The Black Country Geological Society

NEWSLETTER No. 61 - February, 1987:

Editorial:

This newsletter was prepared while the snow outside was level with the bonnet of the car, and none of my neighbours could leave the street. All of you will have stories of failing to get to work or being stranded there. So what can I say to cheer you all up, while the struggle to work is not exactly winter sport?

In the summer at least four members will be going to the western U.S.A. national parks, on a geology tour organised by Nottingham University. The temperature in Death Valley in August should provide an interesting contrast to Britain in January. Other Nottingham trips are noted briefly within, and I have a lot more details of them.

Perhaps these easterly winds from Siberia have been sent by woolly mammoths thawed from the permafrost, to blow messages to some of their number, who wandered as far as Shropshire.

Forthcoming Meetings:

PLEASE NOTE - the correct date for the February meeting is the 9th - Monday. "Green Rock in the Black Country." Talk by Colin Knipe of Johnson, Poole and Bloomer, about large igneous intrusions in and below the Coal Measures, as proved in his own firm's investigations.

Monday March 16th: A.G.M. and buffet.

Indoor Meetings are held at the Saracen's Head, Stone Street, Dudley: 7.30 p.m. for 8.00 p.m. start. Those who would like lifts for field meetings, please contact Graham Worton - Dudley 213207.

The Society does not provide personal accident cover for members or visitors on field trips. You are strongly advised to take out your own personal insurance to the level which you feel appropriate. Schools and other bodies should arrange their own insurance as a matter of course.

Programme 1987:

Sunday 12th April (Note change of date away from Easter Sunday). Field trip to the Jurassic exposures of Hook Norton. Leader Mr.B. Boneham of the Geologists' Association, Midland Group. Meeting point to be confirmed with change of date.

Monday 11th May Informal meeting on aspects of conservation. It is expected that there will be 20 minute talks by members of other organisations about their work, such as nature trails.

June Weekend field trip to be arranged.

Monday 6th July "Evolution and the Fossil Record." Talk by Dr. Derek Gobbett with reference to the Wenlock Limestone and using Birmingham University material.

September Talk by Professor Westbrook of Birmingham University.

October Field trip.

Monday 16th November "Geology and Philately." Talk by Dr. Reg Bradshaw of Bristol University.

December to be arranged.

5th October, 1986 - Field Trip to the Forest of Dean: Leader Mr. Bill Spears.

A turn-out of around 30 people from the Black Country and Shropshire Geological Societies enjoyed pleasant fine weather for their joint field trip to the Forest of Dean. The first site visited showed the Upper Old Red Sandstone series of Brownstones, Quartz Conglomerate and Tintern Sandstone. These were deposited by south flowing rivers, draining the Welsh Brabant Massif to the north, the rivers' courses being controlled by Hercynian tectonic movement. The Brownstones show cyclothermic depositional sequences of shales, sandstones and mudstones related to mountain building as the sea bed rose and fell. The quartz-conglomerate represents a pebble beach environment and has a non-sequence at its base. The micaceous Tintern Sandstone represents a return to shallow marine sedimentation as coastal downwarping occurred.

A short distance further north, the Blue Rock quarry gave us our first view of the Carboniferous of the area. Here the lowest unit, the Lower Limestone Shale, represents marine conditions and contains an abundant fauna of brachiopods and crinoids with rounded algal structures. The quarry face showed large-scale pitting with hollows, which are apparently related to the position of drill holes. Each hollow is around one metre in diameter and half a metre deep, and has developed as a result of the weathering along each drill hole.

The Lower Dolomitic Limestone contains more than 15% dolomite, and its origin is thought to relate to the presence of algae, rich in magnesium which contemporaneously caused this dolomatisation.

Perseverance Iron Mine showed considerable surface evidence of the working of the Crease Limestone's ore deposits of haematite and limonite. Mined back to Roman times and continued by the free miners of Dean in their gales (mines), the origin of the iron is thought to have been related to Neptunean solutions brought down from overlying coal measures and Triassic sandstone, both of which are rich in iron. Iron from these fluids then collected in suitable cavities in the limestone.

Our first view of the limestone with its evident mineralisation was provided by the road cutting nearby where Crease and Whitehead Limestones are exposed in sequence. Their lithologies differ considerably, the former being more coarsely crystalline, the latter a fine, micritic variety.

The Drybrook Sandstone, the upper unit of the area's Dinantian, is very clearly exposed in Staple Edge Sand Quarry. Here some desiccation cracks were observed on a bedding surface showing clear polygonal shape. The sandstone represents a marked change in environment to one of shallowing

waters with a nearby terrestrial source of sand and silt. The sediments show evidence of deposition in cycles.

Mr. Warren's free mine allowed the more eager members to visualise turning an interest in geology to personal gain, but one look down the steeply inclined adits, at the three feet high tunnel with slimy walls and a mud floor made the reality of such mining less than appealing. The mine is, however, in periodic use, as the wide range of Heath Robinson-type equipment showed.

Chimney Scowles satisfied members' curious desire to enter the bowels of the earth, as here the old workings can be entered safely to view the fractured dolomitised and iron-stained Crease Limestone.

A long but pleasant walk over Staple Edge and back along Blackpool Brook Valley ended a most pleasant and varied geological excursion. Many thanks to Bill Spears for leading us.

Andrew Rigby:

17th November, 1986. Plate Tectonics and Magmatic Processes at Mid-ocean Ridges.

Dr. R. Bradshaw of the University of Bristol gave an excellent and well illustrated lecture to a large audience on plate tectonics, with particular emphasis on the activity at the mid-ocean ridges. The theory of plate tectonics, which dates from the mid-1960's, suggests that the earth is divided into a number of rigid plates. Some of the plates are continental and some oceanic, and they move relative to each other. The movement is thought to be generated by convection currents at a depth of 150km. The mid-ocean ridges form where the plates move apart; the rate of movement varies from place to place, for instance it is fast in the east Pacific and much slower in the Atlantic. These ridges are continuous over their 50,000 km. length and they are particularly active zones with igneous activity occurring all the time. Consequently the heat flow is up to 50 times the normal over the rest of the earth's surface. Subduction zones occur where the plates meet and oceanic crust disappears under continental material. It seems probable that such movements have gone on throughout the earth's history since the crust solidified.

The mid-ocean ridges are characterised by the upwelling of magma to form new oceanic crust and submarine volcanoes, and transform faults at right-angles to the ridge. When the magma reaches the surface it splits symmetrically on either side of the ridge giving rise to parallel strips of solid material that can be discerned by polarity changes in the iron content, associated with past changes in the position of the North Pole.

The rate of separation of the plates gives rise to different phenomena at the ridges. Where movement is fast, over 10 cm. a year, the surface profile of the ridge is relatively flat with fissures and a central volcano that is continuous along its length. Intermediate movement of 5 to 10 cm. a year gives rise to bigger faults, a flat central portion and discontinuous volcanoes arranged en echelon. Where the movement is less than 5 cm. a year, the volcanic activity is sporadic, e.g. Hawaii, and the ridge itself there is a trough with parallel faults giving rise to a rift feature. The nature of the mineral layer on the sides of the magma chamber also gives a clue as to the rate of separation. The layers of crystals are vertical where movement is slow, and inclined where faster.

The magmatic material that reaches the surface of the mid-ocean ridges comes from the mantle where peridotite, an olivine-rich rock with a similar chemical composition to basalt, is common. Peridotite melts at 1200° C at atmospheric pressure. At depth in the earth's crust temperature and pressure increase, but the increase in pressure causes the temperature at which melting occurs to increase also. Thus at 150 bars pressure peridotite melts at 1700°C. The temperature at 150 km. is 1500°C and although this is insufficient for melting it does occur. There are two likely mechanisms:-

(a) If some of the mantle material rises near to the surface by convection, the pressure on the rock decreases and melting can occur at the crystal margins.
(b) The presence of water in the rock, even as little as 0.1%, reduces the melting point appreciably.

In the early stages of melting there is a mixture of molten material and crystals, and this diffuse layer can be identified by the slowing down of seismic waves as they pass through. As the mantle rises 15 to 20% melts and as the liquid is less dense it encourages upward movement. The molten material eventually joins together to form a magma chamber at a temperature of 1200°C beneath the mid-ocean ridges. The magma chamber can also be identified seismically because the waves are deflected. The composition of the magma varies slightly according to the depth at which the mantle melts. Crystallisation can occur at depth to form plutonic rocks, in surface sediments to form dolerite dykes, or in pillow lavas at the surface to form basalts.

Although the magma is basaltic, a wide range of rock types can occur at the ridges because of differential crystallisation related to the thermal gradient of 400°C per km. Differentiation is more pronounced the slower the magma rises to the surface. High temperature minerals crystallise out first and thus give rise to a marked banding of minerals in the rocks at the margins of the magma chamber. This process can also result in masses of granite occurring in a gabbro. The rate at which the magma reaches the surface gives rise to different features. Where this is fast lava flows can spread out for a few kilometres from the mid-ocean ridge, and where slower pillow lavas form.

A fairly recently discovered feature associated with the mid-ocean ridges is the black smoker. This is a vent through which sea water which has mixed with magma at depth comes back to the surface at a temperature of 350°C; it is a source of much heat loss. The water contains dissolved metal sulphates, namely copper, iron, manganese, cobalt and zinc. Consequently rich metalliferous deposits are found around these pipes.

Dr. Bradshaw illustrated the activity at the mid-ocean ridges with examples from Iceland and Cyprus. Iceland is a present "hot spot", astride two ridges, the Mid-Atlantic and that betweenGreenland and the Faroes. The ridges at Iceland are atypical because they are above sea level. However, the rocks are similar to those forming in the oceans. Iceland is splitting apart at 10 cm. a year and in some places at 2 m. a year, which results in spectacular surface crevasses. The volcanic island of Surtsey lies at the ridge. Lava is produced progressively and extruded to the surface, and geothermal activity is associated with this volcanic activity. These processes have been going on for a long time and the mountains can be seen to consist of several hundred lava flows.

In Cyprus the ocean floor has overridden the continental plate and the sea floor has come to the surface. The island consists of a huge complex of basic igneous rocks with a concentric pattern. The rocks dip from the central core, the Troodos Massif, which was intruded causing uplift that gave rise to a dome. The central part consists of gabbro which contains blocks of granite. This is surrounded by the sheeted dykes which formed at a gap in the lithospheric plate, and then the pillow lavas. The sedimentary rocks into which the core intruded and the materials around the pillow lavas are rich in metalliferous minerals, especially copper.

Margaret Oliver:

The Shropshire Mammoth:

We are grateful to John Norton of Ludlow Museum and the Shropshire Geological Society for information from which the notes below were taken.

In September 1986 the remains of mother and calf mammoths were found in a quarry near Shrewsbury. About 75% of the skeletons have been found, in quite good condition, and giving scope for detailed study. No previous specimen found in

Britain is so nearly complete, or from so late in the Pleistocene. Associated fauna are similar to those of the present Arctic regions.

Studies proceeding now include radio-active dating, geophysical tests and osteological studies. The specimens may be sufficiently complete to mount as an articulated skeleton on a frame.

Courses for the Public:

1. Bristol University Extramural Dept. Wills Memorial Building, Queen's Road, Bristol BS8 1HR. Tel. 0272 303030 Ext. 4633.

Field trip to the Lake District: Dr. R. Bradshaw, 5-8th April. £95.00. Based Keswick. CB6 K001 SJR.

Minoans and Santorini: 6-20th May. £330.00. Dr. P.G.Hardy. CB6 Z003 RHR.

Building stones of Wells: 26th April. £7.00. S86 D020 SJ.

Central Andes. Advance notice for 1988. 2-3 weeks. Approx. £2,000.00. Enquire for details.

2. Nottingham University Extramural Dept., 14 Shakespear Street, Nottingham NG1 4FJ. Tel. Nott. 473022.

Alston Block and Cross Fell. 26-28th June. £58.50. Based Penrith.

Isle of Arran. 23-29th May. £138.00.

Shropshire. 1-3rd May. £52.00.

Dorset Coast. 9-11th Oct. £55.00.

3. Geology of Northumbria. Countrywide Holiday Assoc. Birch Heys, Cromwell Range, Manchester M14 6HU. £60.00. 11-13th September.

4. Scottish Field Studies, Juniper House, Loch Broom, Ullapool, Ross shire. "Towards the Past" 29th Jly 5th August. £20. deposit. Choice of accommodation. Tel. Ullapool 2568. Recommended by Paul Shilston!

Exhibition - Dinasaurs from Chine
National Museum of Wales. 20th Dec. - 10th April.

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From the Papers:

A report from the Lancashire Evening Post states that the major oil companies are to switch on-shore exploration from the south of England to the north-west Exploration licences have been issued by minister Alick Buchanan-Smith. The largest plot (BP) covers the area from Fleetwood to Formby, including the whole of Blackpool and most of the Fylde. In total 74 licences have been issued covering 8500 square miles. Amoco have a 600 sq. km. area centred on the Pennine town of Darwen and including Chorley. Other sites include the northern coastal plain of Lancaster and Garstang. It is hoped that the area will provide an economic alternative to expensive North Sea operations.

(continued)

AGM

BLACK COUNTRY GEOLOGICAL SOCIETY.

Notice is hereby given that the twelfth annual general meeting will be held on Monday 16th March 1987 at 8pm at Saracens Head, Stone Street, Dudley.

AGENDA.

1. Apologies for absence.
2. Minutes of the AGM held on 17th March 1986.
3. Statement of accounts and Treasurer's report.
4. Chairman's annual report.
5. Election of officers and committee.
   - (a) Chairman
   - (b) Vice-chairman
   - (c) Hon.Secretary
   - (d) Hon.Treasurer.
   - (e) Field secretary.
   - (f) Four committee members.
   - (g) Hon. Auditor.
6. Any other business.

The retiring officers and committee are :

Chairman	A.Cutler	
Vice-chairman	J.Golledge	
Hon.Secretary	P.D.Shilston	
Hon.Treasurer	A.Sutcliffe	
Field Secretary	G.J.Worton	
Committee members	W.J.Easter	Mrs.H.Giltrap
	S.R.Hughes	A.Rigby

SUBSCRIPTIONS 1987

Membership subscriptions are now due and should be paid to the Hon.Treasurer :

A.Sutcliffe
63 Riverside Drive,
Solihull. West Midlands B91 3HR.

Subscriptions can also be paid at any meeting.

SUBSCRIPTION RATES ARE AS FOLLOWS :

Individual membership	£9 per annum.
Family membership	£12 "
Student membership	£2.50 "
Associate/group membership	£25 "

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BLACK COUNTRY GEOLOGICAL SOCIETY.

NAME

ADDRESS

Telephone :

I/We enclose ..... for ..... membership. DATE :-