NEWSLETTER NO. 132

DECEMBER 1998

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 25 JANUARY 1999 Lecture: Dr. Paul Smith. This is the lecture unavoidably cancelled on 19th January this year. "Hunting the Snark - the geology of the northernmost Caledonides."

Dr. Paul Smith writes: "Caledonides are the remains of huge mountains thrown up during the Caledonian orogeny, around 400m years ago at the end of the Silurian. At that time, due to plate movements, Scotland, Greenland and Norway were close together so that the Caledonide belt after leaving the Scottish mainland passes across Shetland and continues up the Atlantic coasts of Norway and Greenland. Until recently the Greenland Caledonides were poorly understood - a direct consequence of their remoteness, difficulty of access and the mountainous, ice-covered terrain.

The northernmost part of the Grrenland Caledonides lies at 81 deg North before disappearing into the Arctic Ocean, and the talk will compare the geology of this remote area with the more familiar geology of north-west Scotland. The area is part of the world's largest national park and the nature of the fauna and (limited) flora will be examined, together with the logistics of working in one of the world's remote areas."

Dr. Paul Smith is Curator of the Lapworth Geology Museum at Birmingham University and is also on the Academic Staff of the School of Earth Sciences. His special interests are the Geology of Norhern Greenland and the Development of Fish in Palaeozoic times; he lectured to the Society on this last subject in 1995, so now he will speak to us about his researches in Greenland. He is a good friend of this Society and is one of our own members.

SATURDAY 21st FEBRUARY Conservation work at Hay Head SSSI, Walsall. Meet at the Three Crowns Pub on the Sutton Road, Walsall. (SP 049 981) at 10.00 a.m. See Conservation Column for more details.

MONDAY 8th MARCH 1999 7.45 p.m. ANNUAL GENERAL MEETING.
Followed at 8pm (approx.) by a lecture: "The Failed Sellafield Deep Nuclear Waste Repository Project." by Colin V. Knipe, B.Sc., C. Eng, C. Geol, M I Min.E . MIMM, F.G.S., Senior Partner, Johnson, Poole and Bloomer, Land Consultants.

Colin Knipe was appointed by the Department of the Environment to be the Technical Assessor to assist the Inspector and Assistant Inspector at a planning inquiry into the refusal by Cumbria County Council to permit U.K. Nirex, the national nuclear waste disposal executive, to construct a deep underground exploratory mine in the Borrowdale Volcanics at Sellafield. This "Rock Characterisation Facility" was intended to be a large scale test bed for the construction and hydro-geological modelling of a deep nuclear waste repository. The 66-day enquiry heard evidence on an amazing array of geological and other scientific research relating to the site and its suitability over a time scale of millions of years to host a waste repository. On the strength of the Inspector's and Colin's reports the Secretary of State, John Gummer, rejected the scheme in March 1997 throwing the whole future of U.K. nuclear waste disposal into turmoil.

MONDAY 29th MARCH 1999 Lecture 'Permian Seas, Triassic Desert, Devensian Ice, and Houses in Holes in North Yorkshire' by Dr. Anthony Cooper, British Geological Survey.

Permian and Triassic sequences crop out along the western margin of the Vale of York. They illustrate the evolution from a desert land surface to the enclosed evaporitic Zechstein Sea (with several cycles of evaporite deposition) through to the desert environment of the Triassic sandstones.

Partially concealing the solid rock, the Quaternary deposits along the margin of the Vale of York record the evolution of the Devensian glaciation. Buried and diversionary valleys cut through the Permo-Triassic sequence exposing the rocks in places like the Knaresborough gorge. Moraines and eskers parallel the margins of the ice sheet and give a distinctive morphology to the area.

The geological legacy of the Devensian buried valleys and the presence of two thick gypsum sequences in the Permian succession results in spectacular natural catastrophic ground subsidence. This is caused by gypsum dissolution underground and the collapse of caves, especially around Ripon, North Yorkshire. Here holes up to 35 metres across and 20 metres deep have appeared often without warning! In the past 150 years, 30 major collapses have occurred, houses have fallen into holes and locally about a million pounds worth of damage has occurred in the last decade.

Dr. Cooper has 22 years experience in the investigation, interpretation, engineering geology and hazard assessment of subsidence caused by gypsum dissolution. He is advisor to industry and government on investigating and planning for gypsum geo-hazards.

SUNDAY 18th APRIL An introduction to Black Country Geology. Itinerary to be confirmed. Leaders: Graham Worton and Alan Cutler.

SATURDAY 8th MAY Field Meeting to Northwich to study the Mercia Mudstone Group, Northwich Halite and other mudstone formations overlain by Pleistocene strata. Observation of salt subsidence features such as terraces, flashes, linear valleys and brine springs. Leader: Dr. John Stanley (Earth Science Department, Keele University).

SUNDAY 20th JUNE Field Meeting to Derbyshire. Itinerary to be confirmed at a later date Leader: Spencer Mather.

SUNDAY 25th JULY Family Meeting to Clearwell Caves, Cinderford, in the Forest of Dean. The largest working ore mine in England, now open to the public. Guided Tours provided. Details to be published at a later date. Limited spaces available.

SUNDAY 12th SEPTEMBER Conservation: Protected sites within the Black Country. Itinerary to be confirmed. Leader: Graham Worton.

AUTUMN 1999 (Dates to be arranged).
OCTOBER Dr. Roger Dackombe "The Quaternary of the Isle of Man: the problems of deciphering the glacial history of the Northern Irish Sea Basin".

NOVEMBER Dr. Charles Turner " The Ice Age Fauna and Flora of England".

EDITORIAL

Sunday nights at present are set aside for watching T.V. "Vanity Fair", freely but brilliantly adapted by Andrew Davies, is true to the spirit of the novel and I delight in watching the way of the world but have not time to reread the text to spot the many changes to the narrative.

"Earth Story", on BBC 2, is another matter. The interest here is in trying to understand the logic, if any, of the series. In my house it has become a new form of inter-active T.V. "But why have they gone there", I ask. "No it isn't", I contradict. The programme seems to work from the premise that geology isn't intrinsically interesting and so must be made so. Hence a superfluity of adjectives (everything is startling or amazing) and visits to 'exciting' locations are accompanied by dancing natives in national dress. The series seems to lack overall geological understanding and control. A long sequence about sea level change is used as major evidence for subduction. It is implied that all land rocks are the same mineralogically and it is said that all derive from volcanoes at subduction zones. The "gentle hills of the Lake District were once as violent and dangerous as the Ring of Fire". "Really"? Am I alone in my appraisal of this series? Will anyone write to the BBC and object? Or am I just growing old, pedantic and querulous?

REPORTS

Sunday 27th Seeptember. Field meeting to Southam Cement Works and Quarry and Burton Dassett Hills. Leader: John Crossling of Warwickshire County Council. (Formerly Assistant Curator of Warwickshire Museum at Warwick).

This trip was in two parts, starting with the quarry at Southam Cement works on the A423. John's teaching experience as a museum curator and his enthusiasm made for a pleasant and informative day. Southam was chosen for a quarry and cement works because the rock consists of alternating bands of limestone and shale, both of which are used in the manufacture of cement. The bands are between five inches and a foot thick. We started at the lowest level of the quarry where we stood on the top of the Triassic, 180 MYA.

The limestone bands were precipitated out of solution since Calcium Carbonate becomes less soluble as temperature rises over 30°C. Because the limestone was formed in relatively deep water there are only a few fossils, mostly bivalves and brachiopods, and including some quite large complete molluscs. Under John's guidance we found some part fossils of Diplocraterium yoyo. This creature lived in the mud and had two projecting tubes, one for food in and one for the other stuff out To keep its tubes just above the mud it had to constantly move up or down, hence the name yoyo. In the cement plant an employee had a display of fossils including a number of Ichthyosaur vertebrae. The shale bands were probably deposited by a river estuary which moved sideways and /or forwards/backwards over periods of hundreds of years.

We drove to the Red Lion pub in Northend for a rather late lunch, and from there walked up and down some of the hills in the Avon Dassett Country Park for an excellent lesson in geomorphology. The Burton Dassett hills are the NW outlier of Oxford Ironstone which forms a cap over soft clays, giving a characteristic "break of slope", i.e. the slope is steeper near the (harder) top of each hill. The Age is about 160 MYA (mid Jurassic). The ironstone was mined for smelting until 1914 and makes an excellent building stone with a very rusty colour. By the end I was shattered from too much walking for an old wreck like me, but at least the rain held off.

Martin Normanton

Monday 26th October. Lecture: "A glimpse of Namibian geology with an excursion to Kimberley and its diamonds" by Dr. A. C. Waltham (Nottingham Trent University).

Tony Waltham began by describing Namibia as "a big flat place" but we were to learn much of interest. We began in the north where the flatness was broken by classic granite inselberge. We saw Triassic rocks from which huge petrified trees had been exhumed and in which large dinosaur prints had been preserved. African cave art was produced by the scraping off of desert varnish from the rocks.

Close to Windhoek and dating from 80,000 years ago is what may be the largest meteorite in the world. Anything larger would explode through differential atmospheric heating. A visit to the shopping mall in Windhoek revealed a display of 25 nickel iron meteorites, just some of the 80-90 which are to be found south of Windhoek.

Conical hills in the north are of limestone and enclose huge limestone caverns and lakes. The rocks are heavily mineralised with over 2000 minerals, 400 unique to this area. The site is economically worked. From the limestone, springs emerge to feed waterholes and the great saltpan of Etosha. Caliche is precipitated in the floor of the dried up pans and the waterholes are a magnet for migrating game. Dr Waltham believed he had identified an earthquake scarp. The metamorphic cratons mentioned in the flyer for this lecture are what the older members of our society were taught to refer to as Precambrian shields and were represented in the lecture by photographs of some "lovely gneiss". Uranium is mined from the metamorphic basement.

A journey across the Great Karoo revealed a huge sequence of undisturbed horizontal rocks from Carboniferous to Late Mesozoic. At the base of the sequence, on the surface below the unconformity, are glacially moulded roche moutonnée and the Dwyka tillites of the Permo Carboniferous glaciation.

The Kimberley Big Hole in South Africa is dug 1000 ft. down through Late Precambrian i.e. Proterozoic quartzites and lavas. The Big Hole resulted from the vertical hand digging of many prospectors searching for the large gem quality diamonds but surface working was plagued by landslips and mining underground was resorted to. The kimberlite pipes are Cretaceous and the upper part is brecciated and eroded. The first diamond finds were from gravels transported by rivers. Any romantic illusions were shattered by the descriptions of present day mining from 1000 ft. underground shafts entered by horizontal tunnels known as scraper levels. The diamonds are found in rotted, serpentinised, thermally altered rock and as the 'gunge' is scraped away yet more rotten rock falls down the shaft to be scraped up in its turn.. The diamonds when found are mostly locked up in De Beer's vaults lest over production should bring down the price. (Diamonds, it would seem, may not be girl's best friends if De Beer's fail to control production from huge new finds in Canada which could flood world markets.)

The Orange River has served as a huge diamond carrying conveyer belt. Where the Orange River meets the sea is Orangemund, a closed company town. To the north is Sperregebiet a closed area where the mining companies strip alluvial deposits away, sieve them and put all but the diamonds back. Small operators on government licences work offshore vacuuming the ocean bed.

To the north are 200 miles of waterless Namib desert. The railway to Lüderitz is buried in sand and a ghost town is retained as a heritage site. On top of the sand are sand blasted, polished dreikanter. The coast earned its nickname the 'Skeleton Coast' from the large number of shipwrecks.

Dr. Waltham's slides showed the desert to be an area of breathtaking emptiness and haunting beauty. This was far more than the glimpse of Namibian Geology we had been led to expect.

K. M. Ashcroft.

Monday 9th November. The Miravelles geothermal system, Costa Rica by Dr. Chris Rochelle, BGS, Keyworth, Nottingham.

Dr. Rochelle began by placing Costa Rica in its world setting. One fifth of the size of the U.K., it is a country renowned for its wildlife, National Parks and tropical beaches. Bananas are grown on the coastal lowlands and coffee on the uplands. It is politically stable but less so geologically owing to its position on an interoceanic volcanic arc associated with the Pacific 'Ring of Fire'. A subduction zones lie to south west of the country and present day volcanic activity is associated with subduction of the Cocos plate beneath Costa Rica. We saw pictures of volcanoes and their craters. Some volcanoes are active but the andesitic Miravelles volcano has been quiescent for the last 7000 years though active over a period of some 50,000 years.

As a result of the world energy crisis in the 1970s, and the desire of the Costa Rican government to reduce its dependence on imported fossil fuels, a national geothermal programme was established. The Miravelles geothermal system was the first to be investigated for electricity generation in Costa Rica. The British Geological Survey did a two year study on the south west flank of the volcano in the mid 1980s and Dr. Rochelle's work followed as part of his Ph.D. from Leeds University.

The geothermal system lies partly within the lava and tuff deposits infilling the ancient collapsed 'Guyabo Caldera'. and is exploited by a series of boreholes that tap dry steam and hot water. There are 23 production and reinjection wells at present, though samples from only eight were available at the time of the study by the BGS and Dr. Rochelle. In the main the flow of hot fluids into the boreholes is via fractures though intergranular flow also occurs. Natural surface expressions of geothermal activity include funnel shaped vents emitting hot steam and the alteration of the dark volcanic rock to white clay minerals by the fluids and gases. Bubbling mud pools and sulphur crusts surrounding gas vents are also observed. Present day surface hydrothermal activity is limited to relatively few sites compared to the number that show signs of previous activity. This is probably due to mineral precipitates sealing up conducting fractures, or tectonic movements opening up new ways of fluid flow.

Present day temperatures show a maxima in the northern part of the field where there is a subsurface boiling zone. Temperatures decrease away from this, though a plume of high temperature water flows to the south. Saline springs some 12 km. south of the main surface activity are thought to represent this water that has cooled slowly on its way to the surface. Maximum present day temperatures observed in boreholes in the northern part of the field reach approximately 260° C though there is evidence for generally higher palaeo-temperatures, possibly in excess of 300°C, at depths of 1-2 km.

Geothermal wells are drilled to depths between 1 and 2 km. and tap high temperature water which flashes to steam when brought to the surface. Dr. Rochelle showed how the boiling point of water varies with the pressure and salinity. At 40 metres it boils at 150°C and at greater depths boiling point can be over 300°C. When released from the wells any water must be separated from the steam. This is done in a high enthalpy separator with steam passing to a turbine and hence to generate electricity. If still under some pressure and at above 100°C the water can go to a low enthalpy separator, or may be reinjected back into the rocks.

Dr. Rochelle explained how isotope analysis of the oxygen in the water provides evidence that the water in the system is largely from recent rainfall.

Techniques used to record temperatures include liquid geothermometers :(quick and easy but prone to error through dilution, boiling or steam loss) and examination of fluid inclusions in the rocks. (The salinity, dissolved gases and fluid composition of the inclusions gives evidence of past temperatures.) Mineralisation also provides evidence of temperatures. For example, epidote only forms above about 200°C and laumontite below about 200°C. Evidence from zoned crystals of epidote and prehnite are thought to have formed at about 250°C, a temperature close to boiling point at that depth. Variations in the composition of the crystals are attributed to small changes in the hydraulic head (and hence the water table) which result in the fluid surrounding the crystals changing between boiling and not boiling, and as a result changing the degree of oxidation of the fluid. Unfortunately, working out temperatures from mineralisation is expensive because of the cost of drilling, so samples will always be few. However by combining all these methods of temperature measurement a clearer picture is formed, and it appears that the water table in the north was higher in the past, and many temperatures at depth seem to have remained fairly constant. In the south temperatures were hotter at shallow depth in the past. There was also some evidence of cooler water recharge in some parts of the system. The overall waning of this geothermal system over thousands of years will not effect its power generating potential as this is likely to operate on a time scale of tens of years. The Miravelles geothermal system currently provides some 20% of Costa Rica's electricity demand and with expansion this may increase. Other geothermal systems are being investigated and it is quite feasible that Costa Rica may obtain half its electricity from geothermal sources in the future.

A very active question session elicited that corrosion of steel borehole linings can be a very expensive problem in some geothermal systems.. (In one case the Americans have lined them with titanium which, though expensive initially, is actually cheaper in the long term).

Kate Ashcroft (with much help from Dr. Rochelle).

CONSERVATION COLUMN

Frustrating Fossils

As I write, I'm sitting in the deserted waiting room on platform 2 of Cardiff Central Station. Why? Firstly, I have just attended an International Conference on "A Future for Fossils" at the National Museum of Wales: a full day of conservation orientated talks. Secondly, I've missed the last train home to Stourbridge. I really must learn to get less involved!

The subject of the conference affects everyone who enjoys Geology. I wanted to learn from others and to participate in the process of deciding how best to use and manage this precious heritage. Also, I wished to assist Colin Reid in encouraging those nice scientists and enthusiasts present to write in support of Dudley's World Heritage Bid. This latter objective was remarkably easy to fulfil. The geo-grapevine worked very well. Of the thirteen papers that I heard, five showed slides of the Wren's Nest and speakers openly voiced their support for the Bid to the other delegates. The collecting of fossils produced heated debate. Impassioned individuals expressed strong steamy views from opposing corners. The enthusiasts and dealers objected to the threat of imposed restrictions from the conservators and land owners. I believe that most of us felt that there was a great deal of common ground which certainly leant towards the great benefit to all from sensible and respectful collecting.

All manner of juicy topics were set under the microscope for dissection and close scrutiny including: who the collectors actually are, how we use fossils, the ownership of fossils (before and after exhumation), what constitutes damage of a site, codes of practice (national and local), the respective roles of professional and amateur, and many more.

It appeared to me that underlying agreements were emerging. In particular, that collecting is instinctive and no amount of legislation will prevent it, that good collecting practice (i.e. safely done without demolishing rock faces, and liaising with landowners, scientists and dealers etc.) was very beneficial. I also felt that general agreement on what constitutes 'damage' was there- as destruction of a site or rock face at a rate greater than that which mother nature would do herself by weathering and erosion.

A distinction was made between 'integrity sites' and 'exposure sites' (or depletable sites and harvestable sites to use biological similes). An integrity site has a very limited and special fossil resource which should be saved for finer and higher pursuits of scientific endeavour. At an exposure site continuous erosion or quarrying is continually releasing new fossil material. Here the action of fossil collecting may be the only means by which fossils could be saved.
The BCGS has been very effective in rescuing samples from sites about to be demolished.
The proceedings of the conference are to be published shortly.

News and Siteworks.
Alf Cole and the Walsall Rangers have secured £10,500 of funding to allow a formal geological trail to be set up at Hay Head SSSI. The BCGS wrote in support of the proposal to the Royal Society. We should also lend our physical support to this project by helping to clear rock faces and paths and to salvage fossil material. This will establish a valuable collection and underpin the good work done to date.

I am proposing to have a meeting at the site on Saturday 21st February 1999 to look a the site and do whatever we can. Meet at the Three Crowns pub on the Sutton Road, Walsall (SP0499810) at 10.00am. If anyone would like to join me and Alf, bring woollies, wellies and a flask!

Well, that's enough for now. I've just learnt that the last train to Worcester leaves in ten minutes. With a little bit of luck and a lot of begging I might get my poor, long suffering wife to rescue me from there in the small hours.

until next time

Graham Worton

ITEMS IN BRIEF

Did someone on the Southam Quarry trip fail to return their safety spectacles? Martyn Bradley would like to receive the missing specs. Contact address can be obtained from Ann Nicholds.

As Christmas approaches you may be interested to know that the confectionery firm Thornton's is making a range of chocolates depicting fossils such as corals, trilobites, ammonites, shark's teeth, neopterygian fish, echinoderms and brachiopods. They are made out of white chocolate on a dark chocolate background. Thornton's also run Rockwatch Club aimed at children, sponsored by BG plc and run by Wildlife Watch and the Geolgist's Association. A magazine (a copy can be seen at our meetings) is issued 3 times a year. It costs £5 a year to join or £8 for a family of four.
The Dudley shop arranged a display at our October meeting and have offered to repeat the display at future meetings.
Chocoholic geologists can have a field day with these confectioneries - and they won't need a hammer!

A message from Gordon Hensman: Meetings Secretary
I try to arrange as diverse a range of lectures as possible and I would appreciate any suggestions you may have. I cannot guarantee that I can get a lecturer but I will be able to get a more accurate idea of the sort of things you want.
Volunteer lectures from B.C.G.S. members would be most welcome.

Would you be interested in a Brains Trust type evening where you can bring your queries and "interesting bits of rock"? We have enough highly qualified and knowledgeable members to solve most problems.
Please contact Gordon on 01384 256423 or at any meeting

Welcome to new members

Michael Carter of Kidderminster
Dr. Clive Roberts of Wolverhampton University
Jo Reynolds of Wolverhampton
Margaret Ridley of Stourbridge