ISSN 1750-855X (Print)
ISSN 1750-8568 (Online)

The future for geology in the Marches

Michael Rosenbaum[1]

ROSENBAUM, M.S. (2008). The future for geology in the Marches. *Proceedings of the Shropshire Geological Society*, **13**, 100–103. One of the reasons that the Marches is so interesting and varied is that it is a geological "frontier zone". The evolution of geological studies in the region is explored, notably by the influential Ludlow Research Group, setting the scene for future work in the area.

[1]*Ludlow, UK. E-mail: msr@waitrose.com*

BACKGROUND

It is perhaps not surprising that the Marches is renowned for its geology since the region includes representatives from all twelve internationally recognised periods of geological history, from the Precambrian to the Holocene, spanning some 700 million years of earth history. Included within these are four which were defined on the basis of the evidence discovered here: Cambrian, Ordovician, Silurian, Devonian, and a fifth, the Permian, was subsequently defined on the basis of techniques first worked out in the region.

One of the reasons that the area is so interesting and varied is that it is a geological "frontier zone". For instance:

- The Malvern Fault, running North South, represents an ancient and fundamental division that has asserted considerable influence through time, at the join between two small Precambrian continental terranes (Barclay & Pharaoh, 2000).
- The Church Stretton Fault/Neath Valley Disturbance and the parallel Pontesford/Linley Fault, both running North East to South West, form the boundary between areas of Caledonian folding to the west and relatively undisturbed, older continental crustal terrane to the east, quite possibly on, or close to, a major plate boundary during the Silurian (Woodcock & Gibbons, 1988).
- The region was uplifted as a huge dome towards the end of the Cretaceous as crustal tensions developed, eventually ripping North America apart from Europe to create the North Atlantic Ocean. One of the associated "hot spots" developed in the eastern Irish Sea basin, raising the elevation of Wales and the Marches. Much of the drainage system recognizable today developed on this uplifted area (Cope, 1994).
- The Pleistocene Ice Sheets encroached the lower ground, but probably left the hill tops ice-free, creating a complex local topography that includes hummocky terrain as moraine accumulated beneath the ice or was dumped as the ice melted, along with considerable disruption to the drainage system, diverting rivers, flooding valleys and eroding new landscapes (Lewis & Richards, 2005).

Our current level of understanding of the 700 Ma evolution of the Marches is based upon detailed evidence acquired through diligent collecting and recording by generations of enquirers. Its interpretation is due to the skills that geologists are able to employ to read it. The earliest geological publication by the world's first geological society is by Arthur Aikin (a pamphlet of 1810 followed by a paper of 1811), since when there have been many more, of the order of one thousand in peer-reviewed publications. However, many questions remain unanswered, awaiting discovery of new facts and interpretation, or re-interpretation, as new ideas emerge.

The Ludlow Research Group (LRG) has been particularly effective at encouraging geological research in the region since its inception in 1951, essentially through establishing a network of contacts fostered by annual meetings in the field. The revised stratigraphy emanating from the LRG was first publicly demonstrated in the field to the Geologists' Association (Allender *et al.*, 1960). A full written record of the Group's work exists within the annual *Ludlow Research Group Bulletin*.

The LRG grew from a small team of young researchers at Manchester University (notably Jim Lawson, Charles Holland and John 'Mac' Whitaker and, later, Vic Walmsley). Their aim (guided by Dr Stephen Straw, 35 years a lecturer at Manchester and himself a Ludlovian researcher, first on fish remains in Ludlow and then conducting geological mapping of the Builth area) was to further research into the detailed geology of the Ludlow area with particular reference to rocks

of Upper Silurian age, their importance having been recognized over a century earlier by local naturalists (notably the Rev Thomas Lewis and Dr Thomas Lloyd) (Lloyd, 1983) and publicised by Roderick Murchison.

It is, incidentally, nearly 175 years since Roderick Murchison first publicly described his interpretation of what had previously been called the "Grauwacke Series" within the "Transition Rocks", in a paper read to the Geological Society of London on April 17th 1833 and published in the Proceedings for that year. A page from his notebook of the time is reproduced in Figure 1. This led in 1839 to publication of his milestone book: *The Silurian System*.

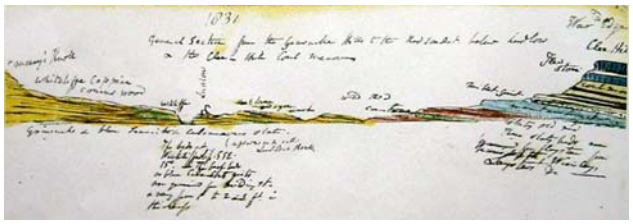

Figure 1. A page from Murchison's field notebook for 1831 showing a general section from the Grauwacke Series beneath Mary Knoll (Mortimer Forest) east through Ludlow (just left of centre) to Clee Hill with its Coal Measures, a distance of about 10 km. The Norton Gallery in Ludlow Museum, Castle Square, includes a display of additional material relating to Murchison's visits to the area in the 1830s. Figure used by John Fuller (1997). © Copyright John Fuller 1997.

Arguments ensued regarding the exact terminology appropriate to each bed, notoriously the overlap between Murchison's Silurian and Sedgwick's Cambrian (Thackray, 1976; Rudwick, 1976). As described by John Fuller in his poster presentation commissioned by the AAPG (1997), considerable areas of Shropshire were being claimed for both systems a century earlier. The disputed terrain of central South Shropshire around the Longmynd is marked yellow (Figure 2), now designated as belonging to the Ordovician. This radical revision was demonstrated by Lapworth and Watts in their field meeting for the Geologists' Association (Lapworth & Watts, 1894a; 1894b). Incidentally, the supposedly Cambrian outcrop of the Longmynd (in red) is now regarded as being Late Precambrian in age.

Resolving the disputes required more detailed studies, particularly of the graptolites, which followed at the turn of that century under the direction of Charles Lapworth at Mason College, which was to become Birmingham University, notably by his two students Gertrude Elles and Ethel Wood (Elles, 1900; Wood, 1900).

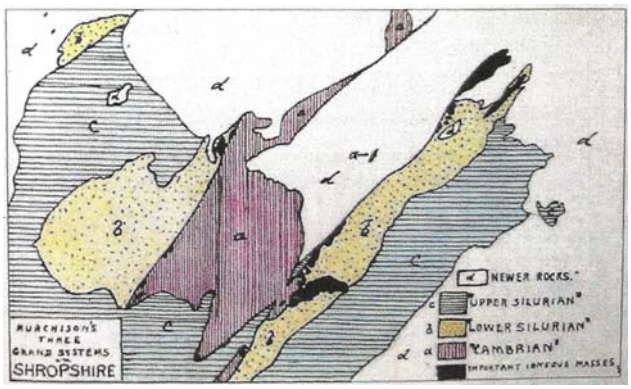

Figure 2. A sketch map from Lapworth's papers in the Lapworth Museum archives, University of Birmingham, made by W.W. Watts to Lapworth's instructions in 1894 in preparation for their GA field meeting to Shropshire (Lapworth & Watts, 1894b). It shows, in yellow, the disputed "Lower Silurian" of Murchison, which overlapped with the Cambrian of Sedgwick. This map needed radical revision, much of the area marked yellow eventually to become assigned to the Ordovician. The large area to the west in yellow is essentially the Shelve Inlier as it is known today. The Longmynd is in the centre; the igneous mass in black in the top right is the Wrekin. Interestingly, what today is regarded as being the main Cambrian outcrop in the vicinity, in the middle of this map east of the Stretton Valley around Comley, is ascribed here to the Lower Silurian! Figure used by John Fuller (1997) © Copyright John Fuller 1997.

The need to agree time zones internationally led to renewed interest and a new sense of purpose for the LRG during the late 1960's into the 1970's, notably by Robin Cocks and Mike Bassett, working mostly in the UK on Silurian rocks. Agreement was reached in the 1980's through the Subcommission on Silurian Stratigraphy under the auspices of the International Commission on Stratigraphy within the International Union of Geological Sciences. Emanating from the work of this Group came the basis for global definition and correlation of chronostratigraphical units and their boundaries, which were to lead eventually to those principles being applied by the IUGS to the whole of the geological column (Cocks *et al.*, 1971; Holland & Bassett, 1989).

The LRG has been, and still is, an amazingly influential body whose informal status and loosely knit membership belies the huge influence that it has had on Palaeozoic stratigraphy throughout the world. Membership of the LRG remains buoyant as a new generation of researchers are becoming excited by the wealth of information still to be discovered, the fantastic fossils of the

Herefordshire Konservat-Lagerstätte (David Siveter) (Siveter *et al*., 2004; Siveter, *this volume*) and the re-interpretation of the Ludlow Bone Bed as containing charcoal of primitive plants destroyed by the world's earliest wildfire (Dianne Edwards) (Glasspool *et al.*, 2004) are but two examples. Others must surely be discovered in the course of time.

REFERENCES

Aikin, A. (1810). *Proposals for a mineralogical survey of the County of Salop., and of some Adjacent Districts*. An undated pamphlet accompanied by an engraved mineralogical map, published by the Geological Society of London.

Aikin, A. (1811). Observations on the Wrekin, and on the great coalfield of Shropshire. *Transactions of the Geological Society of London*, **s.1 v.1**, 191–212.

Allender, R., Holland, C.H., Lawson, J.D., Walmsley, V.G. & Whitaker, J.H.McD. (1960). Summer field meeting at Ludlow, 2-9 Aug 1958. *Proceedings of the Geologists' Association*, **71**(2), 209–232.

Barclay, W.J. & Pharaoh, T.C. (2000). Malvern Hills. Chapter 4 *in:* Carney, J.N., Horak, J.M., Pharaoh, T.C., Gibbons, W., Wilson, D., Barclay, W.J. & Bevins, R.E. (eds.) *Precambrian Rocks of England & Wales*. Geological Conservation Review Series, No. 20. Joint Nature Conservation Committee, Peterborough, 69–79.

Cocks, L.R.M., Holland, C.H., Rickards, R.B. & Strachan, I. (1971). A correlation of Silurian rocks in the British Isles. *Journal of the Geological Society of London*, **127**(2), 103–136.

Cope, J.C.W. (1994). A latest Cretaceous hotspot and the southeasterly tilt of Britain. *Journal of the Geological Society of London*, **151**, 905–908.

Elles, G.L. (1900). The zonal classification of the Wenlock Shales of the Welsh Borderland. *Quarterly Journal of the Geological Society of London*, **56**, 370–414.

Fuller, J. (1997). *Five Future Legends, 1831-1879: Inventing the Lower Palaeozoic*. Poster exhibition commissioned by the American Association of Petroleum Geologists for the 1997 Annual Meeting, Denver, Co, 27 printed A1 sheets *[unpublished]*.

Glasspool, I.J., Edwards, D. & Axe, L. (2004). Charcoal in the Silurian as evidence for the earliest wildfire (Ludford Lane). *Geology*, **32**(5), 381–383.

Holland, C.H. & Bassett, M.G. (1989). *A global standard for the Silurian System*. National Museum of Wales, Geological Series No. 9, Cardiff, 325 pp.

Lapworth, C. & Watts, W.W. (1894a). The geology of South Shropshire. *Proceedings of the Geologists' Association*, **13**, 297–355.

Lapworth, C. & Watts, W.W. (1894b). Excursion to the County of Shropshire, 30 Jul to 4 Aug 1894. *Proceedings of the Geologists' Association*, **13**, 381–387.

Lewis, C.A. & Richards, A.E. (2005). *The glaciations of Wales and adjacent areas*. Logaston Press, Hereford HR3 6QH, 228 pp..

Lloyd, D.J. (1983). History of Ludlow Museum 1833–1983. Ludlow Historical Research Group, 24 pp..

Murchison, R.I. (1833). On the sedimentary deposits which occupy the western parts of Shropshire and Herefordshire, and are prolonged from N.E. to S.W., through Radnor, Brecknock, and Caermarthenshires, with descriptions of the accompanying rocks of intrusive or igneous characters (Parts 1 and 2). *Proceedings of the Geological Society of London*, **1**(31), 470–477.

Murchison, R.I. (1839). *The Silurian System founded on geological researches in the counties of Salop, Hereford, Radnor, Montgomery, Caermarthen, Brecon, Pembroke, Monmouth, Gloucester, Worcester, and Stafford: with descriptions of the coal-fields and overlying formations*. John Murray, Albermarle Street, London, 768 pp (2 vols plus geological map).

Rudwick, M.J.S. (1976). Levels of disagreement in the Sedgwick-Murchison controversy. *Journal of the Geological Society of London*, **132**(4), 373–375.

Siveter, D.J., Sutton, M.D., Briggs, D.E.G. & Siveter, D.J. (2004). A Silurian sea spider. *Nature*, **431**, 978–980.

Siveter, D.J. (2008). The Silurian Herefordshire Konservat-Lagerstätte: a unique window on the evolution of life. *Proceedings of the*

Shropshire Geological Society, **13**, 58–61 (this volume).

Thackray, J.C. (1976). The Murchison-Sedgwick controversy. *Journal of the Geological Society of London*, **132**(4), 367-372.

Wood, E.M.R. (1900). The Lower Ludlow Formation and its graptolite fauna. *Quarterly Journal of the Geological Society of London*, **56**, 415–492.

Woodcock, N.H. & Gibbons, W. (1988). Is the Welsh Borderland Fault System a terrane boundary? *Journal of the Geological Society of London*, **145**(6), 915–923.

ISSN 1750-855x