Newsletter No. 199

February 2010

The Black Country Geological Society

Contents:

Copy date for the next Newsletter is

Friday 9th April 2010

The Society provides limited personal accident cover for members attending meetings or field trips. Details can be obtained from the Secretary. Non-members attending society field trips are advised to take out your own personal accident insurance to the level you feel appropriate. Schools and other bodies should arrange their own insurance as a matter of course.

Leaders provide their services on a purely voluntary basis and may not be professionally qualified in this capacity.

The Society does not provide hard hats for use of members or visitors at field meetings. It is your responsibility to provide your own hard hat and other safety equipment (such as safety boots and goggles/glasses) and to use it when you feel it is necessary or when a site owner makes it a condition of entry.

Hammering is seldom necessary. It is the responsibility of the hammerer to ensure that other people are at a safe distance before doing so.

Future Programme

Lecture meetings are held at Dudley Museum & Art Gallery, St James's Road, Dudley, DY1 1HU. Tel. 01384 815575. 7.30 for 8 o'clock start unless stated otherwise.

Those wishing to attend field meetings please contact our Field Secretary, Andy Harrison, mobile: 0797 333 0706 or email: andrew_harrison@urscorp.com

Monday 22nd February *(Indoor meeting)* 'Keep the Home Fires Burning. The career of an Opencast Coal Geologist'. Speaker: John Bennet. Opencast mining is the cheapest method of getting coal, but can be environmentally disastrous. Deep mining of coal is very dangerous. This lecture challenges us to weigh up the positive and negative aspects of this industry, which provided the energy to put the Black Country on the map as the cradle of the Industrial Revolution.

Sunday 21st March *(Field meeting)* N.B. changed date. Visit to Compton, Wolverhampton. Led by Graham Worton. Meet at 11.00am. (location tbc.) To look at local Permo/Triassic features and glacial erratics.

Saturday 27th March *(Field meeting)* Visit to Lilleshall Village, Shropshire. Led by David C. Smith of the Shropshire Geological Society. Meet at 11.00am at the main entrance to Lilleshall Church (on the east side of the church). To look at the Pre-Cambrian and Cambrian of the area, and Carboniferous deposits from the North Shropshire shelf. Bring a packed lunch. There is a possibility of a pub lunch.

Monday 29th March *(Indoor meeting)* Brymbo and the Clwydian Range Area of Outstanding Natural Beauty. Speaker: Dr. Jacqui Malpass. Jacqui has spoken to us before, and many members have been to see the remarkable Carboniferous fossil site at Brymbo. She will tell us of the progress made to protect and preserve this important place.

Saturday 24th April *(Field Meeting)* Visit to the Cotswolds to view the Jurassic. Led by Dave Owen of the Gloucestershire Geological Trust. Meet at 10:30am at Car Park Quarry, Cleeve Hill (SO 989 271). The trip will take in: the Aston Limestone Formation (Lwr. Inf. Oolite, Mid Jurassic); deeply incised Cotswold - post Ice-Age; the Cleeve Cloud Member (Birdlip Lst. Formationn, Lwr. Inf. Oolite), and great views (on a clear day) across the Severn Vale to the Malverns and various large scale structures. Directions: from the road between Cheltenham and Winchcombe (B4632), at the highest point turn right (if coming from Cheltenham) following the sign for the golf club. Go to the end of the lane, over cattle grid and turn left into an old quarry, now a car park. Bring a packed lunch. Shouldn't need hard hats (unless there are particularly bad golfers around that day!) Can be very exposed as this is the highest point of the Cotswolds, so be prepared for wind.

Monday 26th April *(Indoor meeting)* Lapworth Museum: West Midlands Fossil and Mineral Collections. Speaker: Jon Clatworthy. Jon will speak about the contribution of these collections to the developing science of geology in the 18th, 19th and early 20th century.

Saturday 19th June *(Field meeting)* Buxton Volcanics. Led by Chris Arkwright.
(Full details to follow in the April Newsletter).

Andy Harrison, Gordon Hensman

Conservation work at the Wren's Nest

The Wren's Nest wardens are seeking volunteers to help with maintenance work from August – October. If interested, please contact Andy Harrison and state likely availability (weekdays and/or weekends), mob: 0797 333 0706 or email: andrew_harrison@urscorp.com

Other Societies

Shropshire Geological Society

Wednesday 10 February: How stalagmites reveal Quaternary climatic history (guest speaker: Dr Ian Fairchild)

Wednesday 10 March: British earthquakes (guest speaker: Dr Ian Stimpson)

Saturday 27 March (morning Rockhop meeting, commencing 10.00 am): Clee Hill, to be led by Michael Rosenbaum. Walking (one mile); some rough ground; local cafés if lunch required (Tel. 01743 850 773 or mobile 07986 558 683 for reservation and meeting instructions)

Saturday 17 April (morning Rockhop meeting, commencing 10.00 am): Secret Stones (Craven Arms), to be led by Michael Rosenbaum. Easy walking (half a mile); café lunch available if required (Tel. 01743 850 773 or mobile 07986 558 683 to reserve a place and obtain joining instructions)

All lectures are held in the Shire Hall, Shrewsbury, 7.30pm. A nominal charge is levied for non-members. Please note: the Rockhops are primarily intended for beginners. Arrive 15 minutes before the start of field trips for admin. Further information at: www.shropshiregeology.org.uk/

North Staffordshire Group of the Geologists' Association

Thursday 18th February at 7.30pm. Speaker: Professor Andrew Willmott (Proudman Oceanographic Laboratory) 'Sea Level Science; Global and Local Relevance.' I will discuss what causes sea level to change, where the greatest uncertainties lie in predicting sea level variability on global and regional scales to the end of this century, then focus on some of the challenges faced by the UK.

Thursday 4th March at 7.00pm. AGM and Chairman's Address: Dr Ian Stimpson (University of Keele) 'Staffordshire Stone'. As part of the national Strategic Stone Study for Natural England, a database of Staffordshire building stones has been compiled together with the characteristic native buildings built from these stones and the ancient quarries that they came from.

Saturday 17th April. Field Day: Ecton Hills and the Ecton Hills Field Studies Association. Leader: Peter Kennett and Peter Lane. Meet at 10:00 am at the lay-by below the centre (Grid Ref. SK 097583 – O.S.1:50,000 Sheet 119) The outing will cost £10.00 per head as an entry fee only (no field fee is applicable). Further details nearer to the date but will include: folding at Apes Tor; underground visit (but not the deeper section); surface tour, and a mineral search amongst waste tips. Finish: around 16:00. See website for details: (http://www.ectonhillfsa.org.uk).

Saturday & Sunday May 15-16. Field Weekend: North Wales. Leader: Richard Waller. This weekend field excursion will explore the impact of past glacial activity on the spectacular landscapes of North Wales.

All lectures are held in the School of Earth Sciences and Geography, William Smith Building at Keele University unless otherwise stated. Further information at: www.esci.keele.ac.uk/nsgga/

Birmingham and Midland Institute

Monday March 1st at 1.00pm: J.J. SHAW. The Institute's Seismologist Dr J.P. Lester discusses the innovative work of J.J. Shaw (a Midlands pioneer of Seismology).
The Birmingham and Midland Institute, Margaret Street, Birmingham, B3 3BS. Admission £1.00.

Lapworth Lectures

Monday 15th February: Dr C. Nicholas, Trinity College Dublin & Dominion Petroleum Ltd. The role of field geology in frontier petroleum exploration of East Africa.

Monday 1st March: Mr G. Earls, Director of the Geological Survey of Northern Ireland. UNDERSTANDING UNDERGROUND - what our rocks can Tellus.

Monday 15th March: Dr J. Pike, School of Earth & Ocean Sciences, Cardiff University. The first diatom silica oxygen isotope records from the late Quaternary Antarctic margin.

All lectures commence at 5.00pm in the Palaeontology Lab (G21), Earth Sciences, University of Birmingham. Each lecture is followed by a wine reception in the Lapworth Museum; all are welcome! Further information at: http://www.lapworth.bham.ac.uk/events/lectures.shtml

Herdman Society Symposium

Saturday 20th February 9.30am – 5.00pm (reception). **'Geoscience Frontiers'** A day of lectures at the Sherrington Lecture Theatre, Department of Earth and Ocean Sciences, University of Liverpool. £6.00 non-members and £3.00 Herdman Society Members.
See poster: http://www.liv.ac.uk/science_eng_images/earth/News/GeoscienceFrontiers-L.jpg

Further details from helenk@liv.ac.uk or Mrs H. Kokelaar, Department of Earth and Ocean Sciences, University of Liverpool, 4 Brownlow Street, Liverpool L69 3GP (tel: 0151 794 5146). Tickets and full programme will be available at the door. However, pre-booking (if possible) by e-mail, phone or mail is requested to assist with catering.

Mid Wales Geology Club

17th February: Member Tony Thorp talking on "Colour in Minerals"
21st February: Field trip to a quarry in Hafren Forest
17th March: John Mason will talk on Minerals in the Central Wales Orefield
21st March: Field trip to Ercall, Maddox and nearby quarries, exploring the Precambrian/Cambrian unconformity, etc. Member led "Introductory Day".
20th April: Bill Bagley - "The Wonderful World of Minerals"
25th April: Field trip to Cwm Cerrig Gleisiad in the Brecon Beacons, led by Duncan Hawley

Meetings are held at Plas Dolerw, Milford Road, Newtown, Montgomeryshire, SY16 2EH. 7.15 for 7.30pm. Further details: Ed. newsletter & Hon Sec: Tony Thorp: Tel. 01686 624820 and 622517 jathorp@uku.co.uk

Please send material for the next Newsletter to:

julieschroder@blueyonder.co.uk

42 Billesley Lane, Moseley, Birmingham, B13 9QS.

The Dudley Bug

Welcome

Hello

We hope you enjoyed the last 'Dudley Bug,' which made for an interesting read. After the break from Geology in the last Dudley Bug, we thought we had better get back to the proper Geology. So this issue we bring you a general overview on magma chambers, viscosity and fractional crystallisation.

Chris and Alison

Magma Chambers, Viscosity and Crystallisation

It is believed that magma chambers are formed at the core-mantle boundary, but this varies depending on the tectonic setting. Magma typically ascends within these magma chambers from between 100Km and 40Km depth. Even though the magma ascends, it doesn't always reach the surface. The movement towards the crust is due to the magma being less dense than the overlying rock; this causes it to rise until it reaches a balanced pressure (equilibrium). The speed of the magma movement depends on the viscosity of the magma. The higher the *viscosity*, the slower it will move and vice versa. The best examples to explain *viscosity* are:

- Treacle moves slowly when poured on a tilted board, so has a high viscosity
- Water moves very quickly when poured, so has a low viscosity.

The size of the magma chamber is also important in relation to the speed of the magma chamber movement.

There are three key ways in which the magma will actually move; these are *diaprism, porous flow* and *magma fracture*.

- *Diaprism* occurs when the surrounding country rock is hot and deforms through a process called solid state creep, although the more rigid the lithosphere (the solid outer 100km of the Earth, composed of the crust and the upper mantle, both of which are rigid), the harder it is for this process to occur.
- *Porous fracture* occurs when the boundaries between grains partially melt (to provide a 'crystal mush' which is neither solid nor liquid), which causes the system to interconnect. This allows the magma to move freely through the system in an upward direction. The typical rate for this process is $10\text{-}10^4$ cm per year.
- The final method, *magma fracture* is the opposite of diaprism and occurs within cooler country rock, which is usually brittle and fractured. The magma fills these fractures and can cause a process known as stoping. This is when the cooler rock forming the roof above the rising magma can break off and sink into the molten magma.

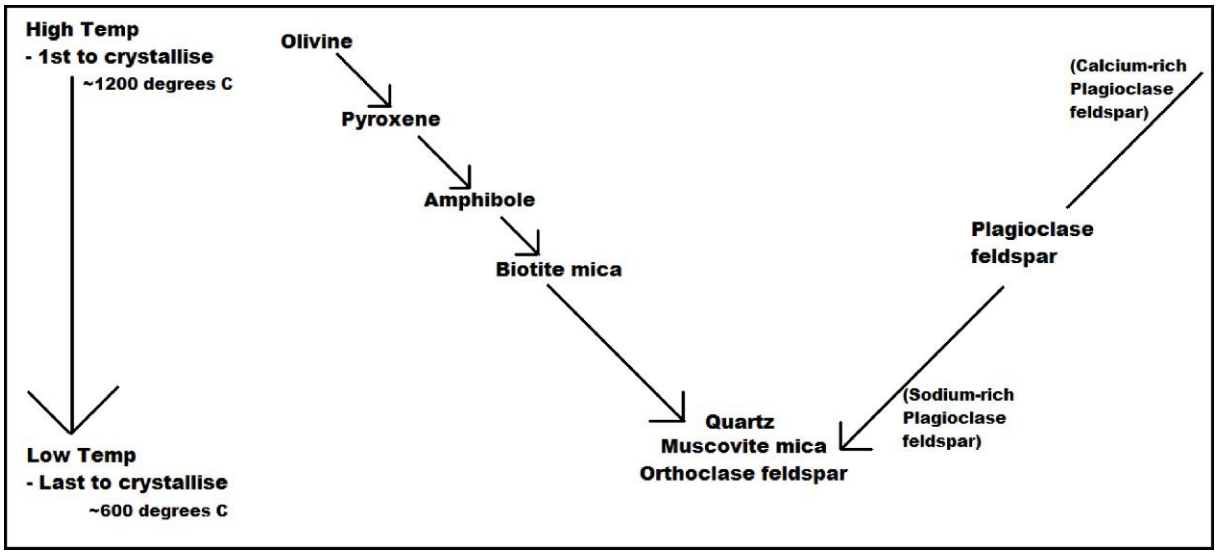
Magma chambers consist of magma which hasn't made it to the surface. We know that magma chambers exist because of the presence of seismic activity within the region of the chamber. Shallow tremors represent shallow magma chambers and deeper magma chambers have deeper seismic waves. Seismic waves are created from the movement of magma within the crust. The two main methods for tracing the movement of magma are the use of tiltmetres to measure deformation on the ground and also to monitor caldera collapse. Man-made seismic waves can also show the location of magma chambers, as S-Waves (Shear waves) cannot pass through a liquid. This creates a shadow on a seismic trace. The reason for this is because they are "sideways" waves, which are not transferred through a non-solid mass. ►

The depth of magma chambers varies depending on their tectonic setting and location in relation to plate boundaries:

- At a typical mid-ocean ridge (e.g. The Mid-Atlantic Ridge) the magma chamber can be anything between 1Km and 10Km deep.
- At Intraplate (within a plate) settings such as Hawaii they are less than 7Km deep.
- At an island arc they can be as deep as 30Km.
- At a continental margin they generally range from 30-90Km in depth, however, the 'Andes – thick crust', magma chamber is at a depth of 100Km.

Over time magma chambers cool and eventually solidify, although this process can take tens of thousands to hundreds of thousands of years to complete. *Fractional crystallisation* is the key process in the solidifying of a magma chamber. The different minerals in solution within the magma solidify at different temperatures, therefore they solidify at different intervals. As different minerals fractionate (solidify) out of the magma, it leaves the surviving magma with a different composition to the original magma. The best example of this is the removal of olivine from the magma; this leaves a magma which is poorer in MgO, the same in FeO and richer in SiO_2, Al_2O_3, CaO, Na_2O and K_2O. Olivine is one of the first minerals to cool and crystallise. Within the magma chamber, the denser minerals sink to the bottom of the magma chamber and build up in layers.

The minerals always fractionate in a particular order, this is known as Bowen's reaction series. A summary diagram is shown below to illustrate the order in which they cool.



Bowen's reaction series

To summarise, magma chambers move at different rates. This is due to various factors which control both the magma type (e.g. viscosity) as well as the state of the surrounding country rock. As the magma chamber cools, fractional crystallisation occurs. This often gives a layered appearance to magma chambers when they are exposed at the surface. Bowen's reaction series explains the specific order in which the minerals within the magma chamber cool and fractionate out of the magma. This then varies the composition of the magma as each mineral no longer reacts within the liquid. ■

Next Time....

Secrets of the Iceland hotspot.

If you have any further questions, comments, suggestions etc., please feel free to contact us on our e-mail, which is... thedudleybug@hotmail.co.uk

Black Country Geologist Dr. Albert Ludford MSc PhD FGS

and a tale of two fossils: *Pronorites ludfordi* & *Ludfordina pixis*

Early years: from the Wren's Nest to the Weaver Hills

Albert Ludford came to my notice via his nephew Ian, a work colleague of my husband John. A remark from Ian that a fossil had been named after his uncle led me on a quest to find out more. Correspondence with Albert enabled me to track down relevant papers, and it was a great pleasure to meet him in person at his home in Malvern. Belying his seniority with great agility of body and mind, Albert told me his remarkable story, recalling in detail events from long ago and the minutiae of his geological research.

Dr Albert Ludford

Born in Willenhall in 1913, Albert attended Wednesbury Boys' High School in Wood Green, Wednesbury from 1924-31. He became a geologist by accident. He wanted to study chemistry at Birmingham University, but did not have the necessary 3 science A levels; one of them was Geography, so Geology was suggested as a possible alternative. He was accepted, and in 1931 enrolled as a student in the Geology Department which then consisted of just 2 labs and the Lapworth Museum.

The first field trip was to some gravel pits in Birmingham, but it was the second excursion which changed his life. This was a visit to Castle Hill and the Wren's Nest led by his lecturer, Fred Shotton. In a cave on the north flank of Castle Hill, Albert cracked open a rock and was thrilled to learn from Fred that it was a coral - identified as *Favosites sp.* From that moment Albert was 'hooked' on geology, and that specimen became a treasured possession, used in demonstration throughout his subsequent teaching career.

A local teacher, Andrew Barnett showed Albert the best route from the station to the Wren's Nest and he remembers approaching via Swan Village, then along an old coal trench (now a housing estate), and picking up a footpath alongside the hill to the bedding planes, which were a treasure trove for his growing collection of Silurian fossils. At nearby Hurst Hill they found two specimens of *conocardium sp. (illustrated).* They jointly presented them to the Lapworth Museum, where they are still cherished as rarities in the fossil collection. In 1934 Albert graduated from Birmingham University with an Honours Degree in Geography and Geology, and was awarded the Panton Geological Prize. He gained a teaching diploma in 1935, and a teaching post at a junior school in Willenhall.

Conocardium sp. (x 2 approx.) Wenlock Beds, Wood Cross, near Hurst Hill. (courtesy of the Lapworth Museum)

Albert looked wistful as he reminisced that he would have loved to do serious research at the Wren's Nest, but this was not possible as A.J. Butler was already working in this area, and later published[1]. However, a younger student, Wilf Cobb, was mapping the boundary between the Carboniferous and Triassic rocks of the Dovedale region and asked Albert for help. Knowing that J.E. Prentice was working on the Manifold area, and D. Parkinson on Dovedale, Albert turned his attention to the Weaver Hills in North Staffordshire, and spent his weekends there researching the stratigraphy of the Lower Carboniferous rocks from the Weaver Hills in the south, to the Hamps valley in the north. With the war looming, Albert was in some haste to submit his thesis on this work to Birmingham University in 1939, but at this stage it was rejected.

The War Years and the ISTD

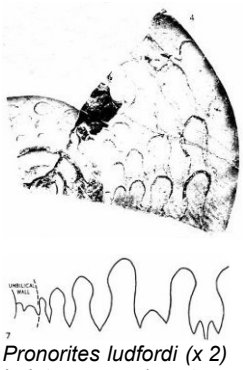
Albert joined the Royal Artillery in September 1940 and was commissioned in 1943. An injury sustained in Nigeria meant 6 weeks home leave, and the opportunity to work on his thesis for re-submission. In spite of the war, there was pressure to complete this work. Prentice was working for the British Geological Survey under the direction of Wolverson Cope (later to become the first Professor of Geology at Keele University) and wanted Parkinson's and Ludford's closely related papers to be published at more or less the same time. After some intensive field work, Albert re-submitted his thesis and it was accepted, but the war was far from over. ►

Albert relates being 'sent home to shoot down doodle bugs just before D Day', but was largely dissatisfied with his lot in the RA after his injury. He had become a personal friend of Fred Shotton, and knew that Fred was the chief geologist at Montgomery's HQ. We now know, of course, that Fred Shotton was involved in the highly dangerous top secret mission to survey the Normandy beaches prior to the D-Day landings; his maps are now housed in the Lapworth Museum. Albert wrote to Fred, and this resulted in a new appointment as a geologist for the ISTD (Inter Services Topographical Department), attached to the Royal Engineers. He was, in fact, the only Royal Artillery officer employed as a geologist during the war.

Birmingham University Geology Department photo (courtesy of the Lapworth Museum)

Based in Oxford, one of his assignments was to prepare coastal maps for tank landing places in the Far East. Then followed a dizzying sequence of ISTD assignments in Scandinavia, Calcutta, Singapore, Bangkok, and surveying along the Burma railway, before discharge and a return to a teaching post at Wolverhampton Grammar School, plus the unfinished business in North Staffordshire.

North Staffs again, and *Pronorites ludfordi*


Pronorites ludfordi (x 2) holotype. (courtesy Palaeontological Assn.)

In 1944 Albert was elected a Fellow of the Geological Society (FGS) and in 1945 he received an MSc from Birmingham for his thesis on the Carboniferous Limestone of North Staffordshire. In 1949 Parkinson's paper on Dovedale was published[2], and this was followed in 1950 by those of Prentice on the Manifold area[3], and Ludford on the Weaver Hills[4]. These papers stimulated debate, and work in this area was far from finished for Albert Ludford. He collaborated with Donald Parkinson, and one particular joint visit to the Manifold valley became particularly memorable. In a horizon bearing a rich fauna of goniatites, Albert found a specimen that neither he nor Parkinson could identify.

The collection was sent to W.S. Bisat, a leading expert on goniatites, for identification. This resulted in a paper by Bisat published in 1957, identifying 2 new species from this collection: *Goniatites warslowensis,* and *Pronorites ludfordi,* after the specimen found by Albert (*Goniatites* and *Pronorites* both belong to the *cephalopod* family, and are closely related). The illustrations reproduced here are from Bisat's paper: *Pronorites ludfordi* sp. nov. holotype ZI 5233, plus a drawing of a characteristic suture line[5]. The specimens were given to the Geological Survey Museum, then based in London. They were found in the bank of Warslow Brook at the Warslow-Clayton footbridge OS ref: SK085 578.

Further work with Parkinson led to the publication of a joint paper in 1964[6]. This included some stratigraphy revision in the Weaver Hills area in the light of further research since Albert's earlier paper. ►

A long career in teaching

Throughout this period Albert's reputation as a geology teacher was going from strength to strength. He joined the Geologists' Association at the inception of the Midlands branch in 1938, based at Birmingham University. He was actively involved for many years; he was on the committee, then Chairman, and organised or lead numerous excursions, locally and further afield to the Weaver Hills, Bridgnorth, the Cotswolds, and many more. Alongside his teaching in Wolverhampton, he was asked by Birmingham University to do some extra-mural teaching and ran A level Geology courses in Bridgnorth and at the Birmingham and Midland Institute.

In 1955 he was appointed to teach geology for the external London BSc at Luton College (later Luton Polytechnic, and now the University of Bedfordshire). He and his wife moved to Harpenden, and he held this post from 1955 until his retirement in 1976. Many of his students went on to pursue careers in geology, and have kept in touch with him from all over the world. During this time he continued with his research, and gained a PhD from London University in 1972, after which he donated to the BGS all the specimens he had collected from the Carboniferous Limestone in the Dovedale area. The remainder of his specimen collection was donated to the college. These included many fossils from the Wren's Nest along with specimens collected from abroad, particularly Norway and Siam during the war. Sadly, the collection was dispersed to unknown destinations at the demise of the geology department.

Frank Kelly, the Wren's Nest, Upper Millichope and *Ludfordina pixis*

It was clear from talking to Albert that one of his happiest geological associations was with Frank Kelly. Albert met Frank in 1943 and found that he had a draughtsman's approach to geology, drawing strike lines on maps, rather than getting his hands dirty! Albert took him to the Wren's Nest to show him how to do 'proper' geology, and together they examined a bed containing Leptaenid brachiopods. From the orientation of these specimens, Frank was puzzled about how they managed to feed, a question which Albert could not immediately answer. Further examination over a wide area revealed that 95% of the specimens were lying on the dorsal valve, and they concluded that they had lived in this position.

This 'hands on' experience fired Frank with enthusiasm for field work and for Leptaenids in particular. Apart from the Wren's Nest, Albert took him to the Wenlock area for further research and to gather more specimens. Albert remembers showing Frank that extreme weathering revealed the internal markings of some of the Leptaenids, a phenomenon not often seen in the Dudley area. This was at an exposure of the Lower Ludlow mudstones in a stream section at Upper Millichope, Shropshire.

Albert encouraged Kelly to further his research through contact with Helen Muir-Wood, Keeper of Palaeontology at the British Museum. By comparing numerous samples, Kelly found differences which led him to publish his findings on Silurian leptaenids in 1967[7]. In his paper he discusses known species (*Leptaena rhomboidalis* and *Leptaena depressa*), two new species (*Leptaena poulseni* and *Leptaena arberae*), and a new genus and its type species, *Ludfordina pixis*, found in the Lower Ludlow Mudstones, Upper Millichope, and named after his friend and mentor, Albert Ludford. There are three specimens in the Lapworth Museum, (BU883, 884 and 885) and the photo is of the holotype (BU883).

Ludfordina pixis gen. et sp. nov. holotype (x4) (courtesy of the Lapworth Museum)

This strand through Albert's life seems to encapsulate the driving forces behind his success: he was rigorous and painstaking in research; patient, encouraging and inspiring as a teacher. His reputation grew from his work on the Carboniferous limestone in North Staffordshire, but his inspiration lay deeply rooted in the Silurian limestone of Dudley, and this in turn fired Frank Kelly's enthusiasm for leptaenid brachiopods. Albert Ludford is proud to have his name attached to a new genus and new species from the Silurian period; *Ludfordina Pixis* stands as a fitting tribute to his long and distinguished career in geology. ■

Julie Schroder

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7. Kelly, F.B, 1967. Silurian Leptaenids (Brachiopoda). Palaeontology, Vol. 10, Pt. 4, pp.590-602

Acknowledgements
Thanks to Jon Clatworthy, curator, Lapworth Museum Birmingham for his assistance and for permitting access to specimens and archive material. Thanks also to Albert Ludford for telling his story, proof reading, and giving technical advice. ■

BCGS Website - Gets a new look and feel

The BCGS website has recently been given a face lift. The BCGS website is our Geological Society's shop window in the 'Digital World'. It advertises our existence and what we stand for.

The BCGS joined 'The Information Superhighway' on 13th March 1996 (Ref: BCGS Newsletter 116, page 8) when Amir Kanwar built and launched the first site. Another refresh occurred in 2002 when David Miller restructured the site and added dropdown menus. Since that time the computing environment has evolved, whereby parts of the site have stopped working for people not running Microsoft Internet Explorer and some of the content has become dated. Prompted by John and Julie Schroder I have rebuilt the site, keeping as much of the original content but building a new structure that could be more easily updated.

As part of the rebuild it prompted me to ask the all important question "what is the purpose of the site?" Being clear on the objectives should drive the content and the design. I propose the following - that the purpose of the BCGS website is:

1. **Build awareness of our Society** - who we are and our geological conservation values.
2. **Build awareness of what we do** - where we meet and where we go.
3. **Build relationships** - providing a point of contact for people seeking information or wanting to join.
4. **Online Newsletter archive** - most Web surfers are looking for **information.** We have a wealth of local geological information bound up in over 30 years of past newsletters. These should be indexed and made accessible.

Assuming you agree with these objectives, I would encourage you to think about them next time you visit www.bcgs.info and make suggestions on how we can further improve it. For example, if you have photographs of members taking part in Society meetings and field trips I think these would be a great addition. Please contact me with your comments and suggestions at hickmang@bp.com. ■

Graham Hickman

Geobabble

I recently went to see the film Avatar, set in the year 2154. It has many messages of interest to geologists concerning the exploitation of resources and conservation. In it, we, that is the US Army, is attempting to conquer the planet Pandora in order to exploit (steal) the valuable deposits of the mineral unobtainium. As part of the film we are shown a specimen of this mineral (see photograph). It appears to be galena, bright metallic, lead grey with cubic cleavage. However, unobtainium is a mineral term used in areas other than science fiction. Apparently in aerospace engineering, when a metal of the highest specifications with regard to physical strength and resistance is required, and ►

no such element exists, you require some unobtainium. It can also be used when you need a mineral that is very rare and expensive, virtually unobtainable.

Avatar was filmed on Hawaii for most of its outdoor shots, which were generally in dense vegetation so no outcrops were on view. However, there were several sequences filmed with a background of sheer cliffs and steep gorges, and here the rock was a hard, bedded sediment, with good joints; it looked like a hard limestone or sandstone. Looking at film localities can often provide the geologist with an interesting sideline from the main action. The Brontë novels were mostly set in Yorkshire, and any film of Wuthering Heights must have scenes set on the moorland; in the recent television production, Heathcliffe and Cathy were often seen in gritstone localities where the sedimentary structures could be made out, and you can also get good shots of Carboniferous limestone scenery.

The French Lieutenant's Woman, filmed with Meryl Streep and Jeremy Irons, must be set in Lyme Regis, as the Cobb is central to the story, and the coastal rocks and fossils play an important part in the background to the plot. The languid television detective series Wycliffe is based in Cornwall and nearly always shot on location; you will often come across good pictures of coastal scenery and geology. However, for anyone who has ever carried out fieldwork in Dorset, or even just visited the Jurassic coast, Thomas Hardy paints a wonderful picture of that county, and when his works are faithfully adapted for the screen, recognisable coastal localities may be seen. Hardy used actual places, although he would change the name, so Lulworth Cove became Lulstead Cove for example, but, be careful! I once watched a television production of a Hardy novel trying to match the countryside to my experience of Dorset geology, with some success I thought. At the end I watched all the credits only to read 'shot on location entirely in the Czech Republic'. ■

Bill Groves

Members' Forum

Letters/emails

R.E. Liesegang's Rings - Origin and Formation in Rock (Newsletters 193 p.10 & 198 p.4).

In 1896 Raphael E. Liesegang noticed what he called "The Rhythmic Precipitation of Coloured Substances in Viscous Aqueous Media". Wilhelm Ostwald (1897) found that this was particularly noticeable in a variety of "thick" media such as gelatin and silica gel, which he ascribed to the hugely diminished mobility of any dissolved molecules.

This technique of "Differential Migration", nowadays called "Chromatography", is a very powerful analytical chemical technique used for the separation and analysis of both colourless and coloured substances. This is widely used nowadays, eg. DNA profiling, measuring drug/alcohol concentration in blood, etc. It is probably the epitome of chemical analytical techniques today, generally involving the controlled **flow** of a gas or liquid (the **mobile** phase) through a tubular column packed with an inert powder (the **stationary** phase), which has superceded gelatin.

This is exactly analogous to what happens quite naturally at the surface of the Earth if conditions are just right, ie. when intermittent pulses of ground water containing tiny amounts of dissolved, leached minerals (the **leachate**) percolate *slowly* (the **mobile** phase) through micro fissures within static, porous substrates such as earth, sandstone and even clays (the **stationary** phase). (Some may recall my impromptu "analysis" with black Quink and blotting paper at the recent AGM!)

In some of Walsall's fine-grained pavement slabs you can see the end result of iron-rich ground water percolation through the interstices of a ►

fine-grained sandstone of local provenance (S.Staffs.). In these cases the bands of brown, rusty staining are due to hydrated iron (III) or Fe^{+3} most likely derived from the weathering of distant, igneous or metamorphic, darker rocks which contain ferrous iron, Fe(II) or Fe^{+2}. This is the stable form of iron at red-hot temperatures >1500K as found in pyroxene, olivine etc., the so-called basic rocks. Coexisting alongside were the usually paler silica-rich "acidic components" such as feldspars (eg. plagioclase), a source of sand (SiO_2).

These erstwhile high temperature erupted igneous rocks were decomposed very slowly at the surface by weathering. This was typically under new colder atmospheric surface conditions in the presence of slowly percolating ground water/steam containing dissolved oxygen and acidic CO_2 (aq). The surface degradation products accumulated slowly but were now well separated from each other by hundreds of kilometres. These products were typically: white crystalline silica (SiO_2, acidic) from the precursor silicates, and the red-brown, amorphous "rust" (basic ferric, or iron (III) oxide hydrate, $Fe_2O_3.xH_2O$) from the darker pyroxenes.

These percolating iron and mineral-rich (chalybeate) waters were, in years gone by, reputed to have remarkable curative and therapeutic properties to such an extent that new 'Spa' towns had developed around natural springs. Spa is such a town in Belgium. Can you think of a few British ones?

So where do the Liesegang Rings come from?

During transportation Fe^{+2}(aq) is slowly oxidised by air to rust-brown Fe^{+3}(aq), most of whose salts happen to be less soluble in water. These tend to hydrolyse to form, initially, a cloudy brownish colloidal suspension which is carried along by percolating ground water. These brown electrically charged colloidal particles collide and clump together progressively as growing aggregations of say 10, 20…or 50+ multiple units. They are still being continuously, but less effectively, buffeted by the ubiquitous water molecules until eventually they settle and become attached (bigger, sluggish, units first) to jagged micro-surfaces within the fine cracks in the new host rock, such as a sandstone.

Remember, the flowing smaller water molecules are still buffeting the settled polymeric units and at the same time continuously bringing up fresh colloidal material (over many thousands of years) until the original micro fissure eventually blocks up. New fissures are opening up all the time and the process continues until the supply runs out, or is diverted elsewhere.

During the precipitation process within the maze of cracks and fissures there will very likely be differentiation between aggregated particles depending, inter alia, on their actual sizes and shapes as well as changes in rate of flow of the water. Some degree of sorting will take place, perhaps erratically, giving rise to crude but often easily recognisable forms of brown banding within the new host rock. These bands can be seen in the field due to, or in spite of, the varying degrees of aggregation (polymerisation) and hence mobility of the brownish, rusty $Fe_2O_3.xH_2O$ zones. They may be recognised as shades of red/brown within broad extended bands, and occasionally with luck, a few well separated, sequenced, even "circularish" brownish zones against the much paler background of the host rock.

Nature's Liesegang Rings! Even in Walsall! But why only iron? Not chromium or nickel or zinc! The underlying chemistry is quite interesting (ie a bit complicated!) Perhaps some other time if the editors are willing! ■

Alf Cole

Walsall isn't the only local place with Liesegang rings. Birmingham has some too, in the paving stones of Brindley Place and around the Cathedral, where this picture was taken.

(Ed)

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The Palaeontologist who played for Wolverhampton Wanderers

As a lifelong Wolves fan I was intrigued to learn of the Emeritus Professor in Palaeontology & Biostratigraphy and Fellow of Emmanuel College Cambridge who had played for Wolverhampton Wanderers FC.

Regrettably this information came to light in the obituary of Professor Barrie Rickards published in The Times on November 21st 2009. Professor Rickards was a world expert on Graptolites and former curator of the Sedgwick Museum, who employed innovative techniques to study their relationships to living animals.

However, it was the connection with Wolverhampton Wanderers which interested me most. Professor Rickards was born in Leeds in 1938 and educated at Goole Grammar school. We can expect therefore that any trials he participated in would have taken place in the early-mid 1950's when it was well known that Wolves recruited many young players from South Yorkshire, thanks to their nursery club "Wath Wanderers". These included Ron Flowers and later Peter Knowles.

Unfortunately, despite the assistance of Graham Hughes (Club Historian and Archivist) I have been unable to identify the exact occasion and for which team Professor Rickards played (Wolves would have had a minimum of four teams at that time).

I can say that in trying to investigate this story I enjoyed a wonderful tour of Molineux, including a visit to the first team dressing room (they had lost 1-0 the day before to the "Blues"), and have contributed in some small way to the club archives, in which there now resides a copy of Professor Rickards' obituary and a specimen of Monograptus. What other Premiership club can claim that!

For more information please visit: Timesonline-obituaries; Professor Barrie Rickards Nov 21st 2009. ■

Mike Williams

On Disposal of Nuclear Waste. ('The Dudley Bug', BCGS Newsletter no 198, Dec 09, P.7)

My reply is addressed to everyone who worries about nuclear waste - which is pretty well everyone! It's very important as this is the main sticking point in any debate for or against Nuclear Power. Fortunately some progress has been made over the last few years. It's time this "waste" product with its massive amount of heat/energy is used as a fuel! I'm reminded of the peculiar comparison of when we first found oil could be used for fuel/heat generation. Originally we derived paraffin (or kerosene in America) from the oil: petrol, with its much higher energy potential was a waste product! Now it's nuclear waste, which is so bursting with radioactive energy potential, it has to be stashed somewhere until that energy, which is pretty hot of course, just fritters away, and that can take millennia. I'm sure that, properly controlled, it could be used for heating in its own right.

Fortunately some progress has been made over the last few years. There are some interesting in-depth articles available in the magazine "Nuclear Future", the 2-monthly journal of the Nuclear Institute which can be looked up on their website www.nuclearfuture.info and some of these I will list below.

There are several articles on waste vitrification in canisters or in situ. This technique is also used to immobilise other types of toxic industrial waste. There are also articles on deep geological disposal and the regulations involved. There is also the very interesting case of the ancient natural nuclear waste system that was formed some 2 billion years ago in what is now the uranium mine at Oklo, Gabon. At that time there was enough uranium to set nuclear fission reactions going which ►

continued on and off for millions of years. The vast amounts of radwaste created, including plutonium, have now mostly decayed or stabilised - but they have moved incredibly little during all those ages! I wonder if there is any natural plutonium still there, deep down? Its longest-lived isotope has a half-life of 80million years... (By the way, there is no lead isotope Pb239. You mean the plutonium Pu239; t½ 24,000 is correct.)

I will now list some titles from the Nuclear Future website:

1. Vol 5 No.4 Environmental Regulation of Long-Lived Radioactive Waste.
2. Vol 5 No.4 The Impact of Increased Waste Loading on Vitrified HLW Quality...
3. Vol 5 No.5 Plasma Vitrification Technology for the Treatment of Nuclear Waste.
4. Vol 5 No.5 GeoMelt Waste Vitrification.
5. Vol 5 No.5 An Overview of Potential Waste Hosts: Apatites...Phosphate (Oklo)
6. Vol 4 No.2 Transmutation of long-lived waste in fast and thermal...reactors.

This last is the best one yet as it actually reduces the quantity and lifetime of actinides by using them as fuel (as I suggested earlier). Earlier research on this started back in 2004: look up N.F. Vol 2 No.6: The Red-Impact Project. Apparently, France, who have 80% nuclear generation and therefore a lot of waste, are now required to build a certain percentage of fast reactors to transmute all the stuff, breed extra fuel, and generate electricity of course.

The latest 'Nuclear Future' Dec.09 Vol 5 No.6 has probably the best website on the front page: www.rwbestpractice.co.uk. - try it and see what you get. I hope all this helps to answer people's concerns, then we can get on with building a new fleet of reliable baseline nuclear power stations, while the R&D dept. get on with the futuristic and waste-free Fusion systems. ■

Ananda Thompson

Why Geologists Love Beer

We had a lecturer at University , who was always looking for "a shady spot" for lunch during field trips. So every time the van passed a pub, the cry would go up "There's a nice shady spot!". ■
(Follow the link for an edifying video on this subject! Ed.)
http://www.wired.com/wiredscience/2009/12/15943/

Les Riley

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