

North Eastern Geological Society

Newsletter March, 2016

UPCOMING EVENTS

Saturday 21st of May

Geological Sites in Sunderland South

(A joint meeting with the Natural History Society of Northumbria)

Leader: Dr Andy Lane

Meeting time: 10.00 am

Date: Sat 21st May 2016

Meeting place: Gorse Road Car Park, on Stockton Rd, close to St George's Church, and not far from Park Lane Metro station. The car park is a pay parking on the left going into Sunderland, on a short stretch of Stockton Road that is one way.

Nearest Post Code: SR2 7DE

Nat Grid: NZ396561

The morning will be spent walking around Mowbray Park (Building Hill) and nearby parts of the town centre, looking at natural outcrop of the Concretionary Limestone, and some prominent building stones. We will move on to Tunstall Hill for an appreciation of the Ford Formation (reef facies), before visiting Hendon Promenade to view an excellent but poorly known outcrop of the Concretionary Limestone (complete with cannon balls).

LECTURE REPORT

Meeting February 19th 2016

Brian Young: Geological mapping since William Smith 1769-1839

Brian generously arranged a presentation in honour of William Smith. He used his extensive experience with work for the Geological Survey.

Consideration of William Smith's early work enabled Brian to develop our understanding of how his maps evolved. He was the first person to develop a coherent approach to mapping. His introduction of a stratigraphical approach was a stroke of genius. This was all the more impressive in view of his social status. This was below that of a gentleman, making his proposals more difficult to be accepted by the scientific elite of the day. His work originates from 1815 when his earliest surviving map was produced. The Geological Survey was second (in terms of age) only to the Greenwich Observatory in terms of getting a legal status. The motivation behind the production of geological maps (in black and white) was economic. Landowners wanted a means of predicting where economic resources might be located.

Sir Henry de la Beche was influential in political terms, he produced hand coloured maps whilst in 1835 he got the government to employ geologists. The Geological Survey was established in 1845, it was given power of access to private lands (except Ministry of Defence) various maps were produced at various scales. It was the groundbreaking field work and map making of Peach and Horne (in the Highlands) that marked the next major development in mapping Brian

illustrated the changes with excellent examples. The 1890 Carrock Fell map was produced in black and white with no contours; it used shading to indicate slopes. A coloured version was a commission and rather costly. The map was revised in 1959, geological detail and colour increased to an amazing degree. In the 1990's it was again updated with more detail and the use of a one inch scale for the base map which encouraged detail. These changes were matched by the development of sophisticated keys. The early broad age classifications were replaced by illustrative bore holes with vertical and lateral changes in facies recorded. The recording scale increased to six inches whilst interpretations of the structures appeared. The ability to record four dimensional data in the two dimensions of a map was evolving into strength of the Survey.

A second example was the Ambleside area. Remapping waited for a hundred years, in part because the area was labour intensive to map. Maps now also include the names of authors who each have their own style and interpretational approach to the map. The geological maps follow the grid pattern of OS maps. Returning to the economic driver for the mapping, the Carboniferous areas recorded coal seams and limestones whilst the dominant shales were virtually ignored and the exposed sandstones were most seen but poorly recorded.

Brian used the Northumberland Shaftoe Crag area to illustrate what the early approaches had missed. The Crag is formed by a faulted channel sandstone that is not exposed (may not exist) to the north or south of the faults. This was not recorded on earlier maps. Thus what is mapped affects structural interpretation.

In contrast to the factual OS maps geological maps are interpretational. The Horsham sheet has the work of three survey staff;

Brian suggested each had their own approach: a lumpers, a splitter and a fudge! The result is very apparent on the map. Today urban areas have a lot of geological data due to borings, tunnels and deep foundations.

Satellites allow new perspectives to be recognised whilst various borehole techniques such as gamma rays and seismic data allow interpretations not possible until the later twentieth century.

Today very accurate maps of; for example, coal seams, oil traps and the rock head each offer factually accurate pictures not possible to the mapping pioneers. The solid, drift and solid and drift versions are very familiar to us. The possibilities are thus much enhanced but still link to the purpose of the map, the potential for subsidence for example, is now possible when extracted material is incorporated, offshore maps facilitate mining developments underwater whilst magnetic data, heat flow and density have contributed to a wide range of maps and uses.

This survey of the changes in geological maps in less than two hundred years was expertly presented with humour and insight. The audience round of applause was evidence of appreciation and a truly deserved vote of thanks.

Gordon Liddle.

March 18th 2016

NEGS were delighted to welcome the Polar Medal holder, Prof Mike Bentley to their winter lecture programme.

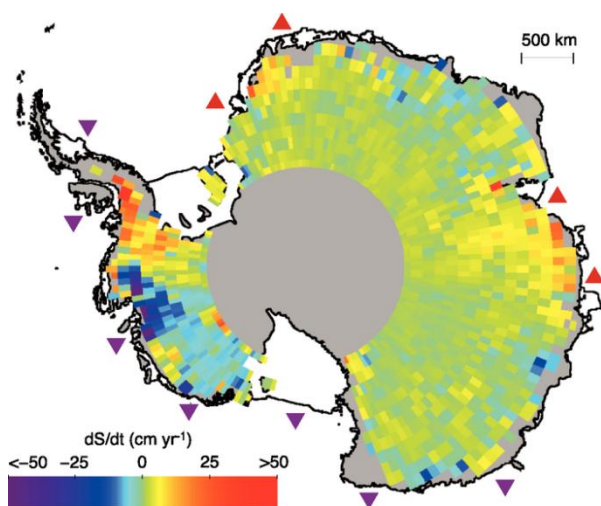
Mike has worked in Antarctica for 14 seasons which would total to about two years of residence. His research and publications reflect his importance as a world leader in research. He outlined his lecture by promising an up to date resume of research

on the continent and how it links to changes in global climate.

Antarctica receives conflicting headlines in the media; Mike explained the continent is very large with different conditions in various parts. On balance the ice cover is shrinking as the area of growth (East Antarctica) although 90% of Antarctica has very slow ($< 1\text{mm/yr}$) rates of increase. In West Antarctica the shrinkage is rapid although localised.

One area was recorded with an 18m retreat in one year. The grounding line is identified as a valuable indicator of the changes; this is the junction of ice with the underlying rock. The movement of this line summarises the nature of the change in ice cover.

Melting ice leads to thinning of the cover and the addition of water to the sea. The total ice cover of Antarctica could cause sea level to rise by 58m if it melted, there is no indication this will happen.



Map showing change in the surface elevation of the ice sheet (slow thickening over East Antarctica and rapid thinning in parts of West Antarctica)

(Source: IPCC at www.ipcc.ch)

In the east the ice displays large areas of instability. The main cause appears to be bodies of warmer water in the adjacent sea causing the lowest layers of the ice to melt

which in turn allows ice inland to flow to the sea more easily. This process has caused sea level to rise, an estimate of a 3 m rise is possible if the small east Antarctica ice cap melted.

At one of the U.K. Stations on Antarctica (Faraday station) the sea temperature has been recorded as 4degrees warmer than 60 years ago. This is the most rapid change anywhere in the world. It is a surface water effect, thought to be a global process.

Today the spot observations of the environmental conditions are much enhanced with observations by aircraft but more significantly by satellite monitoring. A variety of studies are in place, ice thickness, ground vertical motion, temperatures, and ice cover changes being examples. The ability to record large areas enables more useful study of trends.

There are some very significant changes; Pine Island Glacier was retreating about 10cm. a year in the 1990's today the grounding line is retreating at 16metres a year. The Larsen Ice Shelf has lost 87% of its area as warming, thinning and accelerating feeder glaciers take their toll. These changes may be explained by changes that were initiated prior to the effects of man. One process that could account for such change is the 100,000 year warming cycle linked to Milankovitch fluctuations. As warming occurs sea water degases some carbon dioxide. This release of the gas would cause global warming in a positive feedback loop. A study of ice cap thinning has used topographic evidence to date past thicknesses. Results of such studies interpreted evidence to support a mountainous thickness of 650m 11,000 years ago and 350m 4000 years ago. Mans influence on the climate is thought to date from 4000 years ago.

These studies indicate the complexity of the processes together with the long time spans

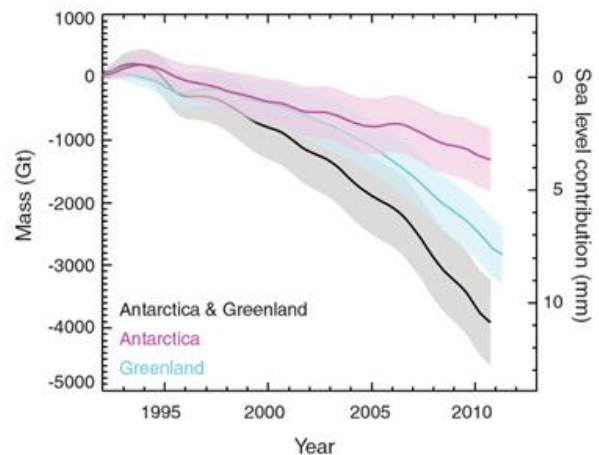
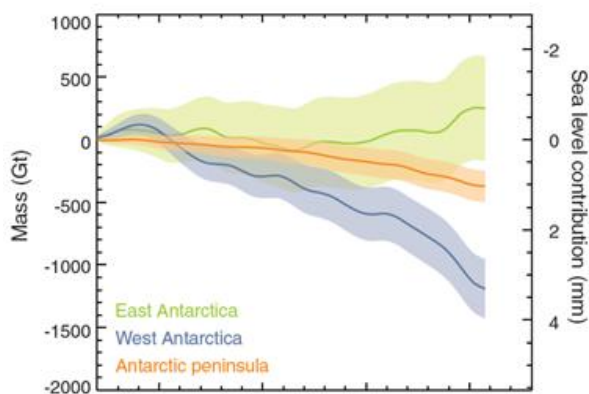
geological processes can take in glacial areas. We know that global warming will cause increased snow fall in Antarctica but marine coastal melting as sea water affects coastal ice. Pine Island for example is probably locally warmed by 4 degrees causing melting and accelerating ice flows.

Today 0.2mm / yr. of sea level rise is attributed to Antarctica ice melt. Ice melt used to account for 10% of such global sea level increase but today it is 33%. A 1m rise is anticipated by 2100.

resourced but the use of fossil fuels at the base is a cause of concern. For scale, there are 50-60 people monitoring an area 9x that of the U.K.

Mike recognises this work is rather depressing but the positive approach is that at least the changes and the causes are recognised and planning for the changes to the UK can take place. The upgrading of the Thames barrier (at £31billion) being an obvious example.

Recent sea level contributions of the Antarctic and Greenland ice sheets. Note the overall acceleration of the contribution from Antarctica. (www.imbie.org)



Modelling is used to make these predictions and world leaders are taking notice of these conclusions but no changes we can make would change it now due to the time scale of such processes. What we will experience is an increase in storms and their intensity. The 100 year flood will become the 10 year flood, leading to extensive abandonment of our coastal areas. The longer term outlook is significantly worse.

Antarctica research is an international affair. The U.K. has five bases, the main one being Rothera. It has a population of 22 in winter rising to 120 in summer. There are four small planes and one international plane at the base. The research labs are very well

The presentation concluded with a selection of exceptional wildlife photographs, not least the penguins and the living - travelling conditions scientists have adapted to.



Antarctic field camp in the Ellsworth Mountains
Photo: Mike Bentley

A series of perceptive questions were ably dealt with. The audience were delighted with the presentation and thanked Mike profusely.

Gordon Liddle

FIELD TRIP PROGRAMME

Saturday 30th July. **Quaternary Glaciation in the Cheviot Hills**. Leader Derek Teasdale

8th or 9th October **Geology of Holy Island**.
Leader: Louis Golightly

NEWS AND LOCAL EVENTS

Saturday 14th May

FORGOTTEN MINERALS" - A SERIES OF TALKS AND DISCUSSIONS.

A joint event by Friends of Killhope and Nenthead Mines Conservation Society. There are many minerals that have been commercially exploited in the North Pennines other than lead and fluorspar. This day will identify and consider these "Forgotten Minerals". Speakers to include Brian Young, Pete Jackson, Tom Gledhill, Peter Tyler and Bill Heyes. This event will be held at St Johns Chapel Town Hall, Weardale, Co. Durham, DL13 1QF and starts at 10.00am. The cost is £12.50 per person including lunch and refreshments.

Booking at Friends of Killhope website:

<http://www.friendsofkillhope.org/events.html>

4th International HSE Geochemistry

Workshop takes place, July 11th-15th 2016

hosted by the Durham Geochemistry Group of the Department of Earth Sciences at the University of Durham. To coincide with this event, their keynote speaker will give a **Public Lecture**. Dr Day, a former Durham University graduate, and winner of both the 2013 Houtermans Award of the European Association of Geochemistry and 2014 Nier Prize of the Meteoritical Society.



James M. D. Day,

Associate Professor, SCRIPPS (USA)

How do meteorites tell us the story of our Solar System?

Monday July 11th 2016, 6.30 pm, Calman Learning Centre, Durham University (South Road).

ADMINISTRATION

AGM Report 18th March 2016.

The Chairman presented apologies from six members. He then gave an overview of the years superb lectures and field trips, and thanks to Professor Gillian Foulger, and to Dr Eric Johnson were recorded. He also gave many thanks for her excellent work to Christine Taylor (in her absence) who was standing down as Membership Secretary due

to an ever increasing array of other commitments. This report, the Treasurers report and the Secretary's report were all accepted by the members present.

Derek Teasdale was accepted as Webmaster, and it was agreed that the Secretary and Treasurer would ensure the Membership database be maintained. It was agreed that the Social Secretary role will be managed by Gordon Liddle and Gordon Hull. The aspect of Marketing and Promotion of NEGS was briefly discussed but as there were no nominations the matter will go on the Committee Agenda for discussion.

Gordon Hull outlined the need to form a **Working Group** for the Heritage Open Days events planned for early September. Proposed dates will be arranged soon.

2016 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

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**

And Finally

- Members will notice that the reports of presentations at meetings, and of field trips are mainly written by Gordon Liddle, with occasional support from Judy Harrison when the report is not completed by the field trip leader or lecturer. If any member would like to volunteer to 'have a go' at writing the occasional report I am sure that it would be greatly appreciated by Gordon.
- Professor Gillian Foulger will be planning the winter season lecture series shortly and would appreciate any suggestions for presenters you may know, or have heard elsewhere.