Geology Matters

The newsletter of Malvern U3A geology group
January 2016

The leader

The autumn lecture series 2015
The history of geology

There must be little doubt about the value of belonging to the U3A geology group. It is well organised, varied and interesting. Sometimes it challenges us intellectually, which is good; more often it provides a fascinating insight into our geological past and present. Richard Edward's lecture series, including the contributions from Alan Gray and Andy Howard, has taken us on a rather different path in looking at the history and development of the subject. If you missed one or other of this fascinating series then here is your chance to catch up, both with the slides and the commentary.

Should you wish to view one of the lectures then all you need to do is click on the appropriate subject title in the table below and download the relevant file location. A simple guide to doing this if needed is included in my email. If you have any problems with this then please contact Richard Newton at: richard@renewton.plus.com

07-Oct-15	Early Mining and the Development of Minerology	Richard Edwards
14-Oct-15	The Roles of Field Work and Experimenting in Understanding Igneous Rocks	Richard Edwards
21-Oct-15	The Development of Stratigraphy and Ideas Concerning the Age of the Earth	Richard Edwards
28-Oct-15	Early Controversies in Structural Geology and the Evolution of Ideas Concerning the Making of Mountains	Richard Edwards
04-Nov-15	Metamorphism and the Impact of Petrology in Resolving Geological Problems	Richard Edwards
11-Nov-15	From Biblical Flood to Glaciation and Ice Ages	Richard Edwards
18-Nov-15	Catastrophe and Uniformity as Geological Processes	Richard Edwards
25-Nov-15	Seismology and the Internal Structure of the Earth	Alan Gray
02-Dec-15	Continental Drift and the Development of Plate Tectonic Theory	Alan Gray
09-Dec-15	Back to the Future of William Smith's Map - Meeting Modern needs for Geological Knowledge	Andy Howard (BGS)

Spring Lectures 2016

As promised last month, here is the list of Spring lectures.

13 Jan 2016	Snowball Earth	Prof Ian Fairchild
10 Feb 2016	The Metal Mines of South Wales	Robert Vernon (Bredon)
09 Mar 2016	How Geology Affects the Man Made & Natural Landscape	Pete King (Leigh Sinton)
13 Apr 2016	EHT Building Stones Project	Kate Andrew (EHT)
11 May 2016	Members Meeting - Feedback from Azores Trip?	TBD

Penetrating the Moho!

You may remember that back in February 2013 we had a memorable lecture by Dr Chris MacLeod on 'Ocean Floor Spreading' in which he described his new research into the mechanisms at play at mid-ocean ridges (click here for a reminder of his talk). Well he is at it again as the Co-Chief Scientist of a new geological cruise which may overturn our understanding of ocean crust and the crust-mantle boundary.

An expedition is underway which may overturn our understanding of ocean crust and the crust-mantle boundary. The scientists on board the Joides Resolution invite you to follow their progress as they drill a very deep hole into the crust that they hope will ultimately penetrate the Moho. They will be looking for evidence that would overturn currently accepted theories regarding the formation of the Earth's crust and mantle. There will be 4 educational specialists on board producing materials for schools and the general public.

Progress of the expedition can be followed live at http://joidesresolution.org and http://iodp.tamu.edu/scienceops/expeditions/indian_ridge_moho.html.

They plan to drill at a site on the South West Indian Ridge in the Indian Ocean, known as 'Atlantis Bank', where they believe conditions are optimum for this challenge. Water depth is very shallow – only 700 m – which will enable the team to drill relatively quickly. At this location geological faults have removed the upper ocean crust entirely; hence the Moho here lies at only about 5 km below the seafloor. Using the latest high-tech drilling equipment during the two-month IODP Expedition 360, the team aims to drill at least 1.3 km below the seafloor to start to explore how the lower crust is generated, and how far seawater penetrates at depth.

Does the Moho in the ocean really represent the crust-mantle boundary? The team proposes that rather than representing the crust-mantle boundary, the seismological Moho may instead represent a serpentinisation front - the lowest point at which seawater has seeped into the mantle through cracks, transforming the mantle peridotite into serpentinite. The seismic characteristics of the crust and serpentinite are essentially the same, so seismology alone cannot distinguish them.

How deep can life exist in the Earth subsurface? The serpentinisation of peridotite generates hydrogen and methane, both of which are fuel for microbes. If we find that serpentinite exists deep in the Earth's interior, then life may also exist in these extreme areas. How much life is down there, and what are the limits of this life? These are important questions which the expedition will try to answer.

They will return to the site at a later date to deepen the hole and achieve the ultimate goal of drilling a 'Mohole' right the way through the Moho and into the mantle.

OUGS WM lectures

OUGS West Midlands branch will be holding our popular biennial Day of Talks again on 27 February 2016 - see attachment. Booking in advance is essential and as early as possible as there are limited spaces. We have attended one of these events before and they are first class. Travel by train is best and group travel discounts are available.

Interested in rocks?

Following the continuing success of the fossils subgroup, we wonder if there might be interest within the whole group for starting a subgroup to study rocks! We even have our own rock collection which could be used as the basis of future study. This might include looking at a rock's physical characteristics visible at outcrop and in hand or core samples as well as its colour, texture, grain size, or composition using low magnification techniques (lithology). It could also include study of the origin, composition, distribution and microscopic structure of rocks (petrology). If you might be interested in such a sub group, please let either me or Dick Harris know (contact details below). Giving us your name doesn't indicate any firm commitment but will give us a gauge of possible interest.

Whether or not there is any interest in starting a subgroup, we plan to include a rock (mineral or fossil) of the month in each newsletter. See below for the first of the series.

....and finally!

We have updated the Group's policy documents to ensure that they are in line with current National and Malvern U3A policy. There are 2 documents; Geology Group Guiding Principles and Subgroup Guidelines. We recommend that you do take a little time to read these documents particularly if you are in any way involved in planning or organising any of our activities. You will find them here on our website.

And now for something different

I've always had a soft spot for Pembrokeshire. It started with family holidays in the 50s and 60s and then one of my best mates at College came from there. Friendly people, great countryside and some fabulous coastal scenery. I think that Cec Roberts must think so too. Talk to him and his enthusiasm shines through. He's written the following guide to encourage you to go and see for yourself:

The rocks of South West Pembrokeshire were deformed during the Variscan orogeny, a period of mountain building, which had several phases and lasted until the end of the Carboniferous Period around 290 million years ago.

The Pembrokeshire Coalfield is one of the smallest British coalfields. The main coalfield extends from Saundersfoot on Carmarthen Bay westwards to Broad Haven on St Brides Bay. A small detached portion of the field is centred on Newgale at St Brides Bay.

The limestone cliffs along the Castlemartin Peninsula display some of the finest limestone geomorphological features in the UK, and they also provide habitats for colonies of seabirds. The unfenced sheer cliffs, which are up to 40m high and often unstable, especially near faults and the many blowholes.

The geology of the area is of particular interest with many good exposures both inland and along the coast, exhibiting a variety of rock types and structural features such as natural arches, stacks, rock folding and sea caves. Here are some of the locations I particularly recommend.

GREEN BRIDGE OF WALES

The site lies at the extreme west of the eastern sector of the MOD's Castlemartin military training area but access for the public is normally available. From the car park at SR 925946, walk 200m to the south west to the viewing platform due west of the Green Bridge. This textbook example of a natural arch has a span of 25m, it is eroded into gently dipping, well bedded Carboniferous limestones with thin interbeded mudstones. These pass up into massively bedded limestone which forms the cliff top above the arch. More resistant and thicker bedded limestone facies also form the wider pedestal of the structure. A small isolated stack represents the remains of a former arch; eventually the main arch will also collapse to leave two stacks.

ELEGUG STACKS

From the Green Bridge rejoin the coast path and walk about 300m to the east to a small promontory, which gives the best view of two impressive limestone pinnacles known as Elegug Stacks. Elegug was the local name for the guillemot, which nests on the guano-covered stacks. Both stacks would originally have been impressive natural arches similar to the Green Bridge. The sheer vertical walls of these features were formed as a result of differential marine erosion along vertical joints. The smaller spire has a prominent palaeokarst surface along its centre.

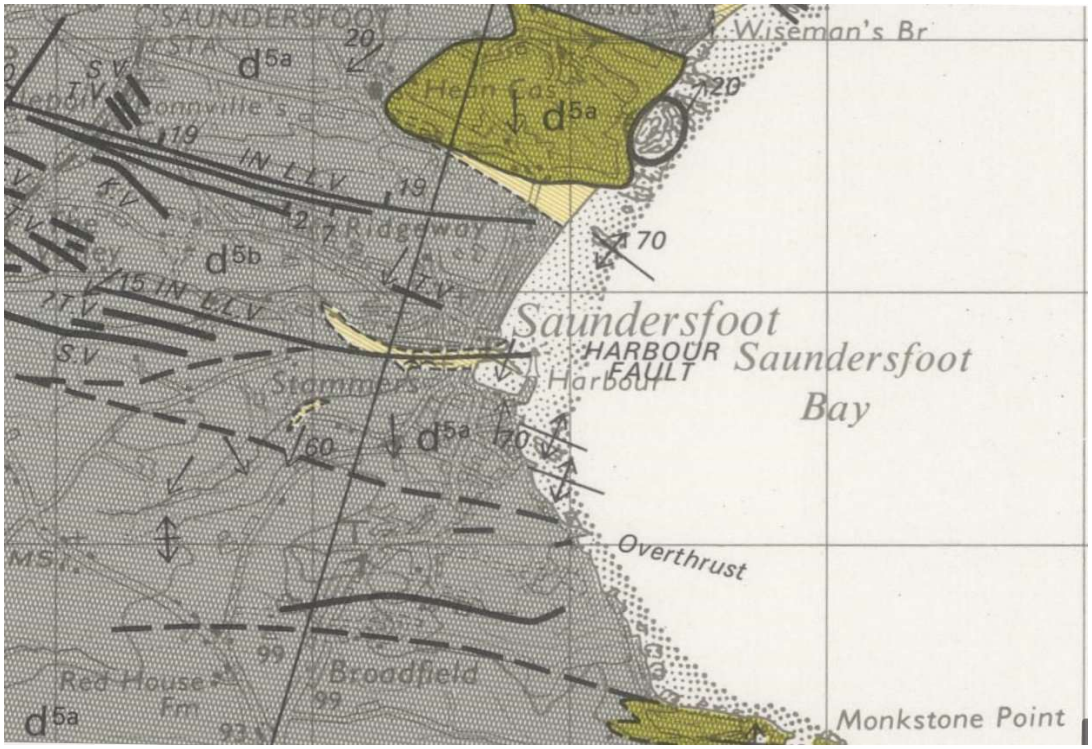
HUNTSMAN'S LEAP

Walk from the car park at SR 967930, west along the coast path to a point where two narrow chasms with vertical limestone faces almost intersect the path. The second gully is known as Huntsman's Leap SR 962931, a magnificent 40m high vertical chasm eroded along a NE-SW trending fault in the Carboniferous limestone. It is 20m wide on its landward side and tapers to less than 2m towards the sea, the other chasm is 200m to the east and is 30m wide. Both these features were eroded along NW-SE-trending faults and probably evolved as a result of the roof collapse of former blowholes. The name derives from local folklore, a hunter on horseback is said to have jumped from one side of the chasm to the other whilst being pursued.

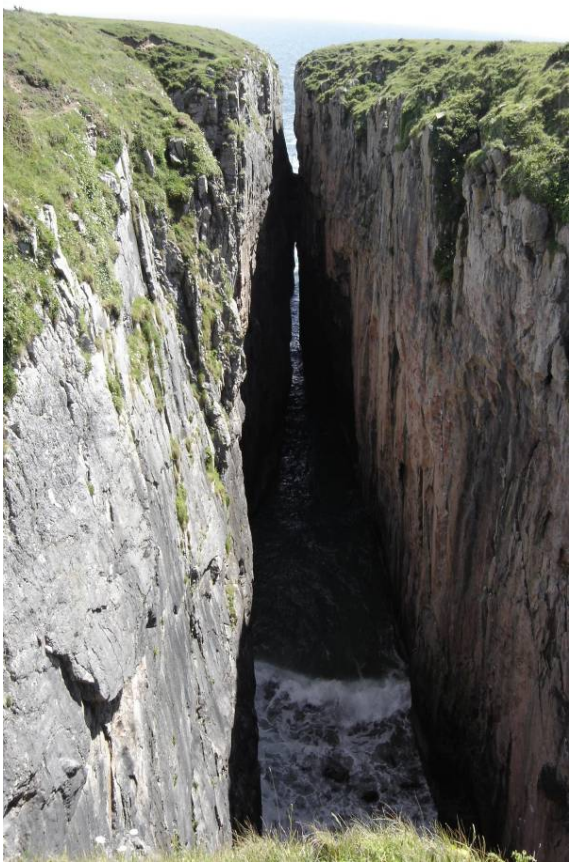
LADIES' CAVE ANTICLINE.

The famous Ladies' Cave Anticline is exposed to the south Saundersfoot Harbour at SN 139043. The anticline is a fine example of a Variscan Chevron fold with long straight limbs in the Westphalian Strata, Lower Coal Measures of the Pembrokeshire Coalfield. The fold is asymmetric and its axial surface dips at 75 degrees to the south, with an inter-limb angle of about 65 degrees.

About 250m to the south-east a major WNW-trending thrust cuts southward dipping argillaceous coal-bearing facies. Above the thrust, the erosive base of thick sandstone is exposed in the hanging wall of an anticline.



Ladies' cave anticline



Huntsman's leap

Please share your experiences with us! Just have a chat with Geoff Carver – it's really quite painless.

Rock of the Month

Whenever you see a dramatic rock face like this, you can be fairly certain that it is volcanic. This particular one is part of the caldera of Taburiente volcano on the Canarian island of La Palma, which we visited nearly three years ago.

Whilst there are a variety of rocks making up the caldera wall, it is predominantly made of basalt, probably the most widely distributed rock on and off the planet. It does, however, have a quite variable appearance, depending on whether it was erupted as a fountain of lava (with lots of gas) or as a slow flowing stream.

The colour is grey, and in its solid form, usually quite a dark grey. Add in the holes caused by the gases and it can lighten the colour. If it cools very slowly then it tends to form very distinctive columns. So, there is quite a range which we have tried to show in the pictures below. Although a bit variable in composition, it essentially contains three minerals – pyroxene (augite), plagioclase and olivine.

Columnar basalt

Massive basalt

Pumice (basalt with lots of cavities)

Well there you have it – this is a bit of an experiment. We want to bring you information about rocks, minerals and fossils. We will also consider different ways of presenting the information, and we'll let you know about this in the near future. In the meantime, have you any interesting rocks, minerals or fossils? Could you please let Geoff Carver know about them, and so share the information with other members of the group. We would be delighted to hear from you.

Who's who?

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And finally finally