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Farnham Geological Society

(A local Group within the Geologists' Association)

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After one of the mildest Christmas seasons down South we are now, in early January, starting our real winter with arctic winds. It will take several decades before one can confidently attribute a steady improvement in our weather pattern to Global Warming. When this does happen there will be increased coastal erosion especially in South and East England due to rise in sea level. Selsey could even become an island if the shingle beach at Bracklesham Bay is not maintained.

For this first Newsletter of 1999 we have to thank Joan Prosser for a vivid account of a trip to Iceland. Iceland lies just south of the Arctic Circle (66° 32'N). The article is in two parts. The two maps of Iceland which accompany it are stapled separately for convenience. The second part will appear in the next Newsletter.

For the next contribution we are indebted to Alan Comer for his article on Ladybirds. These colourful creatures are known to hibernate and I once saw clusters of them on our garden fence. Sometimes they have a boom year: in one such year people were complaining that they were being bitten by them! Perhaps they had run out of aphids.

Finally we have to thank Jackie Clark for her pen-and-ink sketch of the Cliff Palace at Mesa Verde National park in Colorado. This was one of the most impressive man-made objects we saw on the tour, perhaps reminiscent of Petra.

G.A. REUNION

Our Society's last function last year was our display at the Geologists' Association Annual Reunion on 7 November 98.

Peter Luckham accompanied me as navigator through the maze of London's streets. We arrived at University College a few minutes before our appointed time and soon had the display set up, helped by the Darlings and the Stephens's. At this show Cath Clemesha was awarded a prize in the photographic competition.

Our display was of various polished stones, all being English except one from Wales. The centrepiece was a red calcareous alga, popularly known as beetroot stone. This had been sliced in half and polished. It was in the shape of a sector of a circle, seven inches in radius and an angle of 60 degrees between radii. It showed 17 growth rings which may have represented its age. This was the alga Solenopora jurassica. Around

it were arranged various English 'Marbles' together with conglomerates such as Hertfordshire Puddingstone and some flints. A fair amount of interest was shown, specially in the locality of Foss Cross Quarry from which the beetroot stone was collected about ten years ago. It lies on the border of the old Roman Road, Foss Way, a few miles north of Yeovil. Unfortunately we couldn't give the map reference.

Here I would like to pay tribute to Peter Luckham for his skill and patience in navigating us there and back. No way could I have made the journey by myself. Our return journey was a nightmare. It took us an hour just to cover the eight miles or so to Putney Bridge, crawling traffic the whole way. To cap it all we were rear ended by a bunch of yobs in a car while we were stationary on the bridge. Luckily no damage was done.

David Caddy

DIARY OF A STUDY TOUR OF ICELAND
12th to 26th July, 1998.

(A small personal Icelandic saga).

The field trip was organised by the Continuing Education Department of Bristol University. Our friends Drs. Peter Hardy and Reg Bradshaw led the tour, and patiently answered our endless (and sometimes mindless) questions.

We arrived in late afternoon sunshine at Key Cabin Hotel, Reykjavik. Hotels in Iceland are few and far between - and expensive, so it was a kind and gentle introduction. We knew that we would not necessarily be sleeping in a bed again until the final night of our tour!

The view of Reykjavik harbour from my room was quite stunning, with a line of volcanoes and volcanic ridges on the horizon. I was so excited just to be there that I sat up late, watching the sun setting over the sea. In Iceland this means until about midnight in July, and I can tell you that it rises again at around two a.m., with no darkness in between. A rather startling fact , which hit me belatedly (after all, I was very tired by then) was that I had watched both events FROM THE SAME WINDOW ! An interest in astronomy had never led me to dwell on this particular view from Earth, and it would need more thought later.

Earlier in the evening, on our way through downtown Reykjavik to look for a suitable /cheap restaurant, we were impressed to see "under-street" hot water pipes being laid. When the plentiful geothermal supply has circulated through the domestic heating systems in the town, the hot water is relayed through insulated pipes underneath the roads. Result: frost-free roads in the winter. In other parts of Iceland, road conditions are not so sophisticated; some roads are little more than a path roughly cleared of boulders through the lava fields. In these regions, "off road" vehicles are absolutely necessary, and yellow stakes mark the routes, perhaps for winter travellers.

Large parts of the Icelandic plateau are still covered by ice, including Vatnajökull, the largest ice cap outside Antarctica and Greenland, and because the country straddles the Mid Atlantic Ridge, it is being continuously widened. Volcanism, and splits along the Ridge axis are features of Icelandic geology, and these events create reasons for the distribution of the rocks, both in their age and in the areas of volcanic activity.

The oldest, Tertiary (Miocene) deposits lie at the extreme east and west of the island. These old volcanic centres are partly buried in hundreds of thin basalt flows, and are known as the Basaltic Formation. Zeolite invasions of these basalts are common, as we found.

Large areas in the centre have been built up more recently, and one tenth of Iceland is covered by lava flows less than 10,000 years old. Rift line volcanoes are a special feature of Icelandic geology; long lines of craters occupy fissure rows, produced by the movements along the Mid-Atlantic ridge, causing roughly north-south splits across the country. These Pleistocene and Recent volcanics are named after a brownish, hydrated glass, palagonite, which is common in the tuff-breccias. The Icelanders call this rock "Móberg", and it is formed in eruptions under the ice caps. Huge table-top mountains or "Tuyas "are created as a result of these sub-glacial eruptions, which may sometimes cause havoc in the country. The enormously destructive floods of 1996 were a result of such an eruption.

Our journey around Iceland began with a visit to Thingvellir, the ancient site of the original Icelandic parliament, which happens to sit right on the side of a large fault system representing the Mid Atlantic ridge. From the top of the cliff which forms one side of a 5km wide graben we looked across a whole series of black-surfaced faults, downthrow towards us. In the distance lay a glacial shield volcano and two table mountains. Smoke rose from solfataras on the slopes of Hengill. We were standing on lava ruptured with large fissures and surfaced with quantities of pahoehoe, lava which probably came from the shield volcano Skáldbreidur, to the north east. It was at this moment, as we were doing our best to take in this glorious view, that the heavens opened and both rain and hail accompanied our hasty retreat along the fault line, huge walls of columnar basalt towering above on our left.

A visit to "Geysir" followed; the original. No other geyser has this name in Iceland. The snag is that it doesn't erupt nowadays unless there is a local earthquake. Our feelings were therefore rather mixed at the sight of a sad and unimpressive puff of steam rising from the place marked with its name. Nearby however, in this very active geothermal area, we photographed other much more vigorously erupting geysers, fumeroles and steaming fissures. The colours of the minerals crystallising around the vents added to the beauty of the scene, and reminded me of "Fountain Paintpots"(?) in Yellowstone Park, 1996. The weather here was much cooler however, and the grey skies seemed most inappopriate.

Overnight we stayed at a well-equipped school; separate "dormitories" for men and women, a luxury we did not always enjoy! It was obvious that the lovely hot water in the showers

was flowing straight from a geothermal source; the smell of sulphur was unmistakable and all-pervading. This was not the case in other places similarly supplied; I don't know why.

Tuesday, 14th July. Laugarvatn to Varmahlid.

Gullfoss was the next place on our itinerary. What can I say? The sheer beauty of this waterfall in its natural surroundings is breathtaking. The three monumental levels are a result of erosion by the Hvitá river. The falls are at the upper end of a 2.5km canyon, 80m deep, and this has been eroded in the last 10,000 years. Some of us went up to touching distance of the cascade, and there we found ripple marks in the solidified volcanic ash. These may have been part of the tephra layer from the 1693 fall from the notorious volcano, Hekla. We were to see much more evidence of its frequent eruptions later on.

According to plan, we continued to travel in a roughly clockwise direction around "Island", as it is spelt by Icelanders, and consequently continued towards the North. Apart from the geology, some of us had been keeping an eye on the local flora and fauna, and the list included (in the first two days): wild thyme, ladies bedstraw, gentians, pinks and bladder campion. A golden plover was also spotted.

We continued, travelling parallel with the Hvitá river. Colloidal minerals gave the flow a milky appearance. Roches moutoniae were much in evidence in the dark, Martian-like landscape which covered mile upon mile of our journey. No vegetation here, but in contrast a glorious view of the Langjökull ice sheet in the distance,bordered by a row of strangely jagged nunataks (volcanoes which protruded through the ice).

A drive of about 100 miles over this type of terrain followed, taking us between two of the main icefields: the Langjökull and the Hofsjökull, stopping at Hveravellir hot springs, with its sinter terraces, on the way. A VERY cold wind was coming from the snowfields, and we were amazed to see a proliferation of alpine flowers in the bleak surroundings here.

Wednesday, 15th July.

In pouring rain and heavy mist, we viewed lavas and interbedded sediments (sedimentary igneous rocks!), fed by dykes and fissures, as well as central volcanoes. At Kotagil bridge, zeolites were really abundant in the amygdaloidal basalts, and many samples were collected. On a strike face at the side of the adjacent valley snow picked out the flow lines perfectly.

We visited Skagafjördur folk museum, with its beautifully constructed turf houses. No wood here; not even a tree! Realism was taken to its limits with racks of drying cods' heads, exported in Victorian days we were told. The smells were authentic too.

On „the way to Akureyri, we travelled through the impressive Öxnadal glacial valley, which displays all the classic textbook signs of its origins: corries, medial morraines etc, and many hanging valleys, the streams fed by yet more glacial valleys beyond. It was an awesome sight, the valley itself I estimated to be a good two miles across, bordered by basalt cliffs towering above us - into the clouds. Snow was lying in the gulleys, and many streams fed the fast flowing, and eventually meandering river Öxnadalsá, which met the sea at the great Skagafjördur fjiord on the north coast. Akureyri, the capital of northern Iceland, is an important port and an interesting town. We stopped to look around.

Godafoss waterfall (waterfall of the gods), on the glacial Skjálfandafljót river, was our next stop. It lies at the head of a canyon cut through a 5,000 year old feldspar porphyritic basalt lava flow. This lava flow is said to mark the site of a large fault separating Tertiary basalts to the west from Pleistocene volcanism to the east. The waterfall certainly is beautiful. When Iceland became a Christian country the story goes, pagan idols were thrown into the falls.

Further on our journey eastwards, we stopped beside Mývatn (the lake of the midges!) and identified the following birds within a few minutes of leaving the coach:

Arctic skua
Harlequin ducks
Red-necked phalarope
Barrow's golden eye ducks.(These are not seen anywhere else in Europe).

In this unusually fertile soil, enriched by the bodies of millions of dead midges, dozens of Northern Green orchids were growing in the lush grass beside the lake.

MÝVATN, (continued)

We were to spend the next three nights in this area, travelling each day from our base at Reykjahlid, where the view from the school/hotel encompassed a whole series of "pseudo craters" bordering the lake. These craters, which have the appearance of small volcanoes, are formed by an explosion of steam trapped at the base of a lava flow; they have no connection with a magma chamber. The fields surrounding us were covered in buttercups, homely and familiar in this strange and impressive scenery

Mývatn, the lake itself, is shallow; less than 2m. deep in the north, and 2.5 to 5m. in the south. Four thousand years ago this shallow depression was dammed by lava (Older Laxáhraun), but it is the 2,500 year old Younger Laxáhraun lava which covers most of the bed of the lake. Ash layers from Hekla occur in the soils of the district, and help to date the many volcanic events which have occurred.

Thursday, 16th July.

We travelled to Óxarfjödur, 50 Km from the true Arctic Circle, across a huge lava field, displaying great domed blisters, and lava pillars which had risen through a static lake of basalt. The vegetation, such as it is here, is so delicate, and has such a tenuous hold that it may take 100 years for a small lichen to become established, and it can be destroyed by a walking boot. We walked extremely carefully. As we neared the tuff ring at Hrossaborg, we stopped to examine deep pits and tunnels in the lava. The eroded tuff ring crater is the result of a "Surtsey" style event. The lower part of the ring consists of scoria material, overlain by glassy tuffs. We climbed to the top of the crater wall, and found many layers of ash as well as really large boulders, blown out in a series of explosive events. Unconformities occur where the volcanic sediments collapse inwards.

Dettifoss, our next stop, is a gigantic waterfall on the Jökulsá river. Rain greeted us here, mixed with the spray from the incredibly magnificent falls. Some of us, more foolhardy than the rest, stubbornly marched down the slippery, narrow track to the water's edge. (I have photographs to prove it!) The weather in Iceland is extremely unpredictable. There is a saying, "If you don't like the weather, just wait a minute!" Sometimes it does change very quickly indeed. In the extreme north, the local climate is so dry at times that volcanic ash storms are known to occur.

The Jökulsá is one of Iceland's largest rivers, 274km long, and with its tributaries runs in a south to north direction across 120km of lava flows. In the catastrophic floods of early postglacial times it has been calculated that

its flow reached three times the maximum flow of the Amazon. Nowadays the average flow is a mere 220cu.m/sec. We arrived at Jökulsárgljufur, in the canyon, to see the great basalt configurations, so complex that I simply couldn't begin to describe them here (or anywhere else!) Peter Hardy explained his theory that these massive formations cooled at the outer edges of volcanic necks, which may have risen from a large, angled dyke. No-one argued about it! The lavas are post-glacial, therefore this gorge has been cut by the river in less than 10,000 years.

We travelled on. Eventually we reached Óxaifjördur, the most northerly point of our tour. The view from a cliff top of the great Jökulsá lagoons, bars and distributaries as they met the sea was a most impressive sight.

Friday 17th July.

From Reykjahlid we went to see a row of spatter cones lying along the line of the mid-Atlantic rift. Redshank and redwing were spotted; they breed in the short Icelandic summer, then fly south to winter in Britain. At Grjótágja we visited a former bathing cave, now rather too warm at 60 degrees C. We went on to walk in the lovely area of Dimmuborgir, which translated means "The Black Castles". This natural garden in the surrounding wilderness lies in the area of a former lava lake. The black basalt "castles" rise up among small birch and willow trees, and abundant flowers; no man-made garden I am sure could be planted with better effect. We walked among moss campion, northern green orchids, reindeer moss- and so many others not identifiable by me, alas. What a contrast between this and the scenery only a short distance away. We returned to Reykjahlid once more for the night.

Saturday 18th July.

The "road" for the coach through the lava today was so unclear that the yellow markers seemed to be the only sign of our route. Steam issued through many vents and fissures as we passed on our way to Áskja, the caldera of an explosion crater which last erupted in 1961. En route we stopped to photograph Herdubreid mountain (in Icelandic,"The broad-shouldered one"), 1682m. high; the most beautiful stapi, or tuya type volcano in Iceland. Made of móberg material, it erupted sub-glacially, and it is capped by a lava shield, which emerged through the ice. This type of volcano enables the thickness of the ice cap to be determined. Pumice fragments we found at the side of the road here however were from Askja, about 30km. away. As we drew nearer, the black lava which constituted the surface of the ground as far as the eye could see, became progressively overlaid with white pumice. This appeared like a thin covering of snow, black basalt boulders protruding beneath it.

Ladybirds

By A T F Comer

Since my very early retirement in 1976, I have been able to devote a good deal of time to my principal hobby, geology, including several visits to accessible volcanoes in Europe and North America. Mt.St.Helens was a fascinating sight just after its eruption in 1980, and Soufrière in St. Lucia is also noteworthy as the only 'drive-in' volcano I have ever visited, where a road has been built through a gap in the crater wall, and you can now park among fountains of boiling water and springs of hot sulphurous mud.

In Europe, accessible volcanoes are not in general quite so spectacular though many are of great interest. The name volcano was derived in Roman times from the little volcanic island of Vulcano, just north of Sicily, not far from the rocks and whirlpool known in classical times as Scylla and Charybdis, both of which are said to have disappeared after an earthquake at the beginning of the present century. Vulcano is now a holiday resort, although it frightens me - the town is built almost alongside the active cone, which is belching out gas and smoke in much greater quantity than it was ten years ago, and there are some ominous cracks developing in its crater wall right above the town, showing that pressure is building up inside which might well burst out in the next few years. All the Aeolian Islands are volcanic, the most northerly being Stromboli, which has been noisily ejecting jets of hot gasses and a few red-hot stones almost daily for the past two thousand years.

The Greek volcano that charms me most is Santorini, an island just to the north of Crete, claimed by many to be the site of one of the greatest volcanic eruptions ever, which hollowed out the centre of the island into a deep caldera flooded by the sea, in which a new volcanic peak is just appearing. Inside the nearly vertical caldera wall hundreds of superimposed lava flows can be seen, tracing the geological history of the island back through millions of years, but the top layer of all is a thick pink or white pumice that filled and buried a Minoan town which is presently being excavated. There is some scientific support for the local folklore that Santorini was once Atlantis before the great explosion of 1500 years BC, which is said to have destroyed the Minoan civilisation, provoked the plagues of Egypt, and facilitated the escape of the Israelites when its tidal wave (tsunami) withdrew the sea while they passed, and brought it back to clobber the pursuing Egyptians. What is true is that millions of tons of the pumice were exported to make cement for the construction of the Suez Canal, as it was discovered that concrete made fron it would harden under water.

My first European volcano, the one I still like most of all, is Mount Etna in Sicily, which I visited for the first time in the early 1960's on a motor-cycle which I used to carry in the ship in which we called at Messina. Etna continues to fascinate me, and for the past eight or nine years I have paid it an annual visit to see how it continually changes. There are eruptions every two years or so, most of them fairly harmless because the summit is so large, but I have seen several roads buried, buildings and a cable car system destroyed, and several pleasant villages threatened, though none have been demolished recently. Etna is the

biggest live volcano in Europe, over 10,000 ft tall, covering a very large area between Catania and Taormina, which is the most picturesque little town from which to view it. Most of Etna is accessible very easily by road, although some caution is required. It is possible in a couple of hours to go from sea level and Mediterranean temperatures to a breathless 9,000 ft, where temperatures can be sub-zero even in the summer if conditions are cloudy.

And this brings me to the title of this essay. Five years ago during an annual visit with a small group of students, we were surprised to see a large number of ladybirds on the lava just above the 6,000 ft level, where the temperature is always cool, often misty as this is just above average cloud level, and the surface is absolutely dry because any rain that falls sinks straight into the porous lava. There is, of course, no vegetation above this level, the last of the trees being about 1,000 ft below. As we climbed further, the number of ladybirds increased right up to the edge of the snow-line until they were so numerous, literally millions of them, that we couldn't help treading on them wherever we walked, a most astonishing and unexpected sight for which there seemed to be no explanation. It was freezing cold, and there was absolutely nothing for them to eat and not even a blade of grass to give them shelter. Very puzzling.

Nor could any of us find an explanation when we got home, which prompted one of us to write to David Attenburough who is a fount of knowledge on such matters, but even he could not account for it. In a very courteous hand written reply he said that such concentrations of ladybirds on the inhospitable summit of Etna had been recorded on several occasions, but no-one seemed to know why.

And just a final note. Last year there were again ladybirds. Not so many as before, but certainly vast numbers.

Written 1991