

Newsletter April, 2015

UPCOMING EVENTS

Saturday 9th of May

Carboniferous sedimentary cycles between Howick Bay and Boulmer.

The trip will traverse 'Yoredale' type cycles from the top Viséan and Base Namurian along the seashore north of Boulmer. These are some of the most accessible exposures of Carboniferous stratigraphy in the North East and will provide an excellent opportunity to 'get your eye in' on limestones, sandstones, shales and coals.

Length of trip: Full-day, please bring a packed lunch.

Equipment: Hard hats not required. No hammering allowed. Dress appropriately for the Northumberland coast.

Meeting Time: 10.30 am

Toilets: Adjacent to the car park in Boulmer.

Meeting Point: The public car park on the coast at Boulmer (free).

Nearest Post Code: NE66 3BL

Nat Grid: NU 265 139

Saturday 4th of July

Siccar Point and Barnes Ness.

Leader Mike Browne (Edinburgh Geol Soc/retired BGS)

Meet in Cockburnspath village, parking on The Square, opposite Village Store and Post Office, from **10am for a 10.30 start**. There are shops and toilets in the village and car shares can be arranged before moving on towards Siccar Point (roadside parking at NT800 705).

LECTURE REPORT

Meeting February 20th 2015

Chromite, Tungsten and Iron mineral deposits and mines in Portugal.

Lesley Dunlop, Northumbria University

Lesley was warmly welcomed by the NEGS membership and quickly outlined the essential five part (fused together 310Ma) geological structure of Portugal, a country she has studied geologically for many years. In the North, around Braganca / Covilha the geology is ancient Pre Cambrian to Silurian material with granites intruding schists. There are clear geological similarities to the ancient elements of SW England, the areas appear to have been linked prior to the opening of the Bay of Biscay (125 - 85 Ma) A NW -SE thrust fault cuts Portugal, limiting this zone to the NE of the country.

The area experienced 300kms of crustal shortening as the Caldonides developed, the Rheic Ocean closed and the Variscan processes established themselves. Uplift occurred during the Tertiary. Today the centre of the country has a Jurassic - Cretaceous cover with the south dominated by two phases of granite intrusion with associated mineral deposits.

In the North an ophiolite complex is exposed, chromite deposits were worked here for many years. The rocks are interleaved with Ordovician meta sediments, lavas and ultra basic eclogite indicating great depth of formation and subsequent uplift. The structurally fundamental NW-SE thrust developed in the early Variscan with stress from the NE. The environment is interpreted as an island arc in the early Ordovician that experienced plate margin collision. There is a nappe pile with polyphase metamorphism evidenced and serpentinisation with much thrusting and material from locally

and distant sources deposited. The complexity is clearly impressive!

The Chromite is found disseminated in, for example, Dunite. The source is proposed to be from depleted mantle material. It supported many small mines.

Moving on to the central zone, south of the thrust described above, the geography is, in part, dominated by quartzite ridges with a NW -SE trend. Granite (Variscan age) is at a shallow depth, the extracted minerals lie in the cover rocks. The main town is Covilha; the landscape is varied with steep slopes common. Tungsten has been extracted for a very long time in the Panasqueira. - Fundao area. Today there is interest in reopening the mines. The ore lies in Quartz veins together with silver and tin, typically concentrated in an enclosing sheath with micas. The granite is greisenised in some areas. The mineralising fluids appear to be of late pre Cambrian age. The schist material is tightly folded. This evidence has supported an interpretation of fluids at 300C with a slightly acidic pH suggesting an origin in the granite. Romans worked the deposits; British interests were in part responsible in the 1800's for large scale activity which created a desolate landscape with heavy pollution of surface water from the mining and the extensive tailings. Arsenic is a common pollutant. Mining stopped in 1993 but reopened for evaluation in 1995. Fourteen years of reserves have been indicated at a rate of 100,000 tonnes a year. The ore is 0.2%.

Research suggests the vein emplacement was associated with extensional forces with hydraulic valving producing the veins as the area was essentially under compression. The veins are horizontal above the granite. This mineralising activity is dated to 296-292 Ma in a saline meteoric fluid. Typically mineral associations reflect a cooling sequence with wolfram initially, pyrites, siderite and galena deposits later.

These deposits have supported large scale mining with massive tailing deposits scarring the landscape. Barrocca Grande is one of the towns in the area. In addition to pollutants the tailings

are unstable with landslips common. There have been attempts to find a use for the waste without any real success. In the Ervedosa area there are horizontal flues remaining from early attempts at condensing arsenic from the processing activity.

Lesley went on to illustrate the minerals forming from alteration of the granites with some spectacular examples of tourmaline. Granite masses with garnets are one unusual product from this complex history. Pegmatites of huge smoky quartz crystals occur locally with more tourmaline. There is a lithium rich pegmatite at Covilha.

Moving to the third pyrite zone South East of Lisbon, the Seville-Grandola area has Ordovician rocks with massive sulphide deposits. The mineralised zone covers an area 240 x 35 kms. The origin of the deposits is interpreted as hydrothermal. This appears to be linked to sedimentation, volcanic and turbidity sources. This area has experienced 5000 years of extractive activity, gold, silver and copper being found. The extracted material occurs in vertical shafts leading to massive quarrying with innovative techniques. Pollution is again a problem. The Neves Corvo mine has two treatment plants with crush, rod and ball grinding and froth flotation extractive techniques. Copper, zinc and tin are recovered. The presentation was brought to a close with a look at the marble extraction in the Borba area; this is opencast with massive quarries.

The audience were delighted with the quality of the presentation, thanking Lesley for a summary that was a revelation to our members who holiday in Portugal! Vigorous questioning was dealt with expertly. The evening was a great success, Lesley was thanked enthusiastically.

Following the AGM on March 20th 2015

Poles Apart? Glaciers and climate change in the Arctic and Antarctica.

Professor Chris Stokes, University of Durham.

Chris introduced the presentation by considering the survey of cores retaining evidence of past climates. The cycles highlighted by this evidence are linked to variations in the solar orbit that affects solar energy received by the Earth. The patterns are repetitive with a gradual cooling before an abrupt warming at the end of ice ages. Four clear cycles are documented in the last 450,000 years. The average temperature fluctuation approximates to ten degrees Celsius. There has been a cooling trend over the last 1000 yrs. attributed to fluctuations in our solar orbit but rapid global warming in the recent past attributed to the impact of human activity. This effect is not uniform, the UK appears to be getting wetter with a only small temperature increase compared to other areas of the world.

The concentration of carbon dioxide in the atmosphere has risen sharply recently (in the last 170 years) from 290 to over 400 parts per million in the atmosphere, it tends to retain heat by blocking the radiation from solar warming of the Earth. This leads to ice melting and warming of the oceans. Some excellent images of land glacier changes with time lapse photography emphasised the point. Field studies of the mass balance of ice bodies is documented for 173 of the 198000 glaciers, confirms thinning of our ice bodies. The picture is variable with New Zealand showing a large loss of 1.4m a year but Norway thickening in some areas. These changes are of minor significance compared to ice sheet changes.

Greenland ice sheet was part of a massive ice cap covering the northern areas of America, Europe and part of Siberia. Deglaciation took 10,000 yrs. Scotland lost its last permanent ice cover about 15000 yrs ago. 22000 yrs ago sea level was about 120m. Lower with an average rise of 6 cms. since then. This rise was not uniform, a process termed

a meltwater pulse has been identified, and it coincides with accelerated sea level rise and ice loss. The process may be due to a positive feedback cycle. The velocity of ice movement is an issue of significance.

Today 10% of the planet's surface is covered in ice equating to 65 m. of sea level. The stability of the polar ice is of great significance to climate change

Using this understanding Chris moved onto our glaciers and ice caps. Whilst the mountain glacier changes are highly visible, and well documented, their significance is minor in terms of global change; at less than 50cms of sea level rise if they all melted overnight. The ice caps of Greenland (7 m of sea level if it melted rapidly) and Antarctica (57 m of sea level) are by far the more significant. Greenland is losing ice at its margins with high speed ice flows localised in so called ice streams that are seen at the margins of the ice, this generates water at the surface and internally where it appears to lubricate ice flow.

Antarctica is more complex, in the west the ice is grounded on the floor, in the east the ice sheet is on land above sea level. Similar research measures to Greenland show fewer ice streams. Ice wasting is observable but varies with areas of accumulation largely balancing areas of loss. This creates a picture of a stable ice sheet. However oceanic warming is reducing the ice from below, notably in the west. Evidence suggests the western area may break up adding vast quantities of ice to the sea causing sea level to rise.

The research into glacial changes is attracting a lot of governmental funding. The effects of oceanic warming may be the most important process today. The Western Antarctica ice cap could break up and lead to a large rise in sea level. Recent research is suggesting this process has started. The ozone hole may have had a part to play in the stabilising of the ice cap in Antarctica.

Research conclusions are in agreement that our polar ice sheets are shrinking in volume. Greenland is estimated to have lost 400 giga tonnes of ice in a year, this equates to over 1 mm

rise in sea level. Antarctica is more uneven in change but the effect on sea level rise is much greater. The warming also leads to thermal expansion of the water bodies, which adds to sea level.

The consensus of research analysis has moved quickly from human impact being a possible cause of global warming to it being a near certainty. We are now trying to identify a limit for the concentration of carbon dioxide in the atmosphere. It is felt that a figure less than 421ppm would avoid a catastrophic change to sea level.

The exceptional AV support for this lecture was praised by the enthralled audience. Perceptive questions and responses added to a truly exceptional lecture.

LECTURE AND FIELD TRIP PROGRAMMES

Field Trip Programme remains to be confirmed; it includes:-

- Teesdale – led by Brian Young
- Pennine Escarpment – led by Eric Johnson
- Whitby and Saltwick Bay – mid September, led by John Waring

Please note the two field visits on page one.

NEWS AND LOCAL EVENTS

The new NEGS website is now online, it is a work in progress, but do please visit and use:

<http://www.negs.org.uk/>

We're also on **Twitter** courtesy of Kirsten Dutton (**Student rep at Newcastle University**).

The account can be found by either searching

- 'NorthEastern GeolSoc' (it won't allow anything longer than this)

- or '@NEGS_UK'.
- People can tweet at us by tweeting to '@NEGS_UK'.

The website is one of the products of the students of the **Earth Science into Society** module at Durham University. The team, **Alexia Santamas, Stefania Boughey and Rosie Robson**, presented their final report to supervisors, clients and mentors at an event at the university on Friday April 24th.



Christine Taylor their mentor from NEGS, and Christine Burrridge attended a very successful presentation.

-
- A letter from the Geological Society

Earth Science Week, 10-18 October 2015, 'Geological Time'

Following last year's hugely successful Earth Science Week, I'm writing to remind you of the 2015 dates. This year, we're extending the 'week' to cover two weekends, so there are lots of

opportunities for activities! We'd love it if as many people as possible were able to take part, so please do forward this message to anyone you think may be interested, and get in touch if you want to discuss ideas or find out more about how to get involved.

This year, the Society is joining with other organisations to celebrate the 200th anniversary of William Smith's first geological map of the country. Smith's work was a remarkable contribution to the study of geological mapping, stratigraphy and the use of fossils to determine geological time periods – as well as an important milestone in the history of our science. With this in mind, the theme for 2015's Earth Science Week is 'Geological Time.' For more information on the William Smith anniversary, see www.williamsmith2015.org

We're hoping that many of the events during Earth Science Week will explore these ideas in relation to UK geological sites – although all ideas, whether based around the theme or not, are very welcome. As ever, we want to promote guided and self guided geology walks, in towns and cities as well as the countryside, so let us know if you're able to plan one during the week and we'll make sure it gets publicised.

We can promote activities online via our website, blog and social media sites, and through our network of affiliated schools, Universities and Friends of the Society – so we're looking for events and activities that cater for a wide range of audiences!

The homepage is www.geolsoc.org.uk/earthscienceweek, which will be continually updated throughout the year. Please email ESWUK@geolsoc.org.uk if you want to propose an idea or find out more about getting involved, or get in touch with me directly.

Sarah Day, Earth Science Communicator

ADMINISTRATION

AGM Report: The Chairman gave an overview of the years superb lectures and field trips. He also thanked members who were standing down from places on the Committee – Nigel Sprague, Joan Hardy and also thanked John Waring for his long term development and management of the website

The AGM agreed to the amendments to the Constitution, the revised document will shortly be on the new website (but is currently available on the old website).

Gordon Hull is the new Representative to the Geologists Association.

The AGM was unanimous in agreeing the membership fee rise. Current fees are now:

Full Member£20.00

Unwaged Member, or largely dependent on State Retirement Pension£10.00

Family member - for persons residing at the same address as a Full Member to which only one copy of mailed items will be sent
..... £10.00

Postal Member (persons not normally attending meetings)..... £7.00

Full-time earth science Student£0.00

2015 fees were due at the AGM.

Address for cheques:

Judy Harrison, 28 St Ann's Quay, 4 St Ann's Street, Newcastle upon Tyne, NE1 2DJ

For internet banking:

Sort code 09-01-51
Account number 75189803

MEMBER PROFILE

Member Profile: Christine Taylor (Membership Secretary)

It was love at first sight! It is 1959. Picture a 16 year old girl from Norfolk on an overnight train through France and Switzerland on her first trip abroad, travelling with the school to Rome. She is fast asleep, for what else is there to do apart from gossip and sleep for many hours? Daylight dawns and the sun rises up to wake her. She opens her eyes to the Alps in all their springtime magnificence, the first mountains she has ever seen. The rest they say is history but that is not true because that love affair is still the present for me.

I immediately made geography one of my A-levels and became fascinated by physical geography and tolerated the rest. It wasn't long before all I wanted to do was to study mountains and volcanoes but herein lay a problem. It was eventually clear to me that it was geology that really interested me but I

was studying Geography, English, Latin and Fine Arts at A-level. There was no university, even the more progressive ones that would admit me to study geology with such a bunch of subjects and not even an O-level in science or maths in evidence. Dream shattered!

Well, cutting a long story short, I made it to University fifteen years later to study geology.



Like many others I was able, alongside my job as a primary school teacher, to use the Open University to make good my education in science and maths. In the 70s the idea that people could go to university with non-standard qualifications was in its infancy and many universities were cautious about admitting people without the tried and tested exam results. I was lucky because Leeds University, one of the Centres of Excellence at that time was ready to give it a go. They accepted me. More recently I found out that I was well-remembered in the department, not for my great academic skills (hmm...!) but rather for being the only student who interviewed the Head of Department (the celebrated John Ramsey) to see if it would be suitable for my attention and also for being

the first to come in with non-standard qualifications. I loved it. A great choice!

I graduated in 1979 at the age of 37. It was always my intention to be a world famous petrologist but during my time at Leeds it became clear that I would be going to live in Durham and become a step-mother to two gorgeous children. I

have no regrets there but it did mean that professional jobs in geology would be out of my reach. Thus, I went back into teaching. I still had my love of geology to attend to though and it was in 1980 that I found NEGS headed by John Senior. Bliss! John invited me to go with him on field trips and take evening classes in geology and there are still people in the society that I first met back then.

Eventually being a wife, mother and career woman meant that NEGS was by-passed until I retired. Having a science degree within primary education (a rarity) meant that I was much in demand and it enabled me to have a very rewarding career in and out of the classroom. During my final job pre-retirement, I taught sciences in the Education Department at Sunderland University. This included Earth Sciences so I was back in there after 20 years

Since I retired, I have spent a great deal of my time updating my knowledge and improving my field work. Those who know me well will know I am never happier than when my nose is in a geo book or close to an outcrop (and I have travelled to worldwide sites to do it). The house and garage are groaning with rocks and even my tolerant Graham is commenting on the space being taken up by them. My revenge for that is to show them all to his grandchildren and try to give them some of this amazing science. I am having success with at least one of them perhaps he might want to become a geologist too!

Many thanks to Gordon Liddle for the Lecture Reports, Chris Taylor for her profile and the Bringing up the Rear pictures, Dr. Eric Johnson for organising some interesting looking field trips and the EARTH SCIENCES INTO SOCIETY team for all of your work in the module and the products of this.

Bringing up the rear

Answer to last Newsletter picture:

Cone Sheet, Ardnamurchan

<http://www.nature.com/srep/2013/131008/srep02891/full/srep02891.html>

<http://pure-oai.bham.ac.uk/ws/files/10156780/Magee.pdf>

April picture

This photo was taken in Derbyshire, close to the Stone Centre.



Do you have any ideas about the arch shapes?