



OUTCROP

The Newsletter of the Avon RIGS Group

Issue No. 17

Winter 2003

RIGS are Regionally Important Geological and Geomorphological Sites

The Group's aim is to identify, survey, protect and promote geological and geomorphological sites in the area of the former County of Avon –the modern Unitary Authorities of Bath & North East Somerset, Bristol, North Somerset and South Gloucestershire. RIGS are selected for their educational, research, historical and aesthetic value.

Inside this issue

Our local historical celebrity, William Smith, the Father of English Geology, figures in two articles in this issue of *Outcrop*. Andrew Mathieson, who has long been on Smith's trail, reviews a recent book about him. Andrew also describes a recent photographic survey of Smith's Somersetshire Coal Canal.

Eileen Stonebridge presents the first of what we hope to become a series on the geology and geomorphology of local landmarks. She kick starts it with an article on a prominent feature of the landscape of Bristol: Brandon Hill. An early 19th century Bristol councillor was convinced that this conical hill was a volcano and warned that one day it would erupt and destroy the city! The rocks exposed here are in fact sedimentary and there is no danger of eruption.

We invite readers to contribute to the series by describing features that they know well.

Still in Bristol, we introduce you to the opportunity for seeing some geology in and around the Temple Meads railway station complex.

Our Chairman, Simon Carpenter, has been watching over the construction of a pipeline from Bath to Saltford, on behalf of the RIGS Group.

Charles Hiscock describes work in exposing traces of a Silurian volcanic eruption. This has been carried out for English Nature at Charfield in South Gloucestershire.

Brandon Hill	2
Bristol Temple Meads	3
Memoirs of William Smith	4
Somersetshire Coal Canal	5
Cullimore's Quarry	5
Bath-Saltford pipeline	6
Listings:	
Museums	7
Coming events	7
Contacts directory	8

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The Geology and Geomorphology of Local Landmarks, No. 1

Brandon Hill, Bristol

From Eileen Stonebridge

Brandon Hill is a prominent feature of the Bristol skyline, particularly as it is topped by the Cabot Tower, erected in 1897 to commemorate the 400th anniversary of the sailing of John Cabot to Newfoundland. The tower itself is not built of a local stone, the pinkish red sandstone being Mansfield Stone from the New Red Sandstone in the Midlands. Perhaps it was thought that something from further afield was more exciting, even though at that time there were plenty of active stone quarries in the Bristol region.

The local bedrock comprises an exceptionally hard quartzitic sandstone, pinkish in colour, with a crystalline appearance. It can be seen in the walls that surround Brandon Hill, though these contain a variety of other rocks. Good examples are the walls of the recently built Merchant Venturer's Building of the University of Bristol and many of the houses in Woodland Road.

The locality of Brandon Hill was used to name this rock, the Brandon Hill Grit. Stratigraphically, it is part of the Quartzitic Sandstone Formation of the lower part of the Upper Carboniferous, known as the Namurian Series. In the nineteenth century these rocks were called the Millstone Grit, the hard grits that lie between the Lower Carboniferous and the Coal Measures. However, research on the goniatite faunas has brought about re-classification in many areas of the country, but this is not possible in the Bristol area.

The boundary between these rocks and the Coal Measures has been shown to be of different ages in different places. There is a small area of coal shown on the geological map of Brandon Hill. The conditions of deposition for both the quartzitic Sandstone and the Coal Measures were similar. Sediments from a large landmass to the north were deposited in deltaic environments that varied in depth and type of deposition through time. The spatial connections between this shallow water and deeper sea basins to the south also varied through time, giving rise to a complex and ever-changing environment of deposition.

To the north-west of Brandon Hill, the adjacent rocks are of the Carboniferous Limestone Series and both have the same regional dip which indicates that they were subjected to the same set of earth movements, namely those at the end of

the Carboniferous. Erosion and rapid deposition that followed in Triassic times is evidenced by deposits of Dolomitic Conglomerate on the southern slopes of Brandon Hill and in the valley bottom of Jacob's Wells Road.

The isolation of Brandon Hill from the general plateau that forms the Downs is due to two large valleys, along the alignment of Jacob's Wells Road and along Park Street, and to the river cliff formed by the Avon, now the floating harbour. The time and process of formation of these valleys remains speculative, as is the case with most of the steep, usually dry valleys, which abound in the Bristol region. It is thought that during one of the many cold stages during the Pleistocene, glaciers impinged on the area to the north and periglacial conditions existed. Seasonal melting, and the dramatic melting which accompanies the rapid end of a cold stage, would mean that there was a great deal of water about, escaping with great force through any available route. There is evidence from deep-sea cores that there have been 11 cold stages in the last two million years, so the process would be repeated many times. The hard grits would be more resistant than the Triassic deposits, so in many cases the present day valleys are roughly aligned with the outcrops of Dolomitic Conglomerate. Structural weaknesses such as faults would likewise be preferentially exploited.

Brandon Hill has been important as open space in Bristol since the Middle Ages. The citizens would gather here for public meetings. When the Cabot Tower was built, gardens were built around it, and a feature was made of the natural spring, which served Bristol as the main water supply until piped systems were developed. The Victorians were fond of water-washed Carboniferous limestone to decorate gardens and this rock was used to surround the spring. Today, the quarrying of this stone is prohibited, due to its comparative rarity and its importance as a habitat for rare plants. An outcrop of the bedrock can be seen alongside the downward footpath on the south side of the hill. Another rock feature is the walls, built for defence during the Civil War. These are near the top of the hill on the north side.

The hill today provides a place for quiet recreation in a busy part of the city. There is a children's playground and a wildflower meadow managed by the Wildlife Trust. Those with the energy may climb the Cabot Tower, which affords extensive views of the city and the surrounding countryside.

Geology at Bristol Temple Meads Station

For those who are reluctant to put on their boots or stray too far away from a coffee shop, there are many opportunities to see some geology in the relative comfort of the built environment!

Bristol's main railway station at Temple Meads has plenty to show the urban geologist.

The original Great Western Railway station was opened in 1840. Its main façade on Temple Gate is of Bath Stone ashlar, but the side walls are of blue-grey Lower Lias limestone.



Brunel used the Bath Stone that was discovered in digging Box Tunnel and the Lias probably came from the cuttings at Salford and Keynsham.



The Joint Station of the 1800s is made of squared, coursed rough Dolomitic Conglomerate blocks, contrasting with smooth Bath Stone ashlar. The Triassic conglomerate consists of rounded pebbles of grey Carboniferous Limestone in a reddish fine matrix that contains the minerals hæmatite and dolomite. It came from quarries at Draycott, near Cheddar, on the other side of the Mendip Hills. Recent repairs were done by excavating similar stone from a small old quarry in

the Avon Gorge –a good reason in itself for preserving geological sites.



Some of the recycled sandstone paving stones on the approaches to the station buildings preserve "fossilised" ripple marks that give clues to the environment when the sand was deposited. They are best seen when the sun is low, or after rain.

There is a great collection of igneous rocks to be seen in the setts in the station approach road. Watch out for taxis!



You will need a ticket for the next stone. Machine-cut slabs of limestone from France were used for paving part of platform 3 in 2000. It is Rocheret Jaune, an Early Cretaceous limestone that comes from Belley, near Lyon. Beautiful sections through fossil shells, especially high-spired gastropods, can be seen in places. The same stone has been used for paving at Paddington Station and at both ends of the Channel Tunnel, as well as in Bristol's Centre and Millennium Square.

The Jacobean-style Bristol & Exeter House, one-time terminus of the B&E Railway is almost completely of finely cut Bath Stone ashlar blocks.

There is much more to see and the station complex really deserves a geological trail of its own. Perhaps we should make it a RIG Site!

Book review

From Andrew Mathieson

Memoirs of William Smith, LL.D , author of the **Map of the Strata of England and Wales** by his nephew John Phillips, FRS, FGS, first published in 1844. With additional material by Hugh Torrens. Published by The Bath Royal Literary and Scientific Institution, 2003. ISBN 0 9544 9410 5.

Earlier this year BRLSI printed this facsimile of the only published biography of William Smith. Only 500 copies of the original book were produced and the few remaining are only available to see at specialist libraries and museums, so this publication makes it far more accessible. However the reprint also has an extensive introduction, index, bibliography and copy of the William Smith Lecture 2000 by Hugh Torrens, Emeritus Professor of Keele University, which almost doubles the length of the original volume. Torrens has made a lifelong study of Smith, and his expertise adds greatly to the value of the new publication. The result is a most useful source of information to anyone interested in William Smith and an authoritative alternative to some other recent unreliable accounts.



William Smith

Since Smith lived around Bath for much of his working life, it is particularly appropriate that BRLSI has chosen to make this the first of a proposed series of such publications. Smith came to the area in 1791 and was employed for six years on the survey, excavation and construction of the Somersetshire Coal Canal. Between 1799 and 1819 Smith maintained his home at Tucking Mill, and also for some years an office in Bath, but travelled all over the country earning a living as a mineral surveyor and producing his famous

geological map of England and Wales in 1815. The BRLSI was formed in 1824, when Smith had moved to Yorkshire, but it acquired a number of books, manuscripts and specimens relevant to Smith. Torrens notes that most of these sadly cannot now be located in the BRLSI collection. He reveals that the lost manuscripts include the work of Alexander Catcott and John Player, who had both written about the local stratigraphy before Smith.



John Phillips

Phillips and Torrens provide a major source of information about the series of local RIGS designated because of their close association with William Smith. Not only does the original biography provide evidence for Smith's work at such sites as Mearn's Colliery in High Littleton, and the former Swan Inn in Dunkerton, but Torrens adds much more information about local RIGS from his and others' research. In one section of his introduction he takes the BRLSI to task over the location of the infamous Tucking Mill plaque. This was originally placed on a former mill building at Tucking Mill in 1889, and when this was demolished in the 1930s, BRLSI and the Geological Society of London had it erected on the cottage next door, in the mistaken belief that this had been Smith's home. Torrens has produced new evidence to show that Smith only lived in the northern half of nearby Tucking Mill House, and exhorts BRLSI to have the plaque finally moved to its proper home. At least Tucking Mill House has been correctly designated as a RIGS.

BRLSI printed only 600 hardbound and handsome copies of this book, and most have been sold. They are excellent value at £15, and, if you do not yet own a copy, hurry down to 16-18 Queen's Square in Bath!

Somersetshire Coal Canal Photographic Survey

From Andrew Mathieson

Earlier this year the Avon Industrial Buildings Trust (AIBT) invited community groups to participate in preparing an exhibition of photographs to identify local knowledge and concerns about the Coal Canal. The Avon RIGS Group duly visited a number of sites along the canal route, used the disposable camera provided and took part in a workshop to plan the layout of the exhibition boards.

Most of the sites photographed are RIGS associated with the pioneer geologist William Smith, who worked on the survey and construction of the canal between 1793 and 1799. During this time he had the unparalleled opportunity to see the full sequence of local rocks exposed along the "cut" and to collect fossils, leading to his famous realisation that fossils can be used to identify different strata.

In practice most of the best photographs turned out to be of the buildings linked to Smith, rather than rock exposures. These include Rugborne House in High Littleton, which Smith called the "Birthplace of English Geology", the former Swan Inn at Dunkerton, where he first wrote about the use of fossils to identify strata, the Mearn's Colliery in High Littleton, where he first drew an underground cross section, and Tucking Mill in Monkton Combe, where he produced his first geological map.



Combe Hay Locks

One purpose of the exhibition is to focus on problems and issues with sites along the canal,

and we were keen to point out the general lack of interpretation of geological sites in the area - despite the international importance of those linked to Smith. This is not true for all sites since Tucking Mill does have a plaque, but it is on the wrong building and really should have been relocated years ago.

At the same time we hope the exhibition will help to raise the profile of the geological importance of the whole area, and the need for more research into which sites led William Smith to his crucial understanding of stratigraphy.



Rugborne Farm, High Littleton

The contributions made to the exhibition will help to inform the Somersetshire Coal Canal Conservation and Access Study, being undertaken by the AIBT, in association with B&NES Council and the Somersetshire Coal Canal Society. This is hoped to lead to the improved management and conservation of the canal area.



Paulton Canal Basin

The exhibition opened on 30 October at Radstock Museum, and is due to tour museums, libraries and other community centres in B&NES. A new website is planned for next year.

Cullimore's Quarry, Charfield

From Charles Hiscock

The SSSI of Cullimore's Quarry (ST 720926) exposes amygdaloidal andesite lava, the Upper Trap, of Silurian Llandovery age. It has been described by various authors since Weaver in 1824, in particular Reed & Reynolds (1908) on both the volcanic and fossiliferous rocks in the quarry. However, in 1972 Curtis recorded that 'the well-known section at the north-western corner ... is now obscured'.

The quarry was designated as an SSSI on account of the important exposure of the Palaeocyclus Band, a richly-fossiliferous horizon which overlies the Upper Trap. It remained obscured for upwards of 100 years, although loose debris in the vicinity has been collected by various workers over the years. However, following an initiative by English Nature, two trenches have been dug on the western side of the quarry face, extending back from the top of the andesite into the field beyond.

Trench 1, at the north-western extremity, exposed only red clays of the Tortworth Beds with loose blocks of fine and coarse sandstones and andesite. Trench 2 exposed the Palaeocyclus Band, which although rather fragmentary, nevertheless produced many specimens of the richly fossiliferous ashy limestone. A further extension of Trench 2 back from the quarry face is proposed to enable the extent and depth of the band to be determined. Currently both trenches are open to the elements to allow natural weathering to clean the surfaces, but the face of the quarry has been cleared of vegetation to allow better access to the andesite.

Looking for mammoth bones at Newton St Loe

From Simon Carpenter

I was recently invited to look at an excavation that was part of the Bath Combined Sewer Overflow Project. A Rural Rising Main (pipeline) was installed below ground between Bath and Saltford. This entailed the excavation of continuous trench, part of which passed close to a geological Site of Special Scientific Interest (SSSI) at Newton St Loe, near Bath.

A geological 'Watching Brief' – a requirement of the planning process was necessary to record the geology of the trench in the vicinity of the SSSI.

The SSSI consists of a Pleistocene river terrace deposit (mainly river gravels) approximately 10m above the present River Avon. They were laid down by a braided river approximately 25 thousand years ago when sea and river levels were much higher than the present time. During the construction of the Great Western and Midland railway cuttings in the mid C19 the same river deposits were temporarily exposed and contained the bones of mammoth and horse. Mammoths are associated with a cold phase in our climate.



These deposits are not normally seen because they occur below agricultural land, so the Rural Rising Main was an important source of new exposures. These have now been measured, recorded and photographed as part of the Watching Brief. All this new information will be presented in report form to Wessex Water, B&NES Council, the British Geological Survey and Bristol Regional Environmental Records Centre.

I was hoping to find at least one mammoth tusk during the Watching Brief period – but no bones of any kind were found. Probably a good job anyway as most of my visits to the site were by bicycle and I'm not sure how I would have made my way back to Bristol Museum by bike with a mammoth tusk over my shoulder!

Listings

Museums with geology displays in former Avon

Bristol City Museum & Art Gallery

Local and global rocks, fossils and minerals
Queen's Road, Bristol BS8 1RL
tel: 0117 922 3571
www.bristol-city.gov.uk/museums
open: daily 10am-5pm

Kingswood Heritage Museum

Coal mining and brass production
Tower Lane, Warmley, Gloucestershire
tel: 0117 956 4896 or 967 5711
open: Tues, 2nd Sun 2-4pm (and 4th Sun, April-October)

North Somerset Museum

Mendip minerals and some fossils
Burlington Street, Weston-super-Mare BS23 1PR;
tel: 01934 621028, email: museum.service@n-somerset.gov.uk
website: www.n-somerset.gov.uk
open: Mon-Sat 10am-4.30pm.

Radstock Museum

Coal mining, minerals, Jurassic and Carboniferous fossils
Waterloo Road, Radstock BA3 3ER
tel: 01761 437722
email: radstockmuseum@ukonline.co.uk
website: www.radstockmuseum.co.uk
open: Tue-Fri & Sun 2-5pm, Sun & Bank Holiday
Mon 11am-5pm

Coming talks, events and field trips

4 December 2003

Origami tectonics: some simple models of folding and faulting. Professor Richard Lisle, University of Wales, Cardiff. **BathGS.**

9 December 2003

Wegener's Jigsaw. Clare Dudman on her biography of Alfred Wegener. **WEGA.**

5 January 2004

Annual General Meeting. **BathGS.**

14 January 2004

Europa: A Frozen Waterworld? Vicki Griffiths, Royal School of Mines, Imperial College London. Europa is one of the icy moons of Jupiter. **BNS.**

20 January 2004

Current research. Three Bristol University students. **WEGA.**

10 February 2004

Bristol, the last 300 million years. Elizabeth Devon, Stonar School. **WEGA.**

11 February 2004

Members' Evening including a quiz. Simon Carpenter, BNS President and Geology Section Field Secretary, **BNS.**

19 February 2004, 10am-4pm

The Rocky Road Show
The annual geology hands-on day; identification of specimens. **BCM.**

4 March 2004

Glaciation. Oliver Macdonald. **BathGS.**

9 March 2004

Glaciers and their legacy. Geraint Owen, Swansea University. **WEGA.**

17 March 2004

Dinosaur tracks in the Purbeck Limestone Group and where they have led. Paul Ensom, The Natural History Museum, London. **BNS.**

26 March 2004

The Tree of Life. Mike Benton, University of Bristol. **BRLSI.**

1 April 2004

Alan Comer. **BathGS.**

20 April 2004

Annual General Meeting and Book Sale. **WEGA.**

6 May 2004

Earth's Earliest Life. Dr. R. Riding, Cardiff University. **BathGS.**

3 June 2004

Geology and Penguins. Dr D. Brook, Department of the Environment. **BathGS.**

1 July 2004

Club Evening. **Bath GS.**

Contacts for further information

Bath Geological Society (BathGS)

Secretary: Elizabeth Devon, Heleigh House,
Middle Hill, Box, Wiltshire SN13 8QB
tel/fax: 01225 742752

email: bathgeolsoc@bathgeolsoc.org.uk

Meetings are held at 7.15 pm, Bath RLSI, 16-18
Queen Square, Bath.

Website: www.bathgeolsoc.org.uk

Note new web address

Bath Royal Literary & Scientific Institution (BRLSI)

16-18 Queen Square, Bath

tel: 01225 312084, fax: 01225 429452

email: enquiries@brlsi.org

Website: www.brlsi.org_ **Note new web address**

Bristol City Museum & Art Gallery (BCM)

Queen's Road, Bristol BS8 1RL

tel: 0117 922 3571

email: general_museum@bristol-city.gov.uk

Website: www.bristol-city.gov.uk/museums

Bristol Lapidary Society

Jim Edmondson, 60 Lays Road, Keynsham,
Somerset.

Bristol Naturalists' Society Geological Section (BNS)

Field Secretary: Simon Carpenter

tel: 0773 2116671

email: simonccarpenter@yahoo.com

Meetings: 7.00 pm, University of Bristol Earth
Sciences Department lecture theatre (G25).

Website: www.bristolnats.org.uk

Open University Geology Society (OUGS)

Jan Ashton-Jones, tel: 01432 870827,

email: Jashtonjon@aol.com

Website: www.btinternet.com/~mtne/OUGS/

Rockwatch

The national club for young geologists

Website: www.rockwatch.org.uk

University of Bristol (UB)

Department of Continuing Education

8-10 Berkeley Square, Bristol BS8 1HH, tel. 0117
928 7153

Website: www.bris.ac.uk/

West of England Geologists' Association (WEGA)

Deborah White, 66 West Town Lane, Brislington,
BS4 5DB

Recently redesigned website:

www.churchard.pwp.blueyonder.co.uk/WEGA

How you can support the work of the Avon RIGS Group

Surveying and interpreting geological and geological sites in the former County of Avon can be very interesting and rewarding work. The Avon RIGS Group is always looking for fresh volunteers, so if you are interested and able to commit a small amount of time to this work, please contact one of the following Avon RIGS members:

Andrew Mathieson

Eversleigh, Newlands Hill, Portishead, BS20 9AZ

email: andrew@mathiesons.org.uk

Simon Carpenter

tel: 07732116671

email: simonccarpenter@yahoo.com

Contributions to *Outcrop*

Short articles and photographs of geological and geomorphological interest are always welcome. Please contact:

Roger Clark, City Museum & Art Gallery, Queen's
Road, Bristol BS8 1RL,

tel: 0117 922 3593

email: roger_clark@bristol-city.gov.uk

Getting yourself on to the *Outcrop* mailing list

To receive your **FREE** copy of the Avon RIGS Newsletter, please contact:

BRERC, Ashton Court Visitor Centre, Ashton
Court Estate, Long Ashton, Bristol BS41 9JN

tel: 0117 953 2140, fax: 0117 953 2143

email: brerc@btconnect.com

The Avon RIGS Group is co-ordinated by Bristol Regional Environmental Records Centre (BRERC).