North Eastern Geological Society

Newsletter January 2018

UPCOMING EVENTS

Friday 19th January. 7.30 pm Lecture NEGS

Unlocking a volcano's secrets through crystal specific studies

Dr. George Cooper. Postdoctoral Research Associate in the Department of Earth Sciences, Durham University

---

Friday January 26th. 7.00pm
Tectonics of the Cleveland Basin. Dr Jonny Imber. **Natural History Society of Northumbria.** www.nhsn.ncl.ac.uk

Saturday 27 January 2018: 1.00pm - 4.00pm
Joint meeting with the Natural History Society of Northumbria - Geology Section at Great North Museum, Newcastle

GEOSCIENCE & SUSTAINABILITY IN THE BUILT ENVIRONMENT.
http://www.yorksgeolsoc.org.uk/EDITABLE/meeting.pdf

NOUGS Field Trips

Sunday 25 February – Allensford

10am Car Park (A68) NZ077501

Saturday 24 March - Seaham

10am Red Acre Point Car Park, Seaham

Saturday 21 April – Cheviots

Refer to: http://ougs.org/northumbria/

LECTURE REPORTS

Friday November 24th. **MARS.**
Professor. Jim McElwaine, Durham University

With the mythological names linked to this planet and its moons (Gods of war, panic and fear) Jim introduced our planet's most similar neighbour, quickly clarifying how dissimilar they are: Mars is a lot smaller, further from the sun, has a thin atmosphere composed mainly of carbon dioxide and virtually no oxygen or water, the temperatures fluctuate massively during its year and surface winds can exceed 400 km/h.

Despite these contrasts there are a few earth environments that show similarity to parts of Mars. Experimental work uses some of these locations. Mars has a covering of basaltic dust collected over billions of years, this has thick accumulations of frozen carbon dioxide covering it in many locations in the winter. The temperatures that develop during the Martian year (1.88 times the duration of our year) allow the carbon dioxide to sublimate, in turn this appears to be responsible for some surface structures. The low gravity (about one third of Earths) combines with other characteristics to allow features such as Olympus Mons, an ancient volcanic cone that reaches three times the height of Everest and has a base the size of France. Dune fields have been photographed that are similar to those made of sand on Earth. A deep (7 Kms) gash (Valles Marineris) cuts across the surface but appears to be stable now. The basaltic dust however is being used by the planetary morphology and winds to shape and create surface features. Understanding these will contribute to the activities of the visitors we choose to send.

The dating of the surface uses the number and size of impact craters. This assumes the early heavy bombardment phase, similar to that experienced by Earth, created the largest craters, younger smaller craters can be identified cutting the margins of the oldest craters. The motion of the basaltic dust is thought to be similar to the fluid motion and dry intergranular processes that occur on earth. This is one of the key areas that Jim studies using experimental and mathematical techniques albeit incorporating numerous Martian environmental characteristics to enhance the relevance of the research.

Mars has been the target of many rocket expeditions. A lot have not been successful but some such as the Voyager and Viking visitors have enabled extensive sampling and photographic records to be made and returned to Earth.

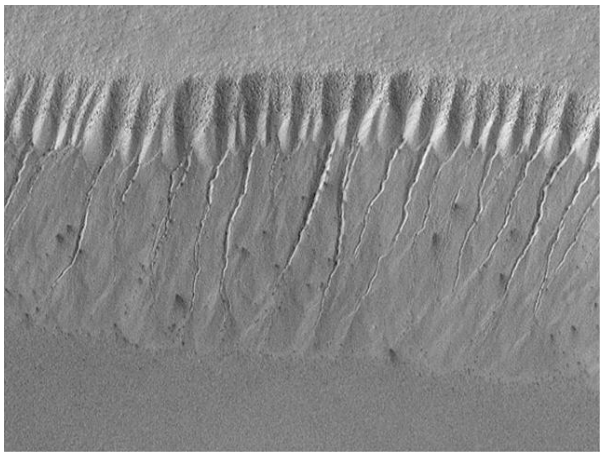


Photo: NASA

In 1965 the Mariner programme sent 22 photographs to earth, in 2012 the rover: Curiosity, marked one of the largest and most successful visits. The photographs taken by the HiRise expedition have supplied many high definition photographs. The programmes have been of several types: flyby, lander, orbital, rover and the crash technique - which allows penetration of the surface and analysis of the material thrown out of the impact site.

NASA has been the most prolific agency involved in the programmes, but several countries are now trying to develop their own programmes. The NASA results are provided freely to the scientific community. These programmes take decades to develop, are very costly and frequently fail nevertheless many are planned in the coming decades.

We know that Mars had a thicker atmosphere in the past and water was present, but when this changed and why is an active research topic.

The slopes develop frequent Avalanche features, these tend to concentrate in the spring period as differential heating causes some frozen material to thaw whilst other areas remain solid. The material moves relatively slowly, pieces of frozen carbon dioxide fall and can sublimate on their base, creating gullies as it slips down slope. The gullies have no apparent cause due to the frozen block of carbon dioxide disappearing by sublimation. Some gullies develop a zig-zag channel, this remains unexplained.

Photographs also show geyser like features puffing the dust through the frozen ' ice'. This may link to changes in pressure causing cracks to form in the ice cover.

Jim has developed some experimental techniques to test the sublimation of frozen carbon dioxide on hot sand slopes on earth. A levitation effect has been recorded supporting the theory for gully formation by the ice. The blocks of ice have been shown to be very mobile when the conditions are appropriate. Key to this appears to be the slip surface, the sliding blocks of ice can form

corrugations on the surface, a smooth surface appears to be most suitable.

The analysis of the Martian surface is a very scientifically young activity. Theories are proposed and rejected as new understanding develops. Thus, photographs have demonstrated that the surface can develop elongated Lineae. They develop on slopes of 30-35 degrees and favour Equatorial locations, the photographs show they are numerous, extend, contract disappear and return. The cause is not clear, possibly the grain size of loose surface material plus wind activity may be responsible in a process similar to the granular motion of sediment we observe on earth.

The photographs, video and tables Jim used to illustrate his presentation were excellent, he thrilled the audience with his approach. Some perceptive questions were dealt with in a question/ answer session following the talk. Jim was given a warm and generous thank you by the audience.

Summarised by Gordon Liddle

Friday December 15th. Members Evening.

There were three very different, very interesting short presentations by members at this meeting.

Firstly, **Paul Newton** and **Gordon Liddle** talked about their visit to the **High Alps of South West France**. They outlined a visit to the Digne, in the department of Alpes-de-Haute-Provence. Intense Alpine deformation was introduced with exposures including the " velodrome" that illustrated the scale and overturning that has occurred.

An icthyosaur is protected by permanent Perspex giving testimony to a Mesozoic marine environment that also produced an amazing huge ammonite packed bedding surface.
Consideration of recent events included a meltwater eroded steep, narrow gash in the landscape, a 2003 landslide and development of the very scarce areas that are flat enough to use despite being backed by very steep active slopes, huge flashy streams, undercutting and faulting! The presentation was illustrated by interesting pictures throughout, especially the supermarket with petrol pumps built on one of the scarce flat areas, with undercutting behind!

Secondly, **Christine Taylor** talked about **The Carboniferous Carbonate Platform of Derbyshire.**

Derbyshire geology is commonly divided, as a starting point, into the White and Dark Peaks. In this presentation the White Peak Derbyshire carbonate platform was used as a setting to show the environments of deposition for the range of carbonates in the area. Cavedale at Castleton illustrates the fore reef environment. The strata dips into the basin at the entrance to the dale and the apron reefs that fringed the platform can also be examined there.

Cavedale - Photo: Derrick Gwynne

Apes Tor in the Manifold Valley is a site to view the abraded and comminuted material that slid off the fore reef and formed accumulations that flowed as carbonate turbidity currents into the surrounding sedimentary basin.

The National Stone Centre (NSC) at Wirksworth also has fringing reefs but these formed a little further into the deeper water of the back-reef lagoon on the platform and are much larger. This site provides an excellent opportunity to examine the reefs, which are not framework reefs, but are created by microbial action and made of lime mud (micrite), flanked by bedded, crystalline limestones (sparite). Large crinoids colonised these reefs and are found close to their growth position or winnowed by currents into parallel deposition. Lagoonal calcarenites have been quarried for building and road stones so at the NSC there is also an opportunity to see the bedded limestones of the platform.

Mud Mounds on the High Peak Trail. Photo: Christine Taylor

The Wye Valley trail offers sites to examine these sediments closely. Millers Dale Station Quarry and the picturesque Chee Tor Bend in the river (accessed by stepping stones) are good places to see the change from the thick calcarenites to the flat-bedded sedimentary cycles of the platform.

The carbonate platform is surrounded by the siliciclastic sediments of the Dark Peak. The limestone turbidites are topped by the Edale Shales followed by the turbidite Mam Tor Beds, now found laterally against the limestones. This is a sedimentary feature and not a faulted contact. The limestone deposition came to an end when the succeeding Kinderscout Grit deltaic sediments spilled over the platform. At Stanage Edge the later large delta lobes of the Chatsworth Grit can be examined.

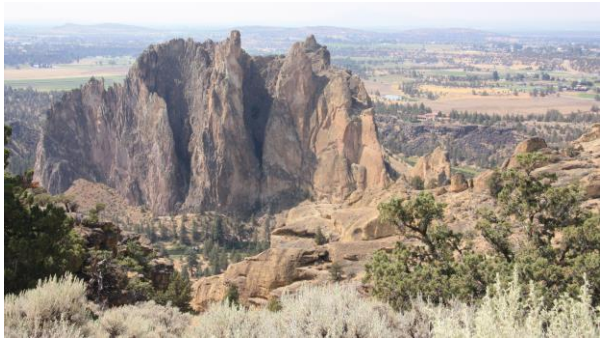
Finally, **Chris Burridge** presented **A story of Volcanoes**, describing several types of volcanic deposits visited during a recent visit to the state of Oregon., USA. She told of the Pacific oceanic and the continental plate collision, pushing ocean floor deep into the body of the Earth. Told of thousands upon

thousands of volcanic eruptions that ensued over millions of years and some of the largest lava flows in the history of the world blanketing the state.

The whistle-stop tour started with lahars, and **ash** at the John Day Fossil Beds, pointing out an Ignimbrite, 150 feet thick in some places, providing evidence of a catastrophic event at the Crooked River Caldera 80 miles away.

Sheep Rock, John Day Fossil Beds National Monument. Photo: Chris Burridge

When the Crooked River Caldera collapsed (30 million years ago) into an underground reservoir of magma causing massive eruptions Smith Rock was formed. Ash and debris almost filled the caldera, hardening into rock - the Smiths Rock **Tuff.**



Smith Rock in central Oregon's High Desert near Redmond. Photo: Chris Burridge

We were then taken to the Newberry Volcanic Monument of 1200 square miles of lava flows, lava tubes, over 400 cinder cones and volcanic vents and the youngest volcanic deposit from the last eruption 1300 years ago – Big Obsidian Flow.

Obsidian at Newberry. Photo: Chris Burridge

The presentations were followed by a very enjoyable seasonal spread provided by some of the members and our thanks go to those who helped this to happen.

FIELD TRIP PROGRAMME

Dates for your diary, further details to follow.

Sunday, April 22nd Lesley Collins. Wensleydale

Saturday, May 26th Derek Teasdale

Sunday June 3rd Ian Kille Howick Bay

Sunday July 8th Louis Golightley Eildon Hills

August Karl Egeland-Erikson Runswick Bay

Sunday September 16th Karl Egeland-Erikson, Tunstall / Ryhope

CORRESPONDENCE

The North West Highlands UNESCO Global Geopark was the first in Scotland to be designated as a Global Geopark in 2004. The designation of UNESCO Global Geoparks was ratified in Paris during November 2015 and now means we hold a similar status to World Heritage Sites. UNESCO Global Geoparks are set up to promote tourism, education and conservation in an area with globally important geological heritage. The North West Highlands Geopark is situated in the northwest corner of Scotland, it covers an area of 2000 sq. km and is home to just 2000 people.

We have two-week long tours running in late Spring and early Autumn next year. Expert tuition by Geopark staff will help you to interpret the geology of this wild and remote highland landscape. The area has the lowest population density in Europe and exhibits unique geodiversity and biodiversity. As home of the oldest rocks in Europe, the first identified thrust fault and with evidence of the earliest life; the North West Highlands Geopark really is the "Cradle of Geology".

Full details of the tours and information on how to book can be found here:

http://www.nwhgeopark.com/geotours-2018-2/

If you would like to sign up to our newsletter, please become our friend here:

http://www.nwhgeopark.com/the-geopark/friends-of-the-geopark/

Best regards, Mike Goodwin, On behalf of

North West Highlands Geopark Limited

Registered in Scotland as a company limited by guarantee

Registered office - The Rock Stop, Unapool, Kylesku, Lairg, IV27 4HW

Reg. no. SC422047

email: mike@nwhgeopark.com
web: www.nwhgeopark.com

Dear geology group member,

I am the Director of an outdoor education Centre on the Isle of Arran. A lot of our focus is on the fantastic Geology of the Island. We are currently working closely with the Arran Geopark to get UNESCO status for the Island. Along with my colleague, Stuart Blake, we took over ownership of the Lochranza Centre CIC from a much larger company. We have been adding new courses etc over time.

We have had quite a bit of interest in offering Geology Introduction courses to members of the public. We have such a course running from **July 21st. 2018**.

Lochranza Centre
Unearthing The Rocks
21st July 2018
WHY NOT ESCAPE TO ARRAN THIS SUMMER & LEARN ABOUT ITS FASCINATING GEOLOGY?

Our public Geology course gives you the chance to do just that. Suitable for beginners or those who understand a little but would like to know a lot more.

6 nights full board accommodation in twin or single rooms. Transport provided. 5 days of guided walks.

Geology which does not cost the earth
£399.00 pp

Chris Traill, Director, Lochranza Centre,

Isle of Arran KA278HL 01770 830 637