Geology Matters

The newsletter of Malvern U3A geology group
February 2017

Maps

If you have been an attentive student then you will have noticed that several recent editions of the newsletter have been dedicated, in a rather general way, to the work of some of our subgroups. Well blinking shyly in the spotlight we now feature our Maps sub group. Alan Hughes has contributed this next article.

What have the Maps Group been up to recently? Well, last winter we had monthly sessions at the Cube investigating geomorphology; looking into the forces and timescales that shape the landscape around us. We followed that up this summer with two field trips to see examples for ourselves.

Landscapes are geologically short lived, even mountain ranges wear down rapidly and Britain's landscape has really been set during the Tertiary with most of the action taking place during advances and retreats of glacial maxima, so there is no shortage of examples to look at.

First stop was the truly beautiful Welsh National Nature Reserve, Craig **y** Cilau near Crickhowell which has a wealth of geological features and natural habitats.
Craig y Cilau boasts the tallest limestone cliffs in Wales and one of the suggested reasons for this is a massive Rotational_Rock_Slope Failure. And by massive I mean at least a kilometre in length of the valley side collapsed in a single event. The mechanism suggested is the undermining at the base of the valley side by an advancing valley glacier and when the glacier retreated it removed support for the valley side which then suffered a catastrophic rotational collapse. Very impressive if you stand there on the ridge that was formed and try to imagine it happening.

Also at Craig y Cilau we looked at moraine, glaciofluvial deposits, mass movements, Talus slopes, debris fans, active scree slopes, melt channels and karst features to name but a few (there is plenty of geology there we didn't have time for)

Then we moved on to Abergavenny and the Neville Hall Hospital A&E dept to patch up members of the field trip who had overdone it. No, not really. We went there because the hospital is built on a huge glaciofluvial outwash deposit and moraine left by a retreating Usk valley glacier. The river Usk now cuts through this deposit and by scrambling down the bank you can see a several-metre-high cross section of well-sorted well-cemented cobble gravel deposit and a more poorly sorted gravelly sandy moraine round the end of the feature.

Finally we moved north to Llanvihangel Crucorney to walk on a spectacular, 30m (110ft) high, morainic ridge, kilometres long, which blocked the SE course of the river Honddu causing it to swing north and join the river Monnow. (really well worth a visit but don't go on a Monday; the pub's shut)

Our second field trip was closer to home, the Severn Valley**.** We considered the paleo-history of drainage in the Welsh borders and English Midlands then the evidence for the more recent history, post ice maxima, as evidenced by the river terrace deposits shared by the Severn, the Teme and the Avon.
There are six identified terraces along the lengths of the rivers, all associated with inter-glacial events from the Anglian glaciation 400,000 years ago but mostly from the Devensian maxima 20,000 years ago. The terraces are easily identified from the BGS sheet 199 (The Worcester memoir is good on the terraces too) The terraces reduce in height from No. 6 at 60m above Ordnance Datum (i.e. sea level) to No.1 at 15m. (the terraces have survived because this part of Britain has been slowly rising and the river adjusted by cutting deeper, leaving the terraces behind for us to find) The highest terrace, No.6, the Spring Hill terrace, is some 50m higher than the present river.

This photo is No.6 terrace at Severn Stoke looking towards the Malvern with two other terraces visible across the river in the middle distance.

Think about it. ……..……there was a braided river flowing at different times and places between the Malvern and the Cotswolds at the same height or higher than Barnards Green is now, less than 400,000 years ago. Go and find the terrace at Severn Stoke or Old Hills**,** Callow End across the river, and stand there in what was the middle of a river 400,000 years ago and look all round you for the next highest ground east and west that might have contained the river and that is the Malverns and the Cotswolds. And look round to see how high above the river you are standing. The map shows Spring Hill terraces that are 9km apart on either side of the river. Some river that!

Suitably impressed we drove round finding terraces 5,4 and 3 (and 2 as well if you've got a good imagination.) (Later I was nagged to find No.1 terrace deposits and there is a good one at the bottom of the river cliff behind Hallow.

What else? Sue Chester and I have been assisting Arthur Tingley's Knighton map project but not as diligently as we should have done.

What now? Currently, our winter monthly sessions concern the formation of rocks and minerals; the chemistry and crystallisation of the minerals that form the rocks under our feet and the reasons that some of them weather faster than others. Where does granite come from, and how come all that gets left is a quartz sandy beach? We shall find out.

What next? Next years' fortnight. summer project is to walk the length of the Geopark Way, in easy stages one day at a time.

Intrigued? Well Mary Geffen is the contact for the group and you will find her details at the end of the newsletter.

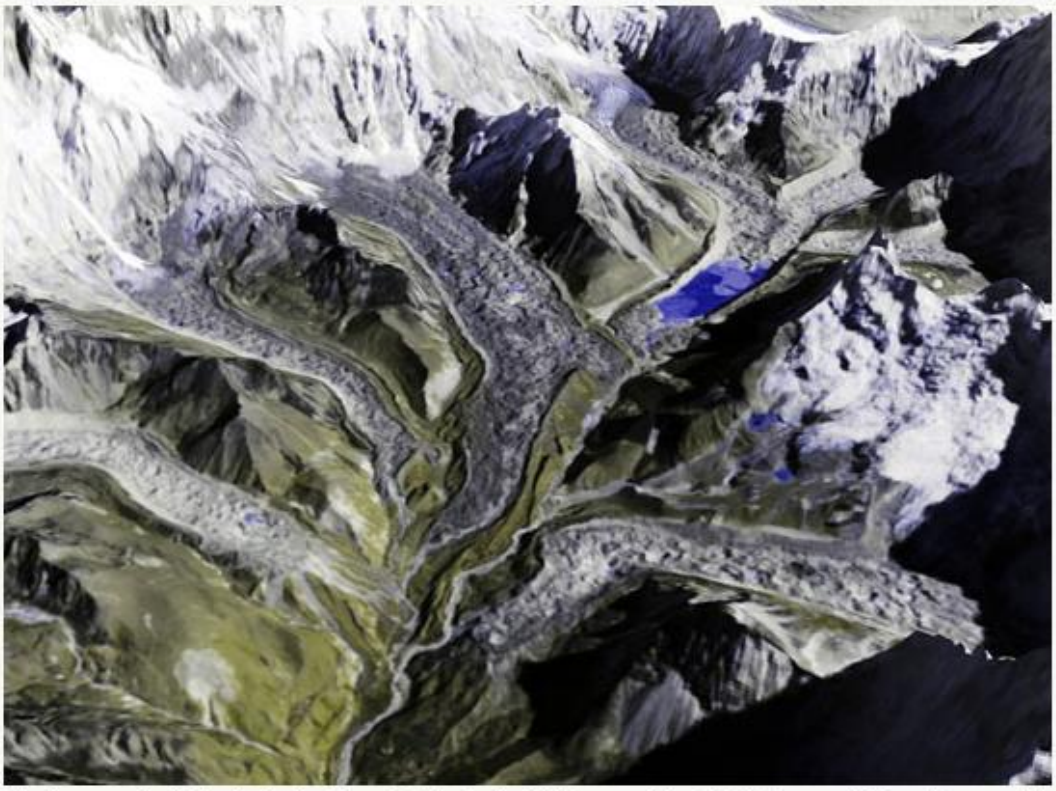
Alan mentioned river terraces and in this picture of Glen Roy, above, you can clearly see the terraces that were formed by previous flood levels at the end of ice ages. At the lower right you can see an exposed section of the silty/gravelly material that was deposited.

Rivers and tectonics

Rivers are remarkable in their relentless work of erosion, and here are a couple of examples. First the Colorado river, responsible for forming the Grand Canyon in Arizona. It is well worth a visit, but its sheer enormity takes some comprehension.

Our second example is the River Sind in Kashmir, which has exposed an interesting fold structure caused by the tectonic interaction of the Indian and Eurasian plates.

This slow motion collision has produced the Himalayas, which like other high mountains have permanent snow fields and glaciers. In the following image you'll find more glaciers than you can shake a stick at. They are perhaps even more erosive than rivers.



The large glacial lake Imja Thso in the Imja Valley south of Mt. Everest/Nepal formed in the 1960s and has grown continuously ever since. 3D view generated from an ASTER satellite image. picture: T. Bolch, Universität Zürich/TU Dresden

These two forces can also be seen in action again in the image below. Taken in a cave system it shows the shiny slickenside produced during the

formation of this transform fault (sideways displacement)

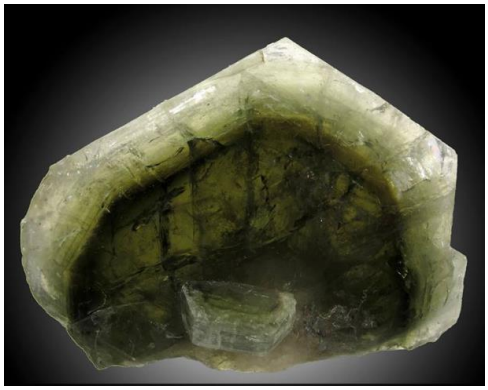
Pesky volcanoes

During the 2010 eruptions of Eyjafjallajökull, the tongue twisting Icelandic volcano, there was widespread disruption to air traffic in Europe. The fear was that tiny particles of volcanic ash would be ingested into aircraft engines, where the 2000ºC temperatures would melt the ash and form a glass that would slowly choke the cooler parts of the engine. Well recently some research has been carried out to find the statistical likelihood of recurrences. Just follow the link below for details.

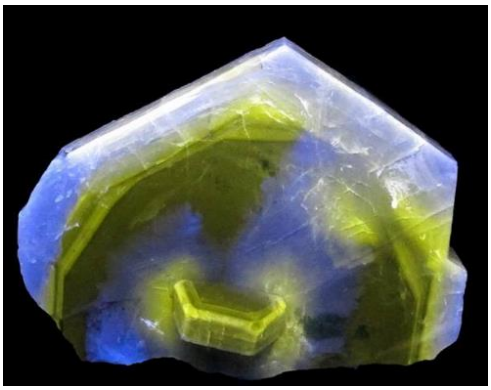
https://www.sciencedaily.com/releases/2017/01/170103101758.htm

Rock of the month

Have you ever noticed that a gin and tonic glows slightly in sunlight? If not , then this is now a good opportunity to carry out a purely scientific experiment and then drink the experimental subject afterwards. Tonic contains the substance Quinine, which as it happens has anti-malarial properties; it is a little on the bitter side, but when mixed with gin it becomes a very palatable drink. However, I digress – this same chemical fluoresces (glows) when exposed to the ultra-violet radiation found in sunlight. Now this is a rather digressive way of telling you that various other things glow in the same way and the two images that follow, show the effect quite nicely.



Fluorapatite in white light



Fluorapatite in ultra violet