod**)). These animals have typically have two pairs of antennae, a pair of mandibles and often many other appendages, and are mainly aquatic. Examples include lobsters, shrimps, barnacles and wood lice.

Cryptic: descriptive of **reef** organisms, mainly invertebrates, that live under **corals**, shells and rocks.

Decapod: a **crustacean** with ten limbs for walking, such as the shrimp.

Decollement: the dislocation surface, commonly in soft **strata**, upon which rocks have slid and become **folded** or **faulted**, leaving the rocks below the surface relatively undeformed.

Depocentre: the centre of (greatest) deposition.

Dessication crack: a crack formed when wet **sediment** dries out.

Diachronous: descriptive of a **lithological** unit, or **contiguous** rock body, that was deposited at different times in different locations and therefore differs in age from place to place.

Diagenesis: (adj. **diagenetic**): the post-depositional changes in mineralogy and texture of sediments and organisms that combine to produce rocks and **fossils**. The term excludes **metamorphic** alteration.

Dinoflagellate: mostly members of the **class** Dinophyceae. These **planktonic** organisms are microscopic, single-celled and possess two flagella (tails) used in movement. Some cause 'red tides' and some are bioluminescent.

Dip: the angle between a bedding surface and the horizontal.

Disconformity (adj. **disconformable**): a break in continuity of deposition, (**unconformity**), where the **beds** above and below are parallel and therefore show no angular discordance.

Dissolution: the natural process of dissolving a solid; specifically in **karst** processes, the dissolving of **carbonate** rock to create a liquid solution of calcium and bicarbonate ions in water; also known as 'solution'.

Distal: far from the source.

Dogger: a traditional term for a type of large **concretion**; also the name formerly used for the Middle Jurassic Series in continental Europe.

Dolomite ($CaMg(CO_3)_2$): a white or colourless mineral with a structure similar to **calcite** but with some calcium replaced by magnesium.

Downthrow: the amount of downward displacement of rock along a **fault**.

Druse (**drusy**): a cavity (**vug**) in an **igneous rock** or mineral vein into which well-formed crystals of the rock or mineral vein project; or the crystals themselves.

Dyke: a band of **igneous rock** that has 'intruded' or 'cut through' pre-existing rocks. *See also* **neptunian dyke**.

Dysaerobic: a depositional environment with 0.1–1.0 ml of dissolved oxygen per litre of water. *See also* **aerobic** and **anaerobic**.

Echinoderm: any member of the **phylum** Echinodermata. These marine invertebrates are characterized by a five-fold symmetry, an internal skeleton of **calcite** plates and a complex water vascular system. Examples include **echinoids** (sea-urchins), **crinoids**, and starfish (*see* **asteroidea**).

Echinoid: a member of the **class** Echinoidea (**phylum** Echinodermata (*see* **echinoderm**)). More commonly known as the 'sea-urchin', these organisms are characterized by a rigid, globular or disc-shaped shell.

Endemism: a situation in which a **species** or other taxonomic group is restricted to a particular geographical region, due to factors such as isolation, or a response to soil or climatic conditions.

Endogenic (**endogenetic**): in geomorphology, the forces operating below the Earth's crust that are involved in the formation of surface features.

Endolithic: descriptive of organisms, such as **algae** or fungi, that live in minute burrows within **sediments**, rocks or shells.

Epeiric sea: a shallow sea that extends far into the interior of a continent; and also a shallow sea area that cover the continental shelf and is partially enclosed.

Epeirogeny (adj. **epeirogenic**): broad and generally large-scale, vertical movements of the Earth's crust, which do not involve much alteration in the structure of the rock.

Epibenthos (adj. **epibenthic**): organisms living on the surface of the seabed or bed of a lake.

Epibyssate: descriptive of organisms that use the byssus (*see* **byssate**) to anchor themselves to rock or seaweed.

Epifauna: a collective term for the **benthic** organisms that live or lived on the substrate of the sea floor, or attached to some solid object.

Epoch: a geological time unit (cf. **chronostratigraphy**), of shorter duration than a **period** and itself divisible into **ages** (e.g. the Late Triassic Epoch.

Era: a major geological time unit (cf. **chronostratigraphy**), which is divided into **periods** (e.g. the **Palaeozoic Era**).

Erosion: the wearing away of the land's surface by mechanical processes such as the flow of water, ice or wind.

Erosion surface: a land or rock surface shaped by the processes of **erosion**.

Eurytopic: able to tolerate a wide range of several factors.

Eustatic: concerning worldwide (as distinct from local) changes in sea level that are caused by a major geological event such as **tectonic** activity or an ice-age.

Evaporite: a **sediment** or mineral grown from a saline solution by evaporation of water, which may be marine or continental in origin.

Event stratigraphy: the **correlation** of **sedimentary rocks** by recognition of **marker beds** or event horizons which are considered to be **isochronous**.

Exogenous (**exogenic**): descriptive of processes originating at or near the surface of the Earth, such as **erosion**, and of rocks and landforms that owe their origin to such processes.

Extrusive: descriptive of **igneous rocks** that have been extruded onto the Earth's surface, rather than being intruded beneath the surface (**intrusive**).

Facies: the sum total of a rock's lithological and gross **faunal/floral** characteristics that together reflect the particular environment in which it formed.

Family: a category used in the taxonomic classification of organisms, which consists of one or several related **genera**. Similar families are grouped into an **order**.

Fault: an approximately planar fracture surface in rock along which there has been some movement of one side relative to the other.

Fauna: animals – often referring to the characteristic animal assemblage of a region/time period.

Ferruginous: containing iron or iron-rich minerals.

Fissile: descriptive of a **sedimentary rock** that contains very thin bedding or cleavage **laminae** along which the rock splits into thin sheets.

Fissure: a fracture surface or crack within a rock along which a clear separation can be seen. Often filled with material, frequently mineral-bearing.

Flaggy: descriptive of a **sedimentary rock** that contains bedding between 0.01 m and 0.1 m thick, along which the rock can be split into thick sheets (flagstones).

Flora: plants – often referring to the characteristic plant assemblage of a region/time period.

Flowstone: a deposit of **calcium carbonate** formed by flowing water on the wall or floor of a cave.

Fluvial: relating to a river or river system.

Fold: a bend in rock **strata** produced by earth movements.

Foraminifera: a mainly marine **order** of the subclass Sarcodina in the **phylum** Protozoa, consisting of single-celled aquatic animals that have a **calcareous** protective external shell, often with an elaborate form. Usually microscopic in size but some are larger.

Foreset: the steeply dipping surface of **cross-bedded strata**.

Formation: a succession of **contiguous** rock **strata** that is distinctive enough in its **lithology** from the surrounding rocks to be mapped as a unit; the fundamental unit of **lithostratigraphy**.

Fossil: the preserved remains of an animal or plant. *See also* **trace fossil**.

Friable: descriptive of a rock that is crumbly or easily broken.

Gastropod: any member of the **class** Gastropoda (**phylum** Mollusca (*see* **mollusc**)). These ancient invertebrates are characterized by a well-developed head, a flattened foot, and spirally shaped shells of aragonitic **calcium carbonate**. Examples include snails, slugs, limpets and conches.

GCR: Geological Conservation Review, in which nationally important geological and geomorphological sites were assessed and selected with a view to their long-term conservation as **SSSIs**.

Genotype: the **type species** of a **genus**.

Genus (pl: **genera**): a category used in the taxonomic classification of organisms, which consists of one or several related **species**. Similar genera are grouped together into a **family**.

Geochronology: the measurement of absolute geological time and its division into episodes, in years, or millions of years (Ma), before the present time.

Geopetal: a sedimentary fabric that records the way up at the time of deposition. Commonly found in cavity fills within **limestones**.

Graben: a linear block of crust **downthrown** between two parallel **faults** to form a **rift** or trough-shaped valley.

Granite: a pale-coloured, coarse-grained, typically **plutonic (intrusive) igneous rock**, with a high SiO_2 content. Commonly found in **batholiths** and veins.

Greensand: a **sedimentary rock** that contains a green mineral called glauconite.

Grike (gryke): a **fissure** between clints in a **limestone** pavement, formed by **dissolutional** enlargement of a **joint**.

Group: in **lithostratigraphy**, a grouping of two or more **formations** with significant unifying lithological and/or genetic features.

GSSP (Global boundary Stratotype Section and Point): an internationally recognized **chronostratigraphical** boundary established following strict procedures of the International Union of Geological Sciences Subcommission on Stratigraphy.

Gymnosperm: a member of a major division of the plant kingdom, consisting of woody plants with alternation of generations and seeds not protected in an ovary. Examples include seed ferns and conifers.

Half-graben: an elongate trough bounded by a normal **fault** on one side only. *See also* **graben**.

Halokinesis: the mobilizaton and flow of subsurface salt, and the subsequent emplacment and resulting structure of salt bodies.

Hardground: a bedding surface of rock formed by cementation of **sediment** soon after deposition whilst it was at or close to the sediment–water interface (the sea floor).

Hemera (pl. **hemerae**): an interval of geological time characterized by the maximum abundance of a named **fossil**.

Hermatypic: descriptive of **corals** that contain zooxanthellae (unicellular **dinoflagellates**) and are **reef** forming.

Hettangian Stage: a **chronostratigraphical** subdivision of the **Jurassic System**, comprising the rocks deposited during the Hettangian Age. The first **stage** of the Lower Jurassic Series, it is dated to approximately 199.6–196.5 Ma (Palfy *et al.*, 2000c), and is preceded up the Upper Triassic **Rhaetian Stage** and followed by the **Sinermurian Stage**.

Highstand: a phase of high sea level.

Holothurian: a member of the **class** Holothuroidea, of the **phylum** Echinodermata (*see* **echinoderm**). Commonly known as 'sea cucumbers', these organisms typically have a non-rigid calcitic skeleton, composed of small sclerites or **spicules**.

Holotype: the single specimen (the so-called '**type specimen**') selected to epitomize a particular named **species**.

Horizon: an informal term denoting a thin **bed** or plane within a succession of **strata**. *See also* **biohorizon**.

Horst: an upfaulted block of crustal rocks, often on either side of a **graben**.

Ichthyosaur: an extinct marine reptile well adapted for swimming; it had a streamlined fish-shaped body, paddle-shaped limbs, and ranged from 1 m to 10 m in length.

Igneous rock: a rock that has formed from the cooling of molten magma, either following volcanic activity or **intrusive** processes. It consists of interlocking crystals, the size of which depends on the rate of cooling of the magma.

Imbrication: a sedimentary fabric displaying typically elongate fragments that are aligned in a preferred angle to the bedding.

Index fossil (index species): a particular **fossil** (or **species**) that gives its name to a **biozone**.

Induration: the process of compaction and cementation during which a soft **sediment** becomes a rock.

Infauna: a collective term for the organisms that live or lived below the sea floor, especially in burrows in soft **sediments** but also including some rock-boring organisms.

Inlier: an outcrop of older rocks surrounded, on a geological map, by younger rocks commonly exposed by **erosion** (cf. **outlier**).

Intertidal: **littoral**; the zone between high- and low-water marks on a shoreline.

Intraclast: a fragment of rock derived from coeval parent material rather than an 'older' (extraformational) source.

Intrusion: (adj. **intrusive**): an **igneous rock** that has formed as a body intruded into other rocks below the Earth's surface.

Ironshot: descriptive of a rock that contains small granules or **ooids** of iron or iron ore (often haematite and limonite).

Ironstone: an iron-rich **sedimentary rock**.

Isochronous: occurring at the same time.

Joint: a fracture in a rock that exhibits no displacement across it (unlike a **fault**). May be caused by shrinkage of **igneous rocks** as they cool in the solid state, or, in **sedimentary rocks**, by regional extension or compression caused by earth movements.

Jurassic Period: a geological time division ranging from about 142 Ma to 200 Ma; it precedes the Cretaceous Period and succeeds the Triassic Period.

Jurassic System: a **chronostratigraphical** unit comprising all the rocks deposited during the **Jurassic Period**.

Karst: descriptive of a distinctive terrain developed upon a soluble rock, typically **limestone**; characterized by caves, sinkholes and dry valleys.

Lacustrine: relating to, formed within in, or produced by, lakes.

Lagoon: an area of shallow, generally salt, water more-or-less cut off from the sea by a narrow bar of **sediment**.

Lamina (pl. **laminae**, **laminations**): the finest layer within a **sedimentary rock**, typically less than 10 mm thick.

Laminated: descriptive of a **bed** with a fabric composed of **laminae**.

Laterite (adj. **lateritic**): red subsoil, rich in hydrous oxides of iron and/or aluminium and commonly with kaolinite and silica that develops as a residual product of **weathering** in tropical and subtropical climates.

Lectotype: a specimen chosen from available **syntypes** to be the designated type of the **species**.

Lenticle: a lens-shaped **stratum** or body of rock.

Lias: a **lithostratigraphical group** of mainly Early Jurassic age.

Limestone: **sedimentary rock** composed of **calcium carbonate**, often partly derived from the shells of organisms.

Lineation: any linear feature that appears on the bedding or other surface of a rock. May be formed during deformation.

Lithic: relating to a rock **clast** found within a **sedimentary rock**.

Lithification: the conversion of **sediment** into rock.

Lithoclast: a mechanically deposited rock fragment, normally greater than 2 mm in diameter, derived from any older, (pre-existing) **lithified** rock.

Lithofacies: a **facies** defined by **sedimentary rock** type (using, for example, colour, texture and mineral composition).

Lithology: descriptive of the constitution of a **sediment** or other rock, including composition, texture, colour and hardness.

Lithosphere: the outer layer of the solid Earth, including the crust and upper part of the mantle, which forms **tectonic** plates above the asthenosphere.

Lithostratigraphy: the organization and division of **strata** into mainly mappable rock units and their **correlation**, based entirely upon their lithological characteristics. Units are named according to their perceived rank in a formal hierarchy, namely supergroup, **group**, **formation**, **member** and **bed**.

Littoral: descriptive of the zone between high- and low-water marks on a shoreline.

Log: a written or graphical record of a borehole or rock section.

Lower Jurassic Series: a **chronostratigraphical** division of the **Jurassic System**, comprising the rocks deposited during the Early Jurassic Epoch. The first series of the Jurassic System, it is dated to approximately 199.6–178 Ma (Palfy *et al.*, 2000c), and is followed by the Middle Jurassic Series. It is divided into the **Hettangian**, **Sinemurian**, **Pliensbachian** and **Toarcian stages**.

Lowstand: a phase of low sea level.

Macrofossil: a **fossil** that is easily seen by the naked eye.

Macrophyte: a plant that can be seen by the naked eye, typical of aquatic regions.

Marker band (bed): a **bed** or layer within a rock succession with distinctive, easily recognizable characteristics that allow it to be traced for long distances or to serve as a reference or datum, and thereby enabling **correlation**.

Marl: a fine-grained **calcium carbonate**-rich **mud** or **clay**.

Mass extinction: a heightened rate of extinction as recorded in the **fossil** record by the termination of a significant number of **species** lineages over a relatively short period of time (in geological terms), reflecting a biotic crisis that may have a variety of causes, such as a change in sea level or climate.

Mass flow: the transport, down slope under the force of gravity, of large, coherent masses of **sediment**, tephra or rock; commonly assisted by the incorporation of water, ice or air.

Massif: a very large topographic or structural feature.

Massive: descriptive of a **bed** or layer of **sedimentary rock** with an apparently uniform structure and lacking bedding fabric or **lamination**.

Matrix: the fine-grained **sediment** or crystalline **cement** that infills the spaces between larger grains.

Megaspore: a **fossil** plant spore greater than 0.22 mm in diameter, for which the parent plant is often unknown.

Member: in **lithostratigraphy**, a subdivision of a **formation**.

Mesozoic Era: a geological time division ranging from 65 to 247 million years ago. It comprises the Triassic, Jurassic and Cretaceous periods.

Metamorphic rock: a rock that has been altered by the action of heat and/or pressure, without melting.

Metamorphism (adj. **metamorphic**): the process of radical alteration of the mineralogical and/or physical nature of rocks as a result of pressure and/or temperature.

Metasediment: a **sedimentary rock** that has undergone **metamorphism**.

Micrite: a microcrystalline **calcite**; typically a lime **mud**.

Microfauna: a microscopic animal.

Microfossil: a microscopic **fossil**.

Miospore: a general term for any **fossil** plant spore smaller than 0.2 mm.

Mollusc: any member of the **phylum** Mollusca, which comprises about 5000 **species**. These invertebrates are characterized by a fleshy soft body and, usually, a hard shell. They may be marine, freshwater or terrestrial, and examples include **gastropods** (snails, limpets), **bivalves** (oysters, mussels), and **cephalopods**.

Monocline: a **stratigraphical** unit that dips from the horizontal in one direction only, not as part of an **anticline** or **syncline**.

Morphospecies: a group of biological organisms that differs in some morphological respect from all other groups.

Mucilage: a layer or mass of organic matter, commonly coating the shells of marine organisms and some grains such as **ooids**.

Mud: a mixture of **clay** and **silt**.

Mudrock (mudstone): a fine-grained **sedimentary rock**; **lithified mud**.

Nannofossil: an extremely small marine (usually **algal**) **fossil**, smaller in size than a **microfossil**, such as a **coccolith**.

Nautiloid: a member of the subclass Nautiloidea of the **class** Cephalopoda (*see* **cephalopod**). These marine invertebrates possess a multi-chambered external shell of **calcium carbonate** that may be straight or coiled. Only one **genus**, the *Nautlius*, survives today.

Nekton (adj. **nektonic**): those organisms that actively swim in water.

Neotype: a specimen designated as the **type specimen** of a **species** or subspecies when the **holotype** and all **paratypes** and **syntypes** have been lost or destroyed.

Neptunian dyke: a sheet-like body of **sand** or other **sediment** that cuts through bedded sediment in a manner analogous to an igneous **dyke**. Formed by the upward or downward injection of liquefied sand through a **fissure**, often as a result of earthquake activity.

Neritic: relating to the **sub-littoral** zone, between the continental shelf and low-water mark.

Nodule: a small **concretion**, generally roughly spherical or ellipsoidal.

Non-sequence: a relatively minor break in the accumulation of **sediment** and therefore a gap in the **sedimentary rock** record.

Obdurate: hardened.

Obrution: sudden burial.

Onlap: associated with **unconformities**, **beds** that successively overlap each other.

Oncolite (adj. **oncolitic**): a spherical or subspherical particle, up to 5 cm in diameter, which is produced by the accretion of sedimentary material on to a mobile grain through the action of **algae**.

Ontogeny: the growth and development through the life of an individual organism.

Ooid (oolith): a spherical or subspherical **carbonate**-coated, sedimentary particle, less than 2 mm in diameter.

Oolite: a rock, usually **limestone**, made up largely of **ooids** produced by accretion of **carbonate** around a nucleus.

Order: a category used in the taxonomic classification of organisms, which consists of one or several related **families**. Similar orders are grouped together in a **class**.

Orogeny: a process of mountain building during which the rocks and **sediments** of a particular area of a continent are deformed and **uplifted** to form mountain belts.

Ossicle: a small bone, or piece of bone-like, calcitic or chitinous material found in various skeletal parts of animals.

Ostracod: any member of the subclass Ostracoda (**class** Crustacea (*see* **crustacean**), **phylum** Arthropoda (*see* **arthropod**)). These small invertebrates are mostly less than 1 mm in size and consist of two **calcareous** valves ('shells'). They can be found in a wide range of aquatic environments, both in fresh- and salt-water.

Outlier: an outcrop of younger rocks surrounded, on a geological map, by older rocks (cf. **inlier**).

Overstep: a relationship in which a younger series of sedimentary **strata** rests upon a progressively older series of strata, the older and younger series of strata being separated by a plane of **unconformity**.

Palaeo-: 'ancient'.

Palaeontology: the study of **fossil fauna** and **flora** including their evolution and reconstruction of pre-existing environments.

Palaeozoic Era: a geological time division; the first major division of geological time characterized by abundant life. It precedes the **Mesozoic Era**.

Palaeosol: an ancient or 'fossilized' soil.

Palyno-: prefix indicating '**pollen**' or 'spores'.

Palynology: the study of **pollen**, spores and certain other, generally plant, **microfossils**.

Palynomorph: any of the microscopic, acid-resistant, organic-walled bodies found in palynological preparations and studied in **palynology**.

Pangaea: a supercontinent formed by ocean floor **subduction**, plate collision and assembly of all continents in late Permian times.

Paper shale: a **shale** that easily separates on **weathering** into thin layers or **laminae** resembling sheets of paper. Often very **carbonaceous**.

Parastratotype: a supplementary **stratotype** used to illustrate the diversity or heterogeneity of the defined **stratigraphical** unit or some critical feature not evident or exposed in the stratotype.

Paratype: a specimen, other than the **holotype**, on which the original description of a **species** or subspecies is based.

Patch reef: an isolated **reef** development, commonly located on a **carbonate** platform, but away from the platform edge.

Pelagic: of, or relating to, the open sea; particularly the organisms that swim or float within the water column.

Pelmicrite: a **limestone** consisting of a variable proportion of **peloids** and **carbonate mud** (**micrite**).

Peloid: a **sand**-sized to granule-sized grain of finely crystalline **carbonate** of many possible origins, including pellets.

Penecontemporaneous: formed or existing at almost the same time.

Pericline: a dome-shaped **anticline**.

Periglacial: a zone or environment peripheral to **glaciers**, so that it is very cold but is not covered by ice sheets; it is characterized by the frozen ground known as 'permafrost'.

Period: a geological time unit (cf. **chronostratigraphy**); of shorter duration than an **era** and itself divisible into **epochs**.

Petrology: the study of the composition, occurrence and origin of rocks.

Phosphate: phosphourus salt, a mineral frequently associated with the preservation of bones and shells.

Phosphatic: descriptive of a rock containing large quantities of **phosphate**.

Phosphatize: the process of becoming enriched with **phosphate**.

Photic zone: the part of a water body in which there is enough sunlight for **photosynthesis** to occur.

Photosynthesis: the process whereby green plants trap light in chlorophyll and use it to synthesize carbohydrates from carbon dioxide and water.

Phylum (pl. **phyla**): a category used in the taxonomic classification of organisms, which consists of one or several related **classes**. The phyla are grouped together into two kingdoms, the Plantae (plants) and the Animalia (animals).

Phylogeny: the line, or lines, of direct descent in a given group of organisms.

Pisoid (**pisolith**): a large **ooid** with a diameter of more than 2 mm.

Planation: the process of **erosion** that causes the **erosion surface** to become flat or level.

Plankton (adj. **planktonic**): minute aquatic organisms that drift with water movement.

Plesiosaur: a predatory marine reptile of the **Mesozoic Era**, which had a long neck and a relatively small head, and swam with flipper-shaped limbs.

Pliensbachian Stage: a **chronostratigraphical** subdivision of the **Jurassic System**, comprising the rocks deposited during the Pliensbachian Age. The third **stage** of the **Lower Jurassic Series**, it is dated to approximately 191.5–183.6 Ma (Palfy *et al.*, 2000c) and is preceded by the **Sinemurian Stage** and followed by the **Toarcian Stage**.

Pluton (adj. **plutonic**): an **intrusion** of **igneous rock** emplaced at depth in the Earth's crust.

Poikilotopic: a **sedimentary rock** fabric in which coarse crystals of **cement** enclose a number of smaller, detrital grains.

Pollen: the microspores of angiosperms and certain groups of **gymnosperm**.

Polymictic: descriptive of a **conglomerate** that contains **clasts** of many different rock types.

Pseudoplankton (adj **pseudoplanktonic**): organisms that are attached to floating material or mobile swimmers.

Province: the geographical region occupied by a particular assemblage of organisms in response to certain environmental factors such as climate and water temperature.

Proximal: near to the source.

Pterosaur: a flying reptile of the Jurassic and Cretaceous periods characterized by a membranous wing supported by an elongate fourth finger.

Pyroclastic: descriptive of unconsolidated deposits (tephra) and rocks that form directly by explosive ejection from a volcano.

Quartz: a rock-forming mineral composed entirely of silica (SiO_2); one of the most common minerals of the Earth's crust.

Quartzose: containing **quartz** as a principal constituent.

Radiolarian (pl. **radiolaria**): a group of marine, single-celled **plankton**, which secrete siliceous skeletons that are often preserved as **fossils** in deep-sea **sediments**.

Radiometric dating: methods of dating certain rocks or minerals using the relative abundances of radioactive and stable isotopes of certain elements, together with known rates of decay of radioactive elements. Radiocarbon dating can extend back to only 50 000 years, but other elements (potassium, lead, uranium) can be used to obtain dates of the order of tens to thousands of millions of years.

Red-beds: a collective term applied to continental sedimentary successions that are predominantly red in colour due to the presence of iron oxides and hydroxides formed in a highly oxidizing environment.

Reef: a rigid and wave-resistant **carbonate** buildup produced by the lime secreting activities of marine invertebrates such as **corals** that lived in shallow, warm shelf seas.

Regolith: a layer of unconsolidated, weathered, broken rock debris that lies below the soil and above the bedrock below.

Regression: the withdrawal of the sea from the land due to a fall in relative sea level.

Reworking: the natural excavation and transportation of **sediment** or **fossil** material that is then re-deposited elsewhere.

Rhaetian Stage: a **chronostratigraphical** division of the Triassic System, comprising the rocks deposited during the Rhaetian Age. The last **stage** of the Late Triassic Series, it is dated to approximately 204–199.6 Ma and is followed by the **Hettangian Stage**.

Rift: a depressed area of continental crust produced by tensile stretching of the crust and down-faulting along parallel **faults**.

Rudite (adj: **rudaceous**): a coarse-grained **sedimentary rock**, either consolidated as in a **conglomerate**, or unconsolidated as in a till.

Sand: **sediment** particles typically between 0.625 mm and 2 mm in diameter.

Sandstone: a **sedimentary rock** composed of **lithified sand** grains between 0.625 mm and 2 mm in diameter.

Scaphopod: any member of the **class** Scaphopoda (**phylum** Mollusca (*see* **mollusc**)). These marine invertebrates burrow into **sediment** and secrete and occupy hollow **calcareous** tubes open at both ends.

Scar: a steep, rocky eminence or cliff where bare rock is prominently exposed.

Scarp: a steep or cliff-like slope, rising above the surrounding land. Typically produced by the outcrop of a relatively hard unit of rock.

Schist: a coarse-grained **metamorphic rock** that displays a strong **foliation** (schistosity) that is often defined by mica alignment.

Sclerite: an exoskeletal element in the form of plates or spines, often mineralized.

Scree: an accumulation of rock fragments formed by the mechanical **weathering** of outcrops. The rock debris generally forms cones or slopes beneath cliffs.

Sediment: granular material such as **sand** or **mud** derived from the **weathering** and **erosion** of pre-existing rocks, biological activity (e.g. shells and organic matter), or chemical precipitation (e.g. **evaporites**).

Sedimentary rock: a rock composed of **sediments**, deposited by water, wind or ice.

Sedimentology: the study of **sediments** and **sedimentary rocks**, including their deposition, structure and composition.

Seismic stratigraphy: the study of **stratigraphy** and depositional **facies** through seismic data.

Seismite: a deposit displaying soft-sediment deformation inferred to be of seismic origin.

Sequence stratigraphy: the study of **stratigraphy** through the use of repetitive, related units bounded by surfaces of **erosion** or non-deposition.

Series: a **chronostratigraphical** division comprising all the rocks formed during an **epoch**; it can be divided into **stages**.

Serpulid: a member of the **family** Serpulidae (**phylum** Annelida (*see* **annelid**)). These small marine worms build tubes that become mineralized with **calcium carbonate**.

Shale: a **mudrock** that splits easily into layers.

Silcrete: a **conglomerate** consisting of **sand** and gravel cemented into a hard mass by silica.

Siliciclastic: a **sediment** or **sedimentary rock** comprising a high proportion of silica-rich grains or **clasts**.

Sill: a tabular body of **igneous rock** that is more-or-less concordant with the bedding or foliation of the host rocks.

Silt: a fine-grained **sediment** intermediate in grain size between **clay** and **sand**.

Siltstone: a rock made of **silt**.

Sinemurian Stage: a **chronostratigraphical** subdivision of the **Jurassic System**, comprising the rocks deposited during the Sinemurian Age. The second **stage** of the **Lower Jurassic Series**, it is dated to approximately 196.5–191.5 Ma (Palfy *et al.*, 2000c) and is preceded by the **Hettangian Stage** and followed by the **Pliensbachian Stage**.

Sorting: the ordered distribution of grain sizes. A well-sorted rock has a narrow range of grain sizes. A poorly sorted rock has a wide range of grain sizes.

Sparite (sparry calcite): a **limestone** in which the sparite **cement** is more abundant than the **micrite matrix**.

Species: a category used in the taxonomic classification of organisms. Similar species are grouped together in a **genus**.

Spicule: a small needle or spine.

Sponge: any member of the **phylum** Porifera; primitive multi-cellular aquatic animals which secrete a skeleton of either silica, **calcium carbonate** or an organic material.

SSSI: Site of Special Scientific Interest; the designation of an area of land for statutory protection under the Wildlife and Countryside Act 1981.

Stage: a **chronostratigraphical** division comprising all the rocks formed during an **age**, and usually taken to be the smallest standard unit.

Steinkern: an internal mould caused by the preservation of the internal features of skeletal remains.

Stenohaline: descriptive of organisms with a narrow tolerance range in water salinity.

Stratigraphy: the study of the temporal and spatial relationships within a rock succession.

Stratotype: a sequence of **sedimentary rocks** at a particular locality chosen as the standard against which other sequences can be compared. Stratotypes are established for **lithostratigraphical** and **biostratigraphical** units, both regionally and internationally.

Stratum (pl. **strata**): a **bed** or single layer in a succession of rock.

Strike: the trend of a geological surface (e.g. a **bedding plane**) measured at right angles to the direction of maximum slope or **dip**.

Strike-slip: a **tectonic** break in **strata** in which the predominant displacement is lateral rather than vertical.

Stromatolite: a **laminated**, mounded structure composed of **limestone** built by cyanobacteria. They are known in rocks throughout the geological record; today, they develop in warm, shallow tropical seas.

Subboreal: pertaining to a Jurassic **faunal province** covering areas including southern England, northern France, northern Germany, parts of Poland and Russia west of the Urals.

Sub-littoral: *see* **neritic**.

Subduction: the process of one crustal plate descending into the mantle beneath another during plate convergence and collision, with the release of energy in the form of earthquakes and often accompanied by volcanicity.

Subsidence: a sinking of a local or regional portion of the Earth's surface with respect to its surroundings.

Supratidal: above the tides.

Syncline: a downfold of rock produced by **tectonic** deformation; the youngest rocks occur in its core.

Syn-: prefix indicating 'the same as' or 'resembling'.

Syntype: any one of a series of specimens which characterize a **species** when there are no designated **holotypes** and **paratypes**.

System: a **chronostratigraphical** division comprising all the rocks formed during a **period**; can be divided into **stages**.

Taphonomy: in **palaeontology**, the study of the changes, including transportation, that affect organisms after death, including the physical and chemical interactions that take place between burial of the organism and its subsequent discovery as a **fossil**.

Taxon (pl. **taxa**): any group of organisms that has been scientifically designated as belonging to a specific taxonomic group.

Taxonomy: the study of the rules of classification of living and extinct organisms.

Tectonic inversion: a change in the relative elevation of a block of crust (e.g. a **basin** becomes a basement high or vice versa), brought about by the reversal of movement direction along structures such as **faults**, due to a change in regional forces.

Tectonism (adj. **tectonic**): deformation of the Earth's crust and the consequent structural effects (e.g. **faults** and **folds**).

Tempestite: a storm deposit – material deposited during a single storm, often on a continental shelf where the tidal range is small and the prevailing winds are strong.

Terrigenous: deposited or formed on land, or derived from the land.

Tethys: an E–W-extending major ocean, which separated the southern supercontinent of Gondwanaland from Laurasia in **Mesozoic** times; subducted to form the Alpine–Himalaya mountain belt.

Thermal (contact) metamorphism: the **metamorphism** or recrystallization of rocks surrounding an igneous **intrusion** due to the heat supplied by the intrusion.

Throw: the amount of vertical displacement between the rocks on either side of a **fault**.

Thrust fault: a **fault** characterized by movement or rocks under lateral compression along a low-angle fault plane.

Toarcian Stage: a **chronostratigraphical** subdivision of the **Jurassic System**, comprising the rocks deposited during the Toarcian Age. The last **stage** of the **Lower Jurassic Series**, it is dated to approximately 183.6–178 Ma (Palfy *et al.*, 2000c) and is preceded by the **Pliensbachian Stage** and followed by the Middle Jurassic **Aalenian Stage**.

Topotype: a specimen of a particular **species** that comes from the same locality as the **type specimen** of that species.

Trace fossil (ichnofossil): a **biogenic** sedimentary structure produced by activity of an organism within a substrate; examples include burrows and footprints.

Transcurrent fault (strike-slip fault): a **fault** in which the major displacement is horizontal and parallel to the **strike** of a vertical or sub-vertical fault plane. Localized zones of deformation due to pressures and tensions across the fault occur at bends in the fault and can give rise to conditions of transtension. The latter process may cause the formation of rhombic-shaped **basins**, **graben**, or marginal **basins** that may be the focus of **rift**-related volcanic activity.

Transgression: the encroachment of the sea on the land due to a rise in relative sea level.

Trough cross-bedding: **cross-bedding** in which the lower bounding surfaces are curved surfaces of **erosion**, due to local scour and subsequent deposition.

Truncation: the cutting or breaking off of the top of a geological structure or landform.

Tsunamite: a **sediment** or rock formed and deposited by a tsunami, often incorrectly termed a 'tidal wave'.

Tuff: cemented and **lithified** volcanic **ash**, comprising rock and crystal fragments from an explosive eruption.

Type locality/area: the place where the **type section** (or **stratotype**) for a **stratigraphical** unit is located, or from where the **type specimen** of a **fossil** came.

Type section: *see* **stratotype**.

Type specimen: a single specimen designated as typifying a named **species** or subspecies. *See also* **holotype** and **paratype**.

Unconformity: the surface that separates two sedimentary sequences of different ages; it represents a gap in the geological record when there was **erosion**, and/or **tectonism** and/or no deposition. There is often an angular discordance between the two sequences.

Uplift: a structurally high area in the crust, produced by movements that raise or upthrust the rocks, as in a dome or arch.

Upthrow: the amount of upward displacement of rock along a **fault**.

Vagile: descriptive of a plant or animal that is free to move about.

Volcanic rock: an **extrusive igneous rock** formed by a volcanic eruption.

Volcaniclastic: generally applied to a **clastic** rock containing mainly material derived from volcanic activity, but without regard for its origin or environment of deposition (includes **pyroclastic** rocks and **sedimentary rocks** containing volcanic debris).

Vug (adj. **vuggy**): a cavity in a rock, which may contain a lining of crystalline minerals.

Wadi: a gorge-like valley formed in arid or semi-arid environments.

Weathering: the breaking down of rocks through the effects of exposure to the weather; the term does not infer any transportation of the weathered rock material.

Winnowing: the selective **sorting** or removal of fine-grained particles by the action of water currents or wind, leaving coarser-grained material behind.

Zone: a **stratigraphical** unit in many categories of stratigraphical classification. In **chronostratigraphy**, a division smaller than a **stage**, defined by its base in a **type section**.

Zonule: a small subdivision of a **biozone** or subbiozone.

Fossil index

Note: Page numbers in **bold** and *italic* type refer to **tables** and *figures* respectively. General terms such as 'crinoid' may be found in the General index as are some names of brachiopod and belemnite zones.

Fossil index

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General index

Individual fossil names are to be found in the Fossil index, but general terms, such as 'belemnites', are included here. Detailed stratigraphical names, and biostratigraphical biohorizon and zonule names, are omitted, since they are given within the figures and tables.
Note: Page numbers in **bold** and *italic* type refer to **tables** and *figures* respectively.