Occasional Erratics

Newsletter of the

MEDWAY FOSSIL AND MINERAL SOCIETY

www.mfms.org.uk

No. 03. December 2014

The editor of this edition of the MFMS Newsletter was Nick Baker

Cover picture

Halling and Wouldham, viewed from Wouldham Common. June 2013

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Editor's Notes

Welcome to the third edition of *Occasional Erratics*. Yet again *Nick's Geological Journal* has been subjected to the natural selection of the MFMS membership, in which some of my contributions have been displaced by the contributions of the membership, which is as it should be.

So, what is the **main news**? Well, at the AGM on Oct 29th, James Downer was elected as new Chairman and Tony Mitchell is now Hon President. Paul Wright is now Vice Chairman. Fred Clouter retains his role as 'Webmaster'. Dave Talbot remains as Treasurer, and Anne Padfield as Secretary. All other posts are unchanged.

Anne has supplied me with the following:

Review of Committee Meeting 4/11/2014

It was a long meeting during which the programme of coming events was updated up to July 2015.
There will be a two week break at Easter, where there will be no club meetings on 22nd and 29th April 2015.
New membership rates after the October 2014 AGM are as follows:-

Single		£25.00	Senior Family	£28.10
Family		£37.50	Away	£10.00
Senior	(state retirement age)	£18.75	Away Family	£15.00

A Field Trip discussion night is to be held on 21st January 2015. Please bring ideas.
Fossil photographs are required for the web site, so please give Fred Clouter any nice pictures you would like to be shown.
Also, articles are required for the next Newsletter.

Anne Padfield Secretary.

That's the **main news**, folks—more later, but, for now, here are some **geological and natural history thoughts**

In my first edition of this era of the letter, I mentioned how different it was in the 1950s and 60s to get geological information, as compared to today. There was, however a renaissance in publications on natural sciences at about that time. One aspect of that renaissance was a book series called the *New Naturalist*, and in 1960 Prof. H. H. Swinnerton took on the subject of palaeontology, under the title of ***Fossils.*** It is a study through geological time of fossils and the background, character and methods of the geologists who studied them. So, as well as a study of trilobites, ammonites, brachiopods, corals, echinoids etc, we are also introduced to Murchison, Buckland, Sedgwick, Lapworth, Miller, Anning, Lamplugh, Spath, Rowe, - to name a few.

Hugh Miller published his work under the title of *The Old Red Sandstone*. A copy of this found its way to the little town of Thurso on the north shore of Caithness, into the library of the local baker, Robert Dick, a born naturalist, who knew Caithness as he did the palm of his hand. The writer, Samuel Smiles published a biography of Dick, entitled ***Robert Dick: Baker of Thurso, - Geologist and Botanist***. Dick's herbarium included examples of every species of plant growing in Caithness. To him it seemed nothing to walk 20 to 30 miles to see a rare flower blooming afresh in its secret haunts. After reading Miller's 'Old Red Sandstone' he turned his attention to hunting for fossil fish. Rising early each morning he made and baked his batch of bread for the day. Then, leaving the bread to be sold, he set out on his fossil fishing foray. With unexampled energy and endurance he walked sometimes fifty miles in the day to distant exposures and returned heavily laden in time for some sleep and another early baking before repeating the programme the next day. With equal generosity he placed his specimens at Miller's disposal. B. N. Peach, a member of the Geological Survey Staff, wrote of him "Dick was Hugh Miller's greatest benefactor." Miller confirmed this by saying "He robbed himself to do me service."

Robert Dick is a classic example of the old style field naturalist – a species in danger of becoming extinct, even in its 21st Century variety, but we must not forget that the geologist (primarily as palaeontologist) is also a variety of that species. The difference with people such as Dick is that their canvas was spread across several sciences, something that is becoming increasingly difficult. The question arises as to whether the digital age cuts us off from Nature. Also, there is the effect of increased urbanisation of the population, and as far as the Internet goes, there is the question of the easy availability of knowledge. Robert Dick had no such means of finding out and it may be that the best ways of nurturing a new supply of naturalists must best include the old hands-on experience, which the Internet should not replace. Then, perhaps some unknown quality may be transferred which other methods of enquiry do not always supply.

Fig 1. Benjamin Harrison in 1898

Benjamin Harrison and the search for Ancient Kentish Man

Nick Baker

Introduction

Benjamin Harrison 1837-1921 (**Fig 1**) spent almost the whole of his life at Ightham, about a mile to the west of Borough Green, Kent. He was a son of the local grocer. When his elder brother, Tom, emigrated, Benjamin began to learn about the business from his father. But this was not his only education. His primary education took place, first at the local dame's school, and then at a private school at Seal, where the master was very harsh. In 1848 Harrison's parents enrolled him at the British school at Platt, where the headmaster, Stephen Constable, had a keen interest in geology, which he imparted to many of the pupils. Some pupils were more willing than others, but Harrison was one of the former. In 1850 the master lent Tom Harrison a copy of Lyell's *Elements of Geology*, which was then read by Benjamin. He also read White's *Natural History of Selborne*. In the summer of 1851 the headmaster took the boys on a trip to Aylesford and Blue Bell Hill, where they studied the river gravels and sarsens. Benjamin's education would have continued but for the departure of Tom, and so Benjamin left school and began his career as a grocer, or at least one of his careers. He continued reading *The Geologist* magazine and learnt of the findings in the valley of the Somme. Thus, his geology trended towards the Quaternary, with a strong leaning towards human origins. Harrison's first task was to become fully acquainted with the arrangement and relationship of the Quaternary deposits. (Harrison H. R. 1928)

Arrangement of Quaternary deposits

Quaternary deposits are generally of six types: - 1. Boulder Clay, 2. Alluvium and Peat beds, 3. River Gravels, 4. Hillwash and Brickearth, 5. Clay-with-Flints and Chert Drift, and 6. Plateau Gravels. Aside from Boulder Clay, which does not occur in Kent, in order of age the Alluvium and Peat beds are among the youngest, followed in increasing age by first, second and third river terraces. The Hillwash is probably of variable age. This leaves the Clay-with-Flint and Plateau Gravels. Many 19th Century geologists thought that the Plateau Gravels were the oldest and thought them to be of Pliocene age. Harrison, thus felt that the oldest human artefacts would be found in these deposits.

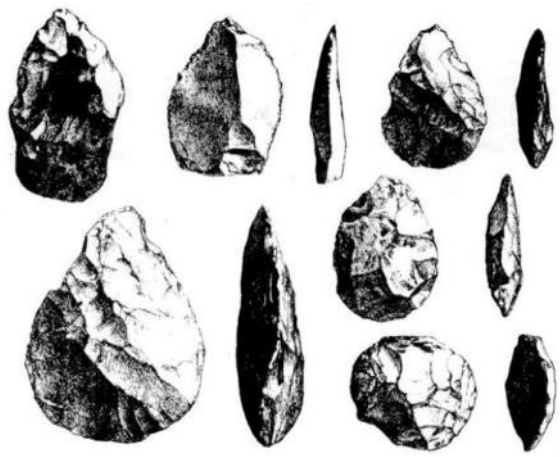
Sites of Plateau gravels

The gravels, on which Harrison focused, are at several sites, mainly on the North Downs, with a few sites on the Greensand Ridge. They are disconnected form the Clay-with-Flints, and usually are emplaced above these. Unlike the Clay-with-Flints, there is a content of sand, sandstone and iron-stone, the sand probably of Lower Tertiary origin. The sites are Knockholt, Well Hill, Ridley, Otford Downs, Cotman's Ash, Ranscombe and Holly Hill, near Luddsdown. On the Greensand Ridge, two sites are of importance – Oldbury Common, right by Ightham, and Gover Hill, on the southern edge of Mereworth Forest. Both of these last mentioned are classified as Angular Chert Drift. The Well Hill and Ranscombe sites have been considered to have connection with the Lenham Beds, in the past considered as 'Crag Age' (Pliocene) (Sherlock 1947), having a heavy mineral content in the sand, but some of the other sites are referred, on modern maps, as Chelsfield Gravels e.g. Ridley and Holly Hill. I will refer to the origin or these sites in a moment, but first, we need to have a look at the progress of Harrison's research.

The research – Harrison and Prestwich

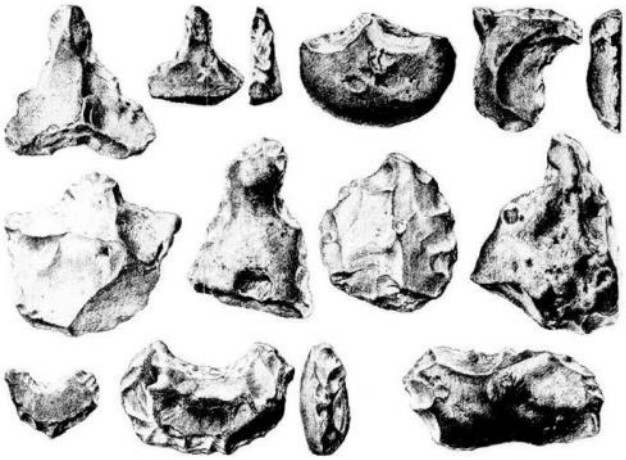
Although his archaeological interests had roots back to his schooldays, his interest in stone implements had a turning point after a meeting with Sir Joseph Prestwich in 1879. Prestwich lived close by at Shoreham. He was not often home, for in 1874 he was offered the chair of geology at Oxford and continued in post until failing health caused him to retire in 1887. He was convinced that the chalk valleys of North Kent offered the same wealth of stone implements as the valley of the Somme. At the meeting in 1879, he had convinced Harrison as well. Harrison set about amassing a collection and by 1887 had 405 artefacts. Prestwich saw the collection and advised Harrison that he should collate them according to the altitude of the location in which they were found. The idea was that the greater the altitude, the older the gravel and the older the specimen was more likely to be.

Fig 2



A mixture of polished neolithic and unpolished palaeolithic implements, found mostly on the high part of the downs but below 500ft (150m)

Fig 3. Very rough flints mostly found on the downs above 500ft (150m)



Prestwich thought that these were of a very primitive culture and coined the term 'Eolith' - 'Dawn Stone'. Harrison had applied the term 'Brownies' to these. The eolith collectors became known as the 'Brownie Group'

Types of implements found

Harrison's specimens fell into two groups. Firstly, **(Fig2)** there was a mixture of polished Neolithic and unpolished Palaeolithic implements, found mostly below 150m O.D. Secondly, **(Fig3)** implements with a brown patina, rude shape and worn appearance, found on the North Downs and Greensand Ridge, mostly above 150m O.D. Prestwich thought that these were of a very primitive culture and so he applied to them the term 'eolith'- 'Dawn Stones' (Spencer 1990 (1))

Presentation of material

Prestwich set about the task of establishing the validity of his proposed chronology. To this end the veteran geologist, with the aid of Harrison, spent several months in the summer of 1890 surveying and examining sites in the Darent Valley and neighbouring chalk plateau. The result of this work was presented to the Geological Society in 1891. Prestwich presented his conclusion that the Plateau Gravels on top of the downs were of early or pre-glacial age. Geological Survey officers, such as William Whitaker and Sir Archibald Geikie, pointed out that there were no glacial deposits south of the Thames. Prestwich countered that he envisaged a small glaciated area in the High Weald.

Excavation at Ridley and Cotman's Ash

Later in 1891, at the Amphropological Society, Harrison's collection came under inspection again. The problem was that every one of the specimens was found on the ground surface. Did they occur below the surface and if they did, what was their relationship with other content? The question was considered important enough for the British Association to set up an Eolith Committee in 1895. The committee ordered that an excavation be carried out at the sites at Ridley and Cotman's Ash, both near Wrotham. Harrison took charge of the enterprise, since Prestwich was now ill and died in 1896. The excavations came to no great conclusions. The excavations did give proof that the eoliths were in position with definite palaeoliths, but in absence of contemporary fossils it was difficult to put an age to the deposits, especially since there appeared to be a random ordering of eroded material. At the present day these 'Chelsfield Gravels' are mapped as 'Pre-Anglian' in age (Spencer 1990 (1)).

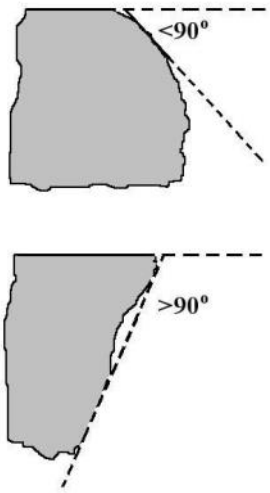
The Ightham Circle

These operations did not quieten the debaters, in fact they grew in number and intensity, but Harrison's fame had spread and an increasing number of eolithophiles gravitated towards Ightham. At one stage these devotees, who became known as The Ightham Circle, numbered up to 100. November 2nd 1891 brought a noted enquirer. It was about 10.30 a.m. when Dr Russell Wallace came into Harrison's shop. Harrison had in fact recognised him immediately, having got to know his portrait well from his copy of *Travels on the Amazon*. There is no evidence that Harrison ever met Darwin, and so this meeting with the co-discoverer of Natural Selection went some considerable way to compensate. After inspecting the contents of Harrison's museum, the two made their way up to Oldbury Common, to view the old cave dwellings, and then for RW to gather some plants – finding *Corydalis claviculata*, which he said was new to him. (Harrison E. R. – 1928)

Reid-Moir in East Anglia

But the eoliths were highly problematic – they were turning up in unlikely locations, such as at the base of the London Clay. One worker by the name of Reid-Moir had found eoliths at the base of the Red Crag in East Anglia, and then, at the same site in 1911, an almost complete, apparently modern human skeleton was found just below the Boulder Clay. This 'Ipswich Man' caused considerable debate, until it was found that the skeleton lay in what appeared to be a working floor. The skeleton was either a Mesolithic or Neolithic internment. But the eoliths were found well below this same floor and appeared not to be associated with the skeleton (Cremo and Thompson 1998)

Fig 4 The Barnes Test



In the 1930s A. S. Barnes devised a test to distinguish between human and natural forces in the production of eoliths.

He said that the angle between the struck surface and the fracture surface was crucial. Human activity would produce an angle <90 degrees. Larger angles were produced by natural forces

Barnes' test disqualified most of Moir's and Harrison's specimens

The Barnes Test

So, was there a test that could be used to decide the authenticity of the eoliths? Various methods have been used to distinguish human tools from natural features. Kenneth Oakley stated that a bulb of percussion is usually present on human tools. Eoliths produced by frost action or sedimentary pressure do not have this, but will have where rocks have been thrown together by wave action (Oakley 1975). In the 1930s A. S. Barnes devised a simple test (**Fig 4**). But, the Barnes Test was far from conclusive – it disqualified many palaeoliths that were otherwise considered authentic. Barnes retaliated by saying that the test required a statistical analysis, requiring more than 75% confirmative results. In spite of this uncertainty, even to this day, scientists resort to A. S. Barnes when considering a newly discovered stone industry, even though the test is considered largely disqualified. (Cremo and Thompson 1998)

The formation of plateau gravels

The Plateau Gravels, on which Harrison was concentrating, have long been problematic in the question of their age. Their contents, at first sight, suggests a wide range in age but it is my proposition that they are emplaced in one or two main events within the Pleistocene. The contents include sands, clays, flints, Tertiary flint pebbles, chert, ironstone of Lower Greensand type, and ironstone of Lenham type. In the light of this I propose the following history of the Weald.

1. Following the deposition of the Chalk, there was an uplift of the land, allowing a large amount of the Chalk to be eroded.
2. Down-warping allowed the deposition of the **Lower Tertiary** formations.
3. Major uplift of the Weald during the **Miocene**
4. Now for a more speculative scenario. During the **Pleistocene**, the weight of ice just to the north caused an iso-static down-warping, and outwash from melting glaciers deposited a 'northern drift'- Red Crag, Tertiary pebbles, and Lenham material, in the northern part of the Weald.
5. At the same time sandstone and ironstone was eroded from the elevated Lower Greensand forming a 'southern drift'. By the **Holocene**, the re-elevated and eroded hills are left capped with these materials. Because of disturbance by later peri-glacial conditions, it is highly probable that what we now see may not be older than the Devensian glaciation – i.e. Latest Pleistocene, but that is not to say that a minority of material may not be older.

Selective collecting

So, if the Plateau Gravels were not necessarily old, how was it that Harrison had found the eoliths in them or in their vicinity, but apparently not elsewhere – even in possibly older river gravels? Why did Harrison get an apparent altitude-related result? In a talk in April 2010 I put forward the idea of selective collecting. What do I mean by this? Tony Mitchell suggested the following. (I trust I report him correctly). Tony suggested that where you find a good supply of definite Acheulian tools, as in River Gravels, you may then miss any more primitive-looking material, while, where the more modern stuff is absent, the researcher will look harder for the eoliths, and often find them. Even the most dedicated and experienced researcher will be subject to this process. Only by detailed excavation and examination of *all* material sifted could this process be subverted. Only at Ridley and Cotmans Ash was this detail used and, as we have already seen, a variety of age of specimens was found. On most other occasions, Harrison was subject to what his eyes picked out, often when pacing the ground. Harrison's logbooks suggest that this was very much the case.

The Galley Hill Skull

But, in all this, were we near to finding anything likely to be the remains of those, the possible producers of eoliths? Between 1888 and the 1930s several candidates arose. In **1888**, an amateur collector, Robert Elliot, found a partial human skull at Galley Hill, near Swanscombe. The remains were near the ground surface and the exact age was in doubt, but some felt it was an example of either *Homo erectus* or 'archaic' *Homo sapiens*. Elliot had not been careful in removing the skull, but Topley and Clement Reid reported that the site was undisturbed. This proved to be in error but the skull remained unquestioned until subject to tests on the fluorine content before the unravelling of the Piltdown fraud in the 1950s. What does the fluorine test tell us? Basically, buried bone material will absorb fluorine from the surrounding environment over time. The fluorine content does not give an absolute age, but by comparing the fluorine content with that of other items at the same site or stratum it was possible to say if the items were buried at the same time. The Galley Hill skull was a later burial, possibly Neolithic. (Spencer 1990 (1))

Piltdown
In **1908** parts of a skull were discovered in a gravel bed near Piltdown, Sussex. The skull was subject to reconstruction but the protruding jaw did not match subsequent discoveries. The discoverer of the first portion of the Swanscombe skull was a London dentist - A. T. Marston. He did not find teeth at Swanscombe but he had examined the teeth of Peking and Java man. Yet, he found the Piltdown remains highly puzzling. What Marston had spotted was the ape-like aspect of the Piltdown canine tooth. There was too much resemblance to that of an ape. He expected to see something more like *Homo erectus*. Fluorine tests on the Piltdown material showed that the molar and canine tooth of the skull were from a modern ape. The rest of the skull was older but still of Holocene age. The rest of the fauna was fossil but not one item had originated from the Piltdown site. So who did the forgery? Three people were in on the original fieldwork – The Lawyer - Charles Dawson, - the Museum Director, Sir Arthur Smith-Woodward, and the Priest - Pierre Teilhard de Chardin. But it was Dawson who 'sat' on the material for four years before reporting to his friend, Smith-Woodward in 1912. On the other hand it was Pierre Teilhard who 'suddenly found' the ape tooth amid the gravel. Yet Pierre Teilhard's knowledge of human evolution caused him to view Piltdown as a 'monster'. So, case not proven and motive unknown. (Spencer 1990 (1&2))

Swanscombe
In **1935**, our London dentist, Alvan Marston, found a skull in the 100ft terrace at Bamsfield Pit, Swanscombe, Kent. Marston was very careful in recording the provenance of the skull, in light of the problems with the Galley Hill specimen. The Swanscombe Skull was less complete than the Galley Hill specimen but showed the same archaic features. Marston had found just half of the cranium. The other half was found by J. Wymer 19 years later! Unlike the Galley Hill Skull, the Swanscombe Skull was in a state of deep burial. Kenneth Oakley carried out fluorine tests on the remains and reported an average of 2 %, well in agreement with the other items in the deposit, confirming a Middle Pleistocene (Hoxnian) age at around 400,000 years BP.

Swanscombe man not the maker of eoliths
So our oldest and best-known *Homo* remains in Britain appear not to be those of the makers of eoliths. The depiction by the natural history artist, Maurice Wilson, shows a hunt, somewhere in the Thames marshes, by a group of very-much *Homo sapiens* individuals. But this is 400,000 BP – a little early for *Homo sapiens*. We are really looking at our much-travelled friend, *Homo erectus*. And I would favour Wilson's depiction of *Homo erectus pekingensis* for a nearer representation of the Swanscombe individual. We can infer that this individual was responsible for the Acheulian tools found in the vicinity, far more elaborate than the eoliths.

Conclusions
So we still do not know the certain origins of eoliths. We are at a collision point between works of conscious and unconscious nature. We do know that present-day primitive humans produce both simple and elaborate tools. Sometimes the most immaculate examples are for religious or ceremonial use. Very primitive societies will produce only primitive tools, which leads us to a possibility. If we are looking for material of human origin, we have to ask, what became of the by-products of the novice flint knapper? Lets face it, the beginner is not going to produce perfect work and it may have been policy for the beginner to have the task of working the edges of flint chips – a relatively simple task, compared to producing a perfect-looking tool. The simple tools could also be the product of hard times. Needs must – no time now to go to the trouble of elaborate production. Whatever the situation, the very name 'eolith' has been allied to those specimens of doubtful origin, so that uncertainty is built into the description. In the majority of cases we still do not know.

In 1906, Edwin Lankester, Director of the Natural History Museum, wrote to Harrison, ending his letter this… "Good heath and happiness to you, courageous discoverer of Pre-Palaeolithic Man". But can we say that Harrison was the director of good, meaningful research, or was he just misguided? As in Harrison's day, those for and against are equally split. The story is still not fully written. Work of people such as Harrison, can often spur other research. Even if totally wrong, Harrison can, and did, act as a catalyst to other researchers, and we cannot say that Harrison was wrong on all points. We must remember that Harrison was a very able natural historian as well as archaeologist.

Five years after his death in 1921, the National Trust dedicated the tumulus, known as Cold Rum, near Trottiscliffe, as a memorial to Harrison. The memorial sign is there to be seen to this day. Another memorial is also present at the Maidstone Museum. In the last month or so of his life, Harrison sat for an oil portrait, by an artist by the name of Charles Chitty. It was said that the much sitting still for this work was hard on the subject and may have brought on his death at the end of September 1921. His invalid wife, of the 40-year marriage, died a week later (Note – this was his second wife – the first had died in 1877). The late Eric Philp reports that he daily saw the portrait on display. We thought that this art work may have been mislaid but we now know that it is safe, somewhere in the vaults.

Whatever we may think about Edwin Lankester's accolade, the stone at the head of Benjamin Harrison's grave in Ightham churchyard has these lines….
He found in life, 'books in the running brooks, sermons in stones, and good in everything'.

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An Interest in Minerals

John Taylor

As members may know, my main geological interest is collecting fine minerals. This set me thinking - why do people collect things? Why do some collect matchbox labels, others stamps or fossils and, a few, vintage cars? Pondering on the subject, and recognising the range of things I collect. I wondered what caused me to start a mineral collection.

I suppose the answer is my grandfather. As a small boy during World War II, my father was somewhere on the other side of the world and my mother was largely occupied by the needs of my younger brothers. I spent a lot of time with my grand-father. He played the piano, read books, painted and taught me to count in Welsh and Russian. Where he gained all this knowledge I never knew but he was like having my own personal reference library. I remember being fascinated by his signet ring that had a polished 'bloodstone' insert; a glossy green stone with blood red flecks in it. He told me that some stones come in amazing colours and showed me pictures of jasper, various agates, jet, carnelian, obsidian and many others. I suppose that was my introduction to lapidary but I was not in a position to pursue the interest. All too soon, secondary schooling, qualifications and career development took over. Sadly, my grandfather died when I was seventeen so I was not able to turn again to him for guidance.

Married with two young children I returned to the Medway Towns and discovered a lapidary shop in Rochester High Street. Going inside I saw boxes full of broken rock of every conceivable variety, tumblers and all of the other rock polishing equipment – it was like an Aladdin's Cave and brought back childhood memories. I discovered that the proprietor ran a lapidary class at the Medway Technical College and joined. I tumbled rough stone, cut and polished rock samples, made cabochons by the score but was frustrated. Cabochons only display to their best if mounted but the mount needs to be silver or gold – the ready-made mounts that could be bought were made from steel sheet and rather 'cheap' looking. With a young family I could not justify spending valuable income on the machines that I would need to take the interest further to my level of satisfaction.

Some time later and purely by chance I discovered a mineral shop in Green Street, Gillingham, close to where the Medway Lapidary and Mineral Society used to meet (although I was not aware of it at the time). I was attracted by a lovely blue specimen of Chrysocholla in the window. Here was a chance to collect lovely minerals without the need for expensive equipment. My collection grew slowly and I concentrated mostly on new mineral specimens that were different types. Gradually I replaced the poorer specimens with finer ones as the opportunity arose and the collection grew. Reaching a total of 400 specimens I realised that the collection was taking up valuable space.

It was time for the next person to influence my collecting interests. I read about the British Micromount Society. These people collected minute specimens in plastic boxes about postage stamp size. The great thing about micromounts is that minerals grow slowly; small specimens mostly have finer crystal forms than larger specimens that can distort over the period in which they grow. I could collect a thousand specimens and store them in a single, low-level filing cabinet. That was great – but where did one get the specimens. By chance I wrote to Richard Bell to enquire. His prompt reply was thirty six specimens, mounted in boxes and labelled; free of charge with his compliments – I joined the BMS.

As my children grew, their education, school and university, became much more important and interest in the mineral collection dwindled.

Time moved on and the last motivation surfaced. My granddaughter had started school and, influenced no doubt by her teacher and other pupils, had started to collect fossils. Remembering the great influence my grandfather had been to me I decided to help her. The wheel had turned full circle; I had to be to her what my grandfather had been to me.

I started to collect some choice specimens that she could neither collect herself nor afford to buy with her pocket money. They would show her the beauty of creatures past and extinct and give a focal point to her collection. However, I had to know more about the specimens than she did or I would not provide much of an 'intelligent grandfather' role! After I had collected fourteen choice trilobite specimens I started to look up information about them – why were they given the names they had? Did the names mean anything? Having a predominantly mathematics and physics background I like things to be precise; without order and precision chaos rules.

I now started my last collection, large numbers of books on fossils. I even have several volumes of the 'Treatise on Invertebrate Palaeontology', including the volume on trilobites. But I was frustrated. Specimens that looked almost identical had not only different specific names but different genus names also. There is a logical reason for the difference between mineral names and fossil names. Minerals have a definable structure with a chemical formula. There are clever analytical techniques for determining the composition of a mineral.

By contrast fossils are the remains of once-living organisms. Each living organism is unique, even identical twins have differences recognised by their parents. Organisms are classified by identifying common features. The study of classification is Cladistics (from the Greek word κλαδος meaning 'branched'). In Cladistics organisms are grouped in an inverted 'tree-like' arrangement according to their characteristics to show how they are related to an earlier common organism. As knowledge is gained and new specimens are found organisms are moved from one group to another where they sit more comfortably. (Otherwise taxonomists would be out of a job!). But with limitless features which should be used for classification?

It is a challenging task for some but I admit my interest in fossils dwindled. Specimens were mostly only pieces, mostly buried in matrix, little to see and identify and seemingly infinite in number. I did not see how I could apply any logic to such subject matter. By contrast, there were only 4,400 or so mineral types formally recognised by the Commission on New Minerals and Mineral Names (CNMMN). That was a task that one could contemplate! My granddaughter must have reached the same conclusion as I did for she dropped fossil collecting in favour of minerals.

That decision had its funny moments. On one occasion she volunteered to give a talk on minerals to her classmates, illustrated by some of her specimens. While unloading them from her mother's car she spilt them. I had an urgent call from her – would I come and put the collection straight again with the right label on each specimen. I guess that's what grandfathers are for.

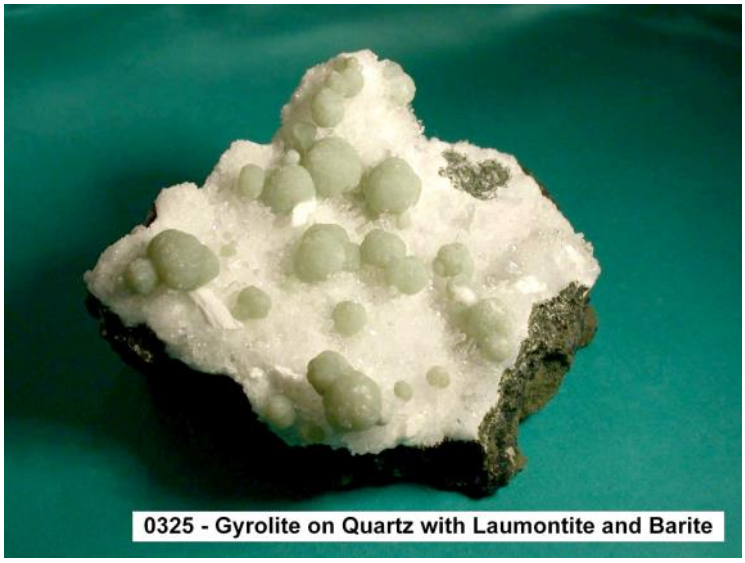
It is some time now since I last collected seriously but I can still be tempted if I see a choice specimen and I still get pleasure from looking at a really nice mineral. However, times change; quarries are mostly closed to collectors, mines are no longer active and are either flooded or closed for safety reasons; what remains on spoil tips is mostly poor quality and hardly worth collecting.

To collect really nice mineral specimens today it is necessary to buy from dealers, the specimens either coming from abroad or from collections that are being sold off; or to travel abroad as members of the Sussex Lapidary and Mineral Society (SLMS) do on a regular basis.

Interest in minerals is not only the beautiful crystal forms and brilliant colours. I have several fluorescent and radioactive minerals in my collection. These move the interest from the aesthetic to the scientific because both are dependent on the structure of matter at the atomic level. This opens up the 'fairy' world of sub-atomic physics; a fascinating area provided one does not have to understand the mathematics but is satisfied by the 'common man' level descriptions that abound today.

In summary, mineral collecting has given me great pleasure over many years and has introduced me to many topics that I would not otherwise have experienced; so I don't think one can say that it lacks interest. If you think you could get interested in minerals I attach a few pictures from my own collection that may help you to decide.

(*John's article has raised the curious question of why minerals or fossils—or both. Largely, it depends where your are and the opportunity for collecting, as well as the factors John has highlighted but there are possible psychological aspects. For instance, although I am interested in palaeontology, I was never interested in the modern sea shore. My own interest was strange at the outset. There was almost an 'alchemical' aspect and the trail led to fossils, although the triggering influences seemed to call for a quest for minerals. If I have space at the end of this letter, I will explain. In the meantime, here are some photos of some of John's collection, and I must say they really are good —Editor*)


0325 - Gyrolite on Quartz with Laumontite and Barite


0216 - Hematoid Quartz


0597 - Rhodochrosite


0155 - Cavansite on Stilbite


0143 - Diopside


0667 - Realgar

The one that got away

Tony Mitchell

Every year Medway is invited to join the Essex Society in their trip to Thrislington near Durham to search in the Permian age Marl Slate for fossil fish. The Thrislington works is a cement works using the Magnesian Limestone as a raw material. Just below it is a layer, about 4 feet thick of a mudstone that splits along a few of the horizontal bedding planes and was therefore termed a slate by the 19th Century workmen. As slates are metamorphic, formed at great pressure, usually in a different direction to the bedding it is not a true slate. It was formed in an offshore lagoon, similar to the Fleet at Weymouth, but much larger. The bottom very slowly filled with mud, laid down in anaerobic conditions producing narrow bedding planes, undisturbed by bottom dwelling organisms.

At irregular intervals there was a storm that overtopped the bar separating the lagoon from the sea and throwing fish and the occasional ammonite along with bits of wood into the lagoon to eventually sink to the bottom, become covered with mud and fossilised. The result is beautifully preserved flat fossil fish, their black scales and bone contrasting well with the grey 'slate'.

The Quarry Company remove the Marl Slate to access a high quality sand directly below it and dump a quantity of the 'slate' in a safe place for us to search. The only problem for collectors is the scarcity of the remains and the perversity of the 'slate' that refuses to split along the bedding plane.

This year a few Medway members joined Essex and some local collectors [including a dealer] and a worker at the Natural History Museum in the search. I found no black fish, unlike Tony Vale, and had to be satisfied with a little wood and some very small crystalline minerals. I did split a slab revealing white markings, which I assumed to be a mineral film, and discarded it. THIS WAS A MISTAKE. Later it was re-found and shown to Mike Smith, of the B.M. who got rather excited. He had recently seen the only specimen of a Permian shark, *Wodnika striatula* being researched by Alison Longbottom and recognised it as very similar.

The Moral of the story. Look carefully, and if not sure, keep.

Cinnabar and others

Nick Baker

In the 1960s I was working for the British Scientific Instrument Research Association, at Chislehurst, Kent. My boss would occasionally pass a request across my desk for red filler. I forget the company we were supplying, and why they could not produce it themselves, since the process was very simple. First get a small tin of bright red paint and then add about half the weight of mercury sulphide. I recall handling the stuff, with no real precautions – the stuff is poisonous, and I recall the large 1kg jar of bright orange powder on the laboratory shelves. I think May and Baker of Dagenham was our supplier.

Cinnabar is the chief ore of mercury. I recall the bright orange crystals in the Geological Museum collection but good specimens, outside of the United States, are rare and any mineral catalogue will have 'poisonous' marked next to the item. In the United States there is a town called Cinnabar. The naming of a town after a local mineral is not uncommon in the old mining areas – and that reminds me of another example, to which I will return in a moment.

Here in Britain, we have a rich mineral store in the county of Cornwall. A large proportion of the world's minerals can be found there, although some in very small amount. These include gold, uranium, and mercury. I recall seeing the small orange crystals within a quartz geode. The mineral areas of Cornwall are associated with old tectonic areas, where mineral brines found an easy way to the surface, but occasionally other processes are active in areas where the resulting minerals seem out of place. A few years back a party of geology students were examining the sediments in the cliffs of the Severn Estuary, near Westbury on Severn. They were mostly palaeontologists and were rewarded by finding a wide range of fossils. One large coral they had found was unremarkable. It had largely decayed prior to burial, but what was strange was the accumulation of small orange crystals within the specimen. The specimen was extracted and the crystals analysed. Yes, the mineral was Cinnabar.

But what was it doing there? It seems that where you have a decay process, the process itself tends to 'mop up' heavy elements, by a form of secondary precipitation. Phosphates are the most common primary mineral, which introduces us to a second and common example. The decay of organic matter in former sediments, leads to the formation of phosphate, mainly as calcium phosphate, in the form of nodules in clay formations. In the south and east of England these 'coprolites' formed local industries, where these nodules were crushed and used for fertilisers.

It was the invention of Geiger counters that showed that these nodules contained more than just calcium and phosphorous. At first it was thought that the elements in question might be Uranium, but analysis showed the radiation source to be mostly thorium, plus some lanthanides. During WWII plans were put forward for mining the nodules near Cheriton, Folkestone, for the purpose of extracting these metals but since Canada and Australia produced much larger supplies, these plans were shelved.

I mentioned the practice of naming a town after a local mineral. In the 1980s BBC radio produced a travel program called *Going Places*. In one edition the program visited a town in Colorado called Telluride. The locals informed the producers that the origin of the name was derived from 'To Hell You Ride'. I got into an argument with the producers, pointing out that Calaverite (Gold telluride) was the chief gold ore in the area and that the tellurium content contributed to a large proportion of the 100 tonnes per annum produced by USA. But the BBC would have none of it. No one there seemed to have even heard of tellurium!

Note—the writer, David Lavender (*The Penguin Book of the American West*, and *One Man's West*) was born and grew up in Telluride. He writes at length on the mining in the area, but makes no mention of *To Hell You Ride* as the origin of the name. The Beeb must have been very selective.

Marl Seams in Chalk– a question of origins.

Nick Baker

Within the Chalk, seams of marl, like the bands of flint, stand out in stark contrast to the rock above and below them, although to the casual observer they tend to go relatively unnoticed. Some years ago I attended a talk given by Dr Chris Wood, his subject being the stratigraphy of the Chalk in relation to Milenkovitch cycles. Dr Wood stated that the exact origin of the clay content in the marl seams was still in question in a lot of cases but many of the marl seams were known to be of volcanic origin. Many (but not all) of the seams were known to contain a significantly high Europium content. The presence of this element was known to be diagnostic of volcanic activity and high levels of Europium, without significant change, occurred across distances of 5000 km or more, suggested large volcanic events (**Wood -1999**).

A problem arises when it is realised that those seams displaying a high level of Europium consist of clays where the primary clay mineral is montmorillonite. This mineral has the capacity to absorb Europium and other rare elements into its mineral lattice and this process has led other workers to make similar claims for other rock formations. Hallam and Sellwood proposed a volcanic origin for Fullers Earth beds in the Lower Greensand around the Maidstone area, citing the dating of the Wolf Rock phonolite as a possible source of the montmorillonite clay (**Hallam and Sellwood – 1968**). The dating of the Wolf Rock at 130 MA may make it too early to supply the Fullers Earth (c115 MA) and other workers have pointed to the relative instability of montmorillonite to withstand long distances of transportation (**Weir and Catt – 1965**). The Fullers Earth and the Chalk marl seams also contain no real evidence of volcanic detritus.

One other aspect that is not often mentioned is the micro-palaeontology of the marl seams. On examination of the material in the Fan Bay Marls, near the base of the Upper Chalk, one is confronted by a larger than usual concentration of larger fossils (>1mm) and fossil fragments, mainly crinoid fragments, fragments of echinoids (mostly *Cidaris*) and small *Porosphaera*. Much of the material shows corrosion to a greater or lesser degree, and there is a relative rarity of ostracods and foraminifera. In the Chalk above and below the marls, ostracods and foraminifera are common, while the larger fossils and fragments are much less so.

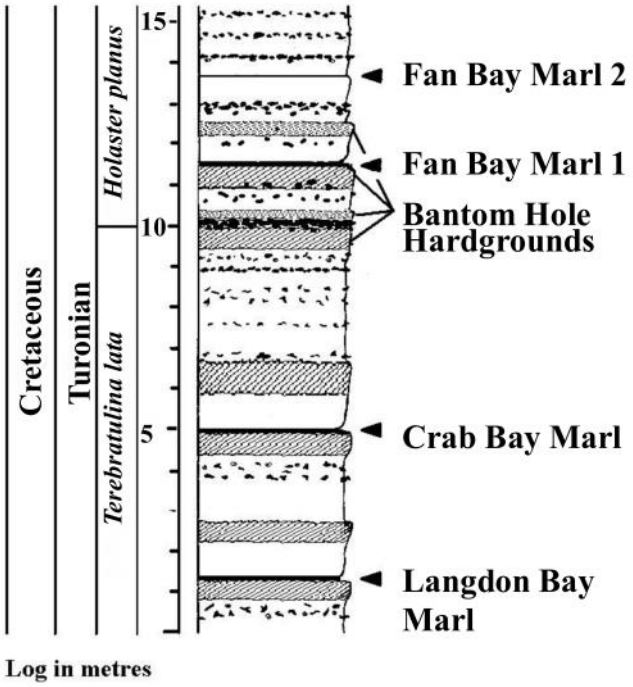
This concentration suggests a weathering process and the fact that these marl seams often occur on an erosion surface, often at the top of a hard-ground, may well provide an answer to the fossil content.

Fig 1 (page 14) shows the distribution of marl seams in the Chalk at Blue Bell Hill. There are four marl seams present, three of which lay on top of hard-grounds, although Fan Bay Marl 2 is known to lay on top a hard ground at other locations. It should be noted that these aspects of Chalk stratigraphy can be found in other limestones, most notably the Carboniferous limestone. I should note that, in this account, I do not include the clay content of the Plenus Marl Formation and the remainder of the Cenomanian Chalk, where the origin of the clay in not in question. The latter formations also supply a normal fossil profile

However one explains the fossil content of the marl seams, there is still the question of the origin of the clay minerals. Several workers suggest an authigenic origin, where pore waters, rich in potassium, sodium, silica and aluminium, accumulate as clay minerals at erosion surfaces and hard grounds. A slightly raised pH is required for the formation of illite and montmorillonite and these processes are thought to have occurred while the Chalk was still undergoing deposition, and probably at relatively shallow depths within the sediment. Dr. Wood cited cases where mollusc burrowing had disrupted the marl and caused it to fill the burrows at levels below.

Such situations do make it easier to consider the migration of the necessary mineral components through relatively shallow sediments, rather than hundreds of feet of chalk, and the volcanic connection may not have gone away. **Buyce and Friedman – (1975**), as cited in **Tucker (1981**) quote cases where the erosion of tephra was thought to have supplied the mineral components. In this respect the marl seams could be a record of volcanic events post-dating the deposition of the neighbouring chalk-level, the intervening time interval being difficult (although perhaps not impossible) to deduce.

Fig 1. Chalk stratigraphy at Blue Bell Hill TQ 741621



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Visit to Canyonlands NP, 5th June, 2011

Dave Talbot

A note first on the geology of Canyonlands

Between the confluence of the two rivers and the top of Canyonlands NP there is a height of 2225 feet, from the Upper Carboniferous or Pennsylvanian Paradox Formation and Honaker Trail Formation, through the Permian Cutler Group of sandstone, shale and limestone including the White Rim Sandstone; the Triassic Moenkopi and Chinle Formations, sandstone, clay and siltstone; in the Chinle Fm the Moss Back Member contains uranium and petrified wood. Above these into the Jurassic and the Glen Canyon Group of Wingate Sandstone, Kayenta Formation and Navajo Sandstone, today we have mainly been on the Kayenta, only occasionally the Navajo; at Grand View we are on the upper ledge of the Wingate, the mesa top of Island in the Sky is cut into these three formations.
At Upheaval Dome the Jurassic Navajo Sandstone forms a ring syncline around a circular anticline of Permian Organ Rock Shale and White Rim Sandstone; the rim is up to two miles across. At Green River Overlook the river is cutting down through Cedar Mesa Sandstone of the Permian.

For Dead Horse Point we look down to the Colorado where the river cuts into Triassic Chinle Formation from the Overlook which is Jurassic Kayenta Formation. At the confluence of the two rivers which is possible to reach from the Needles District entrance, several miles to the south of Moab, uplift and erosion have caused the rivers to reach the Paradox Formation of the Pennsylvanian.

The time span between the lowest and highest formations in Canyonlands is approximately 330 million years; the time it took to carve out these canyons and waterways is anybody's guess, but in the region of 10's of millions of years.

The places we visited

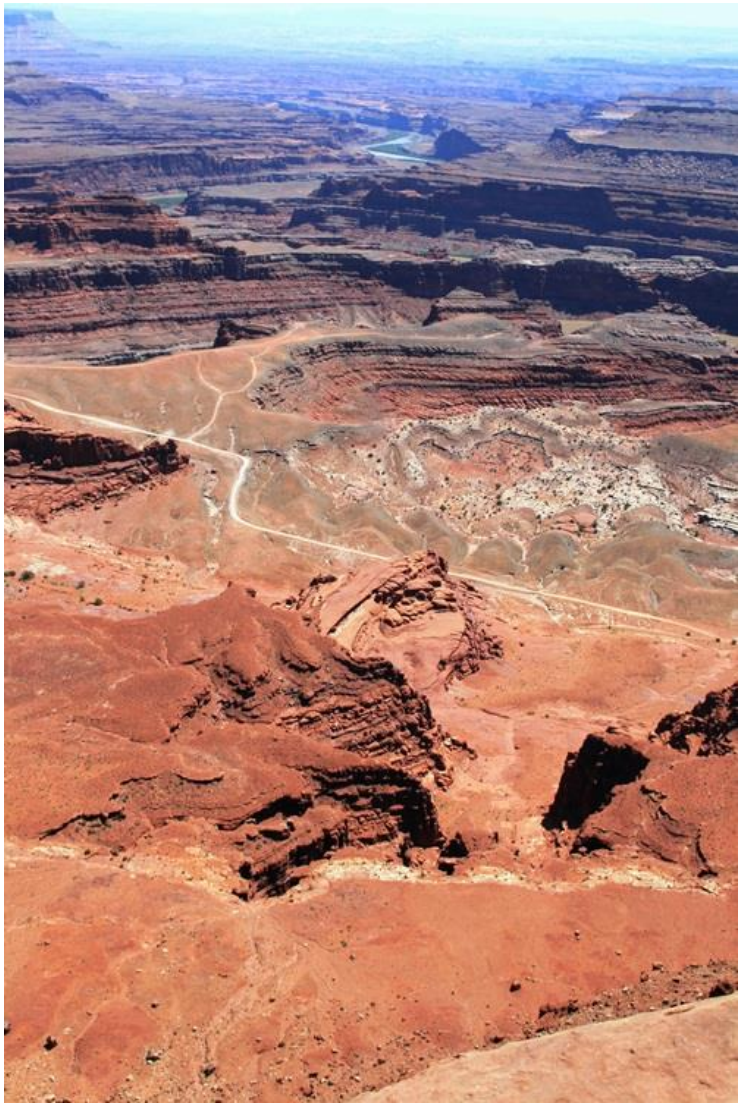
This is a day we spent on holiday in the US on a grand tour of the Colorado Plateau to celebrate my 60th. On tour with Marian and I were my three daughters Louise, Kathryn and Sarah, making up the party was Chris, Kathryn's partner. By now we were several days into the holiday; it had been, to say the least, hectic. The six of us were in two cars, easier that way for travelling especially with the luggage required for two weeks of 'road trip'.

We had stopped overnight at Moab, Utah for visits to Canyonlands, the Colorado River and Arches NP, this report describes our Canyonlands visit. But it wasn't quite like that!!

Both Kath and Sarah had missed the shopping part of a holiday and wished to look around Moab, Chris said he would stay with them; however, they would meet up with us, later at Dead Horse Point Visitor Centre. Because this was the first time I had ever done anything like this I had worked out an itinerary for each day, with mileage, stops, places to see and the amount of time we should be in any one place, especially time and distance to our next hotel. For today I decided to change the order of things so as the others did not have to travel too far onto the Canyonlands peninsula but instead meet us at Dead Horse Point, from where we were to travel together to Arches NP.

Worked well on paper; we would meet them about one pm.

With Louise driving, we left Moab about 9.00, heading north on US191, then R313 into Canyonlands. With our cameras at the ready we were ready for every photo opportunity we could see; and there were 'shed' loads. This entrance road was to take us over 35 miles to the far end of the peninsula and over a narrow ridge onto the 'Island in the Sky', so called due to that narrow ridge. Just before this the National Park visitor centre gave us another chance to stop and take photos, it also allowed us to do our little bit of shopping with tees, caps, books, pictures, maps, pens and pencils etc. for us to purchase. Opposite the centre a trail lead us away from the road to several viewpoints down into the canyon.

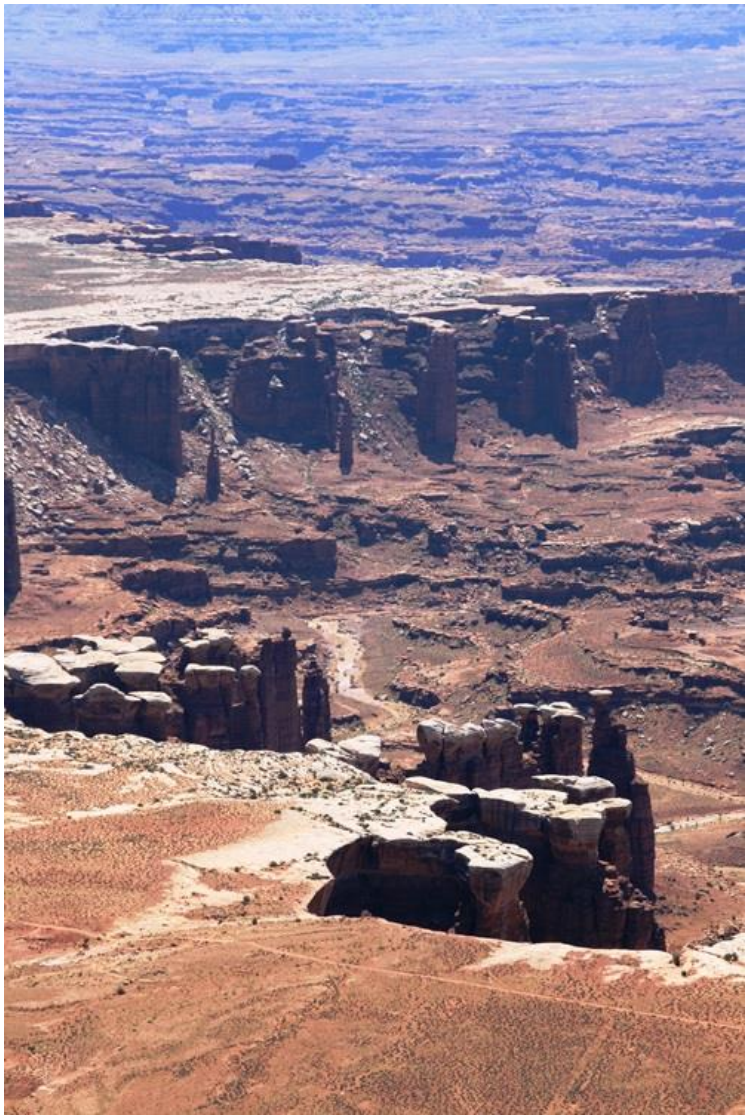


Here we could see the Shafer Trail, which followed the line of cliffs around bluffs and hills down into a dry valley and off into the distance. As we looked a vehicle came into view stirring up clouds of dust, obviously wide enough for 4 x 4's then.

Moving on we now head off onto the 'Island in the Sky', across this narrow ridge, still wide enough for a two-way road, but with drops either side; we are heading for Grand View Point Overlook. Louise parks our car; we have to walk just a short distance to see an incredible view out across a huge area from up to 200 feet high – magnificent. We took a lot of photos here, (*See also next page_ Ed*) it is so easy with cameras today, but what can I say about this. We could not see the Colorado nor the Green Rivers; we are about 6000 feet asl however, the confluence of these two rivers is some distance away to the south, this being at 3855 feet asl.

Over millions of years this whole area has been carved out by fast running rivers removing huge amounts of sediments during pulses of tectonic uplift. From our vantage point it looks as if there could be 15 to 20 of these just by counting the cliff faces I could see, each cliff being the cliff formed as a period of uplift took place. I wonder now that that is the case? Although we try to follow the surface of each of these are we counting the same one several times? Maybe there are only ten or eleven? Anyway, because of the uplift, from here it is impossible to see the rivers.

Around this viewing area there are stone walls and fences, as most people get out, have a look and drive off to the next one.



But there is a trail that we can follow to the west of the car park; this is the first reason we are late in meeting the others, it has not been allowed for, not on the itinerary. The trail takes us along the rim of the cliffs to an area where we are not fenced in, there are none, we can walk right up to the edge of the cliff. Marian is not feeling brave enough, Louise and me are! Like father, like daughter in this case, it is a huge drop, sheer, towering cliffs of red sandstone. We take about thirty minutes at this and, although I am constantly checking the time, I do not want to miss a thing, lizards everywhere with sparsely spaced trees, shrubs and flowers. One lizard I saw had a huge caterpillar in its mouth, scampering off to some corner to devour. Cacti amongst other plants take advantage of open areas between larger ones, so although a desert environment there is certainly enough water here to support an array of different life. Nowhere along this cliff line can either the Colorado or Green Rivers be seen.

Returning to the car it is now off to Upheaval Dome about ten miles away; however, I notice on our drive there the turning to Green River Overlook; oh dear, I feel another distraction coming on, another reason we shall not make our rendezvous with the rest of the party on time.

At Upheaval Dome we walk a short trail to the rim of the Dome, again across rocks and ridges of variously coloured sandstone; at the edge we are met by a colourful array of sediments, thrust up by tectonic forces from below in its centre. Or were they? Geologists have some difficulty in agreeing to what caused its formation to the point that they have positioned two information boards close by. One describes how forces from below, in this case a salt dome, originally buried under many metres of sediment, has been unroofed allowing the salt to push what is left up also, due to its lower density. The other board calls it as traces of iridium have been found – think Chixalub and the demise of the dinosaurs, so meteorite impact crater. The boards then reflect this difference of opinion so give both viewpoints.

At first I favoured the first view, the salt dome, but then looking around the area of the rim into the centre and out around the flanks of the rim, I began to think otherwise. Meteorite impact surely had the power to lift thick beds of sandstone more than salt would be able to? But then, what do I know? This controversy will continue for some time yet methinks; the evidence so far is a mixed bag - of salt, sand and iridium.

On then to Green River Overlook and here at last we are able to see a river. This was well worth the stop and again we can see the many cliffs around the basin where the river/s have cut down into various sediments, and still do, though ice and frost do most damage these days as the plateau has risen, flash floods from time to time wash these sediments away only for the next round of weathering to commence. There are some spectacular canyons to see from here and isolated mesas, one called 'The Turks Head', on a meander of the Green River, (*see over*) is particularly noticeable. Around the rims of this lower platform of the basin we can see a white dusting and from here we can also see how erosion is working its way down to this; it is the White Rim Sandstone, a near-shore dune sandstone.

Enough of this, we have to leave to return to Dead Horse Point Overlook and meet the rest of the party; it is a 16 mile drive, not too far, but we are getting on for being an hour or so late. The trouble up here is no mobile connection, which we all rely on today, and no means of contacting them, smoke signals are not allowed; yesterday, but not today.

We find the others and make apologies for being late. But this just gets better. The views here are as good as we have seen all day; here we can see the Colorado River below the overlook, its meanders forming tight bends below us. Over to the east the rocks form a gentle anticlinal flexure but what is that below them? Two expanses of bright blue, ponds I learn later, most intriguing. These are settling beds for borax which is mined in this area, it is mixed with water and cobalt, pumped to the surface where it is spilled out into the ponds to separate, the cobalt assisting evaporation. Although only two of these ponds can be seen from here, there are actually three of them. On the horizon the La Sal Mountains form a white capped top to this scene, though they are several miles away.

For now, that is it. We are now off to Arches NP for the rest of the day. I said it was hectic, and we are only just over halfway through the trip, but that's another story.

(*Dave supplied 15 photos in all—hopefully, the others can go on the Website. I have always wanted to visit the Desert South-West. Dave has reminded me why_ Ed*)

Florida Fossils

Gary Woodall

The company where I work has a sister business in Tampa, Florida, and once or twice a year I have to travel out there for meetings and I always manage to get a few days sightseeing in when I go. The main things I have gone to visit are the Everglades, Cape Kennedy and the historic St Augustine. (please note Disneyworld was not on the list!). I havn't specifically been fossil collecting (with one exception) but have managed to find quite a number of fossils.

Florida is a very young state, geologically speaking. Most of the exposed strata are from the Pliocene and Pleistocene periods. As Florida is basically a swamp accessible exposures are not common. Many locals go collecting in the rivers but the thought of the alligators puts me off that approach. There are a number of phosphate quarries but without getting permission you cannot get into them, and in Florida the owner can shoot trespassers on sight, again a little bit off-putting. But the spoil from the pits is often used as foundations for car parks and roads, and it was from a car park at a manatee viewing area that I collected some really nice fossil shells.

I had always wanted to see manatees and to my delight only 20 minutes from our factory was a power station where in the winter the manatees come to swim in the warm water outflow from the station. A viewing platform and visitor centre has been built with a large car park which when I went the first time was un-tarmacked and composed entirely of fossil shells.

Now in a similar manner to the Barton shells the fossils still look and feel like modern seashells, but they are of Pliocene age. In the main part of the car park, as one might expect, all the shells were broken. But at the edges and in the far corner there were large numbers of complete shells and I managed to amass quite a collection. I took these back to my hotel room and washed the mud off in the bathroom sink, and blocked the sink! I tried and tried to clear it without success, in the end I scooped the water out and left it. I didn't fancy explaining how it got blocked! Below is a photo of the fossils drying on my bath towel. There was a large variety of gastropods and bivalves, and as I searched it became apparent that some were much more common than others. Some of the Gastropods were quite large and some very spiny, like 'murex' shells today. I went back the following year but unfortunately the car park had been tarmacked.

There are several very good natural history museums in Florida, the main one is at Gainsville which has spectacular exhibits of the vertebrate fossils collected in the state. Many of these were found in 'sink holes', underground caverns whose roof has collapsed leaving a perfect trap for large mammals to fall into. One of these can be visited at the Devils Posthole Geological State Park. Strange how holes around the world always get associated with old nick. Anyway there is not a lot to see there apart from a deep hole filled with water, but as I was in the area!

The specimens in the museum were however spectacular and comprised the usual suspects from the Pliocene/Pleistocene: Mammoths, Bison, Giant Sloths, Glyptodonts etc… But I especially enjoyed seeing the large flightless predatory bird, *Titanis*. These were one of the top predators of the late Pliocene in the southern USA.

One place I did plan to collect was the Venice beach area which is world famous for Miocene fossil shark teeth. These are found washed up along the beach and are derived from offshore sandbanks. These days the area is so famous that everyone goes 'shark tooth fossiking' and there is even a special long handled metal sieve for scooping the teeth from the surf. I unfortunately didn't have one of these but nevertheless collected quite a few teeth from the beach, especially where other searchers had dumped their sieving's. One thing I particularly noticed was the high proportion of ray teeth, I am guessing because the locals solely search for shark teeth and don't recognise the rays.

Anyway Florida is a great place to visit, especially for free, I know David Rayner has been a couple of times and done some collecting. Just make sure you don't go in the hurricane season.

Geological walks

There were two geological walks since July, in the Aylesford area, organised by Anne Padfield.
On the **July 12th** a party of us assembled at The Friars, and then, under a burning sun followed the Medway Valley Walk, first through the sewage works (nice weather for it) and then into a narrow path through low-lying scrubby woodland—mostly elderberry, nettle and bramble. Later, the path widened and we were able to enjoy the wild flowers. This walk has more of natural history and industrial archaeology, for this area by the Medway is the site of the former Burham Brick, Concrete and Cement Works. This used Gault Clay from the Eccles Pit and chalk from the Blue Bell Hill Pits. The works were built in 1850 and ran until the 1930s. The shallowness of the Medway and the lack of a rail line, favoured the works at Halling and Snodland. The works were demolished and the area returned to nature. Very little of the works can be seen today, but the area is still scattered with remains. We later explored the edge of the river where cement and bricks were loaded from concrete quaysides onto river barges. After trying to photograph dragonflies, we walked by the paths towards Eccles and then back to The Friars. Some of us returned to Anne's place where Dennis showed us more of his archaeological collection.

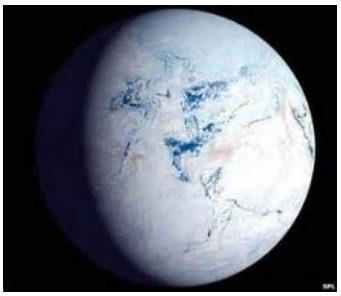
On **September 6th** we gathered at the layby on Blue Bell Hill. First, we had a look at the site of a small fault in the chalk on the east side of the main road. The indication of its presence is a small valley within the chalk slope. We next returned and

made our way to the Mesolithic tumulus, Kits Coty. I wish it did not have to be surrounded by iron railings but it has proved to be necessary. We moved on down the hill to the Pilgrims Way, at this point about 20m below the Melbourne Rock, and then, through some extensive vineyard country, to a moated farm, where the springs mark the Chalk-Gault Clay Junction. The new vineyards extend as far as the Aylesford-Eccles road. At this point Anne pointed out the signs of the Gault –Lower Greensand boundary. Next we walked to Eccles and then up to the Culand Chalk Pit. It is still possible to view the pit via a path through a small wood on the NE side. The small embankment in the centre of the pit, carried the narrow gauge rail line to the Burham cement works and is still visible. Finally we returned to Anne's place via the footpaths.

The Geology of Christmas

Anne Padfield

We see all sorts of images on Christmas cards that make us think of Christmas. Some of these Christmas things can be considered loosely geological, for example Snow Balls. The first 'Snowball' was the Huronian Snowball Earth, 2400 mya, but of course Christmas or even people, didn't exist then. Neither did they exist in the last Snowball Earth period, the Marinoan 650mya.



Looking at the Earth now and thinking of Christmas, the North Pole springs to mind. But that's just frozen sea ice, inhabited by that other Christmas favourite, the polar bear. However, the poles have wandered about just like the polar bear and the Super Continent Pangea may have floated across the North Pole at some point between when it formed and split apart 300 to 200 mya.

What about Lapland, where Santa lives? Finland and other Nordic lands that constitute Lapland are lands forged by ice, with lakes and fjords. There are 15000m^2 of granulite in Lapland containing garnets and zircons. There is kyanite and staurolite schist and gneiss garnets and placer gold. No wonder Santa is always happy and can afford to give all the children presents on Christmas Day, he's 'loaded'!

Santa needs reindeer to pull his sleigh and they like it cold! Very, very cold! So they live in mountainous snowy areas, where there are glaciers, moraines, roche moutonee, corries and erratic's. Rudolph had a red nose from the cold, while robins, another favourite Christmas card image have a red breast? Then we are visited by redwings, migratory birds, in Winter, and red foxes get seasonally brighter red! In Scotland when it snows, there are white hares, ermine and white ptarmigan. We mustn't grouse! Snow crystals are fleeting, but very beautiful, for anyone who's into crystallography. Getting them under the microscope before they melt is a constant problem.

Then there are all the trimmings of Christmas, the decorations, the food. Holly and ivy grows well on Chalk, in fact they grow all over the North Downs, but it seems to grow well on sandstone and clay too. Christmas trees like most conifers prefer acidic soil, or do they make the soil acidic? A bit of both I think. Anyway nothing grows underneath mine. There's plenty of Mistletoe growing on the trees in Kent though, so plenty of opportunities for Christmas kissing.

What about Poinsettias? Those lovely red star shaped blooms we buy as bushy plants for Christmas and then they turn green but don't die, but never go red again. Well they come from sub-tropical climes like the Canaries, where I've seen them growing like trees. The heat makes them red, but we buy them at the coldest time of the year, those growers must think all there Christmases' have come at once. Of course there are a few Scrooges who have plastic ones they bring out every year. This presents an initial hydrocarbon issue, but thereafter is very 'green', just like a real one.

Talking of carbon, why does a Snowman always have eyes made out of small lumps of coal? Because without them he can't see! Also, it makes him a true 'carbon life form'. Coal also features with Christmas card pictures, of blazing fires in a hearth with a mantelpiece bedecked with tinsel, fruits and other goodies. Gideon Mantell's mantel piece is famous in geological circles. Also, there might be paraffin wax candles twinkling in the room, (another hydrocarbon), or the tinkle of Jingle Bells; well they're just 'heavy metal'.

Have you considered that the other old favourite 'Christmas Crackers', work, by using explosives; silver fulminate to be precise, which is extremely unstable. It is a silver salt of fulminic acid and is a Primary Explosive. Well what do you know!

Back to Snowmen, their nose is always a carrot. You need stone free sandy soil for straight carrots. You couldn't grow them on Clay-with-flint, or you'd have a double pronged hooter. Carrots of course are edible and decompose back to the soil they came from, if not eaten.

Leading me on to the subject of Christmas food? Do you prefer a turkey or a goose? Turkeys are wild in the USA, but wild geese are all over Britain, especially in the Winter when many migrate in from the colder North, to forage our shores and open fields. They like Britain because it's an island with a long coast, but this wasn't always the case.

The English Channel is a rift with faults either side, causing the occasional earthquake at Folkestone. There was once a land bridge but ice in the ice age built an ice dam. Stone age man went to the South of France for his holidays, (I don't blame him) and the ice dam broke and swept away the land bridge.

Plum pudding features 'heavily' at Christmas lunch, but watch out for the plum stones. A particularly nice, but stony pudding comes from Hertfordshire. Brussel sprouts along with other brassicas, like alkaline lime rich soils, so they grow well on chalky soil. Some people like Sweet Chestnuts with brussels and these also grow well on poor sandy soils in Kent They're not indigenous to Britain though, being brought in by the Romans (of course) and the Spanish variety are mostly roasted for Christmas by the roadside. In Scrooges day you were lucky to get an orange for Christmas, another sub-tropical tree, which they also grow a lot in Spain.

Classic cubic specimens of 'Fools Gold' come from Spain too. Gold features a lot at Christmas. We have lots of gold decorations and silver ones as well. Real gold comes from hydrothermal veins, along with other precious or useful minerals. The three wise men carried gold, frankincense and myrrh. The latter two are aromatic resins. Hydrocarbons again!

The Three Wise Men or Three Kings of the East, travelled to Egypt to see the Christ Child, and Mary and Joseph travelled to Egypt as well, from Bethlehem. The Holy couple travelled by donkey, but the three kings may have used the great river Nile. With its massive delta intruding the Mediterranean, it snakes an oasis of green through the desert sand dunes and sedimentary Cretaceous rocks. Much of the Mediterranean region consists of limestone's sandstones and evaporite deposits of salt and gypsum. Although the Mediterranean sea has dried up and re-flooded 69 times, (Krijgsman *et al*, 2001) it would have been hot, dusty and hard going for the heavily expectant Mary, but donkeys are notorious for their surefootedness, thankfully. Poor Joseph must have had some mega blisters though.

The Wise men followed a star in the East; perhaps it was a comet or a meteorite? It may have landed somewhere as a magnetic space rock. Now wouldn't that be 'attractive' to collectors. Moving On! Let's go back to the Magi, bringing their gold, frankincense and myrrh. The odour of the aromatic terpenes contained in these substances can be used to identify true amber apparently, because amber is fossilised tree resin. Which brings me nicely to the amber nectar; 'Whiskey'! Apparently it's the local water that determines the taste. What determines the taste of the water is the rock it permeates through. There are many, many different whiskeys. I think I'll leave it there.

Happy Christmas!

References

W. Krijgsman, A. R. Fortuinb, F. J. Hilgenc and F. J. Sierrod (2001). "Astrochronology for the Messinian Sorbas basin (SE Spain) and orbital (precessional) forcing for evaporite cyclicity". *Sedimentary Geology* **140**: 43. Bibcode. doi:10.1016/S0037-0738(00)00171-8.

Jim Greenwood 1927-2014

As we near the end of this letter, I must make mention of a sad note, in the passing of Jim Greenwood. You may not have heard of Jim—but he was very active over the water (in Essex) so to speak. None the less, he was a one-time member of the KGG. If you ever went over to the Essex show, you would have known him by his 'trade mark' surgical collar—an industrial injury in earlier days. I first met him 30 years ago when he was closely associated with Chris Darmon's Nationwide Geology Club. I once asked him whether there were groups more local than the Nationwide and he recommended the KGG. From there I heard of the Medway Soc—So you owe it all to Jim, if you get me! Jim was very active in promoting geological science, easpecially to those of school age—but if you ever had a copy of *Down to Earth* in the 1990s, chances are you would have it sent courtesy of Jim. He must have written hundreds of addresses, but often had a personal greeting attached. There is even now a Jim Greenwood award, for services to geological science. He had a rural Essex accent, which was calm and encouraging—I would like to think that there was a new supply of Jim Greenwoods coming along—but I doubt a duplicate of the original.

Autumn roundup

Sep 10 Recent finds

Sep 17 My favourite minerals. This meeting was well represented. I don't have a favourite mineral but I did bring along a selection of iron minerals - a sort of rhapsody in rust!!!

Sep 24 Richard Forte. A DVD of early life-forms and their links to the present day.
Oct 01 Permian theme. Not a good geological period for fossils but Gary had some good examples from the reef limestones of Durham. I had some fossil plants (Glossopteris) from the coal-measures of New South Wales.
Oct 08 Gastropod display
Oct 15 Photo evening. This was photos of wider 'nature' - someone brought along photos of cloud formations.
Oct 22 3D scanning of fossils. Dr Matt Friedman talked on methods of detecting fossil structure while it is still buried in the rock. Several items of our own collection were earmarked for investigation—see March 11th next year.
Oct 29 AGM
Nov 05 Yarwell revisited—not much material brought in but I had some microslides from a visit in Oct 1998, of fairly modern plants and seeds from the clay pit at Deeping St James.
Nov 12 Triassic theme– which means mostly the Rhaetic Bone Bed—and trace fossils from the Triassic proper
Nov 19 Chris Duffin –talk on Amber. On just about every aspect of amber—from medicine to art, superstition and of course the fossil content
Nov 26 Geomorphology clues (II). A very interesting talk by Tony. All following items post-date this letter
Dec 03 Richard Forte (III)
Dec 10 TBA
Dec 17 Party

And for next year

Jan 14 Open evening	
Jan 21 Field Trip planning. Bring ideas.	All Members
Jan 28 Lower Jurassic. Bring Lower Jurassic specimens	Tony
Feb 04 Evolution of Marine Predators	Joe
Feb 11 Focus on Trilobites. Bring Specimens	All Members
Feb 18 Silent Auction [Geology] Bring salable items 10% to club	All Members
Feb 25 Focus on Crustacea Bring Specimens	All Members
Mar 04 Macro Photography Practical Bring cameras	Fred, John Tony
Mar 11 Results of 3D fossil scans	Matt. Friedman
Mar 18 Geology of the Caribbean	Anne P.
Mar 25 Focus on Devonian Fish	James
Apr 01 Minerals Bring Specimens	All Members
Apr 08 Isle of Wight Bring Specimens	Fred
Apr 15 Photomanipulation	Fred
Easter Break	
May 06 Geological Maps	Anne P.
May 13 History of Sheppey Fossil Collecting	Fred
May 20 Focus on Ammonites Bring Specimens	All Members
May 27 Cephalopods [not Ammonites] Bring Specimens	All Members
Jun 03 Upper Jurassic Bring Upper Jurassic Specimens	Tony
Jun 10 Lower Cretaceous Bring Lower Cretaceous Specimens.	Tony
Jun 17 A British Stratigraphy in 40 pictures.	Nick
Jun 24 TBA	
Jul 01 Folkestone Geology Bring Specimens	Fred
Jul 08 TBA	
Jul 15 End of Term Party & Raffle. Bring food & Raffle prizes	All Members