MERCIAN Geologist

VOLUME 18 PART 1 AUGUST 2012

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Mercian Geologist is printed by John Browns, and published by the East Midlands Geological Society.

ISSN 0025 990X

Front cover: The apron reef limestones of Parkhouse Hill, formed on the edge of the Carboniferous Derbyshire Carbonate Platform, and visited on a Society excursion (see p80). Photo by Tony Waltham.

Back cover: Gypsum extraction from the upper part of the Mercia Mudstone at the opencast pit of Bantycock Mine, at Balderton, south of Newark. Photos by David Bate and Tony Waltham.

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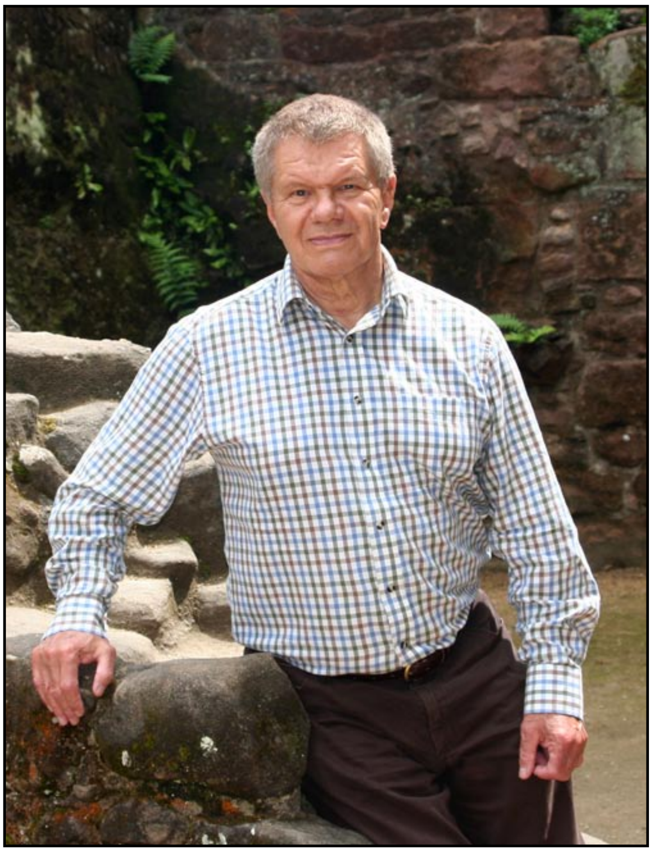
PROFILE

Brian Jones



Our new president, Brian, was born in the suburbs of Nottingham early in the Second World War, and was brought up largely by his mother, with his father serving in the army. Leaving school at the age of 15, he followed an engineering apprenticeship and studied for an ONC and HNC in mechanical engineering at Nottingham colleges, then spent several years in further studies of ancillary engineering subjects.

At this early stage he worked in mechanical engineering, but moved into structural steelwork engineering where his interests were more readily satisfied. Subsequently, he joined a Civil and Structural Engineering consultancy practice in Derby where he acquired experience and knowledge of other construction materials, including concrete, aluminium, masonry, and timber. Additionally work frequently involved geotechnical engineering, a subject closely allied to his later interest in geology.

In preparation for the entrance examinations of The Institution of Structural Engineers, he became involved for several years in the part-time teaching of mathematics and engineering subjects at colleges in both Nottingham and Derby.

On being elected to membership of the Institution of Structural Engineers (M.I.Struct.E.) and becoming a Chartered Structural Engineer (C.Eng), he made a career move into local government in the Structures Section of Nottingham City Engineers Department. In 1973 he was appointed to the post of Principal Structural Engineer at Derby Borough Council, and later he moved to Chesterfield Borough Council as Group Structural Engineer in the Technical Services Department. Although a smaller Authority, work was much involved with geotechnical and geological matters, dealing with the problems left by a largely defunct coal mining industry. This concerned not only the provision of structural design and advice to client departments within the Council, but also with the letting and managing of contracts for the opencast mining of former colliery sites with subsequent redevelopment.

In 1994 he was involved in the refurbishment of Tapton House, which was leased by George Stephenson when he came to Chesterfield in the 1830s to construct the North Midland Railway, and was his home until his death in 1848.

In 1997 Brian took early retirement from local government. Not wishing to give up entirely, he has continued working part time in various Civil and Structural Engineering consultancy practices, and in the East Midlands Branch of The Institution of Structural Engineers.

From the mid 1970s, he attended adult education classes in Nottingham, developing his knowledge and interests, principally in geology, but also in a variety of other subjects such as natural history, vernacular architecture and, more recently, English literature and medieval history.

He was involved in the establishment of a WEA branch in Arnold, serving as Branch Chair for five years, before moving to the much larger Nottingham Branch and serving as Branch Chair for a similar period. It was as WEA representative on Centre Committee at the University of Nottingham's Adult Education Centre that his interest in adult education provision grew, and he occupied the post of Branch Treasurer for nine years, until Liberal Studies courses effectively ended at the University in 2008.

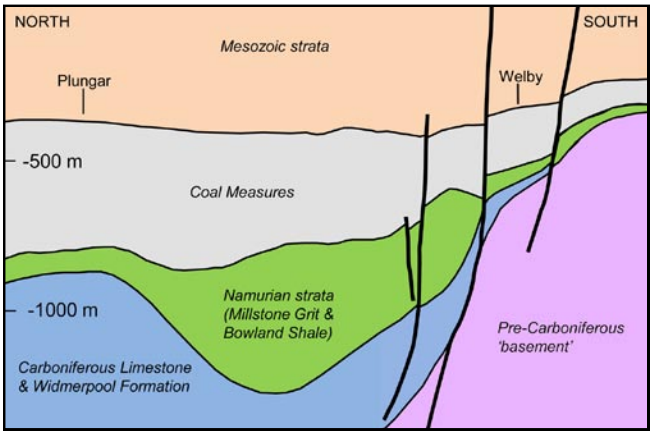
From the mid-1970s, he joined geology excursions both in Britain and abroad to the Western United States and Hawaii. These overseas trips were particularly inspiring and have been supplemented by holidays at home and abroad where investigation of the local geology has been a primary objective. Brian joined the EMGS soon after attending classes in around 1976, and ever since has been a frequent supporter at both indoor meetings and on field excursions.

GEOBROWSER

Energy from the Vale of Belvoir

The pleasantly rolling pastoral scenery of the Vale and its surrounding wolds are developed on Mesozoic strata that conceal one of the most important resources of fossil fuels in north-western Europe. Its value is emphasized by the prodigious amounts of money spent during the last century on exploration. Coal was first proved in the 1920's, during a programme of deep drilling by the D'Arcy Exploration Company (later to become BP). Following intensive exploration during 1973-76 the NCB (National Coal Board) announced reserves of 510 M tonnes, making this the largest unworked coalfield in Western Europe (Mann, 1980; Vale of Belvoir Inquiry Report: HMSO). Meanwhile a combination of geophysics, underground colliery data and seismic surveys had earlier located anticlinal structures suitable for oil or gas accumulation. Oil was first struck in June 1939 to the north of the Vale of Belvoir, at Eakring (QJGS, 1945, 255-317); during the Second World War, with the help of imported American expertise from Oklahoma, many more wells were brought into production and the search extended farther south, into the Vale. This resulted in 33 wells sited around Plungar, which produced 304,067 barrels of oil between 1953 and 1959, but today there are only two producing fields, at Rempstone and Long Clawson.

One major outcome is that the Vale of Belvoir now contains a wealth of subsurface information - well over one hundred exploration boreholes have been drilled for coal and oil, some almost a kilometre deep, and these are augmented by a network of seismic profiles which, with an aggregate length of over 1000 km, probably exceeds the combined length of roads and footpaths. A brief period of underground coal extraction from the Asfordby pilot colliery was fraught with geological problems and ceased in 1997 (Report, Mercian Geologist, 1998), but the search for new oil reserves continues and the stage is now set for a third exploration phase - for shale-gas, which was highlighted on the BBC's Sunday Politics for the East Midlands on the 24th March this year.



Simplified section across the Vale of Belvoir (after BGS).

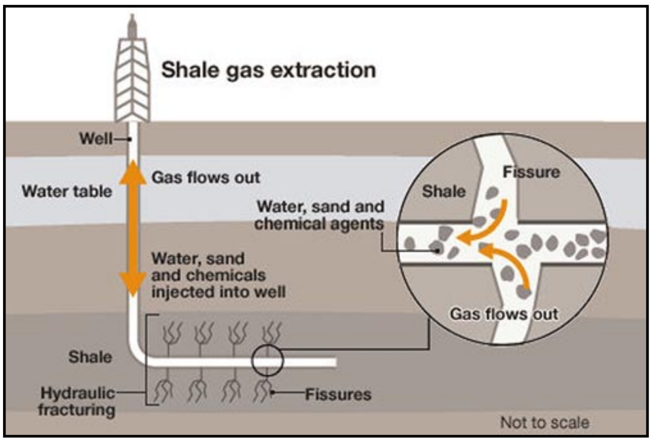
New prospects?

As we reported in Geobrowser for 2010, shale-gas could be a new hope for energy production and is a relatively 'green' resource of fossil fuel. Unfortunately however, sensational headliners have jumped on the bandwagon with titles such as: 'Rich Shale Gas Deposits found in Leicestershire' (http://thegwpf.org/uk-news/5321, from Leicester Mercury, 28 March 2012). On closer examination of this article we see that according to the BGS these are only potential 'deposits' that will require extensive sampling and drilling in order to prove. At the moment it seems that most prospection in the Vale of Belvoir will be directed at strata pre-dating the Coal Measures and in places lying at depths of over 1000 m. Due to syn-Carboniferous subsidence within a structure known as the Widmerpool Half-graben (or 'Gulf'), up to 500 m of potentially gas-rich source rocks are present in some parts. Of Namurian age, they are now referred to as the Bowland Shale Formation and are broadly equivalent to the unit formerly called the Edale Shale Group, which famously crops out at Mam Tor in Derbyshire. Rocks of similar age and lithology in the USA have proved suitable for gas production, causing a 'shale-gas revolution' there over the past 30 years; although the prospectivity of mudrocks is complex, and subject to a host of poorly-understood variables and the direct transfer of technologies to similar rocks in Britain is presently untested.

Fracking, earthquakes and toxic leakages

In order to extract shale-gas the enclosing strata must first be fractured, a process (hydrofracturing, or 'fracking') which involves pumping water and chemicals into shale rock at high pressure. Shale-gas exploration has attracted a vast amount of negative publicity associated with concerns including induced seismicity, demand for an already stressed water resource, and pollution of the local environment.

In Britain, the most alarming developments were the earthquakes of magnitudes 2.3 and 1.5 in April and May 2011 centred around the experimental fracking for shale-gas carried out by Cuadrilla Resources Ltd. at Preese Hall on the Fylde coast, Lancashire. An investigation confirmed that the timing of those earthquakes was closely related to that of fracking, and concluded that they most probably resulted from fluid injection that caused slippage along a pre-existing, critically-stressed



Method used for extracting gas from shale.

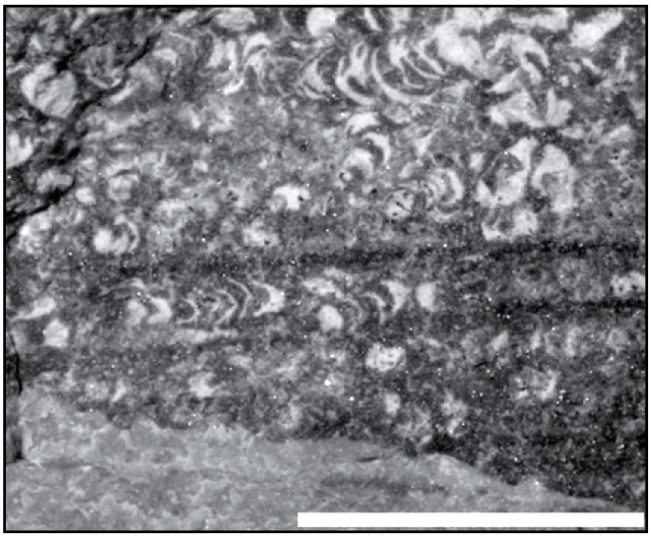
fault plane. The consensus of this and other reports, however, is that fracking-induced seismicity could be mitigated through a combination of close micro-seismic monitoring, more precise control over fluid injection, and the siting of injection intervals away from any fault systems identified in the borehole or known from geological surveys. Such occurrences should also be put into the local context, in that during the long history of underground coal extraction in Britain, mining-induced subsidence caused numerous events up to magnitude 3.

There have been several well-publicised reports in the USA of contamination of groundwater by methane, which in some cases has entered the domestic water supply via private water abstraction wells. The pathway in most cases is by poorly-completed gas abstraction wells, although it is worth stating that the regulatory regime in Britain is not the same as in the USA, and well integrity in Britain is covered by numerous stringent guidelines. Recommendations from the USA include assessing and continuously monitoring baseline data on groundwater quality and source of dissolved-gas concentrations before, during and after fracking (Proc. Nat. Academy of Science USA, 2011; 8172-8176). In Britain the BGS is currently undertaking the first part of this exercise, in order to establish baseline concentrations and likely sources of dissolved aquifer gases before any large-scale shale-gas exploitation begins.

If shale-gas extraction is proved to be commercially viable in the Vale of Belvoir, and the associated concerns can be satisfactorily controlled and mitigated without a prohibitive escalation of costs, then what are the chances of it going ahead? At the surface, the actual extraction sites for shale-gas are in themselves reasonably compact, but it is likely that a certain amount of infrastructure will be needed, such as booster stations and possibly a gas processing plant. The Environment Agency is currently supportive of shale-gas extraction but, as with all new power generation schemes in the UK, the final decision will most probably involve factors such as: national strategic necessity, local environmental 'pressure' and perhaps most importantly, a continued demand for safe, clean, indigenous sources of energy.

Precambrian bioturbation at Charnwood?

In 1995, a major upheaval in Charnian geology took place with the publication of a paper (Neues Jb. Palaeont. Abh. 195; 5-23) describing Teichichnus burrows in the Swithland Formation ('Swithland Slates'). Since Teichichnus is a deeply-penetrating burrow, and such features were unknown in strata of Precambrian age (i.e. pre-dating 542 Ma), the perceived wisdom was that the Swithland Formation was most probably Cambrian. This premise might now need to be revisited in the light of burrows described from of the Khatyspyt Formation (arctic Siberia), in a paper entitled: 'The oldest evidence of bioturbation on Earth' (Geology, 2012; 395-398). These burrows, named as Nenoxites, penetrate up to 5 cm in depth and represent both an intensely bioturbated ichnofabric as well as discrete, identifiable trace fossils. They occur in basinal mudstones and tuffs at a stratigraphical level constrained by U-Pb zircon determinations to be about 555 Ma old, which is 13 Ma before the end of the Precambrian. The appearance of Nenoxites is significant in two respects. First, it provides evidence that in the latest Precambrian there were animals capable of deep burrowing; and secondly it shows that for undated strata, such as the Swithland Formation, we may need to revisit certain of the palaeontological criteria previously used to assess their age.



Vertical cross section showing Nenoxites ichnofabric from the Khatyspyt Formation; the white scale bar is 1 cm long.