Geology Matters

The newsletter of Malvern U3A Geology Group
June 2017

The leader

Here comes the sun – we hope! Well our indoor programme is over for another year and we are already well into the summer field trips. My thanks first go to Sue Munday for all her work organising the trip to Pembrokeshire in early May. Those of us who went on the trip had a wonderful time on the very spectacular Pembrokeshire coast helped enormously by the good weather. The geology was spectacular described with huge enthusiasm by our leader Gareth George. Thank you Sue.

I also want to thank Hilary Edgeley for her leadership of the trip to the Lickey Hills. Although I couldn't make it, I understand it was an excellent trip hosted by Julie Schroder one of the EHT champions. Apparently, they are all now experts on Lickey Hills Quartzite!

Our final monthly meeting in May was a delightful mixture of feedback topics. Thanks to all those who contributed and particularly to Alan Gray who did one of his impeccable presentations on Fuerteventura and Lanzarote. An excellent way to end the year with group members fully to the fore.

You will probably have seen my email regarding the cancellation of our proposed Brittany trip. Obviously, it was a great shame to have to make such a decision, but in view of the numbers it was right to do so before we began to incur costs. I have some feedback from members which will help us understand the reasons and to plan for the future.

On a similar note, our numbers for the visit to the BGS Open Day on 1st July are borderline at the moment. If you are thinking of going and haven't given your name to Peter Bridges (ptrbrdgs@gmail.com), please do so soon.

Finally, may I wish you all a wonderful summer? Keep your eyes open for the announcement of our field trips – hopefully I will see you then.

You either believe in it or you are Head of the Environmental Protection Agency

This isn't a political tract, but recent events in the United States have been alarming for those of us who believe in evidence led decision making. So the appended news stories from The Washington Post are posted without comment.

EPA website removes climate science site from public view

The Environmental Protection Agency announced Friday evening that its website would be undergoing changes to better represent the new direction the agency is taking, triggering the removal of several agency websites containing detailed climate data and scientific information.

EPA dismisses half of its scientific advisers on key board, citing 'clean break' with Obama administration

The move could significantly change the makeup of the 18-member Board of Scientific Counselors, which advises the EPA's key scientific arm on whether the research it does has sufficient rigor and integrity.

President Trump and his newly appointed head of the EPA, Scott Pruitt, are both disinclined to believe the role of carbon dioxide in global warming. So it was interesting to note some recent articles which originated in the United States and which should give them pause for thought.

The first is a little peripheral because it involves Iceland's hot spot and its effect on the melting of the Greenland icecap. According to a new study in the

journal *Science Advances*, the hotspot softened the mantle rock beneath Greenland in a way that ultimately distorted their calculations for ice loss in the Greenland ice sheet. This caused them to underestimate the melting by about 20 gigatons (20 billion metric tons) per year.

That means Greenland did not lose about 2,500 gigatons of ice from 2003-2013 as scientists previously thought, but nearly 2,700 gigatons instead -- a 7.6 percent difference. The numbers are enormous and difficult to comprehend but they represent a step change in the biology, hydrology and geology of this huge island.

A more recent report concentrates on the retreat of glaciers in widely separated locations. The IPCC (International Panel for Climate Change) has voiced its concerns in these terms. Ice loss to the sea currently accounts for virtually all of the sea-level rise that is not attributable to ocean warming, and about 60% of the ice loss is from glaciers and ice caps rather than from the two ice sheets. The contribution of these smaller glaciers has accelerated over the past decade, in part due to marked thinning and retreat of marine-terminating glaciers associated with a dynamic instability that is generally not considered in mass-balance and climate modelling. This acceleration of glacier melt may cause 0.1 to 0.25 metre of additional sea-level rise by 2100.

The following images illustrate iypical changes.

E

F

Stein glacier in Switzerland has retreated ~ 550 m in 10 years

G  H 

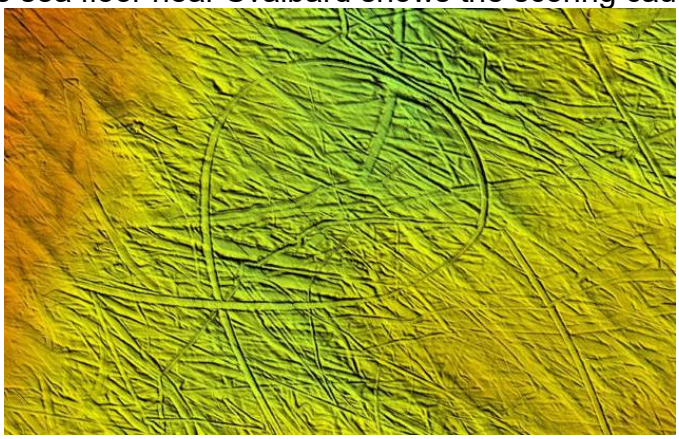
Gori Kalis glacier in Peru has retreated ~1.4 km in 38 years

Whilst from a geological point of view, the 3mm annual rise in sea level which has resulted from the melting may seem small, the cumulative effects in other directions are more dramatic with the drowning and erosion of vulnerable coasts; increased rainfall causing a raised risk of flooding and avalanching being hardly tivial phenomena.

And on this theme you might care to look at the evidence and the scientific consensus published by NASA: https://climate.nasa.gov/evidence/

Icebergs

When the seaward edge of glaciers and ice sheets 'calve' the result is an iceberg. These vary in size quite dramatically from relatively small pieces to giants weighing many thousands of tons. They can, in the right circumstances, leave evidence of their passing. The following image from a high resolution survey of the sea floor near Svalbard shows the scoring caused by icebergs.



You'll see that one berg managed to make a full circle. More images on:
http://www.bbc.co.uk/news/science-environment-39694623

Eskers and drumlins

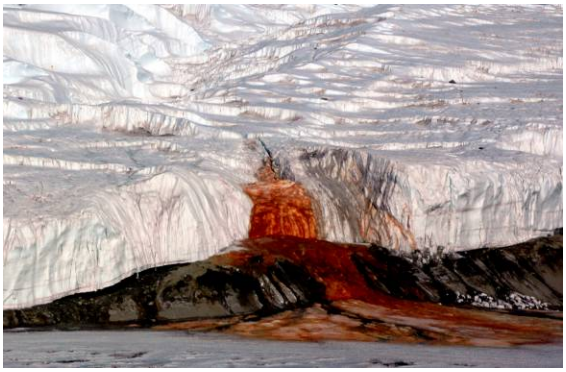
Other, but more permanent features that results from glacial action include U shaped valleys, eskers and drumlins. They are very good at redistributing large amounts of rock, sand and gravel.

Here is an esker on the coastline of Sweden - a long, winding ridge of stratified sand and gravel, examples of which occur in glaciated and formerly glaciated regions of Europe and North America. Eskers are frequently several kilometres long and, because of their peculiar uniform shape, are somewhat like railway embankments. Drumlins are a little different; from the Irish word *droimnín* ("littlest ridge"), first recorded in 1833, and in the classical sense is an elongated hill in the shape of an inverted spoon or half-buried egg formed by glacial ice acting on underlying unconsolidated till or ground moraine – yet more glacial features..

A drowned drumlin in Clew Bay, Ireland.

The Blood Falls

Since we started on a cold theme, then this Antarctic curiosity is a natural next step.



Blood Falls is an outflow of an iron oxide-tainted plume of saltwater, flowing from the tongue of Taylor Glacier onto the ice-covered surface of West Lake Bonney in the Taylor Valley of the McMurdo Dry Valleys in Victoria Land, East Antarctica.

Iron-rich hyper saline water sporadically emerges from small fissures in the ice cascades. The saltwater source is a sub glacial pool of unknown size overlain by about 400 metres of ice several kilometres from its tiny outlet at Blood Falls.

The reddish deposit was found in 1911 by the Australian geologist Griffith Taylor, who first explored the valley that bears his name. The Antarctica pioneers first attributed the red colour to red algae, but later it was proved to be due to iron oxides.

And now something rather different - Seismites

Seismites are sedimentary beds and structures deformed by ground shaking during an earthquake. The German palaeontologist Adolph Seilacher first used the term in 1969 to describe earthquake deformed layers. Today, the term is applied to both sedimentary layers and soft sediment deformation structures formed by shaking. This subtle change in usage accommodates structures that may not remain within a layer (i.e. clastic dikes sand volcanoes). There is reputed to be an example in riverside limestone beds at Ludlow, but on our visits it eluded several attempts at identification, so here is an example you couldn't really miss.

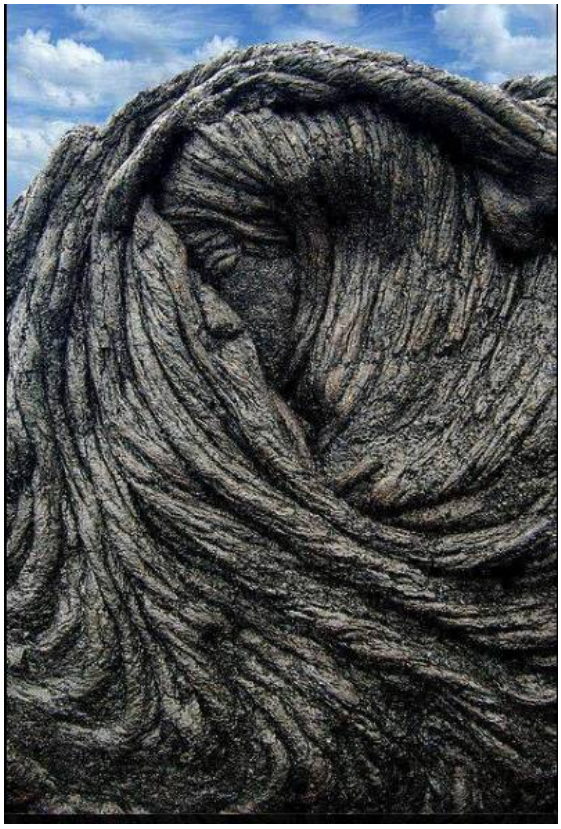
Rock of the month

If you have ever been to a volcanic island, say like Fuerteventura, or any of the other Canary Islands, you will have seen how basalt can assume many different forms and even colours. The naming systems for these have evolved over the years and several are Hawaiian in origin.

Pāhoehoe [paːˈhoweˈhowe] meaning "smooth, unbroken lava" is basaltic lava that has a smooth, billowy, undulating, or ropy surface. These surface features are due to the movement of very fluid lava under a congealing surface crust.

A pāhoehoe flow typically advances as a series of small lobes and toes that continually break out from a cooled crust. It also forms lava tubes where the minimal heat loss maintains low viscosity. The surface texture of pāhoehoe flows varies widely, displaying all kinds of bizarre shapes often referred to as lava sculpture. With increasing distance from the source, pāhoehoe flows may change into ʻaʻā flows in response to heat loss and consequent increase in viscosity. Pāhoehoe lavas typically have a temperature of 1,100 to 1,200 °C.

Most lava flows on the Earth are less than 10 km long, but some pāhoehoe flows are more than 50 km long.



The gallery

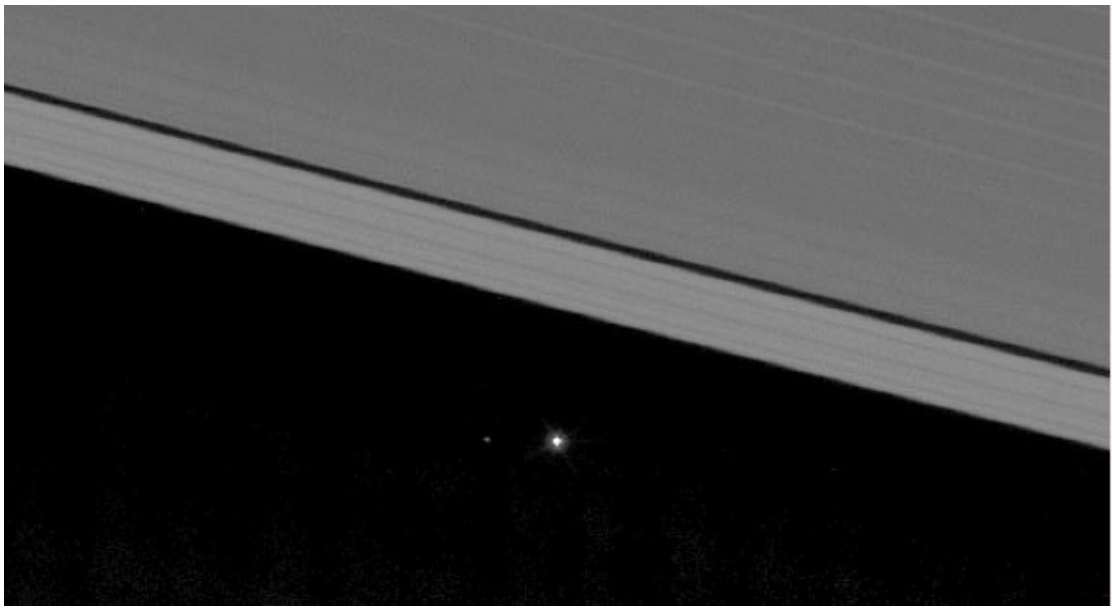
Phyl King, who is doing a sterling job setting up our Photographic Resource, is also clearly a traveller as her image below shows. It is of solfatara a shallow crater at Pozzuoli, near Naples, part of the Campi Flegrei volcanic area. It is a dormant volcano, which still emits jets of steam with sulphurous fumes. It was formed around 4000 years ago and last erupted in 1198 with what was probably a phreatic eruption - an explosive steam driven eruption caused when groundwater interacts with magma. The crater floor is a popular tourist attraction, as it has many fumaroles and mud pools.

Speaking of tourist attractions, here is another. Although a rather more distant one, that shows mud pools and other associated features at their very best.

https://www.facebook.com/waiotapunz/ and view the video

Were you waving?

Yes that's us when viewed by Cassini as it zoomed past Saturn's rings. The



absence of detail is excusable when you realise that the Saturn – Earth distance was then 1.4 Billion km. We are apparently looking at the South Atlantic. The faint dot to the left of Earth is the moon.

The calendar

June	14	Local field trip: Hollybush/Raggedstone Hill
July	1	Visit: BGS Open Day

	26	Local field trip: Bromsgrove building stones (Evening)
August	30	Area field trip: Hergest ridge
October	11	Monthly Talk: Metal Mines of Spain
November	8	Monthly Talk: Glaciology
December	13	Monthly Talk: Malvern Hills Geology
January	10	Effects of Meteorites, Asteroids and Comets
February	14	Speleothems
March	14	Turbidite Flows
April	11	The Devonian System

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