Farnham Geological Society

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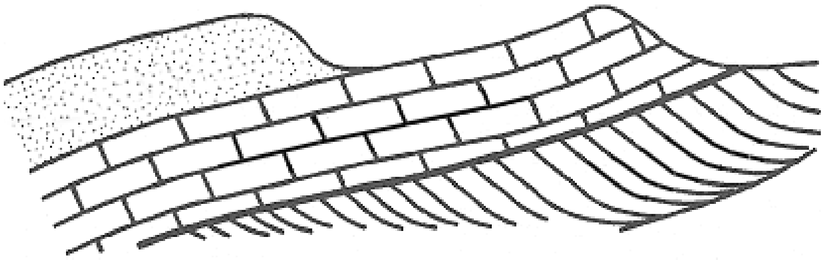

A local group within the GA

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Editorial

There seems to be a continual reminder in recent news broadcasts that the Earth is a very unstable and unpredictable body: damaging earthquakes in New Zealand, the large earthquake in Japan with its associated savage tsunami and, at the end of August, a 5.8 magnitude earthquake in Eastern United States with an epicentre just south of Washington DC. The latter, the worst in the area for over 100 years, caused the White House and Pentagon buildings to be evacuated and widespread delays to flights as airports across the area were closed for a time. An interesting observation was that animals at zoos across the East Coast showed signs of distress up to 15 minutes before the earthquake struck. Keepers at the National Zoo in Washington DC say that red-ruffed lemurs started barking an alarm call a quarter of an hour before the quake. And, about three seconds before the ground started to shake, the zoo's gorilla Mandara gave a yell, gathered up her baby, Kibibi, and then climbed a tree. There are many other recorded instances of animals being able to sense the onset of an earthquake and suggest that scientists still have a lot to learn from the animal kingdom when it comes to earthquake prediction.

Our Editor, Liz Aston, is experiencing a problem with one of her eyes at the moment and has asked me (*Mike Weaver*) to write the introduction to this issue of the Newsletter. I know I represent you all when I send her our good wishes for a rapid and successful recovery following her forthcoming operation.

A thank you note from Mike Rubra, a member of FGS

After I was taken ill, I have had so many kind messages and ‘get well soon’ cards that I could not sensibly answer them all. So please accept the following thank you to all my friends and colleagues for your kind messages, notes, letters and cards on learning that I had been whisked into hospital. I was there a lot longer than I expected, but I am out now.

I was especially grateful to Susan, Joan and Margaret for keeping so closely in touch with my wife Esme, and for their many messages and lovely photographs, and I even received an archaeological report from Joan, who did such a great job on the Crozon Trip. I am glad the trip was so successful, although I was sad not to be with you all. Thank you also for the picturesque card from France with all your nice personal messages.

My thanks also go to Graham, for getting my space on the field trip filled and for everything else he did quietly behind the scenes, it saved me an awful lot of hassle with Saga. I am sorry we could not “do” Chichester, perhaps there will be another time. I think instead you went to Bosgrove, a delightful and historic place with a great variety of geology in its structures. I look forward to seeing you all, hopefully in a month or so.

Very best wishes, Mike Rubra.

Geological uses of Nuclear Isotopes
Summary of February 2011 lecture given by Dr Paul Stevenson, University of Surrey

In its hundred-year history nuclear physics has led to applications famously and controversially in energy production and weaponry. Less famously, the properties and knowledge of radioactive atomic nuclei have led to applications across a much wider range of human endeavour, not least in geology. Radioactive nuclear isotopes have been present in the Earth since its formation some billions of years ago, and have been decaying at various rates.

The longest-lived (Potassium, Uranium and Thorium) are still present and a careful analysis of the composition of rocks helps us date the Earth and particular rock formations. More recent geological activity can be analysed using shorter-lived isotopes, naturally created in the atmosphere through the influence of cosmic rays. Such isotopes get into the Earth's ecosystem and can be used to age, for example, water in deep aquifers. The talk gave a rapid tour of radioactivity followed by a selection of applications in geology.

The story of Horsham Stone and Sussex Marble
Summary of June 2011 lecture given by Dr Roger Birch, Collyers College, Horsham, Surrey

These two stones have very distinctive and unique stories to tell. They can be found in the Wealden Beds of the Lower Cretaceous of southern England. They are approx 120-124 million years old and formed when south-eastern England looked like Florida today with sluggish flowing rivers meandering across a broad flat landscape. Lakes and coastal lagoons were dotted across the region and dinosaurs and a great range of sub-tropical life inhabited this rich ecosystem.

Horsham Stone is a fine-grained yellow / golden sandstone that was deposited in tidal rivers. There are only two recognised beds of Horsham Stone, they occur close together and are never more than 2m thick. They outcrop in an arc that follows that exposed surface of the Weald anticline mainly centred around Horsham, Southwater and running south-east towards Haywards Heath. Considering how limited the actual outcrop pattern it is remarkable how much stone has been excavated over the past 2,000 years. Horsham Stone has been transported into Surrey, East Sussex and into Hampshire. Hundreds of shallow pits or delves were dug to extract the stone. Over the centuries a great profitable trade existed buying and selling reclaimed stone. The Romans first recognised the value of this stone mainly as floor slabs and roofing slates. Virtually all Roman remains in Sussex contain some Horsham Stone.

What makes Horsham Stone so recognisable are the superbly preserved ripple marks. These were formed by tidal currents moving upstream and then ebb flood waters flowing down stream. These symmetrical ripples formed many different shapes and patterns as the currents swirled past each other. In the shallow waters dinosaurs walked and left their footprints preserved as moulds on sandbanks. Iguanodon and Polocanthus prints are the commonest types found. Many other fossils occasionally turn up in Horsham Stone eg coprolites, bivalves, plants, fossil roots and even dinosaur teeth and bones.

As Horsham Stone was only deposited in river channels it is limited in its lateral extent as a bed of stone. The ancient palaeogeography in Wealden times left the stone in channels that today occur around Horsham. This is where most of the stone was dug in the Middle Ages. Low hills around Horsham show where Horsham Stone has created a scarp edge. The Normans built a number of castles on these ridges e.g. Sedgewick Castle to the south of Horsham. The largest know delve workings were around Christ’s Hospital to the south-west of Horsham. In Norman times this areas was known as Stammerham. Charles Lyle and his friends visited these workings in the early 19th century, they speculated on the reasons for the strange ripple marks they saw in the stone. They actually came up with the notion of flowing water currents.

The majority of churches, manor houses, castles and civic buildings were roofed with Horsham Stone throughout medieval times up until the 19th century. The traditional wooden beamed houses so typical of medieval architecture had to be strongly constructed to support the huge tonnage of stone. Many of the roofs of these buildings show distinctive sagging along the ridge area. As well being used for roofing, due to the ability of the stone to be cleaved like slate, it was used for wall construction. Not all the stone could be cleaved into thin roofing slates, so the rest of the stone was cut into brick like blocks for walling.

Today the Historic Horsham Stone Company still excavates stone on a small scale at Broadbridge Heath, to the west of Horsham. This is very close to the site where the Romans excavated the stone for the construction of Stane Street. The stone still shows the remarkable ripple marks but the stone no longer can be cleaved. It would appear that the best roofing slate material has been worked out.

Sussex Marble, also known as Winklestone and Paludina Limestone is not a true metamorphic marble but a shelly limestone that will take a polish quite easily. It is a limestone that is composed of freshwater gastropods or snails. These snails lived in their thousands in the freshwater lakes and rivers that existed across the Wealden landscape. There are several local beds of Sussex Marble, some can be traced for over 15kms across the Weald from East Sussex into West Sussex. The outcrop pattern of the beds follows the arc of the exposed Wealden anticline.

In East Sussex and Kent the beds are known as Bethersden Marble and Laughton Marble. In West Sussex they are known as Petworth Marble and Charlwood Marble. The closest beds to Farnham would be in the Dunsfold area and near Cranleigh. The beds of marble lie just below the soil horizons and could be easily worked by following the seam along the dip. Many streams across the Weald cut through the marble exposing blocks. Farmers plough up marble and weathered out gastropods. Fields around Kirdford are full of weathered gastropods, these are easy to pick up after harvest time.

Sussex Marble was highly prized as a decorative stone. A Bronze Age quern was discovered on the South Downs above Amberley. The Romans used the stone in their villas around Chichester. It was with the Normans that we find the main historical use of Sussex Marble. Fonts and altars were carved in Sussex Marble. Fonts from the 12th typically have a square, tub style. This was mounted on a central pillar. By the 13th centuries moulding appeared on the fonts. The dimensions changed and many fonts were mounted on a central pillar with thinner pillars beneath the four corners of the font. The ability of the marble to be polished made it perfect for decorative work. Thin pillars and mouldings started to appear in churches. Chichester Cathedral has spectacular examples of Sussex Marble. Boxgrove Priory has huge pillars made of Purbeck Marble and base of Sussex marble.

Wealthy nobles had memorials and tomb ledgers made of Sussex Marble. These stones did not last long when exposed to the atmosphere in the churchyard. Today many churches have used tomb ledges as floor slabs. Petworth House is sited on large outcrops of Sussex Marble. Many pavements in Petworth were made of Sussex Marble in the 17th century, but the fact that they weathered too quickly meant that they were replaced in the 19th century. In Petworth House has skirting boards and window cills carved out of marble.

It seems that with widespread use of Purbeck Marble from the 16th Century onwards Sussex Marble declined in its use. The beds of Purbeck Marble are more consistent and the reserves longer lasting. Marble was used as a rubble building stone in farms and barns. The last workings appear to have closed around the First World War. These workings were near Billingshurst.

The study of building stones in buildings is a new development of geology and social history. Stone reflects a social status and financial statement about a person’s home or position. Importing stone from across a county or from adjacent counties was a massive cost in medieval times. Today we can only imagine the huge logistics involved in sourcing stone and then arranging its transportation along muddy cart tracks in medieval Sussex.

FGS Field Trip Western Brittany, France, 3-10 April 2011

Another excellent trip was organised by Graham Williams, which is reported here and will form the FGS display at the GA Festival of Geology in November. Graham identified four elements of the trip in particular for this report, namely:

- Lower Ordovician - Grès Armoricain
- Devonian miniature reef at L'Armorique.
- Ordovician volcanics
- Carnac archaeological remains (see June issue)

Lower Ordovician - Grès Armoricain

Ian Hacker, Christine & Peter Norgate, Barry Eade, Diane Cameron, Louise Milbourn

The Grès Armoricain Formation is part of the lower Ordovician rocks seen in the Crozon peninsula and equivalent in age to the Arenig Formation in Britain. It strikes NE -SW from Morgat to the Cap de la Chèvre. It is predominantly a hard light-coloured sandstone and quartzite that is resistant to erosion and protrudes as a strong feature in the landscape.

We visited an outcrop at Morgat Harbour where the outcropping beds are steeply dipping to vertical (Figure 1). The lowest beds form a headland jutting out into the sea as a line of stacks; these had previously included an arch, now collapsed. It was impossible to examine the outcrop closely as the tide was too high but it would appear to be a massive quartzite.

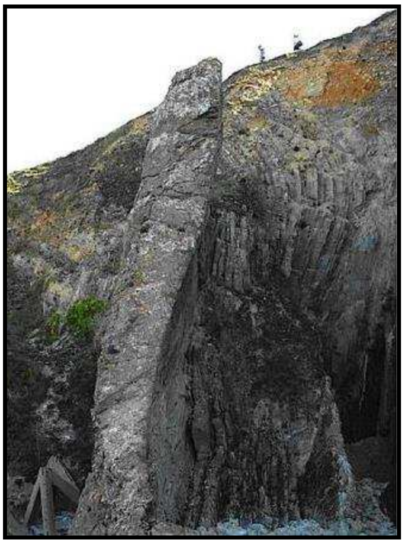

Fig. 1: Subvertical Grès Armoricain quartzites form hard resistant bands.

Fig 2: Diplocraterion

Above this in the succession was a sequence of shales and alternating sands where trace fossils could be seen. The depositional environment changed through time and through the Formation the shales indicate deeper water whilst the sandstones are demonstrably shallow water, the succession finally deepens upwards.

Though hard remains of fossils were not seen; tracks and two trace fossils were identified. The burrows of Diplocraterion parallelum (Fig. 2) and Cruziana (Fig.3) appeared as oblique striations on median burrows (Fig 4), probably formed by a polychaete with rigid bristles. This would indicate that the sandstones were formed in a shallow sea near a coast.

Fig 3: Cruziana

Fig 4: Burrows

The Grès Armoricain were also seen forming a dramatic headland with a war memorial at Pointe de Pen Hir. East of Pointe de Pen Hir at Veryarc'h beach, at the western most end of the beach, again it is seen as a dominant feature in the landscape and close inspection reveals sedimentary features confirming the shallow nature of its deposition.

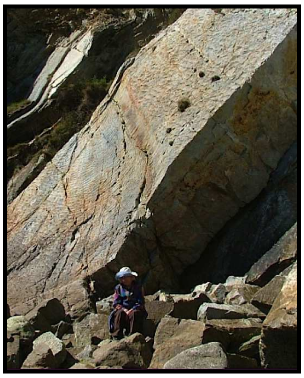

Fig 5: Mega- and other ripples, indicating a shallow water depositional environment

Fig. 6: Close up of mega ripples (left above) with close up (right above) of normal ripples

At Correjou (Figs 5 & 6) we saw dramatic sedimentary features. Here, mega ripples (with a wave length of ~2m, amplitude of 10’s of cm, and asymmetric) were covered by small lunate and normal ripples. The mega ripples trend from top left to bottom right in Fig. 6-left. The lunate ripples are concentrated over the higher part of the mega-ripples. The small normal ripples Fig. 6-right are asymmetric, confined to the deepest part of the troughs of the mega-ripples and trend at right angles to the mega-ripples. The normal ripples are key to understanding the depositional environment; they are drainage ripples i.e. water drained away along the bottom of the mega-ripple trough as the tide went out & thus the sands represent intertidal beach deposits. We later saw similar ripple structures developing today on Veryarc’h beach (Figs 7&8).

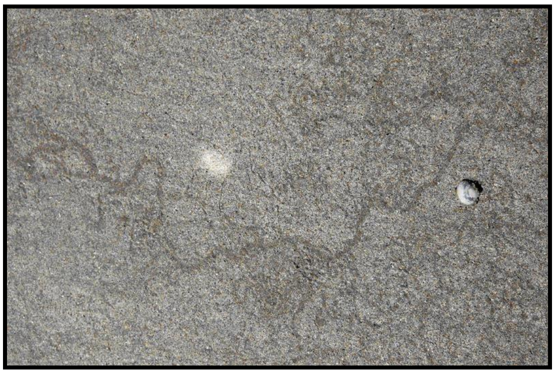

Fig 7: Modern track which would fossilise to form a trace fossil

Fig 8: Modern ripples – large and small

Devonian - miniature reef at Pointe de L'Armorique.

Mary Clarke, Beryl Jarvis, Penny Hatswell, Susan Martin, Dorothy & Alan Whitehead

Though a mere 6 km to the north east of our hotel at le Fret by sea, an hour and a half's drive via the Tèrènez bridge took our party to Pointe de l'Armorique, on the opposite shore of the Rade de Brest. Our destination was a rare exposure of a Lower Devonian Coral Reef in a former limestone quarry on a small beach to the south of the point. This near perfect example of a miniature reef is a protected heritage site, unique of its kind in Western Europe.

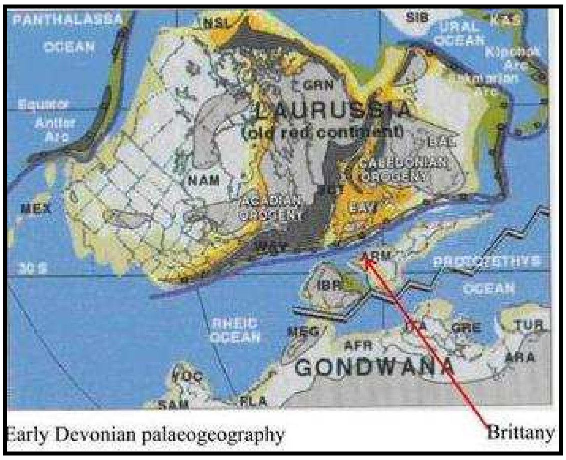

Fig 9: Early Devonian palaeogeography

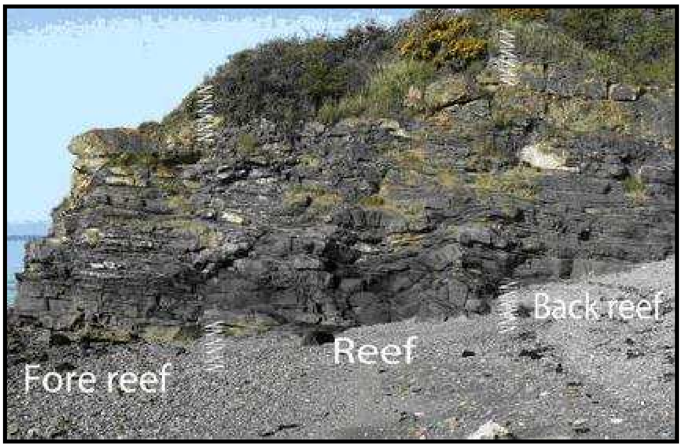

Fig 10: Pointe de l’Armorique Devonian mini-reef

Early corals and stromatoporoid sponges flourished here and built the reef in calm shallow seas off the northern coast of Armorica (Fig. 10). This small plate had separated from Gondwana and had been drifting northwards from Antarctic latitudes through the Palaeozoic era. Corals require warm clear water to multiply and form a reef. Plate tectonic studies have indicated that by the Lower Devonian period this region was within 30° of the Equator. Warm enough for reef building.

With a long career as a professional geologist, Dr Graham Williams, the organiser of our field trip, described it as the most 'fantastic and fascinating' example he had ever seen. The exposure clearly shows the three different facies of a classic reef cross section - fore reef, reef and back reef (see Fig.10). The main reef builders were the massive corals and sponges (Fig 11), together with more fragile bryozoa on the back reef side of the reef.


Fig 11: Devonian stromatoporoid in main reef


Fig 12: Devonian death assemblage – fore reef

The fore reef was composed of bedded layers of coarsely broken fragments of shells and other fossil material in a death assemblage (Fig 12), demonstrating a relatively high energy environment exposed to the waves and tides of the Lower Devonian sea around 410 Ma.

The reef itself is of blocky limestone comprising numerous well-preserved rugose corals and calcareous stromatoporoid sponges in life positions as well as debris of bryozoans, crinoids, and brachiopods. This is the least altered part of the exposure. The back reef, originally lapped by the waters of a Devonian lagoon, consists of a mix of broken fossils in a death assemblage, lying in thinly bedded layers, interspersed with thin beds of dark finer muds. Abundant fragile, well preserved bryozoans demonstrate that this was a very low energy environment.

Our leader Dr Denis Bates pointed out that the flat bedding of the fore reef (Fig 14) suggests that it was formed in shallow seas some distance away from the edge of the continental shelf. There are indications that the reef had been migrating seawards.

Ordovician Volcanics

Janet Catchpole, Jean Davies, Jonathan Hannam, Ann Sayer, Shirley & David Stephens

At the Pointe de Raguenez at L'Aber on the south coast of the Crozon Peninsula, opposite the Ile de l'Aber we looked at a repeated sequence of Ordovician lavas, layers of volcanic debris (ash, lapilli, pumice and bombs) and sediments with shell fragments. The beds were dipping steeply northwards giving us good cross sections. There were pillow lavas and beautiful examples of spheroidal weathering (Figure 13).


Fig 13: Spheroidal weathering at L'Aber


Fig 14: Lava bomb in sediment of volcanic ash

There were beds of lapilli and large volcanic bombs up to 60 cm in diameter bedded into the sediment and covered with onlapping layers of ash (Figure 14). But most striking were two unusual features: vertical vesicles in the base of sediments immediately above lava flows (Figure 15) and beds of volcanic debris with pieces of pumice showing reverse grading – the coarsest at the top (Figure 16).

fig 15 Vertical vesicles in sediment

fig 16 Ash layers at L'Aber showing reverse grading with coarsest particles on top

Questions arose as to whether these lava flows were extrusive or intrusive, whether the whole sequence was a marine, a lake sequence or an eruption onto wet ground. The conclusion was that in some cases the lavas were intruded into soft, saturated sediments perhaps only a metre or two from the surface and steam was ejected from the lava giving rise to the vertical vesicles in the unconsolidated sediments above. The reverse grading was explained by the volcanic debris falling into water. While ash particles might grade normally, pumice fragments being so light and full of gas would float for a while before sinking. The largest fragments would remain floating for longer.

Fig. 17 Pillow lavas at Lost Marc'h

Fig 18 Top surface of pillow lavas

Further south at Lostmarc'h, there is a particularly fine exposure of Ordovician pillow lavas on the point jutting out into the sea, as shown in Figure 17. Two members did venture out along the spine of the point, hoping to find traces of brachiopods in the limestone between the lava flows. None were found, but we did manage to get close up pictures of the top surface, showing a section through the pillow where it had been eroded away (Figure 18).

FGS field trip to Derbyshire July 1-4, 2011

"I've been everywhere man ... never paid my fare man ... I've been everywhere"

The first time I went on one's of Graham's field trips, I was really nervous, shy and worried; what were the people going to be like, would they be nice to me, would I have any fun. I gradually settled in and became more used to all these strangers, and then I relaxed sufficiently to go a bit further from Graham and do a little exploring of my own – great, I had found what I had been looking for - a smell - a rabbit - and off I went - hooray. I caught it – wow; won't Susan be pleased and won't Graham be proud of me.! Actually - no. Graham was a bit cross and took away my lovely prize away. Since then they keep an eye on me to stop me escaping and having fun.

Take this last field trip. We arrive at Lodge House Opencast Coal Mine (Figure 1) where they all gather and chatter (*boring!*). We are going to see the clearly developed cyclothems of the Westphalian Coal Measures, just below the Triassic New Red Sandstones which were exposed in the road cuttings just to the east of the mine. The mine boss man says we will all be able to go down into the pit and into the works area (*exciting*) but no, everyone else goes and I am left behind. Don't worry says the man - those left up here will be entertained to a film explaining all about open cast coal mining – *yawn*!

Sue had left me with Chris (our leader’s wife) while she went down to the opencast site - allegedly to take me for a walk. As I didn't want to go for a walk, I decided to stay with the rest of the group and wait for Sue to come back. I then went into the presentation (for the 2nd time), this time with Chris, and lay very quietly on the floor by her side.

I didn't mind the bit about the planning difficulties (the public thought opencast mining would increase drastically when deep pit mining stopped, but it didn't - it continued just as before); nor the bit about how 14 tonnes of rock is removed to obtain 1 tonne of coal in this pit; nor even the bit about the thick coal seam (1.4m thick) which is the mainstay of the mine financially (all the others being <0.5 m thick); nor the bit about the care they take to protect the local communities and to help the environment (that is the bit I like, that is the bit that smells good); but the bit I couldn't take was the statistics - a repeat was too much for any dog, even me, a long-suffering “*geodog*”.

I dived under the conference tables in an attempt to escape. My plan was foiled; Chris was still attached to me, but she soon gave way (she had no choice really, it was a case of follow willingly or be dragged), whilst the geologist explained the difficulties in calculating exactly how much coal will be in place in any future acreage due to the activities of ancient coal workings, invisible from the surface. I found Sue and Graham - thank goodness they had got back. I hadn't heard them speaking, but I did hear Sue’s familiar footsteps (and of course smelt her lovely scent); she was in the site office returning her hard hat!

Figure 1: The large ‘digger’ at the back removes the bulk of the spoil, the small digger in front scrapes off the last layer exposing the coal bed for mining

Figure 2: Carboniferous limestone quarry within the Stone Centre, typical large scale bedding of basinal micrites

“Derbyshire's biggest export is Derbyshire" – this comment (which summed up the trip) was made at the coal mine and is neatly demonstrated by the photos of its many quarries.

The next day was great - we went to the Stone Centre at Worksworth. The whole area was one large quarry (Figures 2 and 9) which had been made into a SSSI because it had so many different types of limestone - particularly the fossiliferous reefs with backreef, forereef and channel areas. These were the lagoonal limestones of the Lower Carboniferous Dinantian. I distinctly heard the man say he wanted to get rid of all the weeds which were obliterating the geology - great I thought I'll dig you a few holes - but no - someone spotted me and that was the end of that.

The FGS jolly-gists had to stay 5m from the quarry faces but I managed to sneak behind the wire fence to check the quality of the limestone! I was off the lead most of the time, right through the grounds of the quarry to an area of stone walls There our guide explained how different types of walls are made depending on the local stone - rounded granite boulders, flat lying angular limestone blocks, rounded capstones (if the stone could be shaped), long through stones to give the walls stability (these also acted as stiles) and gaps through the walls just large enough for a pair of human legs to get through (and me - so through I nipped but was rapidly called back). The whole area had been one vast lagoon above a basement high with patch reefs around the edge. Lead mineral veins were common in this area, but we didn't see any there, but we did find a steam train taking little children along to see some fossils. That afternoon I snoozed whilst they visited the Mining Museum and went underground along a mine at Matlock Bath. As far as I could see everyone was eating ice cream - what about me?

Figure 3: Landslip at Mam Tor.

Figure 4: Swallow hole at Windy Knoll

Figure 5: Odin Mine

Figure 6: Thin galena band in gangue minerals

Figure 7: Fractured fold in limestones, Manifold valley

Figure 8: Crinoidal limestone, typical of shallow water back reef areas where the depositional environment is high energy, the lime mud is removed and the crinoid stems are left broken and sometimes aligned by strong currents. Stone Centre, Worksworth

Figure 9: A reef in limestones (Stone Centre, Worksworth), one of many reefs in the Carboniferous Limestones of Derbyshire. The reefs are patch reefs placed at intervals along the edges of syndepositional horsts which are spearated by deeper basinal areas

It can get very boring - they all witter on and on - and get excited over rocks! It wasn't all bad, though, as I had several sausages on Sunday (left over from various breakfasts) and we were off to Manifold Valley (Figure 7) and Ecton Mine. Here they all got out and picked up bits and pieces (yawn!!), discussed how these small angular bits of limestone came to be resting in lumps just off the road and coating the hillside. Was it freeze-thaw action of thin bedded limestones? Were they tailings from the adjacent Ecton Mine or crushed limestone from making the road along the hillside above? They never did decide - typical - too many different ideas!

Then would you believe it, these FGS folk scrabbled through the chipppings at the side of the road - very unseemly for humans; I noticed the passing motorists giving them very strange looks. But they seemed pleased enough having found galena, sphalerite, malachite, and someone even found a trilobite head! Nothing edible, but apparently a good haul of goodies! We had a nice walk further along Manifold Valley to look at more reefs and admire the strength of these Carboniferous limestones. Some children and other dogs were having fun, but frankly I found it a bit boring - no rabbits to chase and no way of escaping.

That afternoon, we had a great time. In Millersdale we started off looking at classic thick bedded Dinantian Limestone (yawn) but I had to stay on the lead while we walked up the valley road. Our leader was a very effusive man and very chatty. He explained how important surface water in any limestone (karst) area is for human and animal populations (I agreed, I was hot and thirsty). He showed us a perched water table, explained how this river was flowing in its valley (all the other river valleys were dry). As this river has cut down to the deepest level and is therefore the 'base' for all the water tables in the area, with which it connects, it is the only river which flows at the surface.

He took us up the valley to an outcrop of basalt (Figure 10), a dark iron rich rock full of vesicles (small gas bubbles which were void). Then the humans went across the river and up to an old railway track along which they all walked back to the mill at the end of the valley. They arrived back discussing the exposure of a lava - apparently a basalt had flowed out onto the surface of the limestone in the shallow seas of the Dinantian, and had extruded through its cooling crust forming pillows - the humans were so excited but not as much as me because (and this is the best bit) I had been in the river several times to cool off - no-one seemed interested, but I had loved it.

Figure 10: Distinct eroded junction between a vesicular basalt interbedded within limestones. The top of the basalt had been exposed and weathered to a ferruginous clay. Later, along the disused railway track in Millersdale, FGS members saw an outcrop showing the terminal lobe of another interbedded basalt (with small pillows from extrusion into seawater) which was gradually overstepped by successive overlapping limestone beds

The last morning, we went to Odin Mine (Figure 5) - an old lead mine, Mam Tor (Figure 3) where the land had slid downhill forming a large and still moving landslip, then to Windy Knoll, through Whinnats Pass to Treak Cliff Mine and at last a café - hooray - that meant drink and food, a *geodog*'s favourite pastime when not chasing rabbits.

They say they have fun on these trips - I don't know how - I have done all the trips and I can tell you there's very little fun - there's no swimming, chasing, escaping and definitely no rolling in cow and badger poo!

PS You will be pleased to know I sent a card to Chris to thank her and David for giving me, my mum and dad and all the ‘funny Farnham people’ a good time over the weekend.

Jack (with notes and photos from the Jolly-Gists)

Addendum by Janet Phillips

Jack the Hound - It’s been good to see the conversion of the ‘Cowering Cur’ to the ‘Intrepid Hunting Hound’. While sharing a walk around the Hartingdon YHA garden, Jack and I met a cat. The cat took off, Jack took off and I nearly took off. Jack’s hackles were up and I thought he was shaking as he did when he first emerged from the Leicester Dog Refuge. However, he assured me that he was only panting, the better to chase the cat. I believed him. He demanded an extra two circuits to dissipate the adrenalin that a hound would naturally generate under such exciting circumstances. It was good to see him restored to normal dogginess.

Wildfire: The burning issue - the geological history of fire
Summary of May 2011 lecture given by Prof. Andrew Scott, Royal Holloway College

Fire has been an integral part of terrestrial systems for at least 420 million years. Since the late Silurian, when smouldering fires charred a predominantly rhyniophytoid vegetation, wildfires have been documented in most terrestrial biomes and now, often at the hands of man, control the health and stability of many

The presence of charcoal in the fossil record acts as a proxy through which it is possible to track the changing occurrence and impact of fires in a diverse range of ecosystem settings. As charcoal frequently exhibits exceptional anatomical preservation (Fig 1) and is often readily isolated from rocks by maceration, it not only acts as a proxy for wildfire activity but is a valuable palaeobotanical resource, providing both morpho-logical and anatomical data

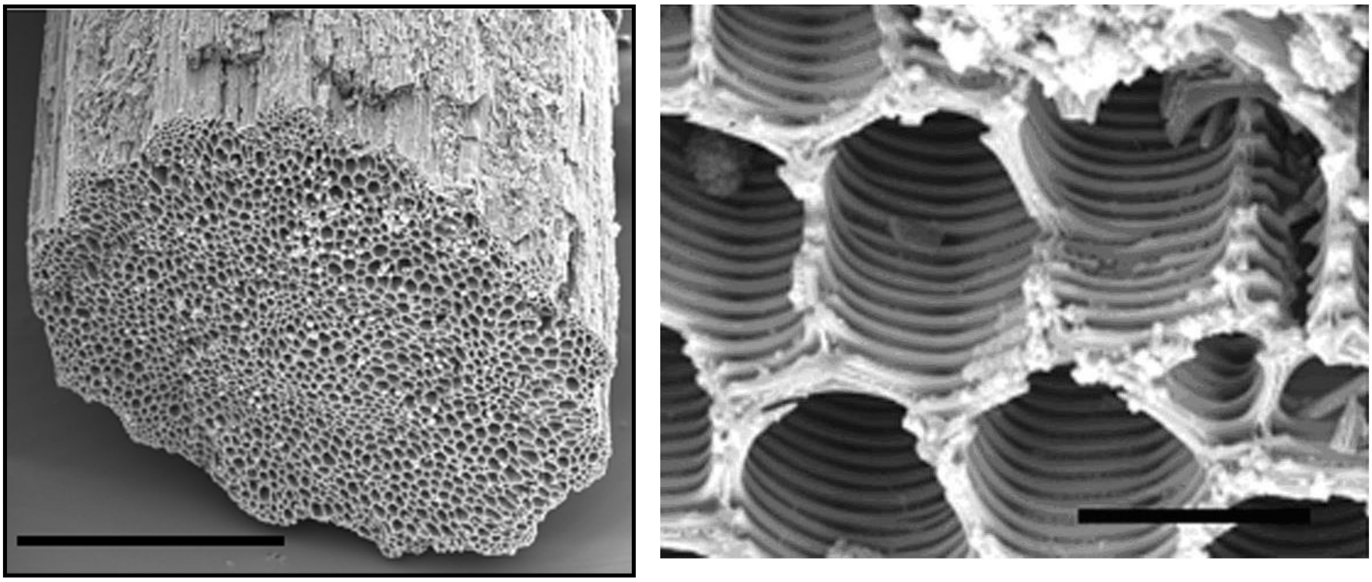

Fig. 1 Scanning Electron Microscope images of Oxroadia stele

Fire systems are governed by complex suites of conditions. However, when considered over geological time, at least in the Palaeozoic, atmospheric oxygen concentration appears to be the overriding factor governing fire frequency. Our earliest records of wildfire come from the late Silurian and early Devonian (420-400 million years ago) but evidence of fire through the Devonian (400-350my) is rare possibly because of low atmospheric oxygen. Atmospheric oxygen levels are thought to have risen rapidly through the Carboniferous and Permian (350-250my) and this coincides with the spread of fire into a range of environments from lowland tropical mires to floodplains and in to upland regions.

Fire is abundant through the Cretaceous and may have played a role in the diversification and spread of weedy flowering plants (angiosperms) but the claim of a global wildfire as a result of an impact at the end of the Cretaceous is disputed. Fire occurrence may, however, have played a role in the rapid global warming at the Paleocene-Eocene boundary.

Although fires are influenced by atmospheric composition they also have the potential to influence both it and through it, climate. Fires also influence other processes, most notably in sedimentary systems, as it has been shown that fire events greatly increase the potential for the erosion of terrestrial sequences. It has been shown that sedimentation rates may increase more than thirty fold following fire and sandstones with abundant charred and uncharred plant material are common in many sedimentary packages that are also known to be oil reservoirs.

There is increasing evidence of a relationship between fire and climate change, especially in the last 200,000 years. However, our current problem concerns the relationship between fire and where all fire is considered by many as a disaster. However, our modification of vegetation, particularly by introducing foreign species, especially grasses, may make normally non-flammable systems flammable.

The full impact of fire related erosional/depositional systems has yet to be fully appreciated but, in combination with its influence on the atmosphere, climate and the evolution of plants and terrestrial ecosystems, wildfire must be considered a significant Earth System Process.

It is in this context that we should see the Earth as a ‘fire planet’.

Diversity in Stone: Regional Geology and Links to Building Style

Summary of December 2010 lecture given by Dr. Lesley Dunlop, University of Northumbria

One of the interesting aspects of the UK is the rich and varied geology. This has contributed much to the range of landscape features seen and also to the character of towns and village which use local material for their construction. Although this contribution may be lost in larger towns and modern developments smaller centres retain much evidence of local materials and the style and character derives from this.

Oxfordshire has recently carried out a building stone survey as part of work with English Heritage and there have been projects within the North Wessex Downs to raise the profile of links to building styles and geology. As expected there is a strong correlation between materials used for older buildings and the bedrock material. In the north of Oxfordshire iron rich marlstone characterises the buildings giving a pleasant warm colour to the villages built from this stone. The stone can be used for all parts of the building for example walls, quoins and window frames. Not far to the south, however the main bedrock is a Middle Jurassic limestone, the White Limestone, this is a much more rubbly and irregular material to work with and so close to the boundary with the ironstone the latter is still used for quoins and window frames. The talk will illustrate other examples of the county.

Moving further south into Berkshire the bedrock is mainly Upper Cretaceous Chalk and Palaeogene sands and clays. The variation can be clearly seen from the building materials used. In the north and west of the county there are many examples of chalk being used, particularly as chalk block, where hard horizons are found (eg Melbourn rock). In the Lambourn valley chalk is used alongside sarsens stones in the north but moving further downstream and into younger chalk flint is seen increasingly as the additional stone.

The sands and clays of the Palaeogene led to extensive brick and tile works, especially from Newbury to Reading giving a characteristic red brick. In places the red brickwork is decorated by addition of grey or blue bricks made by firing at a higher temperature and with the use of a glaze.

Where the Lower Greensand is found further to the south many other styles of stonework can be found such as the use of very characteristic ‘carstone’ either as main walling material or decoratively as galetting and pattern work. Upper Greensand, where used as a building material is nearly always an inferior type of stone requiring other material for more structurally important aspects.

In conclusion it is relatively easy to track local geological changes and even pick up small unusual variations such as tufa and iron cemented gravels by examining wall material from traditional buildings. By doing this a useful atlas of the county can be produced and this can be used to guide and inform local plans and those involved with conservation areas. It has also been found that this is a good way to introduce and involve local people to the subject.

The Christchurch Earthquakes of 2010 & 2011

Summary of July 2011 lecture given by Dr John Gahan, Farnham Geological Society

The 22 February 2011 earthquake is regarded by local seismologists as an aftershock of the Mw 7.1 Darfield Earthquake which occurred on 4 September 2010, mainly because the epicentre was adjacent to the Darfield earthquake (Fig 1). Although the magnitude of the earthquake was not unexpected, the widespread carnage was – the energy released generated unprecedented strong ground motions both horizontally and vertically. Peak ground accelerations (PGA) in excess of 1.8 g were recorded by GeoNet strong motion recorders in the Christchurch area.

The highest PGA recorded was 2.2 g in Heathcote Valley (1 km south of the epicentre). This is the strongest ground acceleration recorded in a New Zealand earthquake, and far exceeds the maximum PGA of 1.26 g recorded during the higher-magnitude September 2010 earthquake. The talk focused on the very high ground motions resulting in liquefaction and landslips, and in some cases very severe building damage. Liquefaction effects were much greater than during the September 2010 earthquake, causing large ground movements which undermined foundations and destroyed infrastructure. The water reticulation and sewerage system was severely damaged by liquefaction-induced ground deformation (lateral spreading, subsidence, differential settlements) in addition to buildings and other damage from localised landsliding effects. With thanks to Hancox et al – *Landslides and related damage caused by the Mw 6.3 Christchurch Earthquake on 22 February 2011*. - New Zealand Geomechanics News, June 2011.

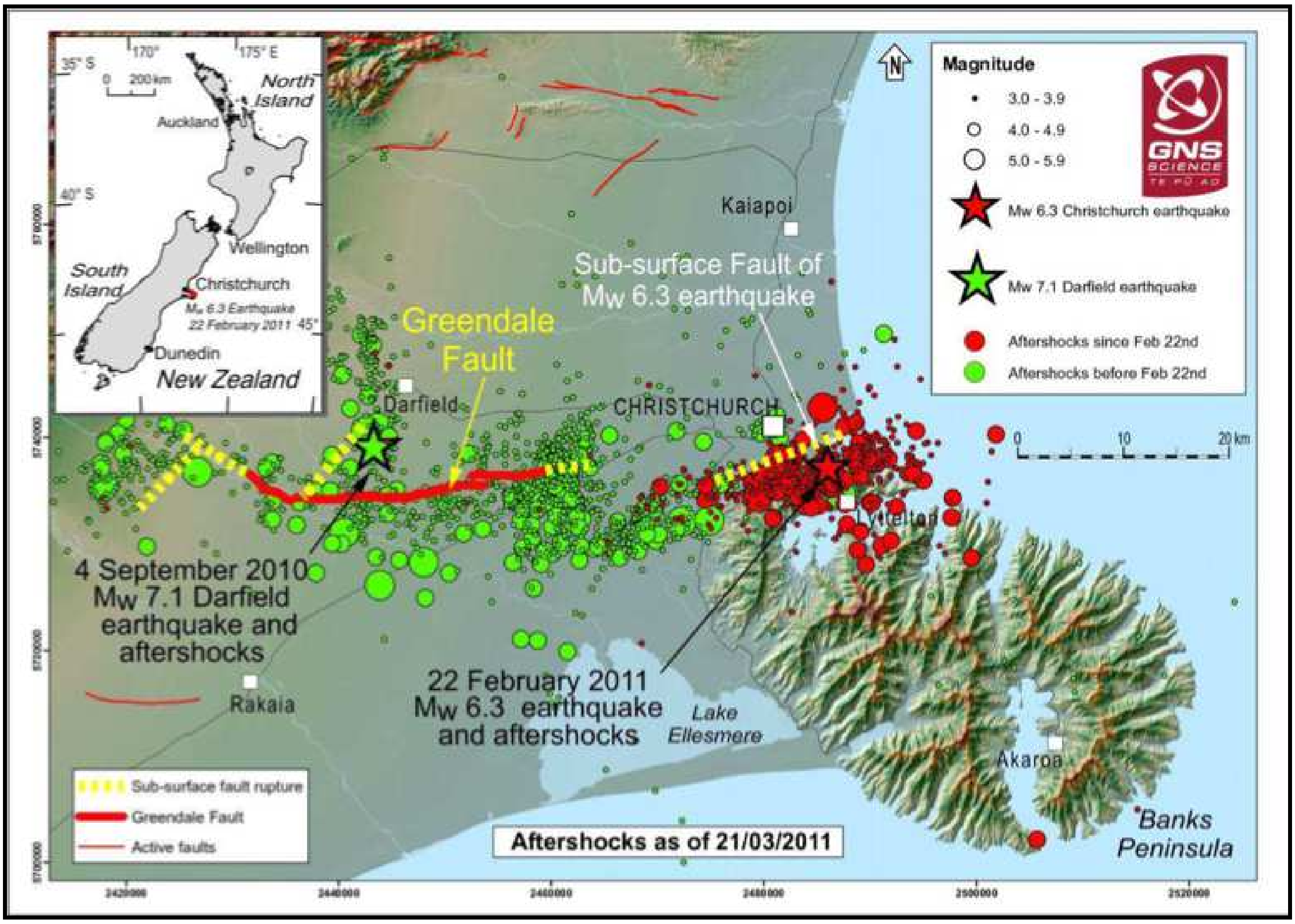

Fig. 1: Map showing locations of quakes