NORTH EASTERN GEOLOGICAL SOCIETY
Newsletter January 2014
http://www.northeast-geolsoc.50megs.com

1. NEGS SPRING/SUMMER FIELD MEETING PROGRAMME

No information of new programme yet.

2. NEGS AUTUMN/WINTER LECTURE PROGRAMME.

2.1 8th November 2013 Meeting.

What lies beneath us – a GeoSculpture at Durham University. Dr Darren Grocke

A large enthusiastic group of members welcomed Dr Grocke. The presentation was to outline the background and process of the creation, of a GeoSculpture. The presentation was to prove an excellent link to the work of William Smith and his first geological map.

The sculpture has taken five years to complete. It was 'opened' on October 14th 2013. It is thought to be unique in its scale (12m x 8m) and complexity. The sculpture has been placed at the entrance to the science campus, approaching from Durham city. The orientation was a matter of prolonged discussion finally allowing the public to walk north along its length thus facilitating a perception of the map despite a magnetic orientation very far from North South. **Professor Bob Holdsworth** worked closely with Dr Grocke sharing his in depth knowledge of the rock types of the UK.

The map team advertised for sculptors to create the map. 150 applied with **John de Pauley** (based in Bridport, Dorset) being awarded the contract. His background of stonemasonry, artistic endeavour and proposed approach attracted the team responsible for the appointment. Initially the contract was for twelve months; the reality was close to eighteen months.

John researched the dominant rock types and worked with the quarries to help with the rock identification, selection and collection. The University team supported him closely. As the map would be available for the public to walk on a few compromises had to be made in the choice of rock type. The Chalk, for example, being especially weak, the decision was made to create a white cement and lay into it flint material. The effect is a success. The uneven weathering rates of the rock types will cause some relief to develop on the map; this was agreed and thought a positive development. The maintenance of the map was also carefully considered and planned.

The pattern of the rocks closely mirrors that of the solid geology of the UK. Some of the rock specimens reflect the fossil and trace fossil history. A piece of the famous 'Frosterly marble' was placed near to the position of the University. The gathering of the specimens proved a real challenge with Dr Grocke entertaining the audience with selected stories!

John developed a template strategy to allow the huge structure to be planned and the pieces

cut and fitted into the overall map. The orientation of the pieces was a particular challenge but the final product is testimony to his skill.

The sand base for map was prepared with the stonework being transported on site by a forklift. (Unpacking the numbered rock specimens was enlivened with the odd Dorset mouse escaping from the straw packing)

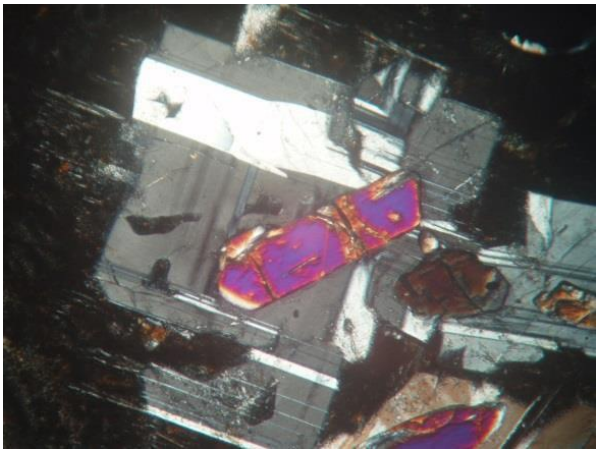
The University were enthusiastic about this project reflecting as it does public art, community support (especially the educational value) and the importance of science in our world. The cost has been close to £70,000, remarkably good value. This funding came in large part from the Banks Community Fund) There remains some minor enhancements to complete and the University team are exploring the possibility of expanding the area allowing key evolutionary plants and rock seats to be placed in support of the map installation.

Perceptive questions from the audience were comprehensively dealt with; the audience enthusiastically reflected their appreciation of the very lively presentation. (Gordon Liddle)

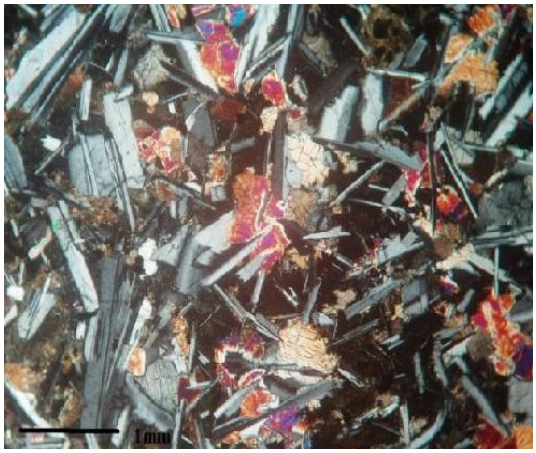
2.2 13th December 2013 – Members Evening

Two members made presentations to the substantial group of members in attendance. Gordon Wilkinsons talk on 'Uluru and Kata Tjuta – the geology of a unique area' could not be given due to IT incompatability. We look forward to this another time.

John Waring outlined the essentials of an amateur making a thin section of a rock specimen. Starting with a catalogued specimen a diamond saw is used to take a thin slice, the thinner the better. This is then mounted on a glass plate and fixed with a resin. A 220 grade grit is used to reduce the thickness of the slice, the aim being 30 microns (0.03 mm). Ideally the rock slice reveals coloured material such as pale yellows of quartz or feldspar. At that stage the grinding uses finer grits and frequent monitoring of the slice takes place until the appropriate thickness is achieved. The sli9ce is then mounted in a material with a known refractive index; this is allowed to harden prior to a study of the rock slide being made.
There are many elements to the exploration of a rock slide; John introduced the polarising microscope with its polariser, analyser and Bertrand lens (for interference figures) Images of slides he has made demonstrated actual colour (glaucophane for example has a blue colour). Pleochroism – changes in colour and the impact of rotating the stage of the microscope when polarising plates are used produce a variety of interference colours of varying strength. These allow the mineral to be identified, especially when other characteristics including habit, relief, cleavage, isotropism and the extinction angle of a mineral are noted. John also illustrated the appearance of twinning, a distinctive feature of a few minerals.



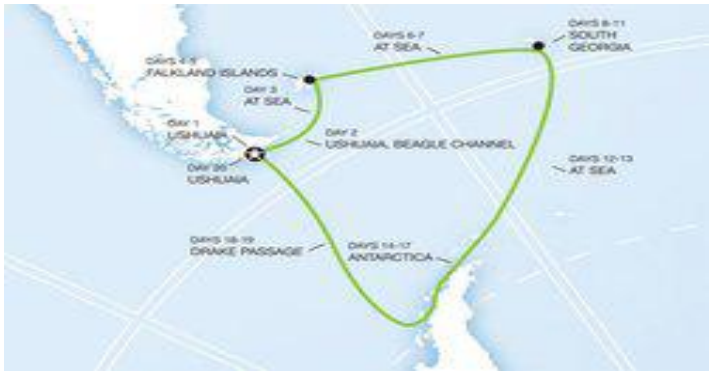
Xenolith in a sill from the Isle of Mull: sapphires (corundum) set within plag. Feldspar



Thin section of TertiaryTynemouth Dyke Mainly plag. Feldspars and augite in a glassy Mesostasis (cross polarised light)

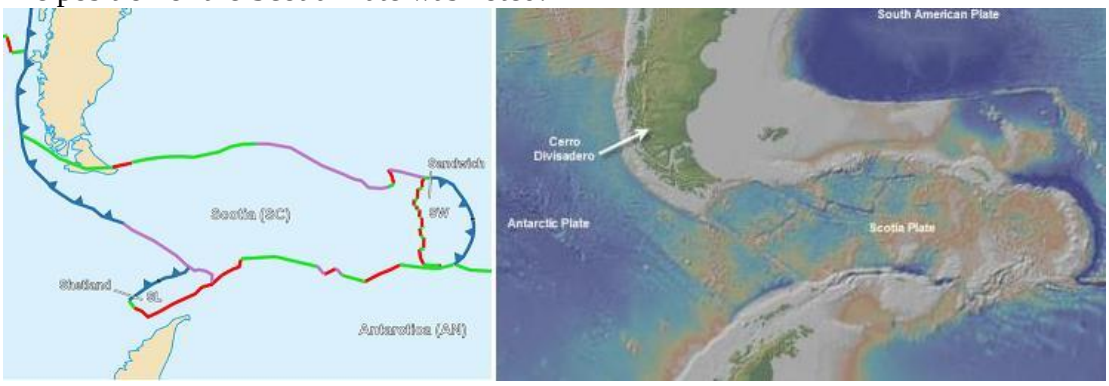
Case studies completed the presentation, which was warmly received.

Christine Burridge followed with an illustrated journey to the South Atlantic and Antarctica. The route:



The journey took the party across the Antarctic Region Convergence, a marked drop in sea temperature reflecting the unique circulation system of the area. Leaving Tierra del Fuego the first landfall was the Falkland Islands. The evidence of Gondwana fossils was outlined helping to support the break up of that massive continent. The islands themselves rotated 180 degrees during the separation from Africa.

The position of the Scotia Plate was noted:



(Wikimedia Commons user: Sting)

This has the characteristics of a plate margin of course. The next land was South Georgia with spectacular coastal scenery built from the largely volcanic material of the island. Jurassic and Cretaceous Andesitic turbidites was noted as an example of the country rock. Grytviken, the location of the graves of Shackleton and Frank Wild, key members of the 1914 'Endurance' expedition, were visited. The party did the Shackleton walk across part of the island, presently infested with rats and reindeer. Both groups are being removed with the Sami (brought in for the task) collecting the reindeer meat for food use. The landscape was spectacular with freeze thaw processes and their products in abundant evidence together with large fjords. The wildlife, of course, was abundant with various penguin species observed and great care being taken to avoid contact. A visit to Gold harbour recalled the abundant iron pyrite that gave the area its name. Glacial retreat was especially clear with three glaciers retreating rapidly in this area. A visit to Elephant Island reinforced the work of Shackleton's geologist James Wordie.
Moving along the Trinity Peninsula of Antarctica and observing Deception Island, a caldera still active with rapid floor movement and seismic activity reinforced the geologically active character of the area. Christine even enjoyed a brief swim in volcanically heated seawater. A visit to Petermann Island allowed the mass of basaltic dyke activity to be noted whilst watching the hump back whales!
The presentation was again very warmly received by the members.

17th January 2014 Meeting

1 **2.3 Natural Born Killers: the Nature and Hazards of Pyroclastic Density Currents**. **Dr Richard Brown, Durham University**

The infamy of Volcanic Pyroclastic activity provided an excellent backdrop to an exceptional lecture by Dr Brown. He led the large audience through an introduction to the variety and essential integrity of these phenomena before outlining how and why their destructive effects occurred. Touching on the generation of the currents he outlined the in depth work currently underway into understanding the deposits of the material, with the help of hand specimens. The audience were gripped by the talk, which was richly supported with visual material. An excellent presentation.

Dr Brown introduced himself and his topic with a video that is on You Tube. This video taken on Mt Unzen shows a Pyroclastic flow pouring down the slope before being stopped (most unusually) by a strong wind that deflected the material. This was real 'super hero' material that thrilled the audience.

These phenomena are described as ground hugging volcanic ash clouds. They are the cause of the large majority of deaths associated with eruptions. Illustrative figures from the 1902 Peleean eruption suggest 28000 died. The more moderate Mt St Helens eruption killed 58. Pompeii and Herculaneum offer historical examples with evidence of fatal methods associated with the flow including scorching, asphyxia, impact, abrasion and obliteration!

A scale of effects has been developed with levels ranging between 0 and 5, 0 is no blast damage with 5 equating to total destruction. Slides illustrated examples of these effects. Montserrat for example, has evidence of a 350 degree centigrade flow averaging 150 mph with 50 Kg m^3 of deposits and pressures of 25 Kpa (when 2 can flatten trees) and these were

averages.

The VEI explosivity index runs from 0 to 8. Mt St Helens is classed as a 4 with 1 Km^3 of debris produced, the 1815 eruption of Tambora sits at 6 –7 whilst the 600,000 year old Yellowstone caldera event is an 8 with 1000km^3 of debris. The flows are made up of gases (mainly atmospheric) with pumice and lithic material heated to 300-700 ^oC. Topography channels the flows although some do cross interfluves as they hurtle along well above 100km per hour. The duration of these events varies between seconds and hours reflecting the large, varied range of factors that affects the flows. Similarly the scale of the effects is very varied with massive changes in thickness (valleys collecting thick deposits) and the area covered reaching extremes of 20,000 km^2 – this equates to the area of Wales.

The duration of the events can be classed as either short lived or sustained events. The single pulse Plinian type eruption for example supports a short duration flow whilst long term eruptions can support repeated flows. One example was used to demonstrate 'lofting' when the flow actually lifted off the ground due, probably to changes in the gas make up of the flow and surface features.

The audience was, by now, fully aware of the complexity of these phenomena. The variations in particle size (amusingly tested with our chairperson volunteering to be the victim) has been linked to the source eruption whilst surfaces, the cover (eg ice and snow, trees, bare surfaces) and gradient all clearly affect the flows. Another characteristic was the danger for the observers!

Exploring the flow mechanisms that occur, the near surface turbulence of the currents appears to be of minimal significance to the structure of the eventual deposit. The maximum velocity lies in the mid section or close to the base. Modelling the flows has highlighted the potential role of interaction between the particulates especially when the effects of degassing are considered.

The lecture then used case study material to illustrate many features of the deposits. Tenerife has varied ignimbrite deposits to the south. The presence of the deposit indicates the flow direction but deposits are rare close to the vent partly due to the slope gradient and also the velocity of the current. The flows are dense causing them to funnel along topographic depressions, where, naturally, much of the material is deposited. The end product is characteristically a very low relief surface, which is warm and subject to collapse as degassing occurs. The deposits are ash, pumice and lithic materials. The recent Pinatubo eruption produced similar flat surfaces.

The base of the deposits typically shows an incremental increase in particle size as the base is approached, this progressive aggradation is often seen in each layer of the deposit. Possibly implying pulses of ejecta whilst the thickness of the layers reflected the location, duration and scale of the eruption. Massive deposits have been analysed for their chemical make up. This can show increasing acidity in the material as andesitic material gives way to more rhyolitic materials. High speed photography is being used to study model flows, this is revealing features such as velocity profiles within a flow.

The mobility of the currents accounts for the widespread distribution of the deposits. 200km not being an uncommon figure. This mobility is explained by particle collision, interaction and upward flow of displaced components of the flow. The sight of the currents moving over

water bodies is one situation that illustrates the effect of the surface on the flow mobility. Such factors allows deposits to be categorised into bubble evacuation close to the steep slopes adjacent to the vent; hindered settling in the mid section of the deposit with packed deposition towards the margins.

The thickness of deposits tends to be concentrated in pre existing valleys with rapid thinning on the flanks and interfluves. These concentrations do focus subsequent erosional forces so that the material can be eroded rapidly unless welding of the clast materials took place. This process causes analysis of deposits to be challenging, in Tenerife for example, much of the erupted material lies beneath the Atlantic. It is possible that no deposits may remain from an eruption.

Deposits may show dune bedding and layering, the causes need careful evaluation as each eruption has unique features but tractional deposits appear to produce stratified and massive deposits whilst the structurally varied beds suggest marginal locations in a flow.

In conclusion Dr Brown used his lecture to reinforce the massive problems with developing protection from these phenomena. Education and an evacuation plan can help but the human timescale causes the events to appear very irregular and the subsequent fertility of the soils can attract farming activity. The work with predictive models may offer some progress meanwhile the understanding of flow characteristics is proving of help to some manufacturing enterprises that deal with powder flow materials -for example.

Some lively questioning completed an exceptionally provocative and enjoyable presentation.

G Liddle

From Dr. Brown: - I very much enjoyed talking to your members last Friday. I wish our students were as interested as your members are!

3. NEWS:

3.1 From Ian Johnson "....a big thank you and to let you know that this magnificent case (of wine) has been safely delivered. On Christmas Eve!! What a lot of Christmas Cheer! A very Happy Christmas and 2014 to you all."

3.2 Please note. The AGM is on March 21st. There are positions vacant on Committee for which nominations are sought. Derek will be standing down as Chairman, one nomination has been received for Gordon Liddle. Nominations are sought for Social Secretary, and we still require a Student Representative. Nominations to Secretary by end of February if possible.

3.3 A large sinkhole opened up in Derbyshire at Christmas, see it on this link: http://www.bbc.co.uk/news/uk-england-derbyshire-25554549

4. INFORMATION

4.1 The 'Institute of Physics' has an open lecture in February which may be of interest. Web page www.iop.org/activity/branches/index.html cont.

Glaciers and Climate Change: The View from Space

Wednesday, February 19, 2014

7:00 pm – 8:00 pm GMTST
Room A003, Eliison Building, University of Northumbria, Newcastle upon Tyne, NE1 8ST
Glaciers and Climate Change
Dr Chris Stokes
Contact:
Richard Hornby
r.j.l.hornby@physics.org

4.2 Recent Correspondence:

"Volcanic Experiences" geology tours. Having been in operation since 1998, this will be our 16th year of arranging such trips, and it may be that some individuals in your group have taken part in our trips in the past. This year, we are arranging trips to La Palma in the Canary Islands, to Sicily & the Aeolian Islands, to several of the Azores islands, and to The Cascades volcanoes of the Pacific NW of the USA.
I will happily send out brochures and booking forms to anyone who contacts me. Full details and itineraries, plus photos from all our tours can be obtained on the website at: www.volcanic-experiences.co.uk. Please use the email link on the website if you have queries to be answered or to arrange for brochures to be sent out. Alternatively, anyone interested can telephone 01527-832578. Alan Clewlow

6. ADMINISTRATION

If you receive this newsletter by post and have an email address, then please let me have it.

negsec@gmail.com Best Wishes, Chris Burridge (Secretary) Tel: 01915289707