



NEWSLETTER NO. 121

FEBRUARY 1997

The Black Country Geological Society

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 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 in the Banquet Room (Dudley Suite) at the Ward Arms Hotel, Birmingham Road, Dudley. Phone: (01384) 458070. 7.30 p.m. for 8 o'clock start.

MONDAY 17th FEBRUARY. 7.45 p.m. Annual General Meeting. (*See announcement in the December newsletter*). Followed at 8.00 p.m.. (approx.) by two short lectures by Society members who have visited the locations recently:

Easter Island by Sheila Pitts.

Geology of Gibraltar by Paul Shilston.

EASTER ISLAND is the loneliest inhabited place in the world, located deep in the South Pacific thousands of miles from the nearest landmass. It is situated over a 'hot spot' in the Earth's crust and so its origin is entirely volcanic. While its geology is of considerable interest, what makes Easter Island so special are the colossal statues of different types found widely across the island, created and erected by the islanders with only the most basic equipment.

Sheila Pitts has visited many remote parts of the globe and has spoken to the Society several times of her travels including talks on Kenya, New Zealand and the Falkland Islands.

GIBRALTAR is obviously a 'rock' and so must have geological connections and in fact it has a lot of geological interest. It is composed mainly of Jurassic limestone, some of it the right way up and some overturned, while there are many additional features including extensive cave systems developed in the limestone, ancient cliffs and wave-cut platforms eroded as the sea-level rose and fell, and the remains of sand dunes built up during strong easterly winds.

Paul Shilston visited Gibraltar a few years ago on a bird-watching trip but couldn't help looking at the geology at the same time and this talk is the result.

SATURDAY 1st MARCH. Morning visit to Wolverhampton Museum & Art Gallery to see items from the FRASER COLLECTION not normally on display. This is an important geological collection built up by Dr. Fraser who was a Victorian enthusiast. For many years it was in store at various locations in the Midlands and it is now housed at Wolverhampton, but due to lack of space only a small part of it (the display Dr. Fraser's Fossils) is normally on public view.

Meet at 10.30 a.m. at Wolverhampton Museum and Art Gallery, Lichfield Street, Wolverhampton (in the town centre).

Chairman
A. Cutler B.Sc., M.C.A.M.,
Dip.M., M.C.I.M.

Vice Chairman
G. J. Worton B.Sc., F.G.S.,
A.M.I.Geol., M.I.Env.Sci.

Hon. Treasurer
Mrs J. Shilston

Hon. Secretary
P.D. Shilston M.A., C.Eng.,
E.I.E.E., M.I. Mech.E.

The visit will be organised by Rosemary Roden, a geological conservator who carried out the work of rescuing the Fraser Collection from the basement of Himley Hall; she set up the children's display 'Dr Fraser's Fossils' in the Museum as well as curating the rest of the collection which is now in store.

MONDAY 17th MARCH. Lecture: Mineral exploration in Europe by Dr. Christopher Morrissey (RTZ Mining & Exploration Ltd.)

Dr. Morrissey writes: "Europe has a 500 year history of mining for metals and minerals, involving some of the largest and richest orebodies that have yet been found anywhere in the world. At present, however, only a few European countries have important mining industries of that sort and the continent attracts only a small percentage of worldwide investment in mineral exploration.

Geologically there are strong incentives for selective mineral exploration in Europe, but there is a shortage of the necessary technical services and information. Overcoming these and other problems can still be worthwhile in a region that consumes about a third of all the metals and minerals mined throughout the world."

DR. MORRISSEY is responsible for RTZ's mineral exploration in Europe but also has an advisory role as their Chief Geologist, western hemisphere. He trained as a mining engineer in South Africa and has worked as an exploration geologist in Ireland, Africa, Canada, Saudi Arabia and elsewhere. More recently he managed the exploration programme developing the Morro do Ouro gold deposit in Brazil and the Las Cruces copper deposit in Spain.

MONDAY 7th APRIL. (*Please note change top the date*) Lecture: Evolution and extinction of Trilobites by Dr. Bob Owens (National Museum of Wales).

Trilobites are everyone's favourite fossil and Dudley is the home of the trilobite, so we are always glad to have a lecture from an expert describing their life and times. Trilobites appeared in the Cambrian and lasted through to the Carboniferous so they had a long period of existence; during that time many varieties of trilobite appeared and they are found world-wide. Dr. Owens' lecture will describe the anatomy of the trilobite and will cover the development, success and eventual extinction of the species.

DR. BOB OWENS is a palaeontologist with the National Museum of Wales in Cardiff and has made a special study of trilobites. He lectured to the Society a couple of years ago on his 'hobby' subject "The Solar System" and now we are glad to welcome him speaking on his 'mainstream' topic.

SUNDAY 18th MAY. Field meeting to Shropshire, Wenlock Edge and Leintwardine. Leader: Dr. Paul Smith (Birmingham University).

Meet at 10.30 a.m. at Wenlock Edge Inn (grid ref: 570963) on the B4371 road about 5 miles southwest of Much Wenlock. Preferably park at the roadside NOT in the Inn car park.

The Welsh Borderland is the classic area for study of the Silurian system and it includes most of the localities after which the subdivisions are named, as well as being an area of great natural beauty. This visit will be mainly in the Silurian of Shropshire and will visit a number of key localities probably including:

- Ippikins Rock, Wenlock Edge (570965) for general view of Wenlock Edge and its setting.
- Hillend Farm (397877) for beds of the Silurian Llandovery series containing *Pentamerus brachiopods*.
- View Edge (416804) for Aymestry Limestone - Silurian Ludlow series.
- Mocktree Quarry near Leintwardine (416753) for submarine canyon features in the Ludlow series.

The lunch stop will probably be at the Plough Inn at Wistanstow (432854) about 2 miles north of Craven Arms.

DR. PAUL SMITH is Curator of the Lapworth Museum, Birmingham University, and is a member of the academic staff. He is also a member of this Society and has been very helpful to the Society in many ways.

Members of the Manchester Geological Association will be joining us for this field meeting.

SUNDAY 8th JUNE. Field meeting to the southern section of the Malvern Hills. Leader: Eddie Bailey (Society Member).

FRIDAY 20th - SUNDAY 22nd JUNE. Weekend field meeting 'The Western Margins of the Peak District' organised by the Geologists Association. Leader: Judy Rigby.

The meeting will be based at Buxton, Derbyshire, starting on Friday evening and finishing on Sunday afternoon. On Saturday the party will study the Carboniferous Limestone areas of the 'White Peak' around Castleton, and on Sunday the River Manifold area and Brown End Quarry at Waterhouses.

As the BCGS is affiliated to the Geologists Association, there is no leader's fee or tuition charge but members must provide their own transport and arrange their own accommodation. The meeting will be based at the Buckingham Hotel (half-board £45 per night) and the Leader can also provide some B&B addresses. Members intending to join the meeting should inform the Leader (Judy Rigby). Her phone number is (0115) 926 7699.

MONDAY 23rd JUNE. Evening field meeting (5.30 p.m. - 8.30 p.m.) to Snailbeach Historic Site and Old Mine looking at the surface features with an underground visit to the mine. Snailbeach (grid ref: 380022) is about 16km (10 miles) southwest of Shrewsbury. Leader: Peter Sheldrake (Shropshire County Council, Environmental Dept.)

SUNDAY 6th JULY. Afternoon field meeting to the Ironbridge area (meeting at 2.00 p.m.). Leader: Adrian Collings (Ove Arup/Society member).

FRIDAY 12th SEPTEMBER to SUNDAY 14th SEPTEMBER. Rock and Fossil Fair at Dudley Town Hall.

SUNDAY 12th OCTOBER. Field meeting to Aust Cliff (near the Severn Bridge) and Hock Cliff near Frampton-on-Severn. Leader: Andrew Mathieson (Bristol City Museum).

MONDAY 24th NOVEMBER. Lecture by Dr. R.J. Kennedy (Birmingham City Museum).

MONDAY 19th JANUARY 1988. Lecture on Greenland Geology by Dr. Paul Smith (Birmingham University).

EDITORIAL

I treated myself over Christmas to a copy of 'The Hidden Landscape: A journey into the geological Past' by Richard Fortey, published now by Pimlico. Its beautifully written and an exciting read. Totally unconnected with the above, recently I gave a lecture on the Geology of Great Britain to my local Natural History Society. I include a copy of the account of the event published in the local newspaper.

Members busy seeing just how the land lies

At the November meeting of Sutton Coldfield Natural History Society, Kate Ashcroft gave a lecture entitled 'The Making of Great Britain: Geology and Landscape'.

She attempted to explain how geological influences can be picked out and identified in the landscape, and how Great Britain has been built up through time.

The oldest rocks, more than 3,000 years old, are to be found in the north of Scotland, she told members.

Slides were shown of

these and the younger rocks that were laid on top of them.

Very old rocks can also be found in the Midlands sticking through younger cover rocks in Charnwood Forest, the Wrekin and the Malverns.

Most of Wales, the Lake District and Scotland was built up when a great mountain chain, greater than the Alps and Himalayas of today, was welded on.

Later, a chain of mountains was added in the south in what is now Devon and Cornwall.

Most of England consists of sediments laid

down under sea, and our landscape is made of these sediments, raised up and folded.

The slides showed the features which result from the folding, as well as pictures of Sutton's rocks.

The Ice Age came very late in the history after a late phase of volcanic activity in the north west of Scotland.

Evidence of all this can be seen in the landscape.

It's a useful reminder, especially in view of the forthcoming election, that one should not believe everything one reads in the papers!

REPORTS

Lecture: Ancient miners, modern collections by Dr. R. Ixer (Birmingham University) November 25th

Early Irish and copper bronzes

Until quite recently it had been accepted by the archaeological community that the oldest of the copper/bronze finds in the British Isles had been imported from Central Europe although there are numerous examples of early copper extraction and working within the U.K. Olden day workings at Great Orme, Parys Mountain, Alderley Edge and Ecton etc. immediately spring to mind. The earliest working had been attributed to the Romans. Hardly any mainland bronze artefacts contained arsenic. The fact that similar parallel operations had taken place around Mount Gabriel (Upper Devonian O.R.S. facies) and Ross Island (Lower Carboniferous- Dinatian) both in the province of Munster, SW. Ireland was worthy of notice since Ireland had never been invaded by the Romans. Also of significance was the fact that most of the Irish Bronzes found in the extreme SW corner of Ireland do contain, uniquely, about 2% arsenic and that the finds decrease in number quite rapidly towards the N. and E, which in turn suggests an origin in S.W. Ireland.

Detailed and thorough searches amongst 200 or so possible locations for a suitable arsenic containing source of this 'old copper' in S.W. Ireland was carried out by Dr. Bob O'Brien of the National Museum, Dublin. Obviously the source had to be compatible with the small % of arsenic in almost all these Irish bronze artefacts. In order to confirm this postulate of a local and probably isolated extractive operation in south west Ireland it was necessary to:-

- (i) establish the location of the pre-Roman mining and extraction centres, which was very difficult because of subsequent mining activities. Clues such as the finding of crude tools for working the Cu/As ore (as at Mount Gabriel), of ore caches and spoil, of charcoal for carbon dating alongside part burnt ore and vesicular slag would provide strong supportive evidence.
- (ii) carry out chemical and mineralogical analyses of all local copper occurrences to try and find an ore which matched the unusual arsenic content of these early Irish bronzes.
- (iii) establish whether appropriate local technology existed in Munster
- (iv) find some other criteria which could be used to confirm, quite independently, a direct link between the artefacts and the finds.

Minerals and ores

There are three main types of copper minerals: (i) native copper which is quite scarce in Europe, (ii) easily recognised blue green oxy-minerals, commonly products of surface weathering in limestone environments, and (iii) dark coloured sulphidic minerals, fahlerz, from which it is very difficult to extract copper but which could contain arsenic. The problem is that since arsenic only occurs in this third type of copper how did the Irish manage to produce copper/arsenic bronze?

A Bronze age Irish detective story.

Recent trends in archaeological thinking are inclined to the view that around 2000 B.C. the production of Beakers and more especially copper artefacts had developed more or less simultaneously yet independently in certain localities and was probably not the result of yet another invasion from Europe. In Ireland the oldest 'Bronze Age' metal artefacts found so far are of nearly pure unalloyed copper, too soft to make good tools and weapons. Perhaps in Ireland the Bronze Age was preceded by a 'Copper Age'.

So what about the arsenic?

Beware archaeologists who delve into the dustiest, most obscure and almost forgotten mineral collections. One of them had found a good hand specimen of olivenite, which is quite rare, in an Irish museum. Hey presto!..... the solution!, this had to be the source of the elusive arsenic. Unfortunately one swallow does not make a summer. Olivenite is very rare, and Bob Ixer was able to show that there is hardly any in Ireland. In a tour de force of reflectance microscopy slides, which took my breath away, he was able to identify an amazing variety of minerals, often in minuscule quantities; but no olivenite. (Surely Anfield is the main source of Spion Kopite!)

A systematic, science based approach, narrowed the earliest production sites down to Mt. Gabriel and Ross Island, both just within the Cornubian mineralization field. No early Bronze Age site, uncontaminated by more recent activities was found but in the limestone caves at Ross Island there are many ore types including some fahlerz and at nearby Muckcross various Co/Ni/Cu/ As/ S minerals. In 1995 O'Brien found 4 tiny bits of ancient vesicular slag and some burnt ore alongside shards of Bronze age beakers beneath much recent spoil and Ixer found microscopic blebs of Cu/ As bronze in the slag. Thus a slag producing process must have been employed. However its not at all clear exactly what flux was used (silica?) or even which mineral was the actual source of the arsenic. Nevertheless Ross Island seems to have everything.

Since all copper minerals contain a trace of lead, mass spectrometric analyses to determine the isotopic ratio Pb(204)/radiogenic Pb(206) in Irish bronzes and in Irish copper containing minerals could be useful in establishing whether any correlation existed between them. Since the ratio in both the Cu/As bronzes and the Ross Island samples showed similar deviations from the standard crustal values it gave strong support to the claim of Ross Island to have been the site of the earliest Bronze Age copper working in the whole of the British Isles, about 4000 years ago. It also strongly suggested that there have been two widely separated copper mineralization events in SW Ireland.

(A more detailed illustrated account of this lecture is available on request to the editor.)

Alf Cole.

Report of the Annual meeting of the Tectonic Studies group of the Geological society of London. 15-18 December 1996 Report from Dr. Jonathan Turner of Birmingham University

Tectonics is that branch of geology and geophysics that deals with the dynamics of, and the mechanisms by which, Earth's principal topographic features - its mountain ranges, basins, plateaux and deep oceanic trenches - are formed and deformed. During the week preceding Christmas, an assortment of approximately 180 geologists and geophysicists from across Europe and the US convened at Birmingham for the 27th annual meeting of the Tectonic Studies Group of the Geological Society of London. The TSG has become the principal UK forum for the presentation of current research in tectonics and structural geology. It has a long tradition of informality and open discussion and, consequently, there was a fairly even balance of talks and posters from professional earth scientists and from research students.

The three days of technical sessions were preceded on the Sunday by a field excursion in the Birmingham area. This provided an opportunity to study the regional setting and structural sedimentary characteristics of the distinctive red Triassic sandstone that crops out throughout the West Midlands. Across much of NW Europe, the favourable porosity and permeability of the Triassic sandstones makes them an excellent reservoir for large accumulations of oil and gas. The day included a visit to a rare example of an active oil seep in Triassic rocks that was discovered by a Birmingham postgraduate just outside the village of Cookley, near Kidderminster. The seep testifies unequivocally to the presence of organic carbon-rich "source rocks" beneath the so called Worcester Graben (rift valley) that are currently experiencing just the right combination of temperature and pressure to generate and expel oil.

Oral and poster presentations combined direct observations from fieldwork, rock deformation experiments and laboratory analysis, and remotely sensed data from satellite and deep seismic probing, to investigate a variety of tectonic problems. A large number of presentations were devoted to understanding mechanisms by which faults propagate in the sub-surface, and are then reactivated repeatedly during subsequent periods of stress build-up. Interest in faults and faulting is currently a prime area of structural geological research due largely to their economic significance. Faults probably constitute the principal conduit along which hydrocarbons and ore mineral bearing fluids are transported, sometimes from tens of kilometres beneath the surface, to relatively shallow depths in the crust. However, as well as being required to transmit fluids, oil companies are realising the important role played by faults in sealing oil and gas fields by acting as barriers to fluid flow. Improved understanding of faults means that the history of faulting is now routinely incorporated in oil companies' evaluations of prospectivity. Furthermore, increasing realistic models of fault systems are helping reservoir engineers to plan the production schedules of new oil and gas fields.

Another highlight of the meeting was the session devoted to Himalayan tectonics. The Himalaya and Tibet plateau comprise the thickest crust on Earth (c. 80km) and they are undergoing the most rapid rates of uplift (around 2cm/yr in the Karakoram mountains of northern Pakistan). They are largely responsible for the Asian monsoon and, by drawing down CO₂ as an essential part of rock weathering, they are directly implicated in Tertiary global cooling. Hence, investigations of Himalayan tectonics tend to be strongly multi-disciplinary with major implications for other branches of science. As the chief area on the continents presently undergoing horizontal shortening, the Himalaya provide a superb natural laboratory in which to study relations between compressional deformation, crustal thickening and the rheological and chemical changes that accompany the temperature and pressure metamorphism of the rocks caught up in mountain -building. During the meeting, many presenters were able to draw parallels between the Himalaya and observations from ancient, and now inactive mountain belts such as the Caledonian mountains of the Scottish Highlands.

Research presented from Birmingham concentrated mainly on the use of seismic reflection profiling to investigate the development of hydrocarbon-bearing basins in Cardigan Bay and offshore West Africa. Funded largely by oil and gas exploration companies, this research has integrated observations from boreholes and fieldwork and the seismic data to reconstruct the history of sedimentary basin subsidence, uplift and deformation. A notable highlight has been the recognition of large-scale submarine slumps that developed during periods of especially deep water. Offshore West Africa, slabs of limestone, up to 2km thick and 20km wide, slid some 20km westward into deep water from a shallow

water position at the edge of the basin. Along much of the length of West Africa, they record the spectacular collapse of the basin margin during deep water conditions that prevailed some 100 million years ago, in the mid Cretaceous. Thus, the presence of an active research group in tectonics and structural geology in the School of Earth Sciences, and excellent facilities provided by The University and the city (including a superb conference dinner at *Chung Ying Garden* restaurant in Hurst Street), made the TSG meeting a great success.

Jonathan Turner

CONSERVATION COLUMN

Just a brief note this time to thank those hardy individuals who turned up on the 26th January to pick over rock debris at Dudley Zoo to collect specimens for Dudley Museum. This was material from specific beds within the Dudley limestone sequence as part of a "precision stratigraphic collection". I can report that we found a range of "beasties" building up a picture of the conditions in the Dudley Seas at the time. The prize of the day was a trilobite discovered by Nigel Bradley which constitutes an important find both scientific and aesthetic.

There are some interesting projects coming up and I'll announce these future conservation activities at the AGM. My apologies for the lack of a logo this time. One was supplied but will unfortunately have to be published in the next newsletter. Keep 'em coming in though! Until next time

Graham Worton

ITEMS IN BRIEF

1. Welcome to new members
Dr. John Powell - British Geological Survey, Keyworth
Marisia Townsend - Gloucester.
2. Nottingham University advertise 'Islands of Scotland' landscape and scenery course based on Mull which will include visits to Staffa and Ardnamurchan and runs from 7th -14th June 1997. Contact 'Learn at Leisure', University of Nottingham, 14 Shakespeare Street, Nottingham, NG1 4FQ Tel 0115 951 6526
3. Congratulations to Vice Chairman Graham Worton on his engagement to Dr. Sarah Lidgley. We wish them every happiness.

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