MERCIAN Geologist

VOLUME 18 PART 3 OCTOBER 2014

East Midlands Geological Society

Correspondence
Society Secretary, 100 Main Street,
Long Whatton, Loughborough LE12 5DG
01509 843297 secretary@emgs.org.uk

Mercian Geologist Editor,
11 Selby Road, Nottingham NG2 7BP
0115 981 3833 mercian@geophotos.co.uk

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

ISSN 0025 990X

Front cover: Creswell Crags. Photo: David Bate.

Back cover: Panoramas in the Peak District:
Mam Nick landslide into Edale, from Mam Tor;
Castleton reef and Treak Cliff, from Back Tor;
Mam Tor and the landslide road;
the River Wye below Monsal Head;
Chrome Hill from Parkhouse Hill.
Photos by Tony Waltham.

Contents

GEOBROWSER

Geology at Flanders and Normandy

This year sees both the centennial of the outbreak of World War I and the 70th anniversary of D-Day, but what role, if any, did geology play in those conflicts? In modern warfare, geology and terrain analysis are essential considerations when planning a military campaign (see *Mercian 2000, 65-66*), but this was not always the case. During the 40-day lead-up to World War I there was hardly any time to consider geology, but that did not seem to matter when a good summer ensured almost perfect battlefield conditions in Flanders. By early October, however, heavy rainfalls greatly hindered the movement of supplies and artillery on poorly drained land and an appreciation of ground conditions then became important. Unfortunately, whereas basic geology had been on the syllabus of British military academies during the 19th century, it had been withdrawn from mainstream teaching by the time that war broke out. The British army did not have a professional geologist in place until 1915, and by the end of the war there were just three full-time officer-geologists *(Geol. Soc. Special Publication 362, 2012)*. By contrast, the Germans had some 250–300 geologists, and although these were of relatively low rank, they had the additional advantage of geological information obtained from the libraries and offices of the Belgian towns and cities that they had occupied.

Geological factors began to loom large when the appalling casualties suffered during trench warfare prompted the advent of offensive (and defensive) tunnelling. Tunnelling techniques in association with siege warfare would have been well known, from examples documented in ancient China between 481 and 221 BC, and later in medieval Britain and France, where battlements were typically undermined from tunnels with entrances concealed within trench systems. Although the Germans were the first to tunnel offensively, in 1914, by mid-1916 the British army had about 25,000 trained tunnellers, and whereas most accounts emphasize recruitment from mining communities, the expertise of sewer workers from the Manchester and London areas was also utilised for excavating through heavy clay substrates.

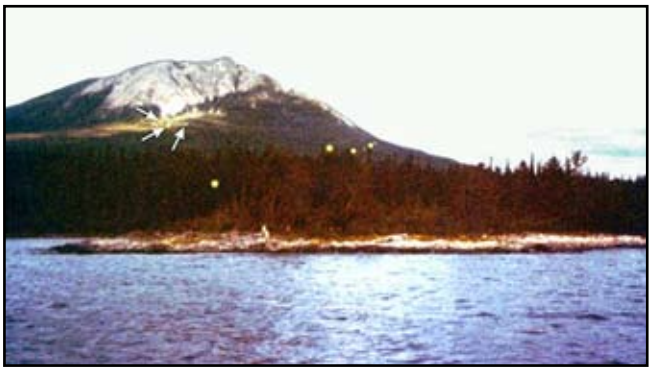
The work of the 'professional' geologists in the British army was mainly concerned with assessment of groundwater supplies and the siting of mine, trench and dugout systems. Some of the world's first detailed geotechnical maps and reports originated during the Passchendaele Offensive of autumn 1917, when an intense artillery bombardment pulverised terrain on poor-draining Tertiary (Palaeogene) clays. In order to predict infantry progress during the anticipated German counter-attack, one report investigated the behaviour of Ypresian clay following shelling to depths up to 5 m, classifying shell holes according to whether they would fill with water from underlying aquifers, be waterlogged by rain, or would be naturally drained by subcropping sands. A further example of best practice was provided by the German positions at Beaumont Hamel (Hawthorne Ridge), where the incorporation of naturally strong chalk outcrops allowed for deep, dry trench systems that were virtually impregnable. On the other hand, the chalk bedrock facilitated excellent undermining conditions for the British, which resulted in a charge of nearly 20 tonnes of ammonal (ammonium nitrate and aluminium powder) being placed beneath the German lines, causing a crater 20 m deep and 55 m wide.

Learning from the lessons of World War I, geological preparations for the D-Day landings on the Normandy beaches were thorough, and here a strong Midlands connection was provided by the work of Quaternary geology expert, Prof. Fred Shotton of Birmingham University. An archive of top secret materials recently rediscovered at the university's Lapworth Museum reveals that preliminary geotechnical investigations were carried out on a Norfolk beach with a geology similar to that of many Normandy beaches. Geological maps of the Normandy coastline were prepared, showing geographical features including rivers and gradients, with numerous notes in red ink (*www.culture24.org.uk*). First-hand information was gained when Shotton flew over northern France in a Mosquito aircraft modified with a glass observation panel in the base of the fuselage, while under his direction clandestine visits were also made to sample Normandy beach sands and other deposits for their geotechnical properties. On one such visit, an auger was accidentally left behind, and so to cover up this potential give-away it was planned to drop augers on every beach between Norway and Biscay; however, it was soon realised that there were not enough augers available to do this. Shotton's involvement continued after the landings, with investigations into water supplies needed for camps in Northern France, the location of new airfields and the likely problems in crossing the Meuse and the Rhine.

Earthquakes illuminated

Remarkable luminous phenomena known as Earthquake lights (EQL's) have been observed before or during earthquakes, and rarely afterwards. They can take the form of spheres or globes of light floating through the air, or flame-like emanations from the ground either seconds or several days before an earthquake. Notable examples were seen in the town of L'Aquila in Italy, seconds before the 2009 earthquake; along the St Lawrence Seaway in Quebec, 11 days before the powerful 1988 earthquake; and about 100 km northwest of San Francisco just before the disastrous 1906 earthquake.

A recent review noted that 85% of EQL's were observed in continental rift environments, either on or near to sub-vertical rift faults or related transform faults (*Seismological Society of America, 2 January 2014)*. Although associated with a range of earthquake



(left) Earthquake lights from Tagish Lake, southern Yukon, Canada, around the 1st of July, probably 1972 or 1973 (exact date unknown). Estimated to be a metre in diameter, the closest orbs slowly drifted up the mountain to join the more distant ones (white arrows) (photo: Jim Conacher).

(right) Tutankhamun's scarab brooch (photo: April Holloway).

magnitudes between M 3.6 and 9.2, some 80% occurred in conjunction with magnitudes greater than 5.0. The authors suggested that EQL's are related to a rapid build-up of stress prior to fault rupture, and to rapid local stress changes during seismic wave propagation. These changes are believed to activate mobile electronic charge carriers, termed 'positive holes', which flow swiftly along the stress gradients until, when reaching the surface, they ionize air molecules producing the observed luminosities. Support for this mechanism comes from eyewitness accounts and security cameras that captured a large number of light flashes during the magnitude 8.0 earthquake at Pisco, Peru, in 2007. Those measurements gave rare information on the origin of EQL flashes, since they coincided with the passage of seismic waves recorded at a nearby university campus.

There are anecdotal stories that animals can sense changes to their environment during the approach of an earthquake, so can we now speculate that ionized air, which cannot be detected by humans if non-luminous, may play a part in this? The United States Geological Survey says a reproducible connection between a specific animal behaviour and the lead-up to a quake has never been made. However, this may simply reflect the obvious difficulties inherent in recognising anomalous animal behaviour, and then linking this to a correlation between detectable ground emanations and seismic wave propagation.

Could it be that EQL's are the explanation behind the biblical story of Moses and the burning bush? For example, Exodus Chapter 3 relates that on Mt. Horeb (sometimes referred to as Mt. Sinai)*: "…the angel of the Lord appeared to him in flames of fire from within a bush. Moses saw that though the bush was on fire it did not burn up. So Moses thought, 'I will go over and see this strange sight—why the bush does not burn up."* We know that during their flight from Egypt Moses and the Israelites must have crossed two intense earthquake zones, the Red Sea Rift and, farther east, the Dead Sea Transform fault system (*see Mercian for 2004, 48-50*). Although the precise location of Mt. Horeb is currently disputed (and the site of the burning bush is claimed by St Catherine's Monastery in central Sinai), many scholars place both it and the region of Midian, where the burning bush encounter is now thought to have taken place, on the eastern side of the Gulf of Aqaba (*Red Sea crossing: accordingtotheScriptures.org)*. That seaway coincides with the southern sector of the Dead Sea Transform, perhaps suggesting that Moses may have either observed an EQL, or somehow utilised local folklore about them. Other biblical stories may have been inspired by seismic phenomena: for example, the partial destruction of Jericho (*Joshua, Ch. 6*), is commonly attributed to a severe earthquake farther along the fault, rather than simply to loud trumpeting.

Comets and pharaohs

A link between ancient religious beliefs and cosmology is evoked by the large specimen of polished yellow-brown glass in the striking scarab centrepiece to Tutankhamun's brooch. The glass could only have come from a strewnfield in the Libyan Desert, where a large area of silica-rich sand was fused by the impact of a comet that entered the Earth's atmosphere 28.5 million years ago. An unusual black pebble recently found at the strewnfield provides further evidence for an extra-terrestrial origin: it has a carbonaceous composition, with microscopic diamonds, and carbon isotopes that are consistent with values obtained for interplanetary dust (*Earth and Planetary Science Letters 2013, v 382, 21-31)*. The investigators concluded that the pebble is a fragment of a cometary nucleus, and as such it constitutes the first ever ground-based evidence provided by a comet exploding in the atmosphere. Further confirmation of this may arrive later this year, if the *Rosetta* mission is successful in analysing the surface of an actual comet. The black pebble was named "Hypatia" in honour of the Greek female mathematician, astronomer and philosopher, Hypatia of Alexandria, a controversial figure who was murdered by a Christian mob in AD415.

Tutankhamun's brooch shows that the glass debris of the strewnfield clearly attracted human attention, and was possibly symbolic in the religious sense. If so, the ancients may unwittingly have chosen a material compatible with their theology based on sky-worship. This included a belief in the sun-disc, known as Aten, which was deified by Tutankhamun's father (although not by Tutankhamun himself). Another cosmological manifestation lies in the internal construction of the great pyramids, which have corridors linking the burial chamber to the sky so that the deceased pharaoh and entourage could spend the rest of their after-life traversing the heavens.

FROM THE ARCHIVES

C B Wedd – the spy who never was

Charles Bertie Wedd (1868–1945) joined the Geological Survey in 1898 as an Assistant Geologist and was promoted to Geologist in 1901 and Senior Geologist in 1922. He retired in 1929.

On 19 September 1914, W H Spaull, a magistrate in Oswestry, Shropshire, wrote a letter which ended up on the desk of the Survey's Director, Aubrey Strahan (BGS Archives: GSM/DR/St/A/4). In the letter Spaull alleged that Wedd, who was engaged in fieldwork nearby, "has twice been taken as a German spy" and that "The last time he was found in a tree at the rear of a camp of about 5000 men" and "the soldiers were with difficulty prevented from lynching him". In his reply Strahan said that he was "aware that Mr Wedd was arrested a few weeks ago by the Military Authorities, but I understood that they were satisfied that he was a Government Official". In a letter to Strahan, Wedd declared that what Mr Spaull alleged "is, of course, wholly untrue in every respect" and suggested that an article "from some local paper, may account for this gossip".

MBER 2, 1914

ALLEGED GERMAN SPY CAPTURED AT OSWESTRY.

ANOTHER MISTAKE.

Only a Government Official.

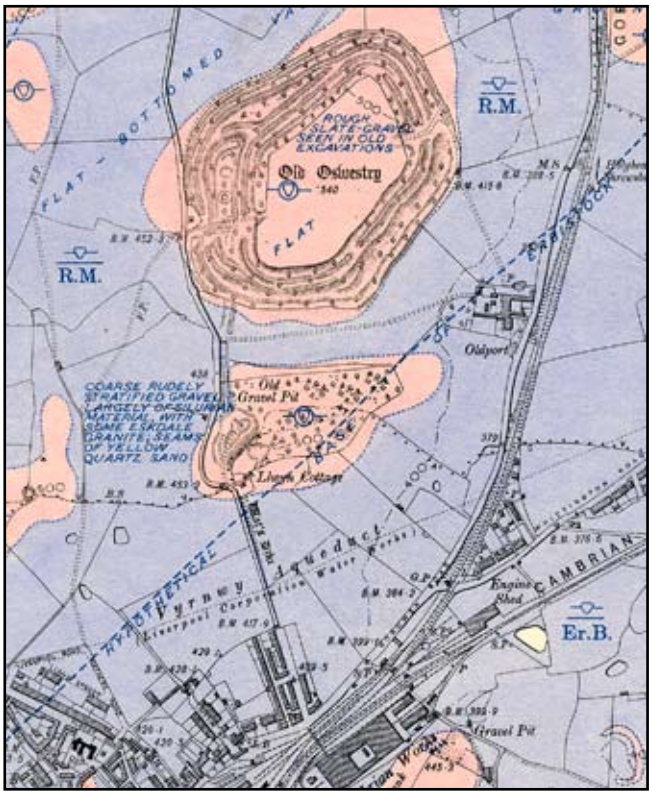
Great excitement was caused in Oswestry on Wednesday evening by the report that a German spy had been captured by the Hereford Territorials in the Oswestry Coppice, overlooking the Territorial camp.

The alleged "spy" was conveyed to the Drill Hall, where the Brigade Headquarters are now situated, and the police were communicated with. Superintendent Hamlet and some police officers hurried to the hall, but, on examination, it was found that the "spy" was a Government official from the Ordnance Survey Department, who was engaged in taking notes for the Ordnance Department. We believe this is not the first experience of the sort this unfortunate gentleman has had. A week or two ago he was "arrested" on the Denbighshire and Shropshire border and immediately released.

While we congratulate the Territorials on their vigilance, it is satisfactory to know that the "German spies" infesting this district are of such innocent and amiable a character.

We understand that while the crowd were waiting outside the Drill Hall for his removal in custody, the "spy" left quietly by the side door for his temporary abode in the Glyn Valley.

Local newspaper report of the arrest of C B Wedd, which evidently occurred in the last week of August 1914. The country at this time was on a heightened state of alert following Britain's declaration of war on Germany on 4 August. Note that the Geological Survey was confused with the Ordnance Survey (BGS Archives: GSM/DR/St/A/4).



Extract from published six-inch geological map of the area north of the town of Oswestry, Shropshire, surveyed by C B Wedd in 1914. The Territorial camp was established during August of that year just to the north of the railway sidings. Wedd was evidently surveying the gravel deposit (coloured pink) in the coppice on the north side of the camp, indicated by Llwyn Cottage, when he was arrested.

This appears not to have been an isolated occurrence as correspondence in 1916 shows that field geologists continued to be "seriously delayed in their work through the action of village constables and special constables and from irresponsible busy-bodies". This was in spite of them carrying documentation showing that they were authorised to carry out work on behalf of the Geological Survey. Such incidents, as well as showing some of the difficulties a field geologist may face, also demonstrate the fear from within the general population about German spies. Such fears and dangers were not unfounded, as on 6 November 1914, less than two months after Spaull had written his letter, Carl Hans Lody, a real German spy, was executed by firing squad at the Tower of London.

Andrew L Morrison
Archivist, British Geological Survey

THE RECORD

Our individual membership in this anniversary year now stands at 202 together with 48 joint members and 29 institutional members and we welcome the new members who have joined the Society during the year.

Indoor Meetings

Following the Annual General Meeting in March 2013, Andrew Naylor uncovered for us The Hidden Histories of Mineral Oil Exploration in the East Midlands.

It the April meeting, a solution to The Problems of Chirotherium and the Triassic Environment was presented by Geoff Tresise.

The programme of winter lectures began in October with The Geology and Palaeontology of the Black Country in the late Silurian Period, reviewed by Graham Worton.

In November the spectacular scenery of the Arctic was on display during The Geology of Svalbard and Jan Mayen, presented by James Creswell.

The December meeting on the very topical subject of Landslides in 2012-2013, presented by Helen Reeves, was followed by the traditional Christmas Buffet.

In January 2014, Nick Riley offered a geologist's view of the controversial subject of shale gas and its extraction by hydraulic fracturing ("fracking" in oil-drillers' slang) of the reservoir rock.

The inaugural meeting of the Society took place on 1st February 1964. So the celebration of the Society's fiftieth anniversary began with this year's Foundation Lecture and Anniversary Dinner. The speaker for this special occasion was Professor Iain Stewart and his subject *Between a Rock and a Hard Place* addressed the challenge of communicating geoscience to the general public, a subject close to the hearts of the 55 people who attended that first meeting of the Society.

Field Excursions

Deltaic sand formation and sequences in the Coal Measures formed the focus of Albert Benghiat's visit to The Roaches in May.

On a June evening, David Bate took us through three billion years of time to view the specimens and stonework along the route of the new Geology Walk constructed at BGS Keyworth.

In July the local geology in the Ticknall area, with its resulting industrial heritage of quarries, mines, limekilns and tramways, was viewed in a visit led by Keith Ambrose.

Also in July, Albert Horton continued his tours of the geology apparent in building stones in local churches, this time from Wilford to Willoughby on the Wolds.

A visit to Monsal Dale in August, led by Peter Gutteridge, gave the opportunity to inspect exposures now visible due to the recent refurbishment of tunnels along the Monsal Trail.

The river valleys of the Lincolnshire Wolds were the destination of an excursion in September.

A weekend in Weardale and Teesdale at the end of August led by Ian Sutton focused on the Carboniferous succession and the area's extensive mining history.

Council

Council met on six occasions during the year to discuss matters for the Society's benefit and where possible to contribute to wider geological issues.

As a result of the bequest received from the late Beryl Whittaker a bursary of £250 has been awarded to a student from Derby University.

Two grants have been made this year to organisations who share the Society's objectives. One of £500 was given to the Nottingham Historical and Archaeological Society to support their excavations of the sandstone caves of Nottingham, in particular for materials with which they constructed a timber bridge to maintain access to the Willoughby House caves. The second grant, also of £500, was to Geoconservation Staffs towards their reprint of the Hamps and Manifold Valley Geotrail leaflet.

After last year's success, the Mercian Geologist was again available for collection at the first indoor meeting. Due to the continuing efforts of David Bate, we hope to have the majority of back issues of Mercian Geologist on the site by the end of this anniversary year.

The Society logo has been updated to provide a clearer image in both colour and monochrome black. A press release that reviews the history of the Society has been prepared and distributed, and further copies are available for anybody who can publicise this landmark year in the Society's calender.

In conclusion I would like to thank all those who have given freely of their time, expertise and energy during the past fifty years, thereby enabling the Society to flourish to the present and hopefully to continue into the future. Our thanks go to Richard Hamblin and all his speakers for the Indoor Programme, to Ian Sutton and all his excursion leaders for the Field Programme, to Sue Miles for editing the Circular (which now goes to most members via email), and to Rob Townsend for managing the Society's website.

We also thank Gerry Slavin for his many years of valuable contributions in his role on the Editorial Board of the Mercian Geologist. He has now had to retire from that position, and we welcome Duncan Short as the new Board member to replace him.

Janet Slatter, Secretary

THE RECORD 1964

The following is a copy of the minutes of the first meeting of the Society, fifty years ago.

Record of the Inaugural Meeting of the East Midlands Geological Society, February 1st 1964.

1. Following the meeting on January 4th, 1964, at the University of Nottingham, which was chaired by Dr Taylor, and supported by various individuals representing a number of Associations, who are named by Dr Taylor in his Report on The Proceedings of that afternoon, who were, or might be, interested in the furtherance of the study of Geology, the meeting convened by common consent for February 1st at 3pm duly took place, at the University of Nottingham Extra-Mural Department Adult Education Centre, Shakespeare Street, Nottingham.

2. Dr Taylor presided, and was supported by Dr Sarjeant, Miss Brindley acting as Meeting Secretary. In his opening remarks, he presented to the gathering the aims and objects of a proposed Geological Society, then for the benefit of those in the audience, who were not present at the informal meeting mentioned above, Dr Sarjeant read Dr Taylor's report on those proceedings, to a number of fifty-five people who were present of the approximate one hundred who had been in contact with the sponsors.

3. At this point, the Chairman opened the meeting for general discussion, and from then on, questions and answers ensued which made it apparent that there was indeed a nucleus of keen interest in the area, which most likely could be maintained and expanded.

4. Items coming under discussion, were: affiliation to the Geologists' Association, which was rejected; affiliation to existing local organizations, which was also deemed not to be beneficial; excursions, lectures, and other events of an educational value; librarial facilities; functional representation with other societies of a like nature, in work connected with the preservation of geological exposures *in situ* in conjunction with the nature reserves and National Trust, commercial and industrial enterprises and individuals, etc, etc.

Lively discussion was carried on, until it was apparent to the *Platform* that there was just cause for putting to the Audience that a Society could be supported by the *Area*, and a request was made for the events to be carried to a normal conclusion and Dr Taylor then proposed 'As from that time a Society should be formed.' This resolution was seconded by Mr Morrell, and all present assented in the usual manner, by a show of hands, to be in favour of this motion.

5. Dr Taylor then declared that a Society had been formed.

6**.** He then went on to define the geographical area known as the East Midlands, and a unanimous decision was carried in favour of the Society being named 'The East Midlands Geological Society'.

7. These proceedings were followed by a request from Dr Taylor for the formation of a Council or Committee of Members to conduct the affairs of the Society. Dr Sarjeant proposed the formation of a Committee, and he was seconded by Mr Stevenson. Then followed the Election of a Committee of Members, who were voted for, the results being checked by volunteer scrutineers from those present. Accordingly the Committee was declared elected (Mr P.C. Stevenson, Mr E. Taylor, Mr R.W. Morrell, Miss F.I. Brindley, Mr P.H. Hanford, Mr P.H. Speed, Dr T.D. Ford, Mr R.E. Elliot, Dr F.M. Taylor, Mr R.J.A. Travis, Mr D.J. Salt, Dr W.A.S. Sarjeant)

8. Discussion followed on the question of Membership Fee, which was proposed by Dr Sarjeant at £1.1.0d. and carried; an amendment that it should be £1.10.0d. being rejected. A further amendment of 10/- was rejected. A humorous interjection came from the audience, in the form of a request that annual fee paying should not be in January, and to the appreciation of all concerned, it was arranged for February 1st of each succeeding year.

9. Subsequently Mr Taylor was elected as Treasurer. Miss Brindley was proposed as Secretary, this office she declined to accept, as being one of the movers in wishing the creation of a Society and was of the opinion a more democratic method would be to have a volunteer, eventually Mr Morrel1 was proposed and seconded.

10. Fee taking then followed, and a number of 28 people joined by paying the announced sum of £1.1.0d. Application Forms were also completed for the joining of the Society. A proposal for a Society journal was accepted.

11.Arrangements were then made for the adjournment, at the conclusion of the meeting, for a meeting by the Committee Members, in order that they might select a date when they could meet to formulate the Constitution of the Society, and February 20th, at 8.00pm at the Technical College was arranged.

12. March 7th at 7.30pm. was selected for the First Ordinary Meeting of the Geological Society, and with closing remarks from Dr Taylor, to the effect that the affairs of the day has been satisfactorily concluded, the meeting came to an end.

The record was signed by P C Stevenson, President, on 6/2/64.