North Eastern Geological Society

Newsletter December 2018

UPCOMING EVENTS

Friday December 14th, 2018

Members Night with

1) Dr. Andy Lane: Glimpses of Harz Geology - Familiar but Different

2) Christine Taylor: Carboniferous Volcanism of the East Fife Coast

Followed by Xmas refreshments

Friday 18th January 2019

Derek A. Teasdale "Modelling ice flow patterns across the NE using a Geographic Information System (GIS)"

Saturday 26th January 2019

YGS/NEGS Joint Meeting at Durham.
1:30pm – 4:30pm Lecture Theatre CG93

REAL GEOLOGY IN AUGMENTED REALITY
New developments in 3D geological imaging and interpretation
Check www.negs.org.uk or
www.yorksgeolsoc.org.uk

FIELD TRIP REPORTS

Sunday September 18th. 2018

Tunstall Hill and Ryhope Railway Cutting (Joint meeting with NOUGS) Led by Karl Egeland-Eriksen

Once again, our group was given the geological background to the area by Paul and ably led by Karl; the focus was to be the Tunstall Reef which is stratigraphically part of the Ford Formation of the Permian Magnesium Limestone.
Starting close to the memorial sculpture formed from a pair of pithead wheels marking the site of the former Ryhope colliery, we moved to the first exposure at Ryhope Cutting which revealed a powdery, brecciated dolomite interpreted as the dissolution residue of the Hartlepool Anhydrite. Here the basin floor of the reef is exposed.
We then moved on along the former track of the railway, now a footpath and cycle-way. Further exposures of fore reef talus, including fallen blocks indicated that we were at the eastern end of the reef with the exposure of large layers of reef material dipping at an angle of over thirty degrees.
Further west we reached Newport Cutting which appears to be separate from the main reef, and can be a Patch Reef, though this is disputed. The Dolomite here is fossiliferous with well-preserved Brachiopods, Gastropods, and Bryozoans are also present. One notable feature was that the fossils were generally very much smaller than is found in strata of a different age (Jurassic for example), and can be explained as due to the extreme conditions experienced by the

fauna associated with the shallow water environment and desert land conditions causing greater salinity. Many brachiopods and Gastropods were measured in millimetres.
Having seen the back-reef facies of the Ford Formation we began climbing onto the reef itself. It is significant that the original height was probably double the present which means that we now stand at the top of the original core consisting of massive dolomite topped by a Reef Flat of bedded dolomite with algal stromatolites interleaved - an impressive feature.

We then moved to the main quarry where there is a long exposure of a buff/brown algal Bryozoan boundstone, dipping eastward from the reef core. Fossils are well-preserved. A common problem is that with many exposures' brambles prevent close inspection of the rock.
As usual the field notes supplied provided excellent explanations of the visible rock formations as well as the conditions of deposition of the strata. The explanation of the classification of carbonate rocks especially the boundstone variants also helped our understanding. Our Chairman, Gordon presented Karl with a bottle of wine as a token of our appreciation of his guidance for all the 2018 field trips. May they long continue!

LRB

Many thanks to Les Barnes for this report.

LECTURE REPORTS

Friday 19th October 2018

The speaker arranged for this first lecture of the season was unable to attend and so **Professor Gillian Foulger** offered to discuss some of her current work with a diverse group of specialist academics and thus presented:

A radical new theory for the origin of Iceland

The breakup of Pangaea to form the North Atlantic Ocean at ~ 54 Ma was not sudden or simple as commonly described in textbooks. The disintegrating supercontinent was an inhomogeneous patchwork of cratons and orogenic belts and tectonic unrest had been ongoing since the Palaeozoic. Propagating rifts unzipped the supercontinent, often along weak zones comprising earlier orogens. Volcanism blanketed the new seaboards and underneath the continental crust stretched and flowed.
North of the Greenland-Iceland-Faroe Ridge (GIFR) the newly forming mid-ocean ridge propagated south along the Caledonian suture. South of the GIFR it propagated north through cratonic lithosphere along a line ~ 150 km further west. These two propagators were unable to break through the Caledonian frontal

thrust zone and stalled when still ~ 400 km apart in a NS direction.
As sea-floor spreading proceeded along the new mid-ocean ridges to the north and south, the ~ 400-km-wide zone that could not be broken through stretched diffusely.

Extension and volcanism occurred along multiple axes that frequently jumped laterally, with diffuse shearing occurring between them. This style of deformation is not a bizarre flight of Gillian's wild imagination – it occurs in Iceland at the present day. This proposal thus merely amounts to the unastonishing suggestion that the GIFR has always deformed in this style.
The crustal structure resulting from this process comprises magma-inflated, highly stretched continental mid- and lower crust blanketed by lavas. Kinematic reconstructions require additionally a full-crustal-thickness microcontinent ~ 150 km wide somewhere beneath the GIFR – probably under Iceland. The igneous layer probably corresponds to the 3-10-km-thick GIFR upper crust plus intrusions in the ~ 10-30-km-thick, largely continental, lower crust.
This model can account for seismic and gravity data that are inconsistent with a GIFR comprising unusually thick oceanic crust. That model as has popularly been attributed to plume activity centred on a mid-ocean ridge. The new model can explain naturally many other hitherto-puzzling observations including petrological data that show no reasonable temperature or source composition could generate a ~ 40-km-thick GIFR crust. Numerical modelling confirms that the new deformation/structural model is possible.

A continuous swathe of magma-inflated continental material beneath the 1200-kmwide GIFR implies that full continental breakup has not yet occurred at this latitude.
The model also fits well other oceanic areas. Complex, piecemeal breakup controlled by pre-existing structures that produces anomalous stretching and volcanism at barriers to rift propagation, and distributes continental material in the growing oceans, fits also the Davis Strait, the South Atlantic, and the West Indian oceans.
The presentation was illustrated with diagrams and explanations throughout. The audience was honoured to be amongst the first to hear this of this radical new theory and Gillian was thanked profusely for both stepping into the breech and for her presentation.

Friday 16th November 2018

Prof. Chris Greenwell, Durham University.

'A time of waste – sustainable environmental geoscience solutions'

Chris Greenwell specialises in searching for sustainable environmental geoscience solutions, heading a team of researchers examining water pollution. His focus is currently on the control of polluting metals which find their way into watercourses causing environmental problems due to contamination, typically by phosphorus, nitrates and, in mining areas, lead, cadmium and zinc.
Professor Greenwell's specialism is in geochemistry and much of his research relies on chemical analysis in his search for methods of control and prevention of pollutant build-up. Removal of the minerals dangerous to health is one

approach but other techniques, to safeguard the flora and fauna, involve the use of chemicals to combine with pollutants to purify the water. Another approach relies on filtration methods. In his case studies professor Greenwell visited coal and lead mines in Wales to conduct his experiments.

Methods of filtration were found to work, but not at an economic cost. Such approaches would have to be subsidised, an unlikely scenario in the current economic situation. One of the possible solutions is in the use of seaweed, since algae are known to absorb metals and thus reduce pollution. The captured metals can then be reprocessed and sold, again the economic cost is too high for this to be a realistic option. However, reprocessing plants do exist, such as the one at Dawdon in County Durham where pollution from deep mines is a concern. In this case, iron oxide, in solution, is converted into ochre.

Other non-geochemical solutions have been tried, like the channelling of water away from mine entrances. Such civil engineering approaches may be effective at certain sites, but the idea is not new and not suitable for many situations.
It seems that effective, reliable, and above all, cost-effective solutions are still at the early stages of development and are very much experimental.

Professor Greenwell's work created much interest among the membership and a variety of questions ensued. Our thanks to him for an enlightening talk.
LRB

ANNOUNCEMENT

NEGS heard, with great sadness, of the death of Dorothy (Dot) Dawson. Dorothy passed away peacefully at the home she had lived in for 65 years, aged 90 years.

Her daughter writes:

Mum was a member from the early 1970s and I remember going to lectures with her when I was in the sixth form. I have just found a signed copy of DH Tarling's 1971 'Continental Drift'. Our love of geology and continental drift came from those exciting early days. Mum enjoyed many excursions and fields weeks in the UK with her good friends at NEGS. It wasn't until 1982 that she first travelled abroad. Together we spent two weeks on a geology tour of Iceland and after that she enjoyed trips as far afield as Kenya, Russia, Yugoslavia and Oregon, USA. How excited were we when my husband's job took us to within a day's drive of Crater Lake to the south and Mount St Helen's to the north?
Mum was a committee member for many years and was very reluctant to give up her place as social secretary at 85. The friendships lasted many years and it's sad that so few of her friends are still able to go to lectures. My sister and I would like to thank everyone at NEGS for the friendship and support they gave Mum for many years.

NEGS were represented at Dorothy's well-attended funeral.