KENT GEOLOGISTS' GROUP

The Kent Group of the Geologists' Association

NEWSLETTER

No.26 - December 2017

Website: www.kgg.org.uk

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The Kent Geologists' Group does not accept any responsibility for the views expressed by individual authors in this Newsletter. The Newsletter should not be regarded as a scientific publication for taxonomic purposes.

Cover Picture: Sandstone Cliffs at Dawlish, viewed from the railway line.

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THE KENT GEOLOGISTS' GROUP IS A LOCAL GROUP OF

THE GEOLOGISTS' ASSOCIATION

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As a local group we receive details of lectures and field trips organised by the GA and other Local Groups and Affiliated Societies. Copies of the GA Magazine and the Circular with these details are on display on the Secretary's Table at Indoor Meetings.

MEMBERSHIP OF THE KENT GEOLOGISTS' GROUP

Membership is open to all who have an interest in geology, regardless of qualifications and experience. The annual subscription (which runs from January to December) is £15.00. There will be only one mailing to each address. The subscription for each Additional Member living at the same address is £2.00. There is an entrance fee of £1.00 per meeting (£3.00 for non-members) but guests and non-members are admitted free of charge for one meeting.

Membership application forms may be obtained from the General Secretary or downloaded from the Kent Geologists' Group website:- www.kgg.org.uk via the "How Do I Join" page.

Editorial

Welcome to your 2017 newsletter. This year will surely be remembered as the one the ladies took over running the Group, and a very successful year they made it. Anne Padfield became Chairperson when Adrian Rundle retired after sixteen years in that position. In addition to chairing the monthly meetings Anne also led a joint KGG/MFMS one week field trip to Snowdonia in June. The aim of the trip was to study the Ordovician and Silurian sedimentary strata in the Moelwyn Mountains, at Tanygriseau, near Blaunau Ffestiniog. At the KGG meeting in September Anne spoke to the group on "Soil - A substance of substance'.

Ann Barrett organised another full and interesting programme of speakers for our monthly indoor meetings. This involved contacting the speakers and ensuring that the supporting projection facilities were available and working.

Alison Taylor, as well as organising several walks in the region of her home, took on the role of door-keeper to collect admission fees and record the names of persons attending our meetings. Alison also provided the opening article for this newsletter. Her article on Dawlish was the first I received for this issue, reaching me early in July!

Finally Mandy Bird, who manages the refreshments at indoor meetings, volunteered to take on as an additional task the vital role of Treasurer that had been vacant since Oliver Hardy-Smith changed his job and left the Group.

Thank you ladies for your contributions.

After Oliver left, Anne Padfield and I had shared the Treasurer's activities between us. The task had been made easier by asking members to pay their annual subscription by a bank standing order. So I thank those members who responded to our request.

I cannot close this editorial without mentioning the Activity Tables that Adrian Rundle and Dennis Fullwood take to the four Rock and Gem Shows at Kempton Park each year. I shall cover these activities in a little more detail later but it is sufficient here to say that without voluntary donations made by the public at these shows the KGG could not exist. Adrian and Dennis are both expert at the facilities on offer and have made setting up and dismantling them a fine art. The expression "A place for everything and everything in its place." is a golden rule in the armed forces but it could have been invented by Adrian. However, once set up, there are a lot of facilities on offer to attract the attention of visitors. Though there are frequent 'quiet spells', at peak times the workload can be quite high. Adrian and Dennis will manage whatever we do but some help from KGG members to alleviate their workload would be much appreciated.

There are only eight days of Rock n Gem Shows per year at Kempton Park. If the support task is shared by more members the workload would be trivial and in the slack periods there is plenty of opportunity to look around. So in advance of each show please let Anne Padfield know on what days you could offer support.

What is 'Geology' and what is 'News'?

Over the years I have written many articles for the newsletter, some definitely 'geologically borderline'. An example is my article on photographing fossils and minerals in the last newsletter. Usually I receive few contributions from members and am most grateful to the few regular contributors for what I receive; but what should I include when reviewing articles for the KGG Newsletter? Should it be primarily 'News' or 'Geology'? Frequently I ask myself "Does this subject matter have a geological or news connection?". In other words, "What constitutes 'Geology' and/or 'News'?"

Like so many of the words we use today 'geology' is derived from the ancient Greek. The word's origin is 'ge', (Greek γη, meaning Earth) and 'logia' (Greek λογία, meaning study). The Study of the Earth is, without doubt, an all embracing subject. After all the Earth is the only home we have. It is the place where we are all born, live out our lives and ultimately die. Taking this definition I suppose the only articles I could legitimately decline would be those on astrology!

However, look up a dictionary definition and it will confine the meaning to the rocks of the earth and the fossils and minerals that they contain. On this definition I am probably taking too broad a view, but what is your opinion? Let me give you an example to explain my reasoning!

If one studies a famous work of art up close with a magnifying glass one can see the fine detail of the artist's brush strokes but I would argue that, by doing this, one loses the stunning beauty of the complete work. Step back and look at the whole. It is only when we combine the two images that we get the most out of the subject.

As editor, I would prefer to receive sufficient contributions from members for the newsletter to reflect their views.

So share with other members your recollection of an interesting field trip or the latest additions to your fossil or mineral collection. Explain for the benefit of others some technical point that may be new to us; as I have tried to do with the talk given to us by Professor David Wray on Zircons.

It is certain that without inputs we do not have a newsletter.

The future of the newsletter is in your hands and you have the power to determine what we get.

Sand Dunes Ancient and Modern .

Alison Taylor

Setting the Scene

Having a daughter and grandchildren in South Devon has involved me in a good few visits to that area over the years. I've looked at cliffs and collected rocks from the beaches, and often thought how much more interesting it would be to know exactly what they were and by what process they came to be there. Consequently, when I saw a geology trip to South Devon advertised, I applied immediately. My thought was that staying with my daughter and joining the group daily, I would definitely be killing two birds with one stone!

I soon discovered that the rocks of the Dawlish to Brixton area are, in the main, from two periods; the Devonian, from 415 million to 359 million years ago, and the Permian, from 299 million to 252 million years ago. At this time Britain was part of The Old Red Sandstone continent and was positioned just to the south of the Equator. There are virtually no rocks from the intervening Carboniferous period: thus there is an unconformity between the Devonian and the Permian sediments. This could either be because they had been present, but all trace of them has been eroded away, or because the South Devon area was no longer submerged. In fact, the latter seems to be the case as, during the Carboniferous, the Rheic Ocean was gradually being squeezed out of existence by the Northwest movement of Gondwanaland, terminating the deposition of marine material. This collision of the continents instigated a major mountain building period, varyingly called the Variscan, Hercynian or Armorican Orogeny. By the end of the Carboniferous period, virtually all the world's continents had coalesced to form the supercontinent of Pangea. Thus, any ameliorating influence of the world's oceans was completely absent from the huge landmass, and the Permian was a period of widespread desertification.

South Devon rocks from the Devonian period are formed of sediment gradually deposited in water, a process with which I am familiar, but the Permian rocks, the product of desert conditions, have a very different history.

The collision of the continents resulted, among other things, in the sandstones, mudstones and limestones of the Devonian period being uplifted into very high mountains further north than the current coast of South Devon. It is thought that there were periodic huge storms with sudden deluges of rain, which swept large amounts of loose material down the mountain sides and dumped them at the edges of the plain beneath. The force of the water cascading down, would have moved material of all sizes, from boulders to sand: the largest and heaviest pieces remaining close to the foot of the mountains, while the flood of water would have moved smaller material further away until it was too heavy to be carried on by the reduced flow. After each storm, the water would have dried up quickly under the heat of the sun, leaving fine material to blow around in the wind. Our examination of the cliffs and beaches from Torquay southwards to Brixham revealed, in the Permian sections, conglomerates and breccias with varying amounts of rocks and pebbles from very large to very small. In general, the clasts, which were mainly Devonian Limestone, increased in size from north to south.

Back to the Future, (or at least to the more recent past)

Having spent a couple of days studying the geology of the coastline of Tor Bay, we caught a train 12 miles to the north, to Dawlish Warren, in order to turn our attention to this much less ancient feature of the South Devon coast. This sand-spit has grown north-eastwards from the Permian cliffs of Dawlish Warren village, across the mouth of the Exe estuary, leaving only a very narrow exit for the river to run into the sea. Dawlish Warren is quite a strange structure, in that there are actually two parallel sand-spits. The Inner Warren is separated by a small channel from the coastal or Outer Warren (see Fig 1 next page). The Inner Warren is covered with grass and bushes and has a golf course and permanent buildings on it, indicating that it is assumed not to be at risk. Our interest was in the Outer Warren which is composed of loose sand, forming dunes along the length of the foreshore, these being protected from wind dispersal by the planting of marram grass and other small sand holding plants. I was interested to find that in "The Sea Coast", J. A. Steers had written that the spit, which had been in excess of 250 yards wide along its length in 1787, was reduced to less than 50 yards wide by 1949. It was further stated that it was likely to disappear altogether by 1953. The fact that it hasn't disappeared must be largely due to the subsequent commencement of coastal conservation work.

The Outer Warren is the result of the long term accumulation of sand and pebbles moved along the shore of the English Channel by wave motion in a generally west to east direction. Sand and/or shingle spits typically extend from the west side of river mouths along this coast by this process of long shore drift,

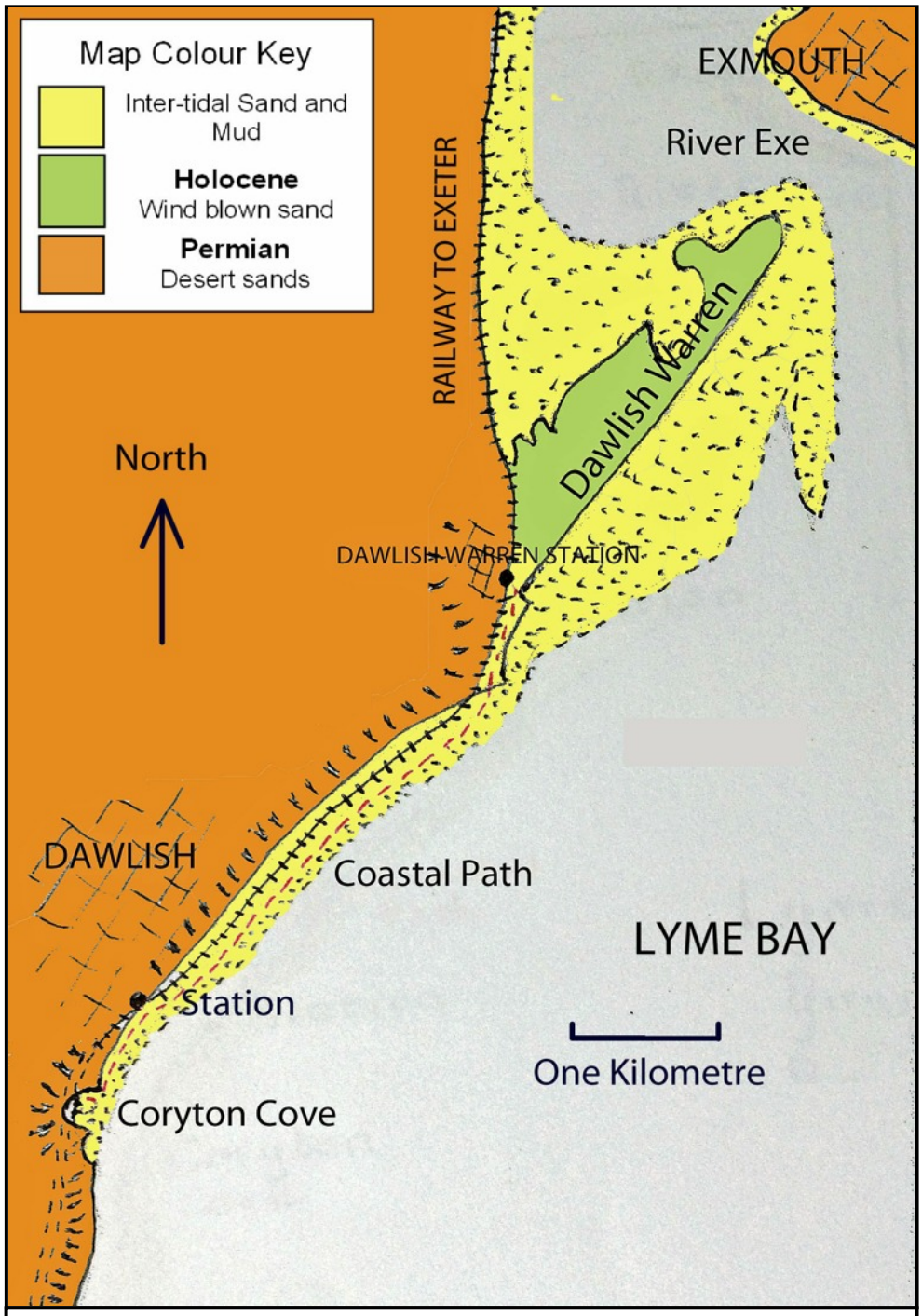


Figure 1 Dawlish and Dawlish Warren Location Map and Key

because the wind is predominantly from a westerly or south-westerly direction. Dawlish Warren is not millions of years old but there has probably been a spit of some kind here for thousands of years – ever since the river first entered the sea here. This type of spit is very vulnerable to storm waves and changes in wind direction and, at various times during its existence, Dawlish Warren will have grown and enlarged year by year, only to be partially destroyed again, sometimes by gradual attrition and sometimes by a major event. The coastline and the spit are quite unusual in that they run in a north-easterly direction, leaving them critically exposed to the occasional destructive south-easterly gale sweeping across Lyme Bay. Over many centuries Dawlish Warren has been transmogrified by endless combinations of wind, tide and the seaward flow of the River Exe, but it does seem that, during the last 200 years, the general trend has been attrition rather than accumulation. The supply of new material from long-shore drift has not kept up with that lost by erosion. It has been suggested that the building of the railway along the coast has had a significant effect, in that it has, over long stretches, prevented erosion of the cliffs by the sea and therefore reduced the supply of new material. An information board told us that several bungalows on the spit had been washed away by the sea during the 20th century.

Dawlish Warren is now a National Nature Reserve and work is ongoing to protect the dunes and the shoreline. The dunes are fenced off so that neither people nor dogs can disturb the plants which help to hold the sand in place. There is a footpath to allow access to the shore further along the spit. When we emerged onto the foreshore we saw that the seaward side of the dunes was protected from the waves by a continuous line of gabions see Fig 2 right. (gabions are netted containers filled with chunks of rock) . The gabions extended for a width of about 10 yards from the dunes onto the sandy foreshore and looked as if they continued beneath the surface of the sand on the seaward side. There were also wooden groynes extending seawards. Interestingly, these were not solid but included horizontal gaps between the planking so that sideways movement was interrupted but not stopped altogether. The foreshore was sandy with tongues of smallish pebbles and gravel stretching from the gabions down towards the sea, which, it being low tide, was about 25 yards from the dunes.

Fig 2 Dunes, gabions and foreshore of Dawlish Warren.

We looked at the sand on each side of the nearest groyne and found it to be marginally higher on the north-east side. This would indicate that the long-shore drift was from east to west: rather a surprise, though, in the circumstances of the wind generally having been from an easterly direction during the previous couple of weeks, maybe more understandable. The dune to shore gravel strips certainly indicated that, at least today, there was little long-shore drift in either direction.

Our next piece of detective work commenced with each person picking up 2 stones at random from the beach. The fact that there were 18 of us produced quite a good sample. Surprisingly, since there is no chalk to the west, and the nearest chalk to the east is 20 miles away at Beer, the most common pebble was flint. We also had Devonian sandstone and limestone, Jurassic rocks, and some basalt and granite: in fact there was material on the spit which had been brought by the sea from all directions, and some which had probably been brought down by the River Exe.

Easterly winds, though much less common than westerly ones along the Channel coast, do have a significant influence on the Outer Warren, so it should be no surprise to find evidence of their constructive effects as well as the destructive ones. Most of the flints on the beach probably arrived on the spit from the chalk cliffs of East Devon and Dorset during prolonged periods of easterly winds, but there are also sand and gravel beds off-shore which, since flint is such a hard, resistant rock, contain a large amount of this material. The Jurassic pebbles will have come westwards from Dorset in similar conditions to the flints. The Devonian limestone and sandstone pebbles come with the prevailing westerly wind from the coast to the south and west of Torquay, but also from the Permian cliffs directly to the south of Dawlish Warren. The Permian beds are almost entirely derived from the Devonian beds which formed the high mountains to the north in the Permian period. The quartz is also derived from the Devonian limestone, from mineral veins, and, although the original amounts would have been small, their extreme hardness makes it very resistant to marine erosion. Basalt pebbles were present but not common, as the basalt intrusions in the Devonian beds are both few and small. Of the granite, Dartmoor granite pebbles would have come down the River Exe from the moors. In addition to these relatively local rocks, some hard specimens will have escaped from the gabions where the netting is broken, much of this being Devonian limestone. The other local source of hard rock pebbles which are in truth, far from local, is the rock-armour protecting the break-water in Dawlish, most of which is granite brought by barge from Norway.

Return to the Ancient Past.

Having finished our examination of the dunes and beach at Dawlish Warren, we started to walk along the sea wall towards the town of Dawlish. At the north end of the coastal cliff, where Dawlish Warren starts to grow out across the estuary, lies Dawlish Warren village with its little railway station. A substantial sea wall, complete with rock armour on the sea side, protects the village, the railway line and the sandy red Permian cliff behind. There was little wind and the sea was calm. Also the tide was quite low. Today, it was a pleasant walk. In a more or less dead straight line, the flat top of the sea wall stretches the 2 miles to Dawlish with the main South Devon railway line running alongside, between the

sea wall and the cliff. It was not difficult to imagine how different the scene would be at the top of the tide during a winter gale.

During the first two days of our trip, we had examined the cliffs and beaches around Tor Bay. We had seen Permian deposits from the perimeter of the desert basin. These contained clasts of varying sizes, generally becoming larger towards the southern end of the bay. As previously explained, when flash floods occurred, a great mix of eroded material of all shapes and sizes would have been carried off the higher ground onto the plain below, larger pieces falling quickly out of the flow of water. At Goodrington Sands, the most southerly exposure of the Permian beds in Tor Bay, the cliff was composed of very closely placed clasts at least 9 inches across. At the north end of the bay the clasts were both fewer and smaller, indicating a rock formed further out in the desert. Here, north of Dawlish, there were virtually no clasts. The 2 mile length of the cliffs between Dawlish Warren and Dawlish is composed of wind-blown sand dunes from the centre of the desert basin, to where the smallest grained material from the flood dumped masses nearer the mountain foot, had been blown and accumulated over the millennia. With very little larger sized material to give them structure and cohesiveness, these low cliffs are very vulnerable to erosion from the sea, and from wind and rain. A paler coloured strip of Quaternary material was often present, sitting unconformably on the top of the red Permian sand cliffs. This had grass and shrubs growing in it and is some help in protecting the barely consolidated sands.

As we walked southwards, (Figs 3,4,5 and 6) we came across various differentiated features in the cliff face. Sometimes lines of strata became more distinct and occasionally there was a length of 10 or 20 yards of a layer of more consolidated blocky material.

Fig 3 Dawlish cliff

Fig 4 Dawlish cliff

Fig 5 Dawlish cliff

Fig 6 Dawlish Cliff

There were odd, elongated shoals of small pebbles and, further on, the cliff became pock-marked with hollows where the softest sands were being quickly and easily eroded away. In some places there was netting to help to protect them. There is a big problem with rock falls and land slides along this length of the railway. Train drivers must be constantly alert for material which has fallen onto the track. Towards the Dawlish end of the cliff there was a length of exposure with impressive cross bedding on a large scale, extending for tens of yards along the face.

As we approached the town of Dawlish, we could see that the construction of the sea wall was very new. This was where the wall had collapsed in the storm of 2014, leaving the track hanging in mid-air. The new wall looked very substantial and some new houses had been built close to the landward side of the railway track. However, we felt that it was a somewhat unwise position to have built houses and unanimously decided that there was no way that we would ever buy a house there. A hundred yards further on was Dawlish Station. The platform on the sea side actually juts out over the sea wall walkway. One of our group, who lives fairly locally, told me that waves often damage the wooden underside of the platform, and that, on one occasion, the whole platform was detached and lifted bodily by the sea to be deposited on the railway track.

We continued along Dawlish seafront, protected along its length by the sea wall, until we came to the cliffs at the southern end. The path continued around a minor headland, soon revealing a small bay with a sandy beach. This was Coryton Cove (see Fig 7 right). The cliff at the back of the cove was sheer and very high. It is composed entirely of wind-blown sand and is, in fact a Permian sand dune. As it stands today, it is nearly 300 feet high, and may have been even higher in the past. It seemed quite remarkable that a desert dune of these proportions could have resisted erosion so magnificently and present a nearly perpendicular face to the sea. It was proposed that this is maybe the biggest wind-blown dune in Britain with its cross section exposed in a cliff for all to see. From the photograph, you can see that during and/or after its formation, the sand has become much more consolidated than that in the much lower cliffs along the coast between Dawlish Warren and Dawlish; a significant contribution, no doubt, to the dune's resistance to the forces of erosion. The extension to Teignmouth of The South Devon Railway in 1846 has also played its part in adding longevity to the dune, as the rock and concrete barrier of the railway embankment runs alongside the base of the cliff, preventing it from being undercut by storm waves.

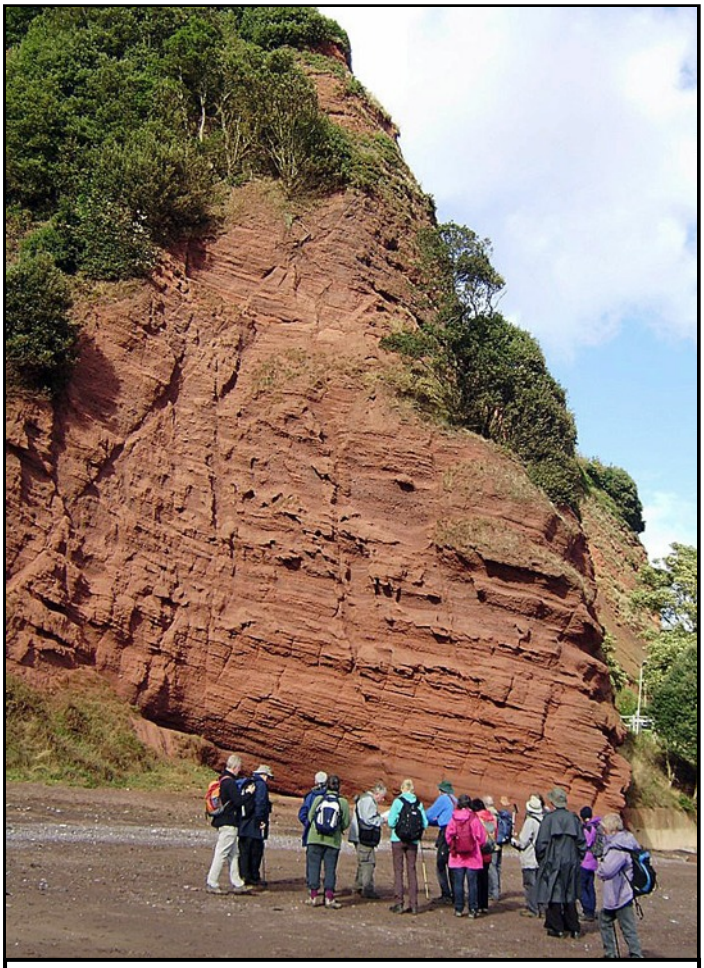


Fig 7 Sandstone Cliff at Coryton Cove

This was the culmination of our day's journey back through the ages. The great sand dune at the back of Coryton Cove is most certainly a much more ancient feature than the little dunes on the Dawlish Warren sand spit. Those little, relatively modern dunes however, must be composed, to a large extent, of the same ancient desert sands, eroded away, over the eons, from the Permian cliffs which stretch all the way to the southern end of Torbay.

There is great concern about the vulnerability of the coastal railway line between Dawlish Warren and Dawlish, especially since the events of 2014. Some people would like to see it moved to a safe location, several miles inland, but this would involve negotiations with a large number of land owners and a tremendous expenditure on a new track. Also, a great deal of money for the purchase of land, and compensation to land owners in its path. It has recently been suggested that a concrete apron, at least 50 yards wide, be constructed all along the seaward side of the track where it is most vulnerable. This would keep the sea at a good distance, thus enabling the railway track to be moved well away from the crumbling cliff, while still allowing a wide expanse of concrete between the track and the sea. The cost is estimated to be £500 million, a drop in the ocean in comparison to the construction of a completely new line.

Many thanks to Anne Padfield for her helpful answers to my geological queries,

and to Doreen van Seenus for photographs Fig 6 and Fig 7.

Zircon, a Real Gem for Correlating Rocks.

Each year, Ann Barrett, arranges a full programme of speakers to entertain those of us that attend the monthly indoors meetings. In July 2017 the talk was 'Zircons: Helping to Understand the History of our Sediments' by Professor David Wray.

I have to admit I know little about Zircons, I thought they were minerals, mostly valued as gem stones and a colourful substitute for more expensive diamonds. But I don't have any Zircons in my mineral collection.

To start with a few facts, Zircon is a mineral, Zirconium silicate, with the formula $ZrSiO_4$. The element Zirconium is a hard silvery grey metal having atomic number 40. It occurs in period 4 of the periodic table with properties similar to steel and to Titanium which appears above it in the periodic table. With a Mohs hardness of 6.5 to 7.5 Zircon is generally harder than Quartz (mohs 7) but less hard than Topaz (mohs 8). Zirconium does not occur naturally as the element, only as its silicate, Zircon and its oxide Badeleyite, ZrO_2,

Professor Wray's interest in Zircon was not as a gemstone but as the small almost insignificant, virtually indestructible, grains that are widespread in most rocks igneous, metamorphic and sedimentary. Zircon originates in molten magma that solidifies as igneous rock. In time the igneous rocks erode to form sedimentary rocks that may undergo heating to form metamorphic rocks. Zircon has a melting point of 2,715°C so, once cooled to this temperature it has a high probability of surviving in its solid state through most of the extreme conditions of its host rocks.

In magma, Zircon is in a molten state and will accept Uranium as an impurity but will strongly reject Lead, the ultimate decay product of Uranium. On cooling and solidifying, Zircon may be assumed to contain no Lead. However, Lead is the end product of radioactive decay of Uranium. There are two isotopes of Uranium, 238U and 235U and these decay exponentially through a number of stages to two different isotopes of Lead 206Pb and 207Pb with significantly different half-lives as follows:-

1. 238U decays to 206Pb with a half-life of 4.46 billion years, and
2. 235U decays to 207Pb with a half-life of 703.8 million years.

By plotting the ratio 207Pb/235U against 206Pb/238U for different values of time one obtains a curve, called a Concordia diagram that has 'Age' increasing as one moves along the curve away from the origin. All results should fall on the smooth curve giving confidence that the data are correct.

Many samples of Zircon are taken from a rock specimen by laser drilling into individual Zircon grains. The samples are then ionised using a Mass Spectrometer that passes the resulting charged ions through a strong magnetic field to deflect and separate the individual ion types, thus determining the sample's detailed constituents, especially its Uranium and Lead proportions.

By analysing a sample of Zircon, determining the proportions of the Uranium and Lead impurities and having the benefit of two separate time clocks, one can get a very accurate estimate, typically 0.1 to 1.0 percent, of the life span of the Zircon since it solidified. However, this does not give a definitive age for the parent rock (whether igneous, sedimentary or metamorphic). Due to its very high melting point, a solid Zircon grain may have migrated through several different molten host rock phases, without affecting its Uranium to Lead transition, before it is trapped in a solid rock specimen.

Zircons originate in molten magma that solidifies as igneous rock. In time the igneous rocks erode to form sedimentary rocks that may undergo heating to form metamorphic rocks. With its very high melting point Zircon is likely survive most of these transitions in the solid state, so that the exponential decay of Uranium to Lead will continue, recording the life of the Zircon grains not the host rock.

Similarly, a rock sample may have gone through several solid/liquid transitions acquiring and losing solid Zircon grains in the process. It will therefore contain many Zircon grains, of different origin, that have different life spans, i.e. period since they solidified. So how does this help us, what can we learn?

The Uranium and Lead content of an individual Zircon grain is its 'life history'. The collective Zircon grains in a rock sample therefore characterise the rock. They provide a very powerful tool for correlating rock specimens; those having the same characteristic signature having a high probability of being closely related.

We thank Professor David Wray for a most interesting and informative talk

[For further information you may wish to look at the 'The American Museum of Natural History' website and in particular 'Zircon Chronology: Dating the Oldest Material on Earth'.]

Favourite Mineral

I'm sure that members have interests other than Geology that take up much of their spare time and I suspect that the collection of Fossils or Minerals features in those interests.

Here is some information on one of my favourite specimens, Okenite. What attracts me to this specimen is the amazingly slender brittle glassy spines. It seems so delicate, witness the sprinkling of crystal fragments around the specimen, that one wonders how it can survive in its place of origin. The answer is simple, it forms within Basalt Geodes and so is protected from the environment. The fragility of this specimen is one reason why I seldom take minerals to club meetings.

Okenite, Hydrated Calcium Silicate, ($CaSi_2O_5.2H_2O$)

For a more detailed description and the origin of its name the reader should visit the MinDat.Org website:-

https://www.mindat.org/min-2967.html.

It should be noted that the formula quoted in the picture came with the mineral and is the same as given by Wikipedia. However, Mindat.Org gives the formula as $Ca_{10}Si_{18}O_{46}.18H_2O$. I leave the readers to track down what is the correct formula. If you find out which is correct please let me know.

The MinDat web site also gives information about Lorenz Oken, the German biologist after whom the mineral is named.

If members care to submit a photograph of one of their favourite specimens, be it fossil or mineral, with a description I shall be happy to include it in another issue of the newsletter.

A Memory of Harry and Joyce

Harry and Joyce Day were founder members of the Medway Fossil and Mineral Society. In my time they only rarely came to KGG meetings - I suspect that the distance was too far for them. One always spoke of 'Harry and Joyce' because that was the way they appeared; a devoted couple who shared everything. Their death, within a few days of each other, a little while back was a sad loss for all who knew them.

On my way to the MFMS meetings in Delce I used to pass close to their house and when Harry felt no longer able to drive it seemed sensible for me to pick them up on my way to meetings, then drop them off on my way home.

On one occasion I attended an open day at the RSPB reserve at Bromhey Farm and was surprised to find Harry and Joyce manning a stall. I guess that they were selling off a few unwanted items to raise cash for the RSPB. There was one item that immediately caught my attention, a lovely coral specimen - see picture above. I asked Joyce "How much" and received the surprising reply "Nothing - it is yours! " I know little about corals but am very sure that it is modern. Never-the-less it struck me as a very beautiful item that, whenever I look at it, will remind me of a wonderful couple.

The Kempton Park Rock Gem n Bead Shows

John Taylor

The two-day Rock n Gem shows have been a Mecca for fossil and mineral collectors for years. My first contact with the shows dates back over fifteen years to when, as a mineral collector, I attended a show at 'The Hop Farm Country Park', Beltring just off the A228 south of Maidstone.

It was there that I first met Diana Franks, Adrian Rundle and his activity tables. At that time all of Adrian's material was stored in Diana's barn at Leighbridge Farm. Diana transported the material for the activities to the various show locations meeting up with Adrian who travelled by train. I still have a vivid recollection of one of the last shows I attended at the Hop Farm and helping to man the KGG stall.. Due to an increase in the number of stall holders the KGG, as a voluntary organisation not charged for its stall, was moved out of the main marquee and placed under an awning for protection from the weather. This was fine in the summer months, but less so in winter. My last memory of the Hop Farm is of standing under the awning with torrential rain falling from its edges. Not long after that I lost contact with the mineral shows. The emphasis of shows at the Hop Farm moved on to military vehicles and my contact with the Hop Farm ended! Through Diana I maintained an interest in geology and joined the Kent Geologists Group, developed its web site and was co-opted onto Kent RIGS to do the same.

By this time the Rock n Gem shows had moved on. Though the shows are now held all over the country, Adrian opted to take his activities to the Kempton Park shows only, the location being but a short distance from his home in Richmond where he now stores his Activity Tables material. Dennis Fullwood, one of Adrian's colleagues at the Natural History Museum and living only a short distance away, transports the material to and fro between Adrian's home and Kempton Park; setting it up, manning the tables and then dismantling them after the two-day show.

Adrian and Dennis do take the facility to other locations for special occasions. Two recent and highly successful events were the GA Festival of Geology held annually at the University College London (UCL) Geology Department in Gower Street, London and the David Attenborough 90th birthday celebration, organised by the Dinosaur Society at the Barnes Wetland Centre.

These events tend to be more geology orientated and the KGG activities tables more numerous, it being quite common for Adrian to have ten tables rather than four. Also some of the young people making microfossil slides are more serious, perhaps because they have relatives who are geologists, scientists, or just interested in geology. It is fascinating to watch these young people totally absorbed in what they are doing, to the exclusion of everything else. It is then that one realises how valuable these activities are.

Inevitably there are a few young people who seem to have had little parental guidance or control and have little respect for the equipment they are let loose on. They have to be closely monitored but they are a very small minority.

While the activities started with making microscope slides of microfossil and micro-mineral specimens, the success led Adrian to extend the activities to his other passion, plants and their seeds. Adrian has amassed a collection of ten of the larger seed types. These, being much larger than the microfossil specimens, are easier for the younger children to handle. They can be picked out with tweezers! One each of ten different seeds has to be picked out from a sample in a tray then mounted, in the correct order, on a strip of double-sided tape on a card which has a printed description for each of the ten seeds. The finished collection is verified (or corrected if necessary) by Adrian then placed in a protective plastic bag for them to take away to show school friends. There are three seed samples, (1) large seeds, (2) small seeds and (3) apiaceae or umbellifera, otherwise known as the Parsnip and Carrot family. A microscope is provided for each seed selection for children to identify the fine difference between closely similar seeds so that they can select the correct seed. However, it is fascinating to watch them remove their selected seed from the sample tray then check their selection with their naked eye to ensure it is correct before mounting it on the double sided tape strip - so good is their eyesight at that young age.

Finally, there is the sales trays. There is a tray each for fossil and mineral hand specimens, donated by well-wishers and sold for a few pence to raise funds for the KGG. For those who have a microscope at home there are small phials of microfossil material, surplus to Adrian's needs, for people who wish to make their own slides at home. As you can imagine, these activities require an enormous amount of effort, not to mention cost, by Adrian. All activities and the supporting materials are free and provided at Adrian's expense. Voluntary donations, made by the public, are all passed on to the KGG.

Please give your support to Adrian's activities, they make a significant contribution to KGG income.

The Birth of Scientific Method, or “Don’t Believe Everything You Are Told”

Tony Mitchell

I have recently reread the script of one of Walter Alfred Mitchell’s [my grandfather] lectures given in the early 1920s to an audience of bacteriologists in Cambridge. He started as a worker in the ‘Science Workroom’ in St Bartholomew’s Hospital in London in the 1890s. This was right at the start of research in the new science of Bacteriology and he records a meeting with Lord Lister and ‘had some words’ with him. He later moved to Cambridge at the Department of Pathology and was eventually awarded an honorary MA. For non-bacteriologists *Bacillus proteus* is harmless and *Bacillus pestis* is the plague.

Tony

“One of the most amusing ‘researches’ I ever had to do work with was a claim to have transmuted *B. proteus* by means of a special ‘pabulum’ into B. *pestis*. Prof. Woodhead sent for me one day and asked for mice. Yes, I had some in stock. He held up an ordinary cream sandwich biscuit and said “this will kill a mouse in 10 hours and I want to P.M. it as soon as it dies”. I replied that I was going to the theatre this evening and would come into the lab after the show and feed the mouse, which would then be ready for him first thing in the morning. Next morning the mouse was sitting up asking for more biscuit and it enjoyed the professor’s entire stock of lethal biscuits without turning a hair.

The biscuits had been prepared by a famous New York consultant, brother of an equally famous Cambridge Arts professor. He was very surprised to get Prof. Woodhead’s report as he had always succeeded. His pabulum must have gone wrong so could he come to Cambridge and prepare some more? He was a most entertaining person and the tales of his patients, and his treatment of them, were most entertaining. They made me wonder what percentage of charlatan psychologist and physician went to make up the successful society consultant. After the Department of Chemistry had been raided to provide the ‘necessary’ apparatus for the concoction of the brew with much boiling and stirring of the, as far as I remember, secret ingredients the pabulum was declared ready. The whole palaver was accompanied by many more entertaining stories about his patients. More mice were supplied and our results repeated. The mice enjoyed it all.

One morning he came into the lab as ebullient as ever. He had found the cause of our failure. The colour bar. “I notice you always gave me tame white mice while I always used wild brown mice and I am sure I will succeed if you get me some wild ones.” “Yes” I replied, “I can get wild ones but did you keep any controls.” He knew nothing of controls, so I explained that wild mice in close captivity die within 24 hours. Controls would have proved this.

So wild mice and controls were used for his next experiment. Next morning he came to me fuller than ever with enthusiasm. All his mice, and controls were dead, Most interesting. And that was the end of what might have been epoch-making research.

W.A.Mitchell

Editor’s Note:

For readers not familiar with the term, the Merriam-Webster dictionary defines ‘Pabulum’ as “a suspension or solution of nutrients in a state suitable for absorption, e.g. roots deliver pabulum to the plant.”

The Oxford English dictionary states that the word dates from the mid -17th century in the sense ‘food’. It derives from Latin, from the stem of pascere ‘to feed’. The term is less familiar today as its use declined from the late 19th century.

Grimes Graves

Ann Barrett

On a sultry, tropical day in June 2016, a small group of Kent Geologists set off northwards for what seemed foreign parts – the Breckland

What remains of this acid based landscape - the growth of tall scots pines and accompanying scrub was extensive and impressive. But beneath is a more familiar layer to Kentish folk – chalk within which lies evidence of a bustling Stone Age industry – the Late Neolithic flint mines of Grimes Graves

One approaches the English Heritage Monument on a drive through the Thetford forest which then gives way to an entrance track over a rolling area of acid grassland. On closer inspection, a tiny world studded

with rare, miniature versions of cranesbills, stitchworts, speedwells and heath bedstraw is revealed.

Overlooking the entrance track on a gentle rise is an odd area of what appears, from a distance, to be ground characterised by alternating coloured bands and patches. These unusual features are formed from different kinds of vegetation which are supported by soils of different types separated by periglacial action during the Ice Age. A relic of the characteristic striped pattern formations visible on Arctic slopes.

In fact the acid, sandy soils of Breckland are due to the freeze thaw action of the Pleistocene glaciers that deposited them.

As we approached the small visitor centre, the main flint mining area became evident as grassy hollowed pits and mounds. These are the visible remains of 433 mine shafts and pits which cover 7.6 Hectares in total.

Grimes Graves flint mines lie on a low chalk ridge beneath the covering of sands and gravels. The sequence of alternating layers of chalk and flint is known as the Brandon Flint Series

It is believed that the first mines were worked there during Late Neolithic times between about 2650 and 2100 BC. The black flint was valued greatly for its quality. Later, there was renewed mining in the Middle Bronze Age between about 1550 and 1450 BC.

During that time, a settlement developed nearby between 1400 and 1300 BC. Huge middens were left in the hollows of the old mines. Later, during the Iron Age, about 390 – 150 BC, some local communities buried their dead there.

The Anglo – Saxons named the strange landscape after their pagan god Grim [or Woden].

As well as using nodules, the prehistoric flint miners mined the three uppermost seams particularly the third, lowest, thicker flint seam; floorstone. This lies at varying depths across the site due to a gentle dip down towards the northwest.

The majority of the earth works at Grimes Graves represent single shafts or pits. Archaeological evidence suggests that no more than one or two mines were open at any one time. The earliest pits are the deepest – up to 13 metres.

One mine, Pit 1, is open to the public and after a short briefing and donning of hard hats, we were able to descend the 9 metre ladder to observe the radiating galleries and flint layers below.

When it was excavated in 1914 by A E Peake, the top of the shaft was 10 metres wide and 3.6 metres at the bottom. At the bottom of the shaft, six horizontal galleries radiated outwards to follow the jet black floorstone flint. Some of these galleries are more than 15 metres long and link up with more shafts. The miners worked along the galleries excavating the flint from the gallery floor then back filling the worked out galleries with the waste chalk.

Five hearths were found at intervals between the floor of the shaft and 3 metres below the top. It is thought that when the miners back filled sections of the mine, they lit fires as a ritualised closing of those areas.

During excavation, numerous artefacts were found there including antler picks, bones and part of a red deer skull.

Fragments of ‘grooved ware’ pottery were found next to flint implements and carved chalk ‘cups’ and balls. It is suggested that these artefacts, many of which are not associated with mining, point to possible ceremonies held to ensure the renewal of flint or the safety of the mines.

The presence of three types of bat remains in one of the galleries appears to prove that some mines remained open and were quiet enough in the winter roosting period for them to roost there.

So what was produced there? Stone tools knapped from the flint at the site during the Neolithic period are commonly oblique arrowheads, discoidal knives and scrapers and the main product, axeheads. Nearly all the axes found appear to be unfinished roughs indicating that they were probably completed elsewhere. Nevertheless some were kept for ceremonial purposes as flint was considered to be special there. Lots of piercing tools have also been discovered which suggest that animal skins were processed on the site.

Later, during the Middle Bronze Age, the inhabitants of the settlement recycled flint from the many local waste dumps and the tools had a wider range of uses than previously. Examples of these are for butchering, food preparation, grinding grain, carving, pottery making and working animal hides.

During the Iron Age, although flint mining had been abandoned, there is evidence, such as the pottery sherds, that people still came to the site. There are also two burials which appear to fit the regional tradition of using old abandoned pits, shafts and quarries for this purpose, possibly because these held mythological or cultural significance.

There is little evidence of Roman use apart from some further pottery sherds.

From 12th Century, rabbit warrens were established by landowners throughout the Breckland including, it is likely, the Grimes Graves site. The sandy, acid soils were unsuitable for crops but ideal for burrowing rabbits which were used for both meat and products of the skins such as glue, size, coney fur and felt.

From 16th century the area most likely consisted of sheep pasture, including, in later times, woodland and arable.

After visiting Pit 1, we explored the site looking at the various depressions created by the pits and even Home Guard foxholes dating from World War Two. Elsewhere on the perimeter of the site were examples of Middle Bronze Age middens.

As we were about to depart, the lone sound of an ascending lark broke the peaceful tranquillity of this ancient site.

Anne Padfield descends into the mine

Thoughts on Evolution

Tony Mitchell

Many years ago, I was phoned by the agricultural college at Wye. They wanted to donate their fossil collection to a worth-while cause and would Medway Lapidary and Mineral Society [as it was then] be interested? I drove there and filled the car up with boxes of fossils and rocks, many with no provenance or other information, and started sorting them at home. Most went to club members but I retained some that were of particular interest to me. Illustrated is one of them.

It is rather sweeping to say, if you read the label, that 'the Chinese' believe that the yellow mud still on some of the brachiopods is the dust from which the Chinese people were created. It would perhaps be more accurate to say that "At least one Chinese tribe believes…". This year we had a holiday in Southern China starting in Tibet and visiting several of the local tribes' spring festivals. The Eruba festival was held high in the mountains, [the steep climb starting at 11000 feet was particularly puff-making] at a spring that supplied calcium carbonate rich water to some brilliant white terraces. This tribe of animists believed that they were created here, hence the festival.

Practically all religions, and there must be hundreds if not thousands of them, if you include ancient ones like in Egypt, Greece and Norway, have their own origin-of-life stories. Why so many?

'Mummy, Mummy, where did I come from?' is one of the earliest profound questions asked by a child. We find it difficult to answer as, 'we evolved by natural selection from non-human ancestors' is not particularly helpful an answer, even if it is, we believe, correct. Recourse to gooseberry bushes, Storks and the like is generally satisfactory. Perhaps to very early Man, [I use Man to include woman child and even foreigner] with the beginnings of a questioning mind, a supernatural answer is most satisfactory, as it does answer every question of that sort. Living as they probably did in distinct tribes, each tribe would have evolved a slightly different answer.

There, I used the word evolved. Even the evolution story does not have a completely satisfactory explanation for the original 'spark of life' though from there on it falls neatly into place. One factor in evolution that seems not to be stressed is that evolution does not invent new structures or chemicals. It works by small modifications of existing ones. And those modifications are at random. We tend to think in human terms and of our 'civilisation' only. We can see that humans come in all shapes, sizes, and abilities, and we bend over backwards to ensure that every-one has an equal chance of a happy and fulfilling life. This colours our understanding of general evolution when thinking of survival of the fittest.

Probably another mistake is using that old phrase, 'survival of the fittest' as that is not what matters. It is 'reproduction of the survivors' that matters. In a life of fourscore years and ten, we can get through 4 generations. That is not enough to see evolution at work in us, so many people cannot understand it. They do, however, take note of MRSA, AIDS and drug resistant Malaria. In our 4 generations, these organisms can notch up several hundred if not thousand generations.

When we have a stomach upset caused by a bacterial infection, we may be given an antibiotic. If you look at the causative organism, all the bacteria look identical. That is because they are identical, on the outside. Inside is a different matter. They are full of chemicals, mostly built following the instructions set out in their DNA. These instructions not only tell the bacterium how to make the chemical but also where, when and how much. They may decide when and how much by detecting other chemicals in their environment. An antibiotic may be such an outside influence. A bacterium that, because of an otherwise useless instruction change happens to make it more difficult for the antibiotic to enter may survive longer than the rest. If it then produces offspring, they too may have some resistance. With a life cycle of only half an hour, a fully-resistant bacteria may have evolved. For many years it didn't, then one did.

A very important point is that for the thousands of years that Man had suffered from bacterial stomach trouble, Super-Bugs did not exist as there was no stimulus for them to evolve. It is only when there is a change in conditions that evolution takes place. A change can be a new predator, food supply, climate

change or similar. Once an organism is well adapted to its environment, it remains unchanged as nothing needs doing. If it ain't broke don't fix it.

Another equally important point is that a fossil bacterium or fossil Man may look identical to a modern bacterium or Man, even though a huge amount of chemical evolution has occurred inside. Lactose intolerance and skin colour are human examples not visible on bones.

Lastly, animals and plants never try to evolve. They are born either with or without the characteristics needed to allow them to live long enough to reproduce. Some will make it and some more capable, will have an accident and not survive, but on average, the better characteristics for life in the prevailing conditions will reproduce and pass on their advantage.

Ruskin pointed out that even an old person would say that a stream well known to him as a youth had not changed in depth or position, so it was reasonable to conclude that geology is unchanged. He did not know, and therefore understand, the huge amount of time available for geology to happen. He certainly was not aware of the now understood fact that the continents have drifted, and continue to drift, over the surface of the earth. In Cambrian times, the land we now call England was close to the Antarctic, in the Carboniferous near the equator and will eventually be somewhere near the North Pole.

Organisms able to survive at latitudes that were similar to present-day South Africa, as they moved north on a drifting landmass towards desert regions either became extinct or became so structurally different from their ancestors, that we call their fossils by a different name. Because of the paucity of fossils, except in a few special places, such as Sheppey, animals may evolve somewhere without leaving a trace, until suddenly appearing in a new area when forced to move. From the evidence of writers like Gilbert White we can be certain that there were none of the, now common, Collared Doves in England in his time. If they had been unrecorded in the rest of Europe we could be forgiven if we assumed they had been suddenly created here.

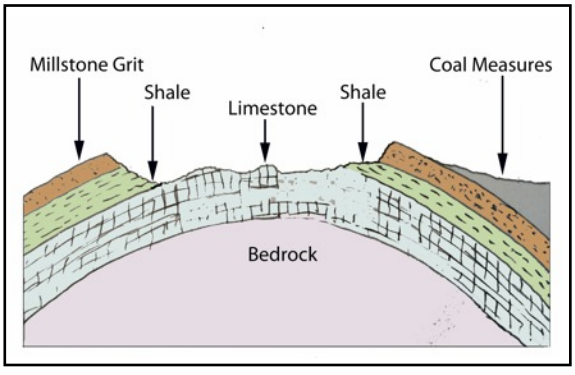
The Peak District of Derbyshire

John Taylor

On leaving School, my daughter went to Nottingham University where she met her future husband and settled in Derbyshire which they both loved. This inevitably meant that we spent more holidays in that part of the world and fewer in the south. It was an area of outstanding beauty that we came to love. With her 'children' grown up and independent she recently moved to Youlgreave. This is a small village of 1300 inhabitants on a raised area of land between the Lathkill and Bradford rivers just south of Bakewell, in the southern part of the Peak District National Park.

The exposed geology of the Peak District now comprises two main areas, the southern white peak that is mainly shale over limestone and the northern dark peak which is predominantly millstone grit over shale. This latter is an unstable situation due to the incompatibility of the grit and shale resulting in the landslides seen in many areas where both rock types are exposed.

Around 350 million years ago, in the carboniferous period, the area that we now know as the Peak District was at the bottom of a deep sea located on the equator. Over millions of years microscopic sea creatures and corals (cnidaria) lived and died in the sea. The calcite remains of these creatures settled on the sea bed and compacted to form a solid limestone rock that underlies all of what we now know as the Peak District. Gradually, the underlying tectonic plate moved northwards and the sea became shallower. Numerous rivers washed material from the land into the sea. Initially only fine silt would have carried far into the sea to be compacted to form clay. As the sea shrank and became shallower the grain size of the material carried into the sea increased. The sea bed deposit changed from clay to shale and then to grit. In time the sea filled completely becoming land that was inundated with plants to form a tropical forest. Over millions of years the vegetation rotted and compacted to form the coal measures that are found in Derbyshire today. This situation is believed to have lasted for millions of years without significant change until about 60 million years ago when, due to plate tectonics, the area was uplifted into a dome shaped anticline. Gradually the peak of the dome was eroded away to expose the underlying strata as rings,just as we have in Kent, to leave a central area of



shale (the White Peak) surrounded by an outer ring of Grit Stone (the Dark Peak). - See cross-sectional diagram above.

The gritstone, being very hard and resistant to weathering has developed near vertical faces, known locally as ‘edges’ that are a Mecca for rock climbers. Over millions of years, weathering has opened up cracks in the bedrock to form gorges and eroded material has been carried away to leave raised areas of rock called ‘Tors’.

The limestone bedrock of the White Peak, being susceptible to weathering by water has developed numerous Karstic features such as gorges, caves, sink holes and waterfalls that contribute largely to the attraction of the Peak District today.

However, not all of the features have their origin in weathering. Periodically, over long periods of time, molten magma rose to the surface through fissures in the overlying rocks to deposit mineral rich veins. These were mostly lead ores that were later mined, though a few of the veins were mined for copper. The principal lead ore was Galena, lead sulphide, (PbS), that forms cubic crystals particularly attractive to mineral collectors. In a few locations, Youlgreave was an example, the lead ore was Lead monoxide PbO (common name Litharge) that because of its powdered colour is often referred to as ‘yellow lead’.

These mineral veins were principally vertical and often only a few feet wide, though extending to great depth and over long distances, called ‘rakes’.. They were therefore difficult to mine. Miners working downwards from the surface constructed horizontal wooden platforms on which they worked the exposed mineral faces and also used to descend into the mine and leave the mine at the end of their working day. In rising to the surface the magma had also penetrated into any horizontal fissures on the way creating some horizontal mineral veins that were also worked for the precious ores. These were often very shallow and difficult to work.

From lead ingots found on Cromford Moor in 1778 and others found across the county since, all stamped 'Socii Lutudarenses', it is assumed that the area has been mined for lead since Roman times. It is also known from historical records that the Romans exploited mineral veins from AD 43 onwards as far afield as Wales.

So important was lead mining in the Middle Ages, that Free Miners were given unprecedented freedom to mine anywhere that the ore was available. They also had right of access to water and space to mine and dump waste regardless of the wishes of the land owner. In exchange, a royalty of one thirteenth of all ore mined was paid to the Crown and one tenth was paid to the Church.

Over time, mines were sunk ever deeper in the pursuit of the lead veins. This meant descending below the water table and required the development of soughs and pumping engines to keep the working levels dry. Lead mining in the Peak District reached its peak (no pun intended!) in 1850 and finally ended when the Magpie Mine closed in 1956.

Evidence of mining still exists in a decaying state today. An interesting example, well worth a visit is Bateman’s House in Lathkill Dale. The ‘house’ was built in 1830 to cover a 12 metre shaft sunk to house a novel water-powered pump for draining water from the mine. It later served a dual purpose as the house of James Bateman, the Lathkill Dale Mining Company’s agent. Long derelict, the site has now been cleared and re-opened to the public by English Nature. A few pictures of Bateman’s house and the half hidden access to the shaft beneath are shown below:-

Bateman’s House, Lathkill dale

The hidden surprise

Going down

Once below ground one finds a small area with a fenced off shaft (by peering over the railings one can see the water surface about six feet or more below). A hand-operated generator provides sufficient lighting to see clearly and there is a detailed description of James Bateman's invention in a display board on the wall. This is open to the public at all times and is probably passed by most visitors to Lathkill Dale as one can walk past the site without even seeing it - a surprising find in a deep wooded valley.

The hidden shaft below

Bateman's house from the footpath

If one is willing to leave the beaten tracks there are so many 'hidden' features to discover. One of our favourites is Robin Hood's Stride and the Hermits cave, dating from the 12th century, nestling among huge boulders, and the crucifix carved into the solid rock wall of the cave - see the pictures below:-

The 12th century hermit's cave

The Crucifix on the cave wall

Another favourite is Monsal Dale where the stunning beauty of the dale with the river Wye is complemented by the man-made Headstone Viaduct carrying the former Bakewell to Buxton railway line across the dale. The viaduct was built in 1863 as part of the Midland Railway's Derby to Manchester line. It is 300 feet long with five arches each 50 feet wide towering 40 feet above the river Wye making it one of the most impressive viaducts in Britain. On closure of the line the track bed was lifted to create a public footpath but the tunnels on the line were all closed for safety reasons. In 2011 the tunnels were opened to the public that can now walk or cycle the full length of the line. Between Hassup and Buxton there are eight tunnels totalling 2,426 yards in length of which the Headstone Tunnel at 533 yards is longest. There are two major viaducts and several smaller ones in just eleven miles! For those readers more interested in geology the local rocks date back more than 300 million years and the Bakewell end of the Headstone tunnel has been declared a geological Site of Special Scientific Interest (SSSI). Faces exposed by the tunnelling have been reinforced by unobtrusive brick columns. To protect people using the track from

falling rock, a steel cage has been erected over the tunnel entrance at the Bakewell end - See pictures below .

The Headstone viaduct from below

Monsal Dale from Monsal Head

Inside the Headstone tunnel

The protective steel cage

When you are tired of climbing rock faces, digging in quarries for fossils and searching for archaeological remains there are two further less strenuous activities that may interest you, one strictly just south of the Peak District National Park.

Two and a half miles north of Ambergate and to the east lies the village of Crich. This is the home of the National Tramway Museum. The museum is home to about seventy trams mostly in working order or undergoing regular maintenance. At any one time there will be a couple of trams giving rides to visitors up and down the valley. The site has a small cafe offering hot and cold meals, a pub (The 'Red Lion' transported from Stoke-on-Trent and rebuilt brick by brick when the A5 was driven through Stoke) offering its own special brew from a cask, an ice cream parlour and shop. There is a play area for children, pleasant woodland paths for walking, and displays of lead mining memorabilia. Visitors can watch trams undergoing maintenance or repair from an elevated observation level in the workshops. They can also see the remaining trams of the collection in the storage hall. Surprisingly, it is easy to spend a whole day there

One has to purchase an annual season ticket and is given an old penny (that is exchanged for a ticket on the first ride) and a receipt that gives free entry for the next year. If one leaves the tram at the top of the valley, a ten minutes walk will take you to the top of the hill where there is a monument to the Sherwood Foresters, now the Mercian Regiment, and superb views over the surrounding countryside.

One of the most popular visitor attractions in the Peak District is the Annual Well Dressing ceremonies. The practice is thought to date back hundreds of years to a time when wells were the only clean source of drinking water. To connoisseurs each village has its own style of display. Essentially a display board is soaked in the local river for about a week. It is then coated with puddled clay into which flower petals,

grass, seeds and other vegetable matter is pressed to form a picture. The ceremony usually involves a procession of the village band leading the local clergy who bless each display in turn,. The procession is watched by many visitors, who usually outnumber the villagers, all taking pictures. A few pictures of the Tramway Museum and Well Dressing are shown below:-

A tram passes the Bowes-Lyon bridge

Trams in the Display Hall

The re-built Red Lion Pub from Stoke-on-Trent

View from the quarry top

Shakespeare's 'Macbeth'

Close-up Detail

All Saints Church - 2017

There are numerous early Bronze-age remains on Stanton Moor, just north of Youlgreave. One popular tourist attraction is a stone circle, about ten metres in diameter, called 'The Nine Ladies' There are actually ten stones, all less than a metre high with one larger, flat stone slightly separated from the other nine.(see the figure below.)

According to legend they are nine ladies turned to stone for dancing on a Sunday. The site is maintained by English Heritage and is about half a mile from the nearest parking place. Every time I have visited the site there has been a bouquet of flowers on the tenth stone and coloured ribbons hanging from the nearby trees. I don't know whether this is an artistic touch provided by English Heritage or whether there are followers of an early religion in the area!

Nine Ladies - Early Bronze-age stone circle

The decorated trees, Stanton Moor

In the Peak District, and particularly the Dales, geology has created a stunningly beautiful countryside that is a very popular holiday area. So whatever your interests, there is much to be seen in the Peak District if you are willing to strike out from the towns and explore the countryside.

Note: For further information about Monsal Head viaduct and Headstone Tunnel you may wish to look at the following website:-

http://www.peakdistrict.gov.uk/visiting/trails/monsaltrail

However, these sites change over time and the editor cannot guarantee that they will still exist when you check - happy hunting!

Favourite Fossil?

Trilobite, Gravicalymene Sp, Wales

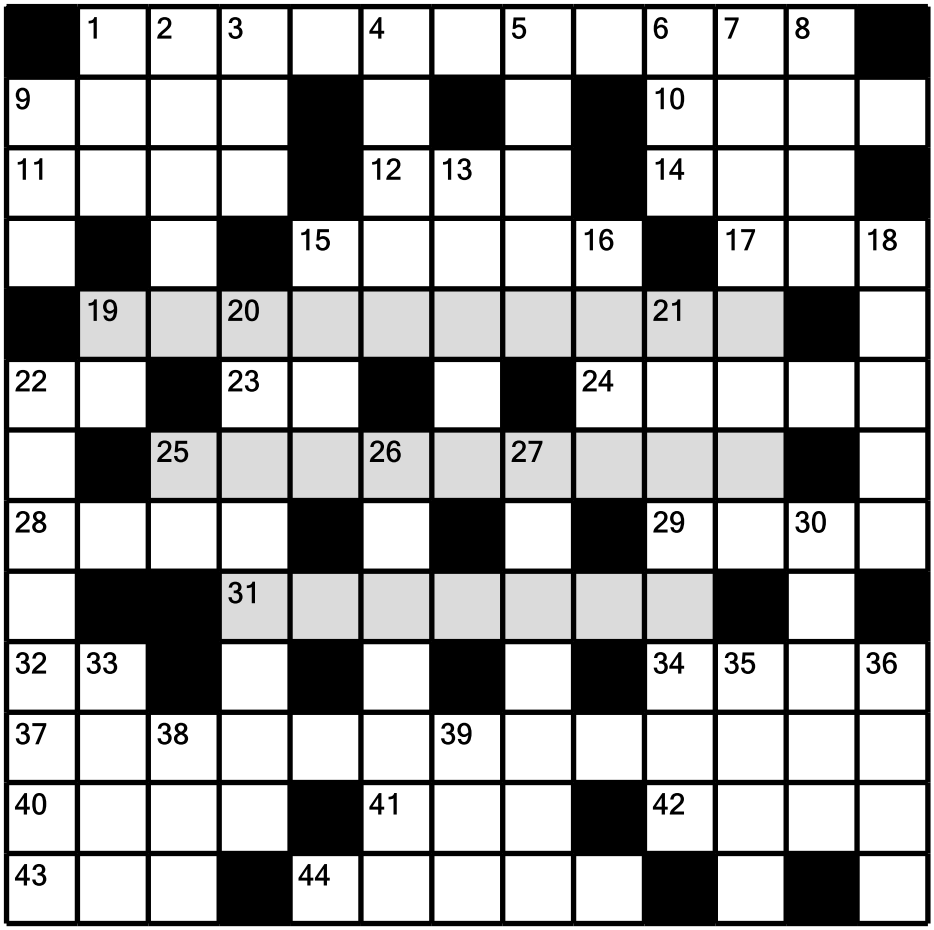
Pictures and descriptions of favourite specimens are an ideal way of filling the small gaps in a newsletter and getting members involved. Geologically, I am a mineral collector. At one time I did start to collect fossils but found the quality of specimens to be generally poor and the apparent lack of precision in determining their type frustrating. I know many members collect fossils and had hoped to persuade them to supply one or two pictures of their favourite fossils to fill the odd gaps in this newsletter, but none was forthcoming; so here is my contribution. When she was young, my granddaughter followed some of my interests and, for a while, I collected fossil specimens for her even after my interest had ceased. The picture left shows one of those specimens. I'm told that it is a Gravicalymene species, comes from Wales, from the Ordovician period 450 million years ago.

Is this definition correct? Can any member throw more light on the subject?

Crossword Puzzle

Stephen Taylor

There's a mystery mineral lurking at **19 Across**. **25 Across** & **31 Across** give its chemical composition. Can you identify it from the remaining (general knowledge) clues?



Across:-

1. A tool to help the drawing of corkscrews. [11]

9. Rain from the North, or strain. [4]

10. Tree genus, or specifically an oak. [4]

11. Pistol feud resolved with this, courtesy of Fluellen. [4]

12. Submerged river valley. [3]

14. The fairies' midwife. [3]

15. Powerful pot-herb formerly used to preserve corpses. [5]

17. A sheep in its second year. [3]

22. A use for 361 stones. [2]

23. Middle English interjection. [2]

24. Informal electronic broadcasts. [5]

28. An end-piece. [4]

29. An oil gland infection. [4]

32. Be present, as the first person. [2]

34. Carriage collection. [4]

37. The 4th of these looks on a notable red granite column [6,7]

40. Showed himself struck from the list. [4]

41. An islet in a river. [3]

42. Sargasso Sea migrants. [4]

43. Professional cycling team. [3]

44. Surround with hills, in a hollow. [5]

Down:-

1. To hasten. [3]

2. Two famously invoke locations in the dooryard, Stoke Poges. [5]

3. A place for sexual exhibitionism. [3]

4. Many lie where winds awake the airy spry in sea pictures. [5]

5. Its chromatic impurities were once removed by our mystery mineral. [5]

6. Endeavour. [3]

7. Non-nucleate cell fragment. [8]

8. Olympian cup-bearer. [4]

9. The corner of Percy's shop. [3]

13. Elf dock generically. [5]

15. Newcastle perhaps, before the great vowel shift. [4]

16. Scottish bunting. [4]

18. Pavement hazard. [5]

19. Delta with at least 14 mouths. [2]

20. A fusiform epidermal structure, or hard part of an ovipositor. [8]

21. Blocks of stone. [8]

22. Native sky-dancers. [8]

25. Greek letter. [2]

26. Loosely-woven silk and wool fabric. [7]

27. Japanese prefecture and coastal city. [7]

30. Countryman. [5]

33. Obvious feature of fungi in the genus *Lactarius*. [4]

35. Serves for no return. [4]

36. Philosophical nature. [4]

38. Rude statue in the Avenue de l'Observatoire. [3]

39. Bits of information; 2^{53}, in fact! [3].

KGG PROGRAMME FOR 2018

Indoor Meetings Programme, 2018

United Reformed Church. 67 Week St, Maidstone, Kent, ME14 1QU

Please bring any material to Indoor Meetings: this does not have to be tied in to the subject of the day and could include recent finds, specimens for identification and books, maps, photographs, etc. of general interest. Details of forthcoming field trips will be given out at Indoor Meetings. There is an admission charge of £1 per meeting (£3 per meeting for non-members). Non-members and guests are always welcome and are admitted free of charge for one meeting. Thereafter they will be charged the appropriate entrance fee. Refreshments are 20p.

Indoor Programme Secretary: Ms. Ann Barrett.

Tel. 01233 623126, e-mail annbarrettgeo@gmail.com

16th January	**Dr Geoff Turner**	The Stones of Pahranagat Valley and other Geological hoaxes.
20th February	**Dr Doreen Van Seenus**	Lahars at Marapi
20th March	**AGM** followed by **Dr Adrian Rundle**	The Bembridge Limestone
17th April	**Tony Mitchell**	Southern China
15th May	**Ann Barrett**	Impressions of Tasmania Part 2
19th June	**Dr Chris Duffin**	Darwin as a Geologist
17th July	**Dr Anne Padfield**	The Building Stones of Maidstone Evening stroll around the town
21st August	**Anthony Brook and Roger Cordiner**	Canary Islands part 2: Tenerife and La Gomera
18th September	**Dr Anne Padfield**	Contaminated Land Remediation
16th October	**James Downer**	Copperas and Gunpowder
20th November	**Geoff Downer**	Global Warming and the Search for the Northwest Passage
18th December	**Christmas Evening and Quiz Hosted by Dr Anne Padfield** Please bring labelled fossils, minerals and rocks for sale for the benefit of the Group and any other specimens found during the year for display. Members may also care to bring in refreshments.	

More Pictures from Grimes Graves

John Taylor

I was very pleased when Ann Barrett emailed me to say she was working on a write-up on Grimes Graves for this newsletter and hoped to get text and pictures to me 'soon'. Firstly, I am always wanting articles for the newsletter that may be of interest to members. Secondly, it brought back many happy memories of visits that Stephen and I had made to the site eight to ten years ago. Ann has added much information about the history of the site that was not available at the time of our visits so I learned quite a few things from her article.

With less information about the site available to us we spent much more time 'underground' trying to take in all before us. At the foot of the 9 metres ladder one arrives at a flat circular floor with tunnels radiating outwards like the spokes on a wheel. The entrances to these horizontal shafts are closed by grills, to prevent the public entering the worked shafts thus protecting the ancient workings from damage and the public from the possibility of rock falls. It is possible to photograph the worked shafts by pointing a camera between the bars.

Figure 1 Looking left from the ladder

Figure 2 Note the hard black flint in the wall

Figure 3 More shaft entrances

Figure 4 And yet one more…

In figure 3 above note the square mesh of hard rubber(?) on the floor. This serves the double benefit of protecting the ancient floor and saves you from taking some of the mine home with you. In our visits the chalk was powdery and the floor was very dusty!

The worked shafts are illuminated by concealed lighting (see figs 2 and 3) and can be viewed through the grills. With a camera close to the bars it is possible to get good records of the mined shafts.

Figures 5 and 6 below show close views of the hard black flint that prompted our ancestors to sink shafts to a depth of nine metres or so to get at it.

Figure 5 A large piece of black flint

Figure 6 More black flint

To give an indication of the quality of the flint,the exposed flint in Figure 5 is at ground level and about eighteen inches wide. Similar large black flint nodules are shown further up the walls of the cavern in Figure 6.

Surrounded by grills leading away from the circular cavern, one is curious about what lies beyond. On our visits, eight years ago, the best views that we could get are those shown in Figures 7 and 8 below. With other shafts now being opened to the public the ability to see more of the worked area may have improved.

Figure 7 One of the mined galleries

Figure 8 Another mined gallery

In her article, Ann stated that 433 individual shafts could be identified at surface level but it is thought that no more than two would have been worked at one time. As the supply of flint was exhausted the shafts were back-filled with spoil and rubble before moving on to another. Over time and with weathering the infill would have compacted and the depressions would have been used for rubbish disposal. Over a period of more than 4,000 years this had a dramatic effect on the surface which is like no other that I have seen. The whole area is a continuous series of humps and hollows in every direction. For an aerial view see the English heritage website:-

http://www.english-heritage.org.uk/visit/places/grimes-graves-prehistoric-flint-mine/

We were confined to less dramatic ground level for our pictures, a few are shown in Figures 9 to twelve below.

Figure 9 Humps and hollows - 1

Figure 10 Humps and hollows - 2

Figure 11 Humps and hollows - 3

Figure 12 Humps and hollows - 4

Your opportunity to give feedback.

In producing a newsletter the aim of the editor and contributors is to create material that is both new to the readers and interesting to read (over a long period of several newsletters this can become quite a challenge!). Did you enjoy reading newsletter No.26? What did you find interesting and was any of it new to you? How many of the following questions can you answer?

1 Where is the stone circle located, and how many stones are there?

2 Why were the nine ladies turned to stone?

3 Where is the hermit's cave and what surprise is inside it?

4 How long (in yards) is the Headstone Tunnel?

5 What is at the eastern end of the Headstone Tunnel that is of interest to geologists?

6 In what geological periods, and how long ago were the sandstone rocks at Dawlish laid down?

7 What is a Gabion, what does it contain and what purpose does it serve?

8 Where are the Jurassic pebbles at Dawlish thought to come from?

9 What was squeezed out by northwest movement of Gondwanaland?

10 In what period did this occur, and what did it mark the end of?

11 In what period (and approximate date) were the mines at Grimes Graves first dug?

12 What were they mining for and how many shafts have been identified?

13 What use was made of Grimes Graves in the Iron Age?

7 What was established at Grimes Graves in the 12th century?

8 Who was photographed descending the ladder?

9 In what forms does Zirconium occur naturally?

10 What properties of Zircon make it important for geologists?

11 How can these properties be used?

12 How accurate is Zircon dating and what makes this high accuracy possible?

13 What was stamped on the lead ingots found on Cromford Moor and throughout Derbyshire?

14 When was lead first mined in Derbyshire and by whom?

15 When did lead mining in the Peak District come to an end?

16 What variety of lead ore was mined at Youlgreave?

17 Which was the last lead mine in Derbyshire to cease operation?

18 How are the boards for well-dressing prepared in order to accept the floral display?

19 What was Walter Mitchell's experiment with mice intended to prove?

20 What does the monument on the top of the hill at Crich honour?

21 What was dismantled and rebuilt at Crich?

22 What surprise awaits an observant visitor to Lathkill dale?

23 Who was James Bateman and what is he remembered for?

24 Where did I first meet Adrian Rundle and his activity tables?

25 How did I come to join Kent RIGS?

26 What fossil did I give to my granddaughter?

27 What is the doubt about the mineral specimen that ranks as one of my favourites?