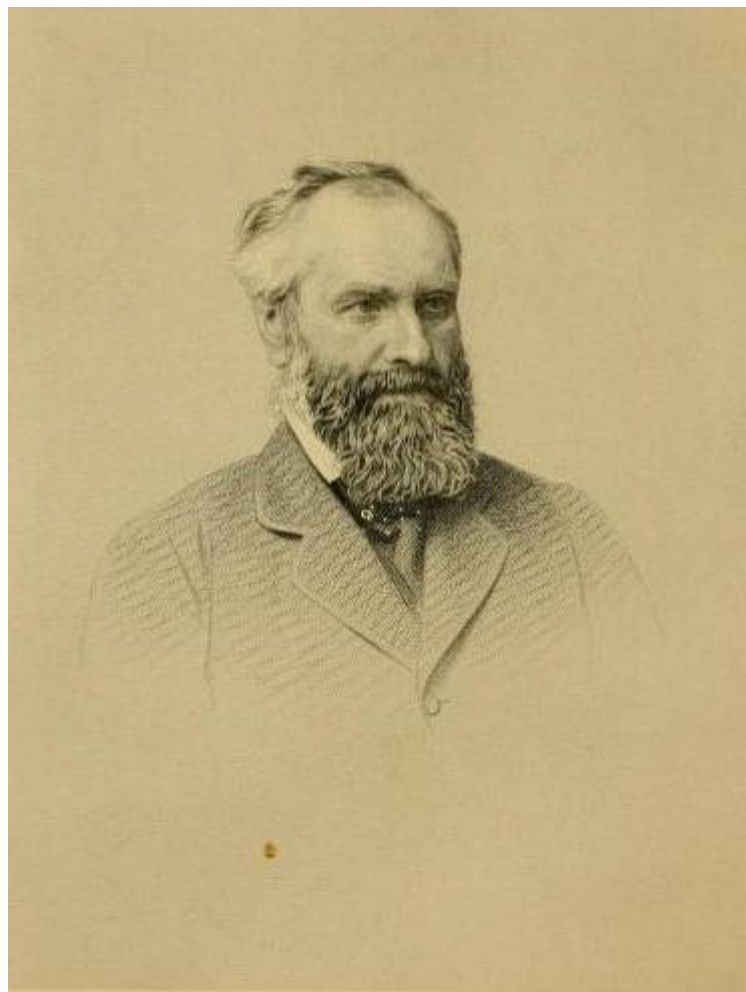


HOGG

**Newsletter of the
History of Geology Group
of The Geological Society (GSL)**



**Number 59
February 2017**

Front cover

Thomas Davidson FRS

This year is the bicentenary of the birth of Thomas Davidson (1817–1885), Scottish naturalist and palaeontologist who became an authority on fossil and recent brachiopods.

Davidson was born in Edinburgh but educated mainly in continental Europe, latterly in Paris. As a young man, he was urged by Baron Leopold von Buch to undertake a detailed study of the then little understood Brachiopoda. Coming from a wealthy background, he was able to spend most of his life ‘in retirement’ researching this Phylum. He published extensively, notably his magnum opus on British Fossil Brachiopoda (*Monograph of the Palaeontographical Society* 1851–1886), with over 200 plates drawn by himself, and his monograph on Recent brachiopods in the *Transactions of the Linnean Society London* (1886–1888). He was an honorary member of all the main scientific societies in Europe and America. Awards included the Wollaston Medal of the Geological Society (1865), a Murchison “Silurian Medal” (1868, for his *Illustrations of Silurian Life*) and the Gold Medal of the Royal Society (1870, for his valuable contributions to palaeontology). He died at his residence in Brighton, Sussex and bequeathed his collection of brachiopod specimens, books and original drawings to the British Museum (now Natural History Museum London).

Sources

Eminent Living Geologists. Sketch of the Scientific Life of Thomas Davidson F.R.S. *The Geological Magazine*, Vol. 8, No. 82 (1871)

Obituary. Thomas Davidson, LL.D., F.R.S., F.G.S., F.L.S., &c. *Geological Magazine*, Vol. 2, Issue 11 (1885)

Image :*The Geological Magazine* 1871.

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The HOGG newsletter will be issued in February (copy deadline 31st January), June (copy deadline 31st May) and October (copy deadline 30th September).

HOGG NEWSLETTER 59

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LETTER FROM THE CHAIR

And so into a new year, with a new leader of the free world who thinks climate change is a hoax fabricated by scientists. I wouldn't be surprised to learn that he also believes that the Earth is flat and sits on the back of a turtle while the sun orbits around it. And is only 6,000 years old. And that *The Flintstones* was a documentary. We should be thankful for our geological perspective of deep time which will hopefully help the next four years pass quickly into history—assuming someone survives to write that history.

Meanwhile, back in the real world: our web officer Sabina Michnowicz has overseen a revamp of our website which now includes, on the home page, the most recent tweets on our Twitterfeed as well as details of forthcoming meetings. We currently have over 1000 followers on Twitter and over 600 on Facebook and, since the relaunch of the website, we have seen a significant increase in Facebook engagement. Our website should be your first stop for anything you want to know about HOGG; you can also book and pay for our meetings there. With much appreciated help from Wendy Cawthorne of the Geological Society Library, the website also now houses a complete set of HOGG newsletters all the way back to Issue 1 of January 1995.

On 16th November, we had our meeting at Burlington House on military aspects of engineering geology, convened by Ted Rose and Judy Ehlen with Ursula Lawrence from the Geol. Soc.'s Engineering Group, and with industry sponsorship from Alpha Associates, Capita, 1st Line Defence and Tony Gee. Live tweeting from the meeting by Peter Doyle and Deodato Tapete kept our followers updated. Ted's work continues as he and his co-convenors are editing a *Special Publication* based on the papers read at this meeting (see P. 4 of this newsletter). Our AGM was held during this meeting and, as I was unable to attend, I am grateful to our Vice Chair, Geoff Walton, for standing in and dealing with business with his customary efficiency. We welcome back to the committee a former Chair, John Henry, who was successful in the election for the post of Committee Member.

There was, as you might expect, a great turnout for the meeting at Burlington House on 8th December to celebrate the life and work of Bob Symes (a former Vice-Chair of HOGG), and the programme reflected the breadth of Bob's interests (see P. 8).

Meetings this year begin in May with a field weekend in the Forest of Dean organised by Cherry Lewis; this meeting is now fully booked. In September, we plan a weekend in Lyme Regis to mark the opening of the new Mary Anning Wing of the museum there with talks and walks looking at Lyme and the geologists linked to the town; and in November, John Henry is arranging a joint meeting at Burlington House with the Royal Society of Arts to discuss their encouragement of mineralogy and geology in the earliest days of our science. See further details of these meetings in this newsletter and keep up to date via our website.

Over the last few months, Chris Duffin and John Henry have been providing advice to Pope's Grotto Preservation Trust during the course of several visits to the grotto at Twickenham. This is a project in which we will probably continue to have some involvement during this coming year (see P. 13).

Under the editorship of Chris, Dick Moody and Christopher Gardner-Thorpe, the papers from our 2014 meeting on geology and medicine are now almost all published online or at the proof stage. They are scheduled for publication in hard copy as *Special Publication* 452 in December this year and will be a wonderful companion volume to *Special Publication* 375 from the 2011 geology and medicine meeting. Speaking of medicine, this year sees the bicentenary of James Parkinson's publication of his description of the shaking palsy. Look out for a new biography, by HOGG member Cherry Lewis, of the surgeon and palaeontologist who was one of the original founder members of the Geological Society (see P.17 of this newsletter).

HOGG COMMITTEE 2017

Chairman Tom Sharpe **Vice Chairman** Geoffrey Walton **Secretary** Chris Duffin
Treasurer/Membership Secretary David Earle **Ordinary members:** Beris Cox (**newsletter**),
Stephen Cribb, Jill Darrell, John Henry, Sabina Michnowicz (**web officer**), Ted Rose.

HOGG WEBSITE

The HOGG web officer **Sabina Michnowicz** (s.michnowicz@ucl.ac.uk) co-ordinates material for inclusion on our main website <http://historyofgeologygroup.co.uk/>. The site provides easy access to all aspects of HOGG including details about our meetings and the facility for online registration and payment, as well as subscription renewal. Please contact Sabina if you have any queries or items for inclusion. We also have a presence at www.geolsoc.org.uk/ where you will find some useful resources.

HOGG NEW MEMBERS

HOGG welcomes the following new members:

Peter Austen (Seaford, East Sussex)
David Bate (Keyworth, Nottinghamshire)
Simeon Brown (Stavanger, Norway)
Thomas Cotterell (Ruardean Hill, Gloucestershire)
Kevin Edwards (Aberdeen, Scotland)
Eric Freeman (London)
Debbie Hutchinson (Bristol)
Anthea Lacchia (Naas, Kildare, Ireland)

RIP We are sad to record the deaths of HOGG members Trevor Ford and Deryck Laming.

MARSH AWARD FOR MINERALOGY

HOGG member Roy Starkey has won the prestigious Marsh Award for Mineralogy. The award recognises unsung heroes who have made a contribution to the promotion of mineralogy in the UK and abroad. Roy is a former President of both the Russell Society and the British Micromount Society, and has been a member of the Mineralogical Society for many years. He is a well known collector, author and scholar at an international level. He was a key player in the recent upgrading of the mineralogical exhibit at the refurbished Lapworth Museum in Birmingham (see HOGG Newsletter 57 (June 2016), pp. 18–19) and author/publisher of *Crystal Mountains—Minerals of the Cairngorms* (2014) (see HOGG Newsletter 52 (October 2014), pp. 17–18). The award was presented at the Natural History Museum London on 6th February 2017.



Roy (left) receiving the Award from Brian Marsh OBE. Image © R. Starkey

MILITARY ASPECTS OF ENGINEERING GEOLOGY: PAST AND PRESENT

*Jim Spencer¹ reports on the HOGG meeting held at Burlington
House on Wednesday 16th November 2016*



John Mather (Royal Holloway, University of London) led proceedings off with *Water Supplies to Maritime and Coastal Defences: a story of risk and innovation*. In this talk, he pointed out that coastal forts were sited for strategic reasons and not much advice was available on water supplies until the 1850s. Intermittent rain could not be relied on as a source of water, nor could water derived off-site; the most secure water supply would be from a well within the fortification. In the 16th Century, a fort at Mount Orgueil in Jersey had its well shaft sunk in granite—the source of the water was not understood until the 1950s.

In 1781/2, Captain Thomas Hyde Page looked at defences on either side of the River Thames. At Sheerness, he realised water could be obtained there from the Reading Beds, as at Queensborough, but it took over a year to find it at a depth of some 100 m. To the north, Landguard Fort downstream from Harwich, was strengthened in the 1780s. Page obtained water there from superficial deposits, eventually connecting two wells with a gallery between. He realised that freshwater ‘floated’ on denser seawater. The deep well also provided evidence of the London Basin. In recognition of his work, he was elected FRS and knighted by George III.

In 1859, Palmerston set up a commission to look at UK defences. The commission recommended that Portsmouth be protected by a ring of forts (becoming known as ‘Palmerston’s Follies’), four of which (Horse Sands, Spit Bank, St. Helen’s and No Man’s Land) would be in the sea. It was believed that the Chalk extended out to sea and that water could therefore be obtained from there. However, after going through superficial deposits, water was found at a shallower depth in the Bracklesham Beds. No Man’s Land fort is now a luxury hotel. It is obvious that the military had the financial resources and the best geologists to carry out these high-risk projects.

Tony Brook (West Sussex Geological Society) then spoke about the *Response to the Napoleonic Threat of Invasion in 1804: canals, coastal forts and the cartography of south-east England*. In response to that threat, the government had divided the UK into defence regions, of which the most vulnerable were the flat areas in the south-east of England. It was decided to construct a 26 mile-long canal, the Royal Military Canal, encircling the Dungeness peninsula, for the purpose of flooding the Romney Marsh area in the event of a French invasion. Work was carried out between 1804 and 1809 but by the time it was finished, the threat of invasion had mostly disappeared. Flooding the area would have been too slow to be effective and, in any case, the local landowners objected. It is now a public walkway.

The engineer, John Rennie, proposed to build a canal from the Chatham dockyards to the Portsmouth dockyards so that ships could avoid the English Channel. In 1804, Pitt approved the construction of the canal and a series of forts, now known as Martello Towers, around the coast. Seventy-four of these were built between Folkestone and Seaford. These were of a similar design, with a thicker wall facing the sea, and built with a quarter of a million bricks. Some of these forts have now collapsed due to subsidence, some were destroyed in 1860 for target practice by Armstrong guns, and some were demolished. Of the remaining 26 (16 in Kent, 10 in Sussex), some are now homes, some museums.



After coffee, the American Civil War was the theme of the next talk—*Geologic Influence of the Great River Raft on the Red River Campaign of the American Civil War*—given by **Danny Harrelson (US Army Corps of Engineers, Vicksburg, USA)** and based on collaborative field work in the 1980s. In 1864, the Union forces devised the Anaconda Plan, in which the strategy was to divide the Confederate forces by sending the Union army and navy up the Mississippi River and its tributary, the Red River, and seizing Shreveport, whilst also blockading the ports of the eastern US. The planners, however, had failed to understand the vagaries of the Red River.

Hazards on the Red River, of which the Union forces were unaware, included rapids located south of Alexandria and the Red River ‘Raft’ situated between Alexandria and Shreveport. The raft consisted of a series of logjams forming where banks of sediment, developed from the very high sediment load from Permian red-beds, split the river channel into a series of anastomosing channels. The raft made navigation difficult and the first attempt to clear it was made in 1837–8 but by 1864, it had re-formed.

The Union forces advancing up the river in 90 ships were unaware of the raft, which impeded progress. A Confederate soldier interrupted a ball to announce that the Yankees were coming. The Confederates made life more difficult for the Union forces by sinking a steamboat, the ‘Cairo’, in the river and lowering its level by blowing up a dam. The Union army, becoming detached from the navy, were routed by the Confederates. The Union navy, in danger of being grounded, managed to beat a retreat by building makeshift dams in the river to raise the water-level.

Peter Doyle (University College London) examined the use of geological know-how in *Geology and Military Mining: Gallipoli and the Western Front, 1915–1918*. By 1915, a state of mutual siege had been established on the Western Front, with Allied and German troops facing each other in trenches while to the east, a new front was established in Gallipoli to supply the Russians. The nature of substrates—chalk in Arcady and Picardy, clay in Ypres—affected trench design. At Ypres, the clay affected water-levels in Allied lines whereas the Germans had the advantage of high ground in sands. By 1917, elevated walkways came into use.

To break the deadlock, emplacement of explosives under enemy lines came to be considered, which required some mining expertise and geological knowledge. Standard timber supports were used in mining, being replaced later in the war by steel. To drive the tunnels, picks and grafting tools were used—a team of four could advance 18 inches per hour. Listening posts were set-up to detect tunnelling

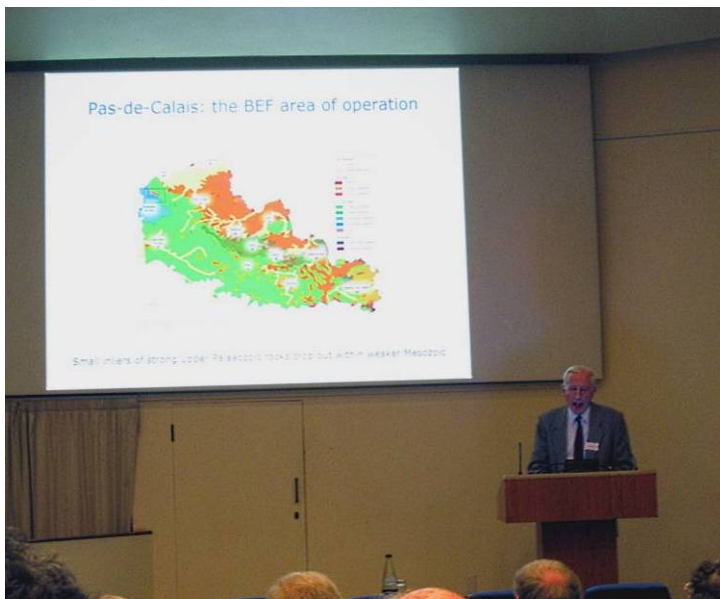
—noise travels more in chalk rock. There was a need to understand the hydrogeology—both British and Germans produced maps to show wet and dry ground. Spoil had to be disposed of carefully to avoid detection.

In reply to questions, the speaker said engineers used a mine dial to establish the direction of tunnelling and that the British used two types of tunnelling machine, both of which got bogged down in the Ypres clay.

In his talk on *Tunnelling Companies Royal Engineers in the Second World War: excavation of bomb-proof military facilities in France, Gibraltar, Malta and the United Kingdom*, **Ted Rose (Royal Holloway, University of London)** explained that the 25 tunnelling companies formed in World War I to breach the Western defences were disbanded at its end. One of them, 170 Tunnelling Company, was re-formed at the outbreak of World War II, with other ranks comprised mainly of coal-miners. They were involved in building underground headquarters in France, which had to be over 50 feet deep to prevent vulnerability from bombing, but above the water table. Work was curtailed after the German invasion. They, along with the newly-formed 171, 172 and 173 Tunnelling Companies, were then deployed around Britain to construct regional command centres.

170 Tunnelling Company joined other companies in Gibraltar, a British outpost important for the Royal Navy, and by 1943 had excavated 20 kilometres of tunnels in the north and south-east of the Rock, removing 700,000 tons of rock. In 1941, 173 Tunnelling Company was deployed to Malta, an important staging-post for Egypt, where their work included excavation of an underground hospital. After the war, they helped to improve the water supplies on the island.

The work of Tunnelling Companies changed throughout the course of the war as the threat of invasion and bombing diminished; the 4th Tunnelling Company was based in Britain and latterly was involved in drilling for oil at Eakring. The last company was disbanded in 1960.



When asked about the number of tunnellers who had died during World War II operations, the speaker responded that there had been no casualties.

After lunch, **Ted Rose** continued with *Quarrying Companies Royal Engineers: a geology-related innovation stimulated by World War*. In World War I, the Royal Engineers had formed a number of special units—Tunnelling, Boring and Quarrying; two Quarrying Companies were formed in 1916, with a further eleven in 1917. The German invasion meant that road-stone from Belgium

was no longer available in France so had to be obtained from elsewhere. The Quarrying Companies were involved in quarrying limestone from the Ferques inlier, near Boulogne, where good-quality Devonian and Carboniferous rock was overlain unconformably by Jurassic and Cretaceous rock. Three quarries were established in Carboniferous and three in Devonian rocks, near railways, producing a daily output of 10,000 tons. After the war, the companies assisted in re-construction work before being disbanded.

Quarrying Companies were re-formed in World War II and were used initially for bomb-disposal work, and then to build ports in western Scotland out of reach of the Luftwaffe. In 1943, they were sent to North Africa following the Allied invasion of the former French territories (Algeria, Tunisia and French Morocco) then on to Italy. Other companies were employed in Gibraltar, the Faroes and Northern

Ireland. Following the Normandy landings, the Quarrying Companies assisted in quarrying stone in France, Belgium and Germany.

Hermann Häusler (University of Vienna and Reserve Army Austria) continued with *The Northern Atlantic Wall: German engineering geology work in Norway during World War II*, in which he outlined the role of geologists supporting the German Army, Navy and Air Force in Norway. The Fennoscandian Shield contains rich mineral deposits, notably ores of iron and nickel, and, as such, Norway was strategically important to Germany. An organisation, Organisation Todt (OT), reporting to Albert Speer, Minister for Armaments and War Production, was set up to support the armed forces. Included in OT were geologists who assisted with specific geological problems of building aerodromes, submarines' pens, roads, railway tunnels and coastal defences.

The Casagrande brothers, Leo and Arthur, had both attended Vienna University. The OT, with Leo as chief engineer, developed novel solutions to technical problems and produced information leaflets on various aspects of military engineering for general use by the forces. OT was very well organised.

In *The Impact of the Military Engineering Experimental Establishment (M.E.X.E.) Approach to Terrain Evaluation*, **Paul Nathanail (University of Nottingham)** reviewed the development of terrain analysis for military and other purposes. That part of the military involved in this field, the Military Engineering Experimental Establishment (M.E.X.E.), had been formed in 1946. By the 1960s, academics from Oxbridge devised a formal classification of terrains in conjunction with M.E.X.E.; these were summarised in a series of reports and conference presentations. In conjunction with these, terrain evaluation, based on the work of Mitchell in 1973 involving analysis, classification and appraisal of terrains, provided a means of producing simplified reports for non-specialist military personnel. The advent of satellite-imaging allowed analysis of land in remote or hostile areas; combined with the use of digital computers, this resulted in the development of the Geographical Information System (GIS).

Judy Ehlen continued on the theme of terrain evaluation in *Predicting Joint Trace Length using Remote Sensing: a neural network model*. Estimation of bedrock properties is important for both civil and military applications. For military applications, this estimation may necessarily have to be carried out remotely. Rock-fracturing properties can be determined by estimating the trace lengths of faults, joints and lineations remotely.

Five granite terrains—Nevada and New Mexico in the US, north and east Dartmoor in England, and a site in Asia, where actual lineation trace lengths were known—were chosen to benchmark three Neural Network models. Two of these models proved to give good results with the test data but when applied to other areas, disappointed. A revised model produced more satisfactory results.

Asked about the military applications of such a model, the speaker replied that it could be used to assist in the targeting and fusing of penetrating weapons, estimation of payload needed to destroy underground facilities, and damage assessment from the rubble volume.



After tea, **Eddie Bromhead** (retired **University of Kingston, UK**) discussed the history of the Roman fort at Lympne (pronounced with a silent 'p') in *The Landslip-Damaged Roman-Era Fort at Lympne, Kent*. The fort at Lympne was constructed in Roman times on a slope overlooking a coastal port but now, due to sea-level change, looks down over Romney Marsh and the Royal Military Canal running along the base of the slope. The fort was one of a series of forts along the south and east coast of England and the Channel coast of France and Belgium, known as the 'Forts of the Saxon Shore,' constructed to deter coastal raiders from northern Europe. The fort was constructed of stone from the Hythe Beds, which locally

overlies clay. Roach Smith discovered the Principia and Bathhouse when excavating the site. It appears that slumping in the clay had caused the fort to become buried.

There was a question as to what happened to the south wall of the fort. Eddie thought it had tilted and toppled over; fragments were found in 1979.

The last talk of the day was given by **Deodate Tapete (British Geological Survey)** who discussed *Coastal Processes that have led to the Loss of British Military Heritage*. In this talk, he described the defensive structures built around the south-east coast of England during the first and second World Wars, as they are today

In the World War I, before the invention of radar, acoustic mirrors were used to detect aircraft. These were concave structures made of concrete, built to focus sound waves to a listener. Some were built on cliff-top sites, but not all. One can be seen at Dover, while others have fallen down cliffs into the sea. During the World War II, 20 radar towers were built, supplemented by ones to detect low-flying aircraft.

Pillboxes, another class of structure, were constructed in 1940 to various basic designs. Some 7,815 pillboxes have been recorded across the UK of which Type 22 and 24 are the most common. ‘Dragon’s Teeth’, concrete obstacles with no foundations, laid out along beaches to thwart tanks, are another. The coast is subject to erosion; three localities were examined to demonstrate this. Firstly, Walton-on-the-Naze where there is a radar tower still standing, along with pillboxes. Two pillboxes are now in the sea as also are two gun-mounts, while a third gun-mount has appeared in the sea. At Worden Point, in the Isle of Sheppey, a church standing in the 19th Century is no longer there. Here coastal erosion is more gradual, with occasional pronounced events; two rotational land-slips occurred—in 1971 and 1988--and pillboxes which stood on the cliffs are now in the sea. At Timber Hill in Dorset, only the foundations and steps remain of a coastal battery, and on Chesil Beach, sand is burying a pill-box. An acoustic mirror at Fan Bay, covered in 1970, has been restored by the National Trust. DEFRA has a number of Shoreline Management Policies in place.

At the close of proceedings, Judy Ehlen thanked Ted Rose and Ursula Lawrence for their organisation of the meeting, while Ted in turn thanked Judy. Our thanks go especially to all three co-convenors, and to all the speakers who helped to make the day interesting and successful.

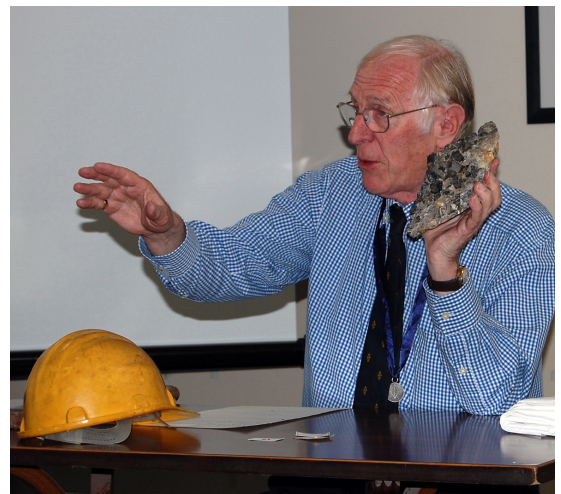
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Images © Barrie Chacksfield

A COMMEMORATIVE MEETING TO CELEBRATE THE LIFE AND WORK OF ROBERT F. SYMES OBE, 1939–2016

Roy Starkey¹ reports on the meeting held at Burlington House on Thursday 8th December 2016

This meeting was about celebrating Bob’s life and many, many, achievements. The organisers hoped to capture, and to share, something of his sense of fun and enthusiasm for everything to do with the Earth sciences through the presentations and displays, and I am sure that anyone who was present will agree that we achieved that objective.



Robert Frederick Symes, known universally as Bob, has been a prominent figure in British mineralogy and geology for around 50 years. Many of you will have known, or met, Bob Symes, in his capacity as an officer of one of the many societies with which he was involved, through his employment at the Natural History Museum, or simply as a consequence of his outreach activities in giving talks, leading field meetings and attending mineral shows.

The meeting, held under the auspices of the History of Geology Group, Ussher Society, The Geological Society, Geologists' Association, Natural History Museum, and Harrow and Hillingdon Geological Society was held on 8th December 2016 in the Janet Watson Lecture Theatre of The Geological Society, at Burlington House, London. The event attracted more than 80

attendees including nine members of Bob's family, and speakers included friends and former colleagues from the world of academia, museums, BGS, Geologists' Association, Gem-A and Russell Society.

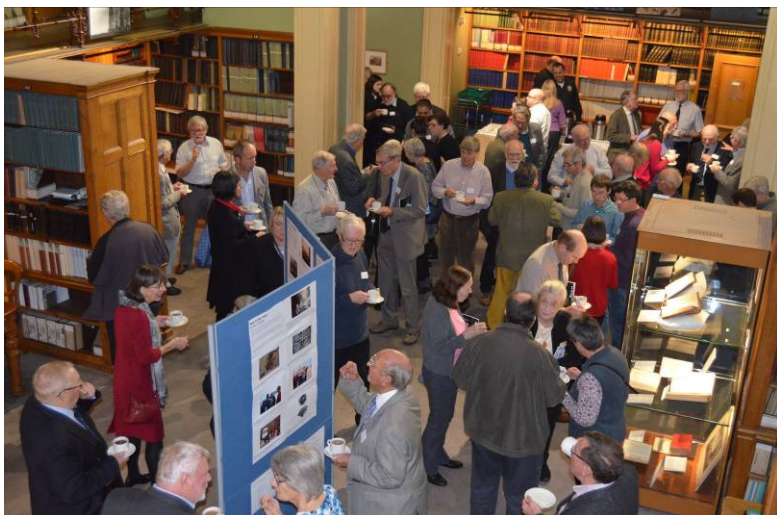


Proceedings got under way with a welcome from Dick Moody, who then talked about his memories of Bob and their time working at the helm of the GA. Their efforts saw major changes in terms of the GA Circular and the huge gatherings at Earth Alert 1 (in Brighton) and Earth Alert 2 (in Scarborough). Next up was Richard Scrivener, with a talk about Devonshire Shining Ore: micaceous hematite from NE Dartmoor which took us up to the coffee break. Richard noted that one of the principal uses of micaceous hematite was in anti-

corrosion paints, and that many of the railway bridges in the south-west had been treated with the product. One such bridge had been recently over-painted with a 'modern paint', which had quickly cracked and peeled, exposing the reliable micaceous-hematite paint which was in a pristine state beneath.

A selection of poster displays, in the Lower Library, provided a stimulus for conversation and reminiscing, and included contributions from Jenny Bevan and Gary Jones, former colleagues of Bob's at the NHM, with some interesting anecdotes about the role of microprobe operators in the early days of the science. Other posters featured Bob's scientific publications, his relationship with the Russell Society and Sussex Mineral and Lapidary Society, and his broader outreach activities. Table displays from Peter Tandy and Peter Underwood, both told stories of Bob's enthusiastic football career. After coffee, Roger Le Voir talked about Bob's ten years at Sidmouth Museum, noting that his "Mr Fix It" qualities were legendary, with new display cases appearing from nowhere, and Bob always seeming to know the right people to get things done, how to attract funding and so on. Ron Cleevely (formerly a palaeontologist at the NHM) gave a presentation on the use of archive material to enhance our knowledge of mineral collecting in the past, and this prompted some discussion about the changing nature of records and the potentially transient nature of electronic media, and the likely data loss which

may result in the future. The last speaker before lunch was Alec Livingstone (formerly with National Museums Scotland), who gave an insightful talk highlighting the importance of museums, collections and mineralogy, and the scope for future research on material in museum collections.



Delegates dispersed to various establishments in the local area for lunch, with some returning with sandwiches to continue chatting with friends and colleagues in the Lower Library. The so-called “graveyard slot” after lunch was ably filled by Alan Hart, now CEO of Gem-A, but for 35 years a member of the staff of the mineralogy department at the NHM, and for whom Bob had been mentor. Alan’s sparkling presentation was rich in stories and anecdotes, and illustrated by many previously unseen archive photos.

Two more technical presentations followed—the first, by Rick Turner, reviewed something of the history of research of the minerals of the Mendips and his early schoolboy encounters with Bob Symes, and then focussed on on-going work which is likely to see symesite established as a mineral group, rather than a single species. Frank Ince followed Rick, with a talk on vanadium chemistry and geochemistry, and UK vanadates, neatly taking us up to afternoon tea.

The final session began with Brian Young (Department of Earth Sciences, University of Durham) describing the story behind publication of *Minerals of Northern England*, and continued with John Mather (another former colleague, also formerly with BGS) speaking on Sidmouth geology and geologists, focussing particularly on the work of Peter Orlando Hutchinson, a Sidmouth resident and local amateur geologist who had published *The Geology of Sidmouth* in 1843. The last speaker of the day was Roy Starkey from the Russell Society who described Bob’s relationship and fascination with Sir Arthur Russell and his fabulous mineral collection. Roy concluded his talk with a reading of a poem—*The Song of the East Tower Mob*, penned back in the 1960s by Bob’s friend and colleague Jenny Bevan (now resident in Western Australia), which seemed a fitting way to bring the meeting to a close. A good proportion of delegates stayed on for a wine reception in the Lower Library, whilst the remainder headed out into the vibrant Christmas atmosphere of the retail world and crowds in Piccadilly—more than a couple venturing into Fortnum and Mason for some festive “bargains”. The meeting was a considerable success and thanks are due to all the organisers, speakers, delegates, and to our hosts, The Geological Society, for making it a day to remember, and a fitting tribute to a much loved man.

¹ email roy.starkey@gmail.com

FUTURE HOGG EVENTS

*WEEKEND MEETING:

THE HISTORY OF GEOLOGY AND MINING IN THE FOREST OF DEAN

19th–21st May 2017

Forest of Dean, Gloucestershire

Convenor: **Cherry Lewis**

This meeting is now fully booked.

*WEEKEND MEETING:

THE GEOLOGISTS OF LYME REGIS

9th–10th September 2017

Lyme Regis, Dorset

Convenor: **Tom Sharpe** (Lyme Regis Museum; email tom@tomsharpe.co.uk)

This summer, Lyme Regis Museum opens its new extension, the Mary Anning Wing and, to mark the occasion, HOGG is holding a weekend meeting based at the museum to discuss the remarkable contribution made by geologists associated with Lyme Regis, particularly in the first half of the nineteenth century.

Saturday 9th September will be a day of talks on Lyme and its geologists, with speakers on Mary Anning, Henry De la Beche, William Buckland and William Daniel Conybeare, amongst others. There will also be an opportunity to see the museum's new geology gallery. On the morning of Sunday 10th September, a town trail will take us around sites and buildings associated with Lyme's geologists and, for those who wish to stay after lunch, we will head onto the beach to see where Mary and Joseph Anning collected their famous ichthyosaur and take a look at the Lias section of the coastal ledges and the cliffs towards Black Ven.

The number of participants will be limited to 30 which is the capacity of the venue. The meeting fee is expected to be around £35. The full programme will appear in the June HOGG Newsletter and on the HOGG website.

*THE SOCIETY OF ARTS AND THE ENCOURAGEMENT OF MINERALOGY AND GEOLOGY—1754–1900

Thursday 9th November 2017

Burlington House, Piccadilly, London (including HOGG 2017 AGM)

A joint meeting with the William Shipley Group for RSA History

We had a very good response to the Call for Papers in the last newsletter and have put together a provisional programme. See P.12.



The Society of Arts and the Encouragement of Mineralogy and Geology 1754–1900

Thursday 9th November 2017
Geological Society, Burlington House,
Piccadilly, London.



THE WILLIAM
SHIPLEY GROUP
FOR RSA HISTORY

The Society for the Encouragement of Arts, Manufactures and Commerce, now referred to as the Royal Society of Arts (RSA), was dedicated to raising the standard of living through encouraging invention, discovery and improvements. To achieve this, it initiated a series of awards in several fields. The prizes in the fields of chemistry, cartography, and land improvement encouraged the emerging science and field practice of mineralogy and geology. Although there was a direct award for a mineralogical map of England, won by William Smith, geology and mineralogy were encouraged by awards for discoveries of practical uses for certain minerals, for reclaiming land by hydrological and coastal defence work, and for accurate maps. Several prominent people of the time were members of both the Society of Arts and the Geological Society.

The role of the Society of Arts is an under-researched area in the history of geology. The RSA's archive is relatively little known to historians of science. The RSA still occupies its original home on John Adam Street just off the Strand. The visit to the RSA, after the conference, will introduce a new research resource and a fine Georgian building. In the next Newsletter, details of costs and methods of payment will be given, but enter the date—9th November—on your calendar now!

PROVISIONAL PROGRAMME

- 09:00–09:30 Registration
09:30–09:40 Welcome and Housekeeping
- 09:40–10:10 'If diligently sought after'—encouragement given by the Society for the Encouragement of Arts, Manufactures and Commerce' *Susan Bennett*
10:10–10:40 Society of Arts Map Awards; an assessment of their contribution to Geology
John Henry
- 10:40–11:00 BREAK
- 11:00–11:30 National Water Supply, conflicts between geologists and engineers and role of the Society of Arts *John Mather*
11:30–12:00 Silver Medals for Agriculture: to John Farey and William Smith *Cherry Lewis*
12:00–12:30 Promoting Art Manufactures and Commerce in One—the Society's role in the development of British marble industry *Gordon Walkden*
- 12.30–13.45 LUNCH (and HOGG AGM ½ hr)
- 13:45–14:15 Collecting Minerals in the Early Nineteenth Century: the Royal Institution and Humphry Davy *Frank A.J.L. James*
14:15–14:45 Waterhouse Hawkins and the First Dinosaur Models *Mike Howgate*
- 15:15–15:35 BREAK
- 15:35–16:05 Royal School of Mines Outreach Through Lectures to Working Men (tbc)
Anne Barrett
16:05 – 16:30 Panel discussion/summary *chaired by Hugh Torrens*

VISIT TO ROYAL SOCIETY OF ARTS ARCHIVES

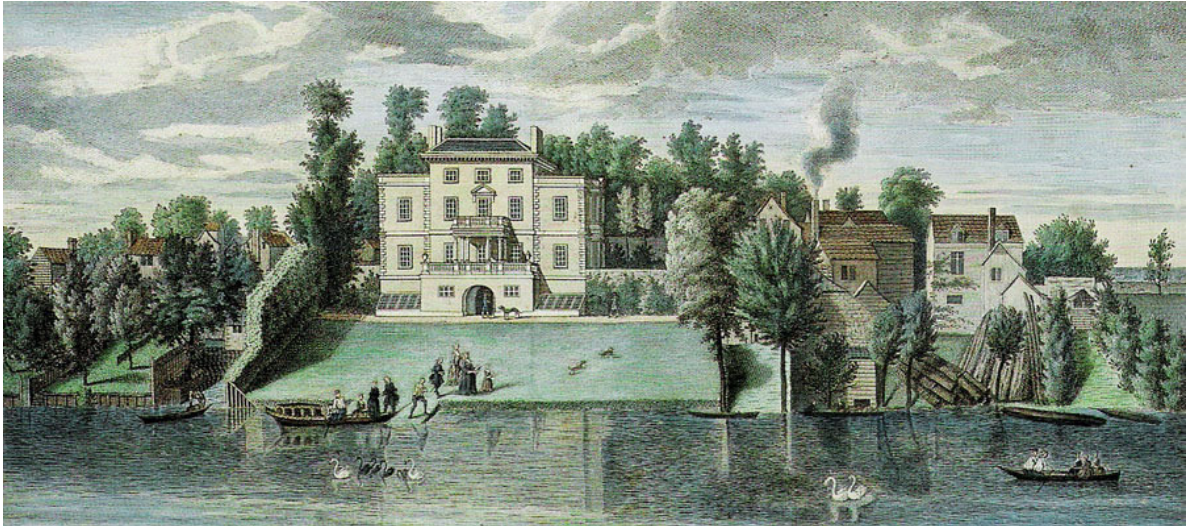
www.historyofgeologygroup.co.uk

www.williamshipleygroup.btck.co.uk

POPE'S GROTTO

John Henry¹ reports on HOGG's collaboration with the Pope's Grotto Preservation Trust.

The poet, Alexander Pope (1688–1744) lived the last 25 years of his life in the Palladian mansion which he had built, in 1720, on the banks of the River Thames at Twickenham, Middlesex. He had made his name and fortune with his successful translations of the *Iliad* and the *Odyssey*, and his poetry, and it enabled him to pursue his interests in architecture, and landscape and garden design. In this mansion, he incorporated classical elements observed on Grand Tours of the continent, particularly Italy. Among these were the popular shell grottos. Pope's shell grotto occupied the basement and provided a passage for his guests, who arrived by river, to enter his five acre garden.



The entrance to Pope's Grotto is the prominent arch below the portico. This view is long gone and classrooms of Radnor House School now occupy the space between the river and the surviving entrance.

Much later, in October 1739, Pope visited the thermal spa of Hotwells, in Bristol, and marvelled at the spectacular and varied geology of the Avon Gorge. Smitten by the concept of a mineral cave, the shells had to go for the conversion of his grotto to reflect nature rather than classical mythology. He requested/cajoled his many wealthy friends to supply him with minerals from their estates or collections with which he could line his grotto. Over 50 letters document the shipment of approximately 30 tons of material. Minerals were sent to Pope from Cornwall by William Borlase; alabasters, spars and 'snakestones' (ammonites) were sent from Bath by Ralph Allen; Sir Henry Bethel sent petrified wood and mosses from Knaresborough. The Duchess of Cleveland sent amethyst and quartz; two 'joints' of basalt from the Giant's Causeway were donated by Sir John Sloane. There are anonymous marbles, amethysts, calcites, fluorspars, quartz crystals, and coloured glass, foundry slag and random tiles. Pope had mirrors installed so as to reflect sunlight off the Thames to add some sparkle.

It is rather kitschy and bizarre in many ways but the Grotto is like a very large cabinet of curiosities, popular in its day. Decades later (1796), William Smith remarked that "fossils have been long ... collected with great pain, treasured with great care ... and expense, and shown and admired with ... much pleasure ... without the least regard to that wonderful order with which Nature has disposed" them. This was true also of minerals. Pope's eclectic grotto collection certainly has no pretence of scientific order. Nevertheless, from this popular fascination for natural curiosities, there is an arguable transition to the sciences of mineralogy and geology just beginning to develop. In its day, it glittered and drew many visitors. Now it is dingy and weathered, but solid and remarkably intact. The Grotto is Pope's material legacy and witness to a pre-scientific fascination with mineralogy and geology. It is now a Grade 2 listed building. In the 'Heritage at Risk' category, its conservation, which will require a great deal of time and considerable work, has attracted development funding from Historic England (formerly English Heritage).



View of the Grotto as drawn by Samuel Lewis in 1786.



Present view of the Central Grotto.

Last summer, HOGG was contacted by the Pope's Grotto Preservation Trust for assistance in assessing its history of geology content and identifying the minerals in it. The Grotto occupies what remains of the basement of Pope's mansion. Pope had wanted to create the impression of a mine and so shaped tunnel-like galleries, and encrusted the walls and ceilings with thousands of rock, mineral and fossil specimens. His house was knocked down in 1808 by a later owner who lived nearby and who was irritated by Pope 'groupies' and souvenir hunters who continued to visit the empty house. The cellar survived and since the early 1900s has formed part of the foundation of a private school, now Radnor House Independent School. The school is interested in developing its association with Pope and, to that end, enables visits on some weekends and during school holidays.

Chris Duffin and I visited the Grotto on behalf of HOGG, with several trustees, and formed the view that HOGG could assist them in identifying many of the rocks, fossils and minerals and that a virtual model

of the grotto would not only be useful for internet ‘visitors’ but also facilitate the recording of the exact location of each mineral and linking it to a database in which the identity, possibly the provenance, and chemical and other characteristics could be recorded. The chemical character is important to the conservationists who will clean the minerals. Subsequently, I introduced the Trust to surveyors Plowman Craven who undertake detailed surveys of historic buildings. For an example of a virtual model, see <https://www.youtube.com/watch?v=5O9hU813nKA> for their work on Grimes Graves.

It is hoped that HOGG can organise visits of volunteer mineralogists/ geologists to identify minerals throughout the cave. Our initial concept was to tag the minerals before a physical survey but such is the pressure of lottery grant deadlines that the physical survey had to happen early in the New Year. Therefore Chris and I had a trial, shortly before the Plowman Craven survey of the Grotto, in order to discover the practical problems of an identification exercise. There was concern to assess how well physical labelling would be recorded by the survey, and a first set of images were taken. We confined our efforts to the smaller chamber on the left of the entrance. We identified a dozen different rock and mineral types and tagged them with coloured or numbered sticky circles unique to each type. We photographed what we had done.

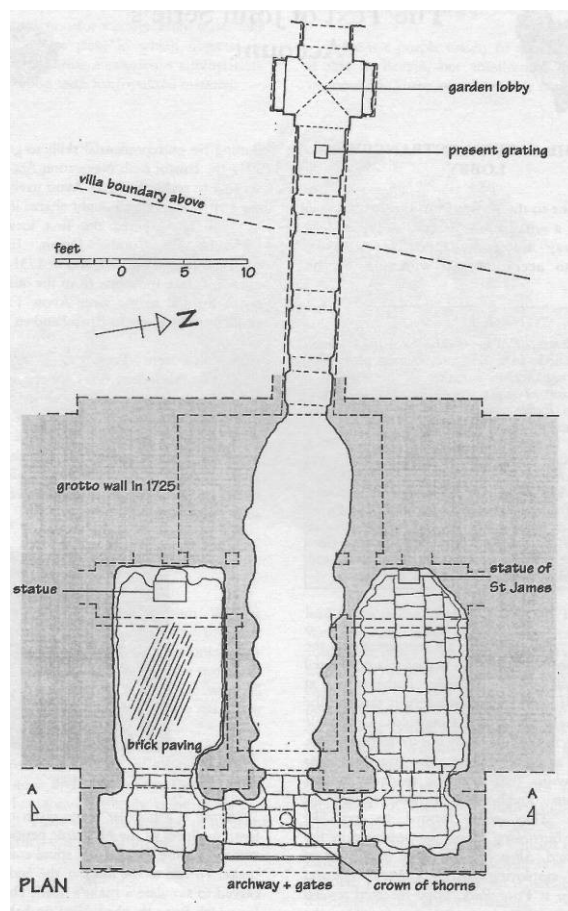
We learned that:

- it was very easy to lose one place in the completely random ‘melange’ of relatively small rocks and minerals, and that it was necessary to keep a finger on the particular mineral until the appropriate sticker is found.
- the coordinate system to be devised for the virtual model will be critical to correctly transferring each individual mineral’s data to the images of the model and conversely, using the image to locate each mineral for appropriate conservation.
- the greatest variety is on the upper walls and on the ceiling and that much of the latter induces a neck-ache.

Plowman Craven’s survey was carried out on the weekend of 14th–15th January this year. We have not yet seen the images but have heard that the minerals and our tags show clearly and that the resolution of the coordinate system will be sufficient to give each mineral a unique coordinate. Plowman Craven’s survey model framework is designed to have new imagery attached to it, taken after the conservation and clean-up, which registers with the pre-clean-up image.



The diameter of the circular sticker is 8 mm. In the virtual model, each mineral will have unique coordinates.



1997 plan of Popes Grotto. The archway faces the Thames. The tunnel at the top of the drawing extends under Deep Cross Road.

Going forward, HOGG aims to assemble volunteer mineralogists to identify and tag the rest of the grotto over several sessions. The trustees intend that the mineral information will assist in quantifying and planning the conservation programme and, in time, provide visitors, real and virtual, with information about Pope's minerals.

SOURCES OF INFORMATION

Batey, Mavis 1999. *Alexander Pope; the Poet and the Landscape*. Barn Elms, London. 135pp.
ISBN 1 899531 05 X

Willson, Anthony Beckles 1996. *Mr Pope & Others at Cross Deep, Twickenham in the 18th Century*.
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Twickenham Museum. 51pp.

<http://www.radnor-twickenham.org/about/history-governance/popess-grotto>

<http://www.popessgrotto.org.uk/history.html>

www.twickenham-museum.org.uk

If you feel able to assist in this project, please contact:

¹*John Henry* (email john@geolmaps.com) or
Chris Duffin (email cduffin@blueyonder.co.uk)

BOOK AND MAP NOTES



John Phillips's Lithographic Notebook

*Reproduced in facsimile from the original at Oxford University
Museum of Natural History*

edited by Michael Twyman

Printing Historical Society, London. 2016

ISBN 978-0-900003-16-5 hardback £30.00

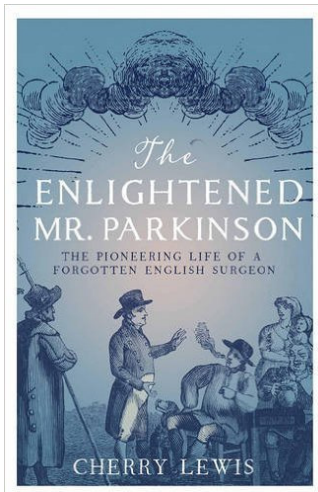
Copies available from www.printinghistoricalsociety.org

“Almost two hundred years ago the teenage John Phillips (1800–75), who would achieve fame as a geologist, became fascinated by the emerging process of lithography. In one of his notebooks, reproduced here in facsimile, Phillips recorded the experiments he made in the process between 1817 and 1819. At the time he was living with one of his uncles, the surveyor, engineer, and geologist William Smith (1769–1839). Later known as the ‘father of English geology’, Smith made good use of the young Phillips’s precocious understanding of fossils, and must also have backed and encouraged his nephew’s experiments

in lithography, probably for practical reasons. Thus it was that two of the most important nineteenth-century geologists became interested in printing from stone when the process was still very much in its infancy, at least in Britain.

The young Phillips’s attempts to understand lithography were informed by a few sketchy published descriptions of the process and by tenuous contacts with practitioners, but above all by a series of systematically conducted experiments with materials and procedures. The records of these experiments provide insights into the mind and working methods of a young scientist, while also revealing something about the state of lithography in Britain at the time.” [from dust jacket]

NB. This book will be reviewed by Nina Morgan in the next (June) HOGG newsletter.



The Enlightened Mr Parkinson: the Pioneering Life of a forgotten English Surgeon

Cherry Lewis

Icon Books Ltd 2017 (publication date 6TH APRIL) 304pp.

ISBN 9781785781780 hardback £20.00 (RRP)

NB It will also be published in the USA by Pegasus Books sometime in the summer.

“Parkinson’s disease is one of the most common forms of dementia, with 10,000 new cases each year in the UK alone, and yet few know anything about the man the disease is named after. In 1817—exactly 200 years ago—James Parkinson (1755–1824) defined the disease so precisely that we still diagnose it today by recognising the symptoms he identified. The story of

this remarkable man’s contributions to the Age of the Enlightenment is told through his three passions—medicine, politics and fossils. As a political radical, Parkinson was interrogated over a plot to kill King George III and revealed as the author of anti-government pamphlets, a crime for which many were transported to Australia; while helping Edward Jenner set up smallpox vaccination stations across London, he wrote the first scientific study of fossils in English, which led to fossil-hunting becoming the nation’s latest craze—just a glimpse of his many achievements. Cherry Lewis restores this neglected pioneer to his rightful place in history, while creating a vivid and pungent portrait of life as an ‘apothecary surgeon’ in Georgian London.” [publisher’s notes]

History of Geoscience: Celebrating 50 Years of INHIGEO

W. Mayer, R. M. Clary, L. F. Azuela, T. S. Mota and S. Wolkowicz (editors)

GSL Special Publication 442. 2017 (publication date 20TH MAY)

ISBN 978-1-78620-269-7 hardback



This volume celebrates the 50th Anniversary of the International Commission on the History of Geological Sciences (INHIGEO). It covers the history of advances in the geological sciences, the lives of some of the scholars who contributed to these achievements and discusses how this knowledge is passed on to a younger generation. Prior to the publication of the volume on 20th May, the 36 contained articles are available at the Geological Society’s *Online First* site at <http://sp.lyellcollection.org/online-first/442> :

- Antony R. Orme *Dynamic geomorphology: historical convergence towards modern practice.* doi:10.1144/SP442.34
- Francesco Gerali & Jenny Gregory *Harsh oil: finding petroleum in early twentieth century Western Australia.* doi:10.1144/SP442.33
- Francesco Gerali & Paolo Riguzzi *Gushers, science and luck: Everette Lee DeGolyer and the Mexican oil upsurge, 1909-19.* doi:10.1144/SP442.37
- Stanisław Wołkowicz, Marek Graniczny, Krystyna Wolkowicz & Halina Urban *History of the oil industry in Poland until 1939.* doi:10.1144/SP442.32
- Grzegorz Racki *Methodological uniformitarianism of Hugo Kołłataj: an unknown Polish precursor of the Lyellian geological paradigm.* doi:10.1144/SP442.29
- Renee M. Clary & Tom Sharpe *The furthest end of the Earth: the role of geological research in Antarctic exploration, 1895–1922.* doi:10.1144/SP442.28
- Kenneth L. Taylor *Before volcanoes became ordinary.* doi:10.1144/SP442.27
- Zova A. Bessudnova *The first Russian monograph on the History of Geology by Grigory E. Shchurovsky, professor of Moscow University: on the 150th anniversary of the publication.* doi:10.1144/SP442.31

- Renee M. Clary *Controversies in the history of geology and their educational importance for facilitating understanding of the nature of science.* doi:10.1144/SP442.36
- Sally Newcomb *Progression of instrument use and practice in mineralogy and petrology, 1750–1950* doi:10.1144/SP442.22
- Philippe Taquet *A look into the history of geology in France.* doi:10.1144/SP442.21
- T. Sato, T. Yamada & M. Yajima *Teiichi Kobayashi: his life and works, with an emphasis on his contribution to the history of the geosciences in Japan.* doi:10.1144/SP442.19
- Marianne Klemun *Spaces and places: an historical overview of the development of geology in Austria (Habsburg Monarchy) in the eighteenth and nineteenth centuries.* doi:10.1144/SP442.20
- Stefan Cwojdzinski *History of a discussion: selected aspects of the Earth expansion v. plate tectonics theories.* doi:10.1144/SP442.24
- John Diemer *Murchison in Sweden: consolidating Lower Silurian stratigraphy in the summer of 1844.* doi:10.1144/SP442.26
- Guillermo E. Alvarado & Lina C. Patino *The history of volcanology in Costa Rica: from the Amerindian legends to the beginning of the twenty-first century.* doi:10.1144/SP442.35
- Barry J. Cooper *Changing reflections on the history of geology.* doi:10.1144/SP442.23
- Martin Rudwick *Insiders and outsiders: INHIGEO seen from the sidelines.* doi:10.1144/SP442.25
- Algimantas Gruigelis & Stanisław Czarniecki. *International Commission on History of Geological Sciences: the earliest events.* doi:10.1144/SP442.30
- M. Kolbl-Ebert & S. Turner *Towards a history of women in the geosciences.* doi:10.1144/SP442.16
- Mike R. Johnston & Kenneth L. Taylor *Historians of geology in the field: a half-century of INHIGEO excursions.*doi:10.1144/SP442.17
- Aalto, K R. *Clarence Dutton's geology.* doi:10.1144/SP442.18
- Yufeng Zhou *Review of the history of higher education in geology during the past 100 years in China.* doi:10.1144/SP442.14
- Alberto C. Riccardi *Geographical and geological explorations of the La Plata Museum 1884–1905.* doi:10.1144/SP442.13
- Kennard B. Bork & Barry J. Cooper *INHIGEO in recent times.* doi:10.1144/SP442.15
- Luz Fernanda Azuela *Towards a nationwide geological survey in nineteenth century Mexico.* doi:1144/SP442.11
- Jiuchen Zhang *Social functions of historical studies of Chinese geology.* doi:10.1144/SP442.4
- Alberto C. Riccardi *Life and geological studies of Joaquin Frenguelli.* doi:10.1144/SP442.6
- Björn Sundquist *Early geological studies and mapping in Sweden.* doi:10.1144/SP442.10
- Silvia F. de M. Figueirôa *Innovation and critical thinking: contributions of the history and philosophy of geological sciences to teaching, especially undergraduate teaching.* doi:10.1144/SP442.7
- Martina Kölbl-Ebert *Thinking about the geosciences in their religious/philosophical context.* doi:10.1144/SP442.5
- D. Letsch *Swiss contributions to mid-nineteenth century tectonic research: a step backwards or the prologue to the nappe tectonics revolution?* doi:10.1144/SP442.1
- Isabel Rábano *Early history of the Spanish Geological Survey: the Commission for the Geological Map of Spain (1849–1910).* doi:10.1144/SP442.3
- Teresa Salomé Mota & Ana Carneiro *The ups and downs of geology in Portugal: the Geological Survey, a historical perspective.* doi:10.1144/SP442.2
- Lucero Morelos-Rodríguez *Brief history of geological and mining exploration in nineteenth century Mexico.* doi:10.1144/SP442.8
- Spencer G. Lucas & Guillermo E. Alvarado *Vertebrate palaeontology in Central America: a narrative and analytical history.* doi:10.1144/SP442.9

***William Boyd Dawkins & the Victorian Science of Cave Hunting.
Three Men in a Cavern***

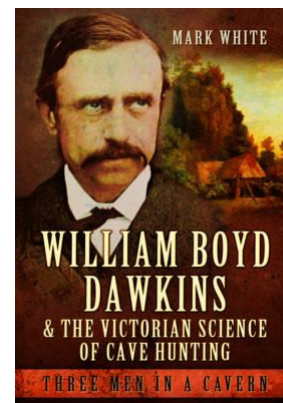
Mark White

Pen & Sword Books Ltd. 2016. 302pp. 60 illustrations

ISBN 9781473823358 hardback

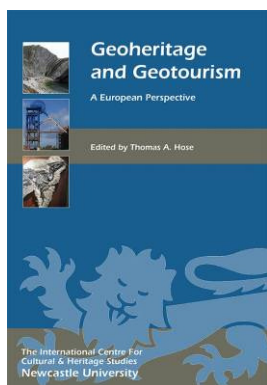
£25.00 (but widely available for less; £15.99 in publisher's sale)

Kindle £15.00 ePub £15.00



“William Boyd Dawkins was a controversial Victorian geologist, palaeontologist and archaeologist who has divided opinion as either a hero or villain. For some, he was a pioneer of Darwinian science as a member of the Lubbock-Evans network, while for others he was little more than a reckless vandal who destroyed irreplaceable evidence and left precious little for future generations to assess.

In this volume, Professor Mark White provides an unbiased archaeological and geological account of Boyd Dawkins' career and legacy by drawing on almost 20 years of research as well as WBD's archive of published and unpublished work which places him at the centre of Victorian Darwinian science and society. White examines WBD's work in both the field and study to provide a critical yet balanced account of his achievements and standing in relation to the field today as well as among his peers. At the heart of this book is a detailed study of the circumstances surrounding the Victorian excavations at Creswell Crags where two celebrated finds became a cause celebre.” [publisher's notes]



Geoheritage and Geotourism

A European Perspective

Edited by Thomas A. Hose

Boydell & Brewer 2016 352pp. 30 illustrations

ISBN 9781783271474 hardback £60.00

25% discount for HOGG members (see below)

“Europe's engagement from the late sixteenth century onwards in scientific Earth science inquiry has generated numerous and varied collections of minerals, rocks, and fossils, together with their associated archives, artworks and publications, forming a rich cultural geoheritage held in major private and especially royal and aristocratic collections, museums, universities, archives and libraries. The mines, quarries, geological structures, landforms, minerals, rocks and fossils—or geodiversity—that underpin these collections populate past and present-day Earth science literature. However, for too long their scientific, historic and cultural significance was not universally recognised and generally they were not accorded adequate resources and protection—or geoconservation. Hence, geotourism was developed in the 1990s to raise public awareness of Europe's geoheritage and geodiversity and to promote its geoconservation; the volume's theoretical essays and case studies examine these four core geoelements and provide a timely introduction for anyone interested in natural history museums, countryside management, and landscape-based tourism.” (publishers' notes)

CONTENTS:

Introduction: Geoheritage and Geotourism – Thomas A. Hose

Britain and Europe's Geoheritage – Thomas A. Hose

Geological Inquiry in Britain and Europe: a Brief History – Thomas A. Hose

Museums and Geoheritage in Britain and Europe – Thomas A. Hose

Geoheritage for Sale: Collectors, Dealers and Auction Houses – Thomas A. Hose

Geoheritage in the Field – Thomas A. Hose

Geoconservation: an Introduction to European Principles and Practice – Jonathan Larwood

Geotourism in Britain and Europe: Historical and Modern Perspectives – Thomas A. Hose

Protecting and Promoting the Geoheritage of South-Eastern Europe – Thomas A. Hose & Djordjije Vasiljevic

Geoheritage Case Study: the Isle of Wight, England – Martin Munt

A Geoheritage Interpretation Case Study: the Antrim Coast of Northern Ireland – Kevin Crawford

A Geoheritage Case Study: GeoMôn in Wales– John Conway and Margaret Wood
Geoheritage Case Study: The Ruhrgebiet National Geopark, Germany – Volker Wrede
Geoheritage Case Study: Andalucia, Spain – Thomas A. Hose
Geoheritage Case Study: Geotourism and Geoparks in Scotland – John Gordon
Geoheritage Case Study: Canton Valais, Switzerland – Emmanuel Reynard
Geoheritage Case Study: the Danube Region in Serbia – Djordjije Vasiljevic, Slobodon Markovic & Nemanja Tomic
Conclusion – Thomas A. Hose

SPECIAL OFFER FROM THE PUBLISHERS FOR HOGG MEMBERS

Catherine Watts (Boydell & Brewer Marketing Assistant) writes:

“Boydell & Brewer, the academic book publisher, is delighted to offer the members of the History of Geology Group a 25% discount on Thomas A. Hose’s new book, Geoheritage and Geotourism, A European Perspective. This volume of essays and case studies on Europe’s GeoParks discusses the natural world, its heritage, and how best to preserve it.

The 25% discount will make the price £45.00 (instead of £60.00 RRP). Orders can be placed by phone on 01243 843 291, by fax on 01243 843 303, by email at customer@wiley.com or online at www.boydellandbrewer.com. Postage is £3.70 in the UK, £12.75 per book to mainland Europe and £14.95 per book outside Europe. Please quote the offer code BB246 to ensure that the discount is given. The offer ends 30th June 2017.”

It’s warmer down below

The autobiography of Sir Harold Harding 1900–1986

Edited by Amanda Davey

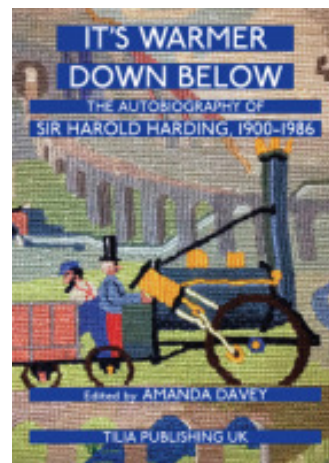
Tilia Publishing Ltd 2015

ISBN 978-0-9933965-0-2

See www.tiliapublishinguk.co.uk for more information.

Reviewed by Geoff Walton¹

Harold Harding became a director of John Mowlem & Co, a major construction firm set up in the 19th century. Harding trained as a civil engineer at City and Guilds College from 1915, and much of his early career with Mowlem was in tunnelling and, subsequently, in dam construction. Together with people such as Glossop, Golder and Skempton, a systematic approach to soil mechanics was established in the latter part of the 1930s, at a time when the Building Research Establishment and the Road Research Laboratory were set up. Although the 1939–45 war intervened (with some fascinating work by Harding on concrete structures for D Day), immediately following the end of the war, the firm of Soil Mechanics Ltd was established (with Harding in a senior position) and it was not long before he and others recognised the need for geologists, and the disciplines of engineering geology and geotechnics began to develop.



There are many interesting and some amusing episodes in the early development of geotechnics in which Harding, Glossop, Golder and Skempton played a major part. Early on, geologists had their problems; Harding says Soil Mechanics were *“almost the first to engage engineering geologists on our staff although there seemed a reluctance to employ them. A friend told me that he took an antler to his boss, an engineer so distinguished he should be nameless, and said he would be interested as it had been found in their tunnel and a Professor had dated it to several million years old. His reception was not what he expected: ‘How dare you talk like that. Do you not know that God made the Earth in 4004BC?’ ... So when we set a precedent by engaging geologists, their names were buried in the staff list among the civil engineers.”*

The book covers many major construction projects after the war and Harding acquired an international reputation for sorting out serious problems and assisting in the subsequent litigation. In consequence, he was invited to become a member of the Inquiry into the Aberfan Disaster which was itself an epic piece of work still highly regarded as an example of a thorough scientific analysis of a geotechnical failure. Subsequently, he was one of the prime movers of the feasibility of the Channel Tunnel.

All in all, the book is a very interesting account, by a key player in the initial development of an important area of applied geoscience.

¹ e mail geoffw@dustscan.co.uk



HENSLOW'S MAP AND MEMOIR OF ANGLESEY (1822)

The February 2017 issue of *Geoscientist*—the monthly Fellowship magazine of the GSL—includes an article by Jack Treagus on the Reverend Professor John Stephens Henslow (1796–1861) and his extraordinary 1822 map and memoir of Anglesey—one of the first detailed geological maps ever published of any part of the UK. Henslow was appointed Professor of Mineralogy at Cambridge University in 1822 and took holy orders in 1824. He resigned this professorship in 1827 to become instead Professor of Botany, and he is best remembered today as a distinguished botanist. The article will appear in *Geoscientist Online* in due course (<https://www.geolsoc.org.uk/Geoscientist/Archive/February-2017>)



GEOEXPRO

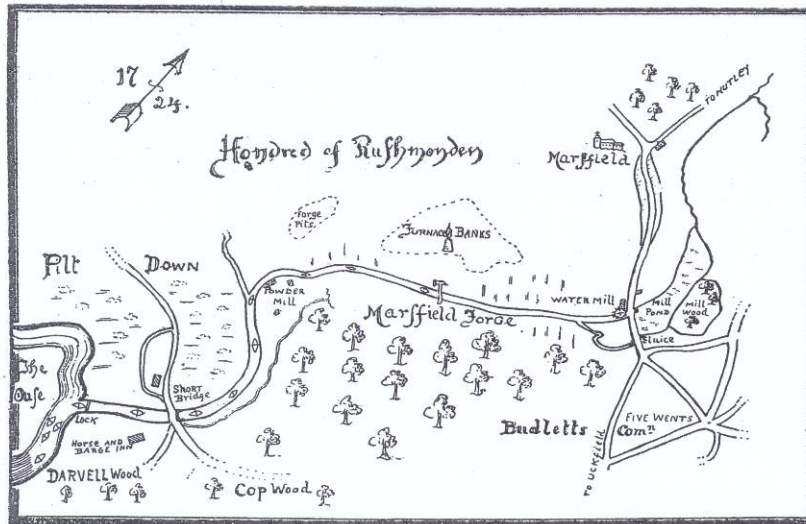
Tony Brook draws our attention to a 'History of Oil' article entitled 'The Yanks are coming' by Bruce Blanche in GEO EXPRO—"the favourite petroleum geoscience magazine"—VOL. 13, NO. 5 (2016), pp. 30-32. This tells the story of a team of American oil-drillers who spent a year (March 1943–1944) during World War II drilling 106 wells in the Nottinghamshire oilfield to help the war effort. They became known as the "roughnecks of Sherwood Forest".

Read the article at <https://www.geoexpro.com/articles/2016/11/the-yanks-are-coming>

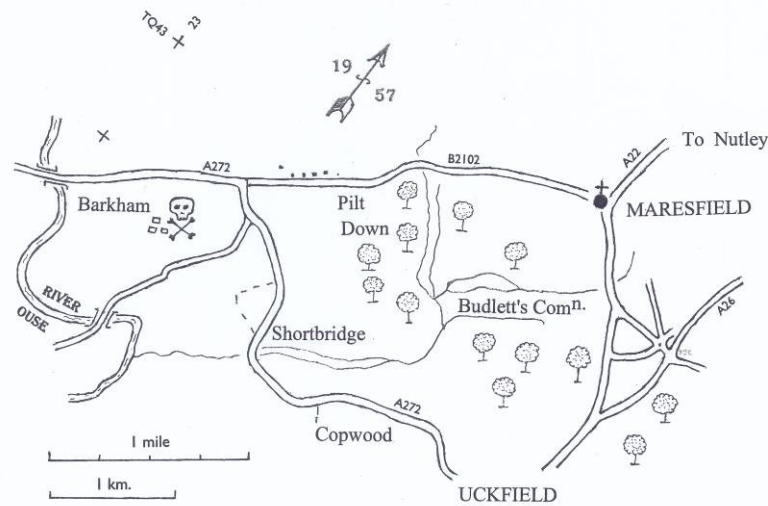
PILTDOWN MAN'S TREASURE MAP

Eric F. Freeman¹ recounts the story behind the so-called Maresfield Map and how it might have exposed Charles Dawson as the fraudster he is now known to have been.

In early 1913, at roughly the same time as Piltdown Man was being formally described in the Geological Society's *Quarterly Journal*, a small and mysterious map, measuring only 103 x 67 mm, appeared in a journal published in Lewes by the Sussex Archaeological Society (SAS). It showed the area south-west of the small Sussex town of Maresfield, and supposedly contained features pertinent to the area's old iron industry in 1724 (Fig. 1). Piltdown Man was eventually revealed as utterly fraudulent in 1953, as was the so-called Maresfield Map in 1974 (Andrews 1974; Russell 2003).



COPY OF A MAP OF THE MARESFIELD FORGE IN 1724.
 Made by C. Dawson, F.S.A.



COPY OF A MAP OF THE MARESFIELD AREA IN 1957.
 Made by E. Freeman, F.L.S., F.G.S.

Fig. 1 (top). The Maresfield Map as published in the *Sussex Archaeological Collections* Vol. 55 for 1912.

Fig. 2 (bottom). The Maresfield area traced by the author from a one inch to the mile Ordnance Survey map (no. 183) of 1960. The reader is invited to photocopy the bottom map at 200% and then fit it over the top map.

In a new study (Freeman, *in press*), the relevant details of the Maresfield Map were traced from an old one inch to the mile Ordnance Survey base-map (Fig. 2). Not only does this show how far the Maresfield Map departs from reality, but further work then revealed that it points fairly accurately to the supposed 'find-spot' of Piltdown Man, and makes a coded accusation of fraud against its 'finder', Charles Dawson.

The Maresfield Map analysed

Only two small areas of the Maresfield Map are now seen to be reasonably accurate and true to scale (at two inches to the mile): the main road within Maresfield itself and, curiously but significantly, the single meander of the River Ouse near the bottom left-hand corner. Everything else, the middle ground in Fig. 1, is just a distorted jumble of fictitious, not-to-scale and misplaced oddments. One such is the word 'Hondred', supposedly a mis-spelling of 'Hundred'; the erroneous letter 'O' is highlighted by a curious arrow-like blot which also connects it to the words 'Forge Pits' some 12mm away.

The Maresfield Map decrypted

Figure 2 was photocopied to a two inch to the mile scale (1:31680), and then superimposed over the Maresfield Map; when orientated to True North, and using that curious meander and its tributary as a landmark, the X marking the spot of Piltdown Man (at TQ 439217) was seen to lie suspiciously close to the letter 'O' in 'Hondred'.

When repeated more carefully in four trials with the maps doubled in scale for easier handling, the word 'Hondred' was seen to fall directly over the farm-track leading to Barkham, with the 'O' being roughly half-way down it and only at an estimated 190-270 metres from the Piltdown Man pit, near-misses surely too close to be coincidental (see Fig. 3).

The position of the 'O', the arrow-shaped blot next to it and the proximity of the words 'Forge Pits' make a barely veiled accusation that the Piltdown finds are fraudulent, the point being hammered home by the presence of the words 'Pilt Down' in large letters displaced from their proper position near the village to the north-east, and roughly aligned with 'Forge Pits'. The accusation is made personal by the map's caption 'Made by C. Dawson, F.S.A.'.

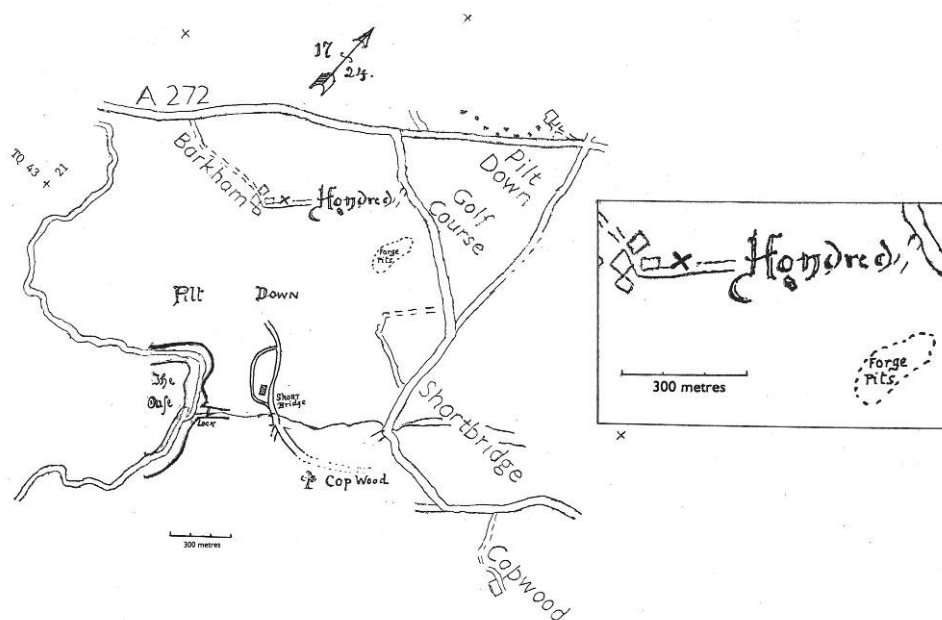


Fig. 3. Piltdown Man's Treasure Map is decrypted when elements of the Maresfield Map are overlain on a tracing from an Ordnance Survey map (no. 183) enlarged to two inches to the mile. The word 'Hondred' falls directly over the farm track leading to Barkham, with the 'O' being roughly at the mid-point and only c. 270 metres from the 'find-spot' of Piltdown Man, marked with an 'X'. Note the 'arrow-shaped blot' and the words 'Forge Pits'.

The Maresfield Map plotted

It seems likely that in late December 1912, following Dawson and Woodward's grand unveiling of Piltdown Man before the Geological Society, an 'insider' at the SAS decided on the spur of the moment to insert a last-minute coded denunciation of it into Volume 55 of the SAS's annual publication, the *Sussex Archaeological Collections*, then nearing its deadline for publication. To this end, he quickly plotted out the right and left hand sides of his map using just a two inch to the mile base-map (perhaps a tithe or enclosure map), tracing paper and pen or pencil.

Using the meander of the River Ouse as a reference point, he then pin-pointed on his base-map where he guessed the Piltdown Man pit was and marked it on his tracing with an 'O'. From local hearsay, the map plotter would have known that it was somewhere on the right-hand side of the track leading to Barkham, but most certainly he would not have been one of those privileged to have visited the site itself, on private land. Even so he was nearly spot-on, and near enough was good enough. He then buried this 'O' within an irrelevant inscription, 'Hondred of Rushmonden', but marked it with an arrow-shaped blot. He then filled in the centre ground of the map with the accusation 'Forge Pits' and all the other fictitious oddments only realised as such in 1974. Finally, he attributed all this to 'C. Dawson, F.S.A.'.

The Maresfield Map—who and why

So whodunnit and why? The overwhelmingly obvious suspect, with means, opportunity and, most certainly, motive, was Louis Francis Salzman (1878–1971), the editor of the *Sussex Archaeological Collections* from 1909 to 1958. As to motive, at first sight it could have been just the latest round in a decade-long tit-for-tat feud that started in 1903 when Dawson, a member of the SAS from 1892, clandestinely bought the premises in Lewes that the Society rented, and then evicted them to make a home for his new wife, a rich-divorcée. More specifically, the Maresfield Map seems to have been Salzman's reprisal for a spiteful attempt Dawson made the previous year to sabotage his election to the Society of Antiquaries. But perhaps Salzman also had a more honourable motive than simple revenge, however justified.

Could it have been a rather risky attempt to flush Dawson and his forgeries out from cover? The Maresfield Map now appears as the only denunciation of Piltdown Man to have been openly published in Dawson's lifetime, albeit a cryptic one. Could Salzman have been trying to provoke Dawson into bringing an over-hasty action for libel against himself and/or the SAS? In 1913, Dawson was both a practising solicitor and a fully paid-up member of the SAS. Inevitably, he would have seen the map, supposedly 'made' by himself, in his own personal copy of the *Collections*, and must have realised what it insinuated. But otherwise, the map could have been deliberately intended to be somewhat ambiguous and opaque, to give enough 'wriggle room' for a defence to be mounted in court if necessary. If that was Salzman's game-plan, it came to naught, as Dawson didn't take the bait, and didn't appear as a plaintiff in a Court of Law, nor in the national newspapers as something less than a respectable English gentleman and scholar. The Maresfield Map merely slumbered on in obscurity until it was exposed in 1974, three years after Salzman's death.

So, in conclusion, the Maresfield Map now seems to have been made as a sort of 'treasure map', in a negative sense, not with an 'X' marking the spot of buried pirate treasure, but with an 'O' marking quite the reverse. It is perhaps significant that R.L. Stevenson's *Treasure Island*, that classic Victorian boys' adventure story with its treasure map, was first published in 1883, just at the right time within Salzman's boyhood to have given him the idea some 20-25 years later, then aged 34, to draw his own equally fictitious map, but one seemingly made with the underlying purpose of bringing to light a serious academic falsehood. However, this did not happen, and so nearly 60 years later, at his passing, Salzman took his secrets and opinions of Dawson with him. Sadly, he was to be denied a final bow, and his last laugh at Dawson's expense.

REFERENCES

- ANDREWS, P.B.S. 1974. A fictitious purported historical map. *Sussex Archaeological Collections*, **112**: 165-167.
- FREEMAN, E.F. (in press). The Maresfield Map decrypted. *Sussex Archaeological Collections*.
- RUSSELL, M. 2003. *Pitdown Man: the secret life of Charles Dawson and the World's greatest archaeological hoax*. Tempus, Stroud. pp .141-144, 258-259.
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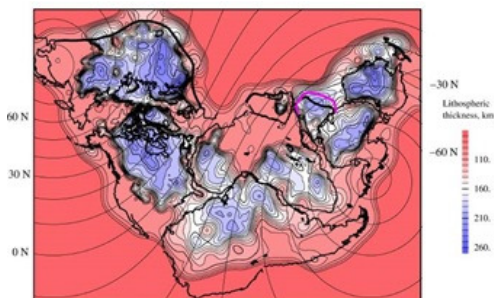
¹ Eric F. Freeman, 146 Haydons Road, Wimbledon, London SW19 1AE

PLATE TECTONICS AT 50



The GSL Library is planning a number of activities in 2017 to mark the 50 years since the geophysicist Dan McKenzie published his seminal paper defining the principles of plate tectonics.

The Library is privileged to have been donated Professor McKenzie's archive of notes, papers, correspondence and photographs, including his early work on plate tectonics and mantle convection. A selection of these documents will be made available to the public via a new website which will launch later this year.



In October, Dan McKenzie (Cambridge University) will give the annual GSL William Smith Lecture as the finale to a three-day conference—*Plate Tectonic at 50*.

Visit www.geolsoc.org.uk/wsmith17 for more information.

GSL LIBRARY NEW EXHIBITION: THE THREE-MONTH ISLE

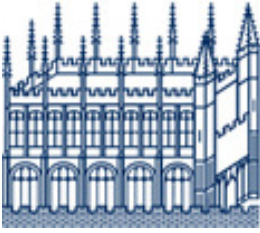


Until March 2017, the GSL Library has a new exhibition celebrating a remarkable moment in the history of volcanology and international diplomacy.

In 1831, a submerged volcanic island appeared for a few months above the surface of the Mediterranean Sea off the coast of Sicily. During this time, it acquired seven different names as well as claims of sovereignty from three different European nations. The display features a selection of the contemporary accounts reported by naval officers and scientists who visited the area.

The exhibition can be viewed Monday–Friday, 9.30–5.30 in the Lower Library and Lyell Room at Burlington House, Piccadilly. Please contact the Library before making a special journey so that access to the rooms can be confirmed. Read more about it on the GSL blog posting of 20th December 2016.

OTHER FUTURE MEETING AND EVENTS

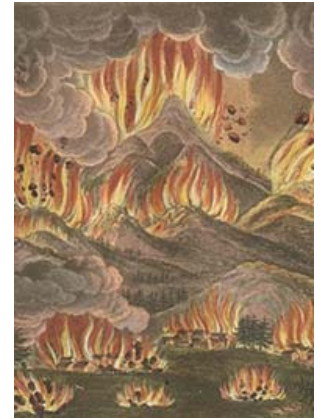


VOLCANOES WESTON LIBRARY, OXFORD

10TH FEBRUARY–21ST MAY 2017

“From fire-belching mountains to blood-red waves of lava, volcanoes have captured the attention of scientists, artists and members of the public for centuries. In this exhibition, discover a spectacular selection of eye witness accounts, scientific observations and artwork charting how our understanding of volcanoes has evolved over the past two millennia.

Discover the impact of some of the world's most spectacular volcanoes including the 79 AD eruption of Vesuvius, one of the most catastrophic eruptions in European history, and the 19th-century eruptions of Krakatoa and Santorini, two of the first volcanic eruptions to be intensely studied by modern scientists.



Featuring fragments of 'burnt' papyrus scrolls which were buried during the 76 AD eruption of Vesuvius, the earliest known manuscript illustration of a volcano, and lava and rock samples and notes from 19th-century volcanologists and explorers, this spectacular exhibition brings together science and society, art and history.” [from Bodleian Libraries, University of Oxford website]



YORKSHIRE GEOLOGICAL SOCIETY JOINT MEETING WITH LEEDS GEOLOGICAL ASSOCIATION WEETWOOD HALL, OTLEY ROAD, LEEDS LS16 5PS

SATURDAY 4TH MARCH 2017 13.45–17.00

LEADING YORKSHIRE FIGURES IN THE HISTORY OF GEOLOGY

13.45 Society Business

14.00 *Adam Sedgwick, geologist and dalesman.* Colin Speakman (Ilkley)

14.35 *George William Lamplugh (1859–1926).* Peter F. Rawson (University of Hull and University College, London)

15.10 Tea/Coffee

15.40 *Yorkshire Geology as seen through the eyes of notable British Geological Survey geologists 1862–2000.* Tony Cooper (British Geological Survey)

16.15 *Tempest Anderson, vulcanologist and photographer.* Stuart Ogilvy, Yorkshire Museum, York.

16.50 *Wrap up and close.*



THE GEOLOGISTS' ASSOCIATION EVENING LECTURE

FRIDAY 5TH MAY 5.30 for 6.00pm

JANET WATSON LECTURE THEATRE, BURLINGTON HOUSE, PICCADILLY

AGM and Presidential Address:

CONSERVING ROCKS!—HOW DID THAT COME ABOUT?

A BRIEF HISTORY OF GEOCONSERVATION IN THE UK

Tel. 020 7434 9298 or e mail sarah@geologistsassociation.org.uk to book a place.



**THE GEOLOGY and MUSEUMS of the JURA REGION, FRANCE
11TH–17TH JUNE 2017**

LEADERS: Eric Buffetaut, Dick Moody

DEPARTURE: Sunday June 11th: London Heathrow–Lyon. Overnight in Lyon.

Day 2. Monday June 12th: Lyon to Cerin. Lithographic limestones, visit to museum and quarry, lunch, and on to Martignat footprint site (5 km from Oyonnax). Evening and night in Oyonnax with tour of the collections of the Société des Naturalistes d'Oyonnax (Late Jurassic rudists etc.). Overnight in Oyonnax.

Day 3. Tuesday June 13th: Oyonnax and Loulle area to see dinosaur footprint site and study Kimmeridgian coral reefs at Plagne with lunch at Nantua (glacial scenery with good Late Jurassic section), dinosaur footprint sites at Hautecourt Romanèche and Coisia, then back to Oyonnax for dinner and overnight stay.

Day 4. Wednesday June 14th: Oyonnax to Macon visiting dinosaur footprint site at Loulle and overview of typical folds of the Jura. Afternoon visit to famous Palaeolithic site (and museum) at Solutré Pouilly. Overnight in Macon.

Day 5. Thursday June 15th: Short tour of Beaujolais and afternoon visit to see the geological site and museum at Espace Pierres Folles. Overnight Lyon.



Panorama of Solutré Pouilly in the Département Saône-et-Loire, France.
Image Bourgogne Tourism

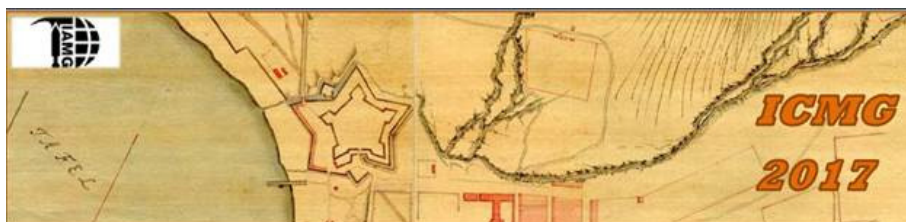
Day 6. Friday June 16th: Tour of Lyon including a visit to the magnificent Musée des Confluences. Overnight Lyon.

RETURN: Saturday June 17th: Lyon–London Heathrow.

*Estimated cost per person including flights, local transport and hotel B&B
£660.00 (sharing twin room)*

**Contact: Prof. R T J Moody, Gnoll House, 15 Forster Road, Guildford GU2 9AE
Tel. 07973273623 e mail rtj.moody@virgin.net**

**INTERNATIONAL ASSOCIATION FOR MILITARY GEOSCIENCES
12TH INTERNATIONAL CONFERENCE ON MILITARY GEOSCIENCES**



**18TH–23RD JUNE 2017 (+ post conference field excursion 24th–29th June 2017)
STELLENBOSCH, SOUTH AFRICA**

The theme of the conference is *The scope, reach and impact of Military Geosciences*. With this deliberately broad theme, the organizers aim to host a conference celebrating the diversity of research avenues explored by Military Geoscientists, as well as the impact this research has on military activities in the broadest possible sense.

The five day conference will take place at the picturesque Lanzerac Wine Estate in the scenic university town of Stellenbosch, about 50 kms from Cape Town. The Lanzerac Wine Estate can trace its history back to 1692 when Governor Simon van der Stel granted the farm in the Jonkershoek Valley to Isaac Schrijver and three freed slaves.

For more information about the conference, preliminary scientific programme, timeline and key deadlines for registration and submission of abstracts, please visit the conference website at <http://www.icmg12.co.za>.

The last date for abstract submission (oral and posters) is 19th May 2017.

**ABRAHAM GOTTLOB WERNER (1749-1817) AND THE EARTH SCIENCES
29TH JUNE–1ST JULY 2017
FREIBURG, GERMANY**

**A CONFERENCE CELEBRATING THE BICENTENNIAL ANNIVERSARY OF WERNER'S
DEATH**

This symposium focuses on the geosciences at the end of the 18th Century to the beginning of the 19th Century, and the impact of Abraham Gottlob Werner's research and teaching. The following issues are being addressed:

1. Werner's charisma (analysis of his personality and its outward impact)
2. Europe-wide network and its influence on progress in the earth sciences
3. Transfer of knowledge (history of cartography, history of collections, effect of geoscientific insights to other fields like fine arts; development of mining academies following the Freiberg model)
4. Werner's students and their work for earth sciences
5. Teaching and education at the early Mining Academy (Freiberg)

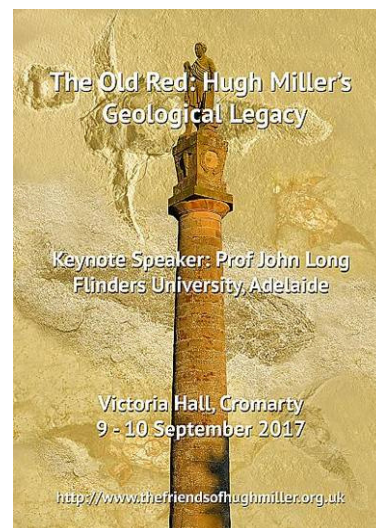
Abstract submission deadline was 30th September 2016. Authors will be notified on their paper acceptance as soon as possible and no later than 15th October 2016 Full submission required by 30th January 2017.

Contact: Susanne Kandler (Director), TU Bergakademie Freiberg, Universitätsbibliothek "Georgius Agricola", Agricolastr. 10 09599 Freiberg GERMANY
Tel. +49(0)3731 39-2959. Fax +49(0)3731 39-3289 Email susanne.kandler@ub.tu-freiberg.de

**THE OLD RED: HUGH MILLER'S GEOLOGICAL LEGACY
9TH–10TH SEPTEMBER 2017
VICTORIA HALL, HIGH STREET, CROMARTY,
SCOTLAND**

Organised by the charity The Friends of Hugh Miller

A focus will be the presentation of a paper by Professor Ralph O'Connor and Dr Michael Taylor concerning publication of a new edition of Hugh Miller's great work, *The Old Red Sandstone*, following 10 years of research. A keynote speaker will be palaeontologist and author Professor John Long, from Flinders University, South Australia. Gavin Berkenheger, a young Black Isle-based gold prospector, whose entire career was directly inspired by Hugh Miller, will also be on the presentation line-up, which will also include talks on Miller's Jurassic and mineral explorations and news of recent fossil specimens that would no doubt have interested Miller.



The conference will be followed by an excursion to Miller's famous Devonian fish bed. Delegates will be offered a three-day post-conference field trip to Achanarras Quarry, Sutherland. The event is envisaged as an important contribution to Visit Scotland's Year of History, Heritage and Archaeology 2017.

More information can be found at www.thefriendsofhughmiller.org.uk



**42nd INHIGEO SYMPOSIUM
12TH–18TH SEPTEMBER 2017
YEREVAN, ARMENIA**

This conference is being planned as a 50th Anniversary INHIGEO conference. It will be organised by the Armenian Institute of Geological Sciences and Armenian National Academy of Sciences.

The first meeting of INHIGEO was held in Yerevan in 1967 and this conference will be held at the Armenian National Academy of Sciences in Yerevan, the same venue as the 1967 meeting.

The conference themes will be:

1. 50 years of INHIGEO
2. Development of geological ideas and concepts
3. History of geology in Armenia
4. Ancient knowledge of stone and metals

5. Studies of historic and prehistoric evidences of seismic and volcanic activity
6. General contributions and biographies of famous geologists

Both mid-conference and post-conference field trips are being planned to geological sites, historical sites, archaeological sites, geological museum and the Armenian Museum of Ancient Manuscripts (Matendaran). For any questions please contact the Organising Committee by e-mail at inhigeo2017@geology.am or Khachatur Meliksetian at km@geology.am.

Visit the conference website <http://inhigeo2017.geology.am/> for more information.

FUTURE INHIGEO SYMPOSIA

Future venues/dates for the annual INHIGEO symposia are as follows:

2018 43rd Mexico City, Mexico (4th–14th November).

2019 44th Como/Varese, Italy.

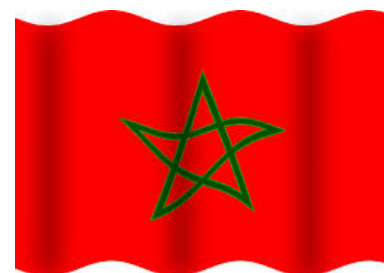
2020 45th New Delhi, India.

2021 46th Poland.

FIELD TRIP TO MOROCCO

Leaders: Professor R. T. J. Moody & Professor Habib Belayouni

27TH SEPTEMBER–10TH OCTOBER 2017



PROVISIONAL PROGRAMME.

This trip will be a combination of geotourism and the study of the diverse geology of a country that holds many of the answers to the history of the opening of the Atlantic, and the palaeogeography of Tethys and the Afro-European plates. The phosphate industry is particularly interesting to our understanding of the opening of the northern Atlantic Ocean in Cretaceous-Tertiary times and the economic wealth of Morocco. The major themes of the excursion will be:

- The structural geology of the Rif Mountains and the Straits of Gibraltar.
- Petroleum geology of the Rharb.
- Phosphates: Extractive industry and sedimentology, stratigraphy and palaeontology of Mesozoic-Tertiary deposits.
- Ordovician glaciation and regional tectonics.
- Precambrian-Palaeozoic Geology of Ouarzazate Region.
- Mesozoic sediments of Essouira Basin. Heteromorphic ammonites; reefs.

PROPOSED ITINERARY

DAY 1 (27/09/17) Fly London-Tangier or Algeciras. **Overnight Tangier.**

DAY 2 (28/09/17) Visit Grottes D'Hercule and views of the Straits of Gibraltar town centre and historic monuments. **Overnight Tangier.**

DAY 3 (29/09/17) From Tangier across Tetouan Valley towards Azla studying Rif Mountain geology en route and emplacement of peridotites and the contact of the Sebide Nappes over the Dorsale Calcaire and the geology of the Tirinense Intramontane Basin. Cascades d'Akhour. **Overnight Chefchaouen.**

DAY 4 (30/09/17) Chefchaouen to Meknes via N13, Ouezzane the Roman City of Banasa. **Overnight Meknes.**

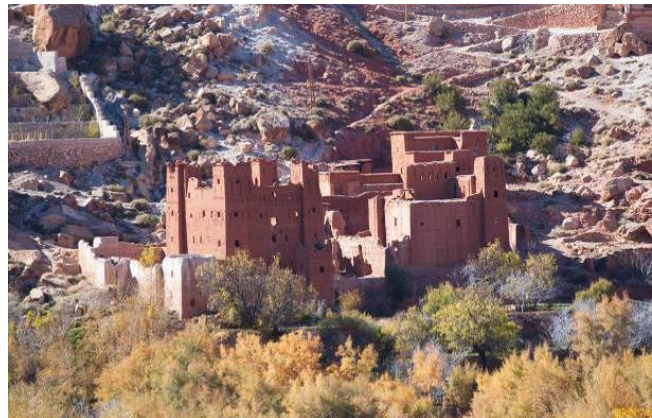
- DAY 5 (01/10/17)** Meknes. Historic City and environs. Geology and petroleum geology of the Rharb Region of Northern Morocco. **Overnight Rabat.**
- DAY 6 (02 /10/17)** Rabat. Natural History Museum and city tour? **Overnight Rabat.**
- DAYS 7/8 (03-04/10/17)** Rabat to Khouribga (?Ben Guerir). Introduction to geology and mining processes of the Regional Phosphate Series in terms of the geology and commercial exploitation. **Overnight Khouribga.**
- DAY 9 (05/10/17)** Khouribga to Beni Mellal and Imilchil through the Gorges De Todra and Atlas Mountains to Tinghir. **Overnight in a local hotel or a hotel in Bourmalne de Dades.**
- DAY 10 (06/10/17)** Morning visit to valley at Bourmalne De Dades; regional geology Atlas Region. **Overnight Ouarzazate.**
- DAY 11 (07/10/17)** Ouarzazate to Zagora. Ordovician glaciation of Bou Ingarf Mountain, Zagora-Alnif area. **Overnight Zagora**
- DAY 12 (08/10/17)** Zagora to Taroudannt via Draa Valley. Desert terrain and view of Dj Siroua Volcano.. **Overnight Taroudannt**
- DAY 13 (9/10/17)** Taroudannt to Essaouria. Coastal geology of Essaouria Basin. Heteromorphic ammonites. **Overnight Essaouria**
- DAY 14 (10/10/17).** Return UK via Marrakesh.

Estimated Cost (based on shared rooms): £1490.00

Enquiries to: PROF. R.T.J. MOODY, GNOLL HOUSE, 15 FORSTER ROAD, GUILDFORD GU2 9AE
Tel. 07973 273623 **e mail rtj.moody@virgin.net**



Panorama of the Ziz Valley from the northern entrance to the Tunnel de Legionnaire. Families are attracted to bathe in hot springs.



Derelict riad in Draa Valley south of Ouarzazate. (Image Ross Sandman)



Beautiful Precambrian stromatolites from the Ouarzazate region.

HOGG STANDING ORDER MANDATE

Name of bank or building society.....

Branch address.....

.....

.....

Sort code.....Account number.....

Account name.....

Please pay the amount of £15 (fifteen pounds) to the History of Geology Group of the Geological Society (Santander Business Account, Sort code ___-___-___ Account number _____) on 1st January (or closest date thereto) following the date of this instruction and annually thereafter until terminated by me in writing. **[NB Account details will be inserted by the HOGG Treasurer.]**

Signed..... Date.....

PLEASE SEND THE COMPLETED MANDATE TO

**David Earle (HOGG Treasurer)
61 Straight Road, Old Windsor, Berkshire SL4 2RT**