Additional Newsletter—

Medway Fossil and Mineral Society—14th February 2021

Kits Coty.
The original photograph was taken in 2014. This version, the Editor recently edited on the challenge of removing the iron fencing. Though I say it myself, I think the operation was fairly successful !

I am obliged to add the following, to all those members of the Medway Fossil and Mineral Society, who receive this communication by direct email or by post, under the provision of the General Data Protection Regulation (2018)

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The Editor/Compiler of this letter is Nick Baker

Well, that light at the end of the tunnel was not a train but nor was it the end of the tunnel. I was thinking many times, as I often have, on the conditions needed for an *actual* meeting of the group. Nothing seemed to come up. I fantasied on the idea that we would all need to carry a virus detector. But how to get the biological detectable by the electronic. Not possible … er.. But in the realm of nanotechnology.. On a specially prepared micro-plate, the virus could cause a chemical change—the metabolites of which could be detected electronically. The metabolite could be unique to the virus. Such chemical detection is already in use in some processes - just needs a smaller scale If the alarm sounded it might be too late for you but it would certainly clear the crowd…. Just thinking !

I was commenting in the previous letter on the subject—to paraphrase—on sediments and fossils being close by (round here) and minerals, igneous and metamorphics more distant. Then Brian talked, on a recent zoom meeting (Jan 27th) about his rock thin section cutting and grinding, and so the igneous and metamorphic came close, and I have described one example in this letter. Brian also demonstrated the hazards of front-line zoom technology—which he resolved on Feb 3rd.

The contents of this letter are as follows

Dinosaur Statues 2 : Brontosaurs

by Gary Woodall

Following on from the previous article on Iguanodon statues I will look at the iconic Brontosaur group of dinosaurs. Ironically there is no such dinosaur as Brontosaurus as it had already been named Apatosaurus and that name took precedence. But sauropod dinosaurs are often commonly called Brontosaurs.

One of the earliest models was at Rapid City in South Dakota, erected in 1934, again of dubious realism.

Rapid City Brontosaurus.

Sinclair Gas Sign.

Now one of the large petrol, or should I say gas companies in America is Sinclair and their logo is of a Brontosaurus. At the 1964 World's Fair in Chicago the company produced an exhibit consisting of life-size dinosaur models, and of course this included a Brontosaurus. After the fair the statues were distributed to various parks and museums throughout America. The Brontosaurus ended up at Glen Rose State Park in Texas which is famous for its dinosaur trackways, including many Sauropod prints.

Sinclair Brontosaurus, at Glen Rose, Texas

Wall Drug Store Brontosaurus

Now the Wall Drug store is famous throughout America, it is much more than a store as it has museums, exhibits and all manner of attractions within its premises. It became a popular stop off for families heading to nearby Mount Rushmore. To publicise itself in 1967 an 80 foot high statue of Brontosaurs was put up by the interstate freeway. It is reputedly the largest dinosaur statue in America.

In eastern Utah / western Colorado is Dinosaur National Monument, where a wall of dinosaur bones 200 feet long can be seen. The nearest town is Vernal, Utah and as one might expect of America, the town had completely linked itself to dinosaurs and many statues, museums and signs feature them. Perhaps the most amusing being the huge pink brontosaurus on the Vernal town sign.

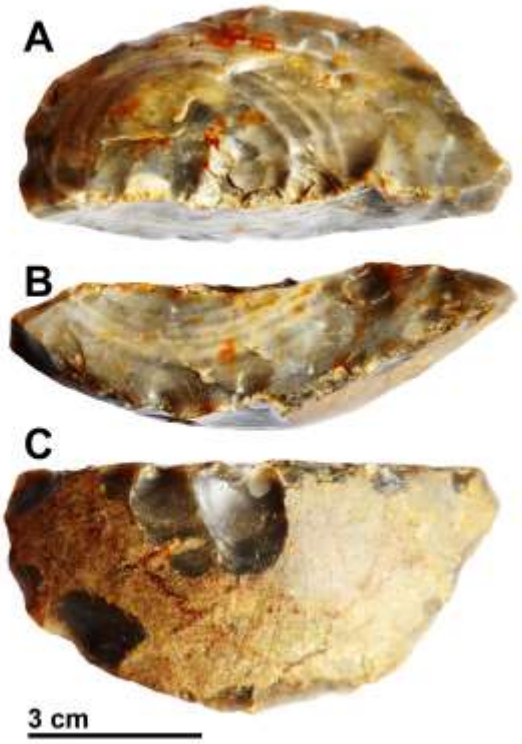
Form this imaginative to the highly accurate skeletal statue of a Brachiosaurus outside the Field Museum in Chicago. This museum is one of the top natural history museums in the world.

Field Museum skeletal Brachiosaurus.

Vernal pink Brontosaur

A flint scraper from Horton Kirby

Nick Baker

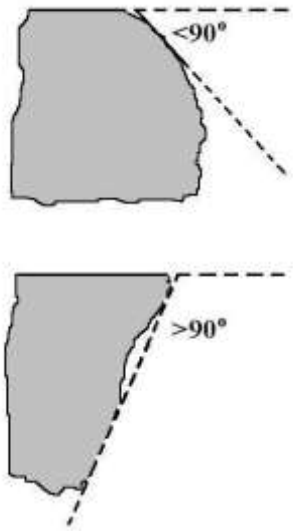


I have to admit that flint implements have been rather neglected in my collecting activities. Largely, because of the problem of the boundary between the real thing and the 'Sports of Nature', a problem that did not seem to worry the lad from Ightham—Benjamin Harrison, who often saw the dubious as the genuine work of very early Palaeolithic Man. So, when I found the scraper I was even of the opinion that it was a fake. But how likely would it be if a fake was produced, thrown away, and then found by me? I suspect, less likely than me finding the genuine. The scraper in question is illustrated on the right. I have long suspected that implement production was very opportunistic. You did not break a large flint in order to make an arrow-head. The fragments might present possibilities for a whole range of items. In the case in point the outer part of the original flint is shown in viewpoint C. A and B are the interior fractures. So the possibility of a scraper seems to have presented at an early stage. The curved, working edge has been worked at several points around the edge in order to increase the sharpness and make sure that the scraping operation was as even as possible, while the edges on the straight fracture have been worked in order to decrease any sharpness and make holding the item easier on the hands.

The item was found beside a field path about 500 metres north-east of Horton Kirby church, at grid point TQ 566688 and appears to be of the Mousterier type. This area of Kent is apparently noted for its richness in flint implements. In *The Geology of the country around Dartford*, Henry Dewey has this to say of the area. He is commenting on the local Quaternary deposits…

'On the east side of the (Darent) valley similar (Brown Flint) drift covers a terrace cut in the chalk hill east of Eynsford, which extends nearly to Horton Kirby at an altitude of about 200ft above O.D. The plateau east of Horton Kirby is nearly free from Clay-with-flints, but is one of the most productive localities for flint implements in Kent. There are representatives of the Palaeolithic period, including the Chelles, St Acheul, and Moustier stages, many grattoirs and racliors resembling the Cave types, and polished Neolithic hatches, all found lying on the surface and mixed together. They occur especially around the small outliers of Tertiary Beds (Thanet Sand), where the green-coated flints are common. The localities appear to have been flint factories since early Palaeolithic times'.

So, was there a test that could be used to decide the authenticity of doubtful implements. In the 1930s A. S. Barnes devised a simple test. Basically, with Human action, the angle with the stuck surface and the cleavage surface, according to Barnes, was less than 90 degrees. With natural forces it was greater. 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.



The Barnes Test

Note:-

When we get back to possible, normal field work, it might be an idea to organise a field trip to the area, for those interested in flint implements. We could combine it with Farningham Wood and look for the Woolwich Shell Bed.

Ref. *The Geology of the country around Dartford*. (HMSO. 1924) Dewey H, Bromehead C, Chatwin C, Dines H.

Genes and Evolution.

Tony Mitchell

There is an unwritten law that all living things only need to be 'good enough' to live under the prevailing conditions. Obviously, if they are not 'good enough', in any important aspect, they won't do as well as the competition, and may die. On the other hand, there is no point in overdoing things. Good enough is good enough.

So, it is the conditions under which an animal lives, that mainly determines how an organism survives, using the design it inherited. Any animal, be it a bird, fish, snail, wasp, bacterium, or virus, is the descendant of a previous animal. The detailed design of each parent must have been good enough for it to survive long enough to reproduce, or there could have been no offspring. The offspring inherits that design from its two parents [in the case of sexually reproducing organisms]. The result is an individual that is similar to, but not identical to, the parents. The obvious example is the male child born of a female mother. At conception, the embryo receives a copy of the design information from each parent. The two sets are passed on when the cell divides and as the embryo grows, every cell in its body will have two sets of information. These two sets, between them, determine almost everything about the finished adult.

If both sets were added to the two sets of the partner when the next generation is conceived it would contain 4 sets, then 8 and 16, so after only a few generations the result would be impossible to store. Therefore the male sperm, and female egg must contain only one full set of instructions, but the cell it is derived from, contains two sets [one from each of its parents]. So which set to use?

The answer is bits of both. When a sperm is formed, a cell containing 2 full sets of instructions creates 2 cells with 1 set each. These individual instructions are called genes, and a huge number of your genes are identical to the genes in a salamander and even an apple. The reason being that all living things are made of cells, and the instructions for making a basic cell, and the complex chemistry that goes on inside them, is the same for everything, human, salamander, and apple. Different types of cells have different extra instructions. Every cell in an individual still contains a full set of genes, even if it will never need most of them. The materials a liver cell needs are different to those a nerve cell needs, so liver cells only use those genes producing the materials it needs. Even so, it still contains the genes required by nerve cells. An additional complication is that the process of copying the information from one cell to create two, while fantastically efficient, does make mistakes. The mistake makes the information that gene holds, different. The mistake is called a mutation. Sometimes the gene still works, sometimes it doesn't work and sometimes it produces a different result. If it does not work, the working gene in the other set is used, or a hybrid result occurs. The AB blood group is an example of a hybrid result [see below].

An example of this is the ABO blood group. The ABO gene comes in 3 types, A, B, and does not work. If the embryo inherits A from each patent it is AA and therefore Group A. BB gives Group B and OO gives group O. AO [and OA] is Group A and BO [OB] is group B. The proportion of each type of gene in the whole population is different, B being the rarest.

Genes are stored in chromosomes in the nucleus of every cell in your body [except red blood cells which, once made, using the instructions in its nucleus, loses it to create more space to carry oxygen. Without maintenance instructions, red blood cells have a very short life.] Each chromosome, and humans have two sets of 23, contain some of the full set of genes derived from each parent. These genes are stacked in an extremely long line along each chromosome with the complimentary gene, doing the same job, beside it. A chromosome has been likened to a shelf in a reference library, with the genes represented as instruction books. Each book has another edition beside it. The ABO gene could have an 'A' type in one book and a 'O' type in the other, giving the blood Group A. When the cell needs to access some instructions, the appropriate book [gene] is copied and the copy exported to where it is to be used. The original genes remain in their place in the chromosome.

To get one set of chromosomes [shelf of genes] from the two available, into a single set in a sperm, the chromosomes organise themselves in pairs, shelf M (from his Male father) beside shelf F (from his Female mother). They break and re-join [called crossover] at random, at the end of a gene, so that, although the order of genes remains the same as before, one section of hundreds of genes from M is joined to hundreds from F and sometimes back to M again. In this way each chromosome contains genes from both parents in one string. MMMMMMMFFFFFMMMMMMMM The other string is therefore now FFFFFFFMMMMMFFFFFFFF. In practice the strings are much, much, longer. Two sperms are produced, both containing all the necessary information, but from both patents and different from each other. ABA in one BAB in the other. As the crossover point differs each time a sperm is made, every one of the 30 million produced is different to all the others in some way. The egg is created the same way, but usually only 1 or 2 in humans, but millions in fish. It has been calculated that there has never been an individual with exactly the same set of genes as you. Even identical twins have some unique differences.

There is only one example of the environment changing a gene. Radiation of various types may hit a chromosome and damage it. In most cases the chromosome repair system can rectify matters, though when it can't, the altered gene [mutation] may affect the individual, and could be passed on to the next generation. But the environment can, and does, influence the way cells use the gene information it has. Exercise makes the muscles get bigger and stronger. Exercise cannot make new muscles where there were none before. Muscle cells that experience hard work can respond by using their genes to cause the cell to divide and grow into more cells, thus creating more muscle and more strength. They need more oxygen and sugar so can also cause their energy creating department [mitochondria] to increase in number, and influence blood vessels to grow more densely and become leakier to release more material for the cells. All this also has disadvantages. Larger muscles take up space, stronger muscles put extra strain on bones and the heart. They need more energy and material in the form of more food so bigger intestines are needed as well as kidneys to remove the extra waste products. Too much muscle growth can therefore become a disadvantage for hunting animals. It is best to be just 'good enough'. The over activity of a gene, produced by exercise, is not inherited. [This was the basis of the now discredited explanation of evolution called Lamarckism]

Humans have to a large extent changed the local conditions in which they live, so that there is usually no problem if there are mistakes or shortcomings in our genes. Drugs, transplants, wheelchairs, and other interventions can reduce most inherited problems.

So long as conditions remain stable and unchanging, all plants and animals that are about at any one time, will be 'good enough' to survive until the conditions do change. What those conditions are, and how rapidly they change, will determine what species increases in numbers and which remain unchanged or die out and become extinct. Changes to the human created environment could have a very serious effect. If we all had to live without any source of energy, electricity, coal or oil, the population would crash for lack of heat, pumped water, food and transport and many local populations, even countries, could become extinct. Many 'primitive' tribes, on the other hand, probably would not even notice.

Note that any changes in the genes in the next generation comes under the heading 'conditions', and constitute a change in conditions. This change in the vast majority of cases is neither a help or hindrance and just continues to be passed on.

Meltdown of an atomic power station releases vast amounts of dangerous radiation which, in the case of Chernobyl, required abandoning a large area. Many people died of radiation, but at the same time, some others survived. This was because individuals in the local population were not identical, and some had genes which, while of no value in 'normal' conditions, gave some protection against the damage of radiation and that difference, can be inherited. Some of the wild animals of the area are also surviving, others are not.

Evolution depends on organisms at the edge of 'normal' in one characteristic or another. When a change occurs, it is they that may inherit the earth. Most evolution seems to occur on 'islands' where a group of creatures are separated from the rest of their kind over a long period of time. Most islands are surrounded by water, but mountains can also be islands if the surrounding low land is impossible for a mountain species to cross. A small group has a limited 'gene pool', i.e. the whole group has a limited number of different genes to work on. In this case evolution [or extinction] can happen quite rapidly.

The horse is a good example where evolution has happened fast enough for us to notice. In this case, artificial selection has created 'islands' of two individuals, selected to breed because they are [e.g.] good at pulling loads. Scores of breeds have been created, from large shires to miniature horses no larger than great dane dogs. However, there is a limit, which seems to have been reached with racehorses which do not seem to have got faster in the last two centuries. The point here is that for the most part, evolution can only proceed with the genes it already has. It is very rarely that a mistake in a gene, or particularly, mistakes in several genes, comes up with a completely novel 'idea' which produces a completely new animal or plant. Some think it could never happen. But never, is a long time, and geological time is an unimaginably long time, so never could, and did, happen; otherwise life, as we know it would not have evolved.

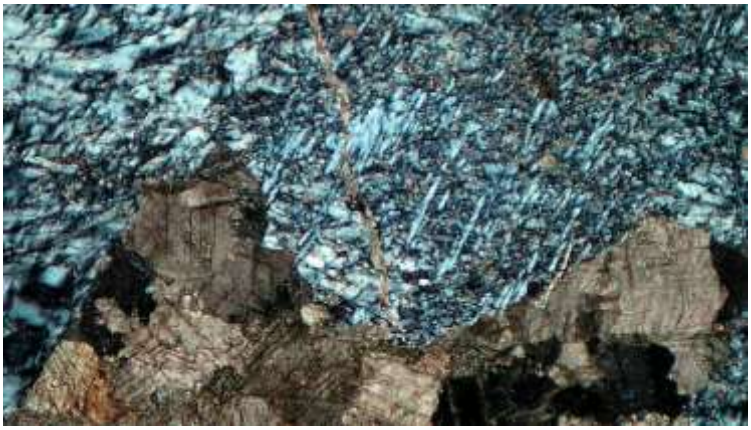
That Irish Builders Marble

Nick Baker

Scroll back 28 years. In September 1992, I and others went with Chis Darmon (of Down to Earth and Geo-Supplies), on a geological trip to The Irish Republic, starting from Cork, we drove to Galway and then spent time geologising in Connemara and then Co Kerry and back to Cork. We were promised, that while in Connemara we would be able to get some samples of green Connemara Marble. And so, on a day of occasional downpours, we arrived at a small disused quarry a mile of so from Ben Lissoughter. And there we

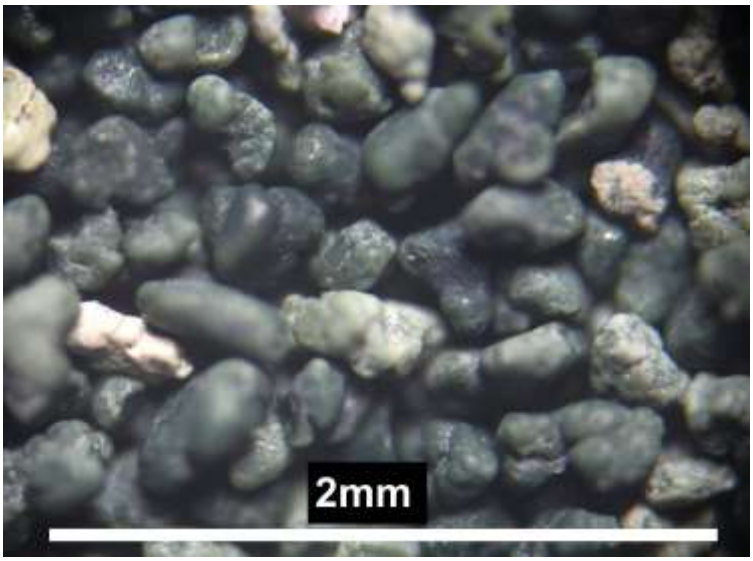
found boulders of a beautiful, green (electric green) rock. *In my journal I had noted that this was described as a Serpentine marble but then I labelled it as marble and forgot everything else—until this year.*

Fast foreward 27 years. I offer Brian Lines my collection of Metamorphic and Igneous rocks. Now, Brian has engineering skills and so developed a rock cutting, grinding and thin-sectioning method. And also photographing from thin-sections etc. He demonstrated the results on a recent zoom meeting. One of the subjects was that Connemara 'Marble'—which it was not. Not a marble. Not a *geologists* marble. It was a **Serpentine, with added Dolomite.** The photos on the right are of the whole rock with photo of Brian's thin section. Brian was not able to get an accurate focus on the slide photo but I have managed to sharpen it a little. The top part of the photo shows the Serpentine. The lower shows a Dolomite inclusion. The magnification of the original is x40 but I was not able to add a scale bar. The rock appears to be about 85% Serpentine and 15% Dolomite. The metamorphism is of a Dalradian age but I have little geological literature on the area and so cannot comment futher.



Glauconitic Marl

Nick Baker



For a long time the Glauconitic Marl (at the base of The Chalk) was called the Chloritic Marl—the green mineral being thought to be Chlorite and not Glauconite. It's position has been something of an enigma, being the boundary between a clay and a soft, white limestone. The boundary consisting of grains of glauconite and, in the samples that I have, occasional pyrite and phosphate nodules. See photo to the right. Glauconite has been long attributed to be derived from mulluscian excreta. And it was thought that this was the source of the potassium, comprising the potassium silicate, of which the mineral is partly composed. The potassium is said to be *ultimately* derived from sea water, so it's presence is indicative of a marine deposit. It is true that the Glauconite is indicative of marine deposits but the potassium could have several origins. But this exercise was triggered by Phil Hadland, authour of ***The Fossils of Folkestone***. In a talk to the KGG a few months back he stated that the Glauconitic Marl was of volcanic origin. There are studies (**Jeans et al. 1987**) that indicate the presence of volcanic minerals within glauconite grains, including those in the marl at Folkestone. In the light of this I want to examine the other conditions that prevailed and whether those conditions were triggered by volcanic activity.

There are three main components in the marl—Glauconite, Phosphate, and Pyrite. There is also a varying degree of fine clay material with some fossil content. At this point I want to compare a similar deposit of the same age—The Cambridge Greensand. The latter has a good micro-fauna and in both deposits there are commonly well preserved vertebrate teeth, mostly of specimens derived from the underlying Gault clay and Upper Greensand. But there are marked differences that I will mention below.

Phosphatic nodules.

Phosphatic nodules are abundant in the Glauconitic Marl, particularly where the sequence is condensed. Some of the nodules are derived from the underlying Gault and Upper Greensand, and are phosphatic fossil fragments, fossil moulds, and calcareous concretions. Concretions in particular show signs of a complex history of multiple phases of boring, encrustation, phosphatisation, and glauconitisation. Phosphate and glauconite are both replacements after fine-grained carbonate sediment and cement. The majority of the phosphates are whole and fragmentary moulds of fossils. The origin of theses nodules involved: (1) infilling of shells, (2) burial, (3) prefossilisation-cementation of fossil infillings. probably by high magnesian calcite, (4) dissolution of aragonitic shell material, (5) disinterment and exposure of moulds on the sea floor, followed by (6) phosphatisation, boring. and encrustation by various organisms, and sometimes glauconitisation. Many nodules bear evidence of several cycles of cementation, exposure, mineralisation, boring and encrustation.

The closest Recent analogues to the Glauconitic Marl phosphates appear to be the phosphatic crust and nodules forming today off the coast of southern California. The features described and processes inferred from the Glauconitic Marl occurrences appear to have been widespread in nodular phosphatic facies.

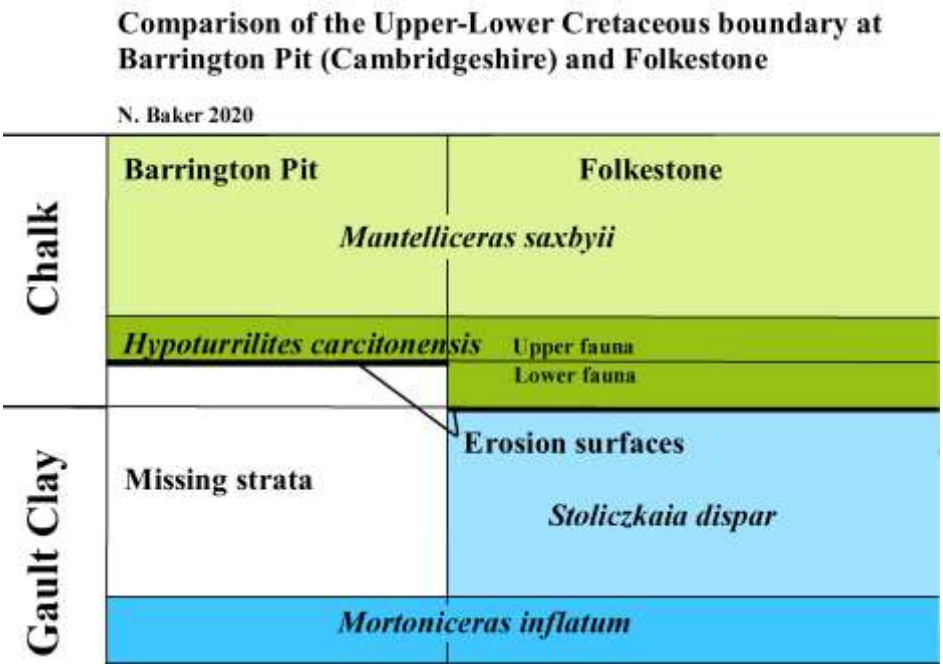
Glauconite

The production of Glauconite can involve several processes **(Tucker 1981).** There was a common opinion that the potassium was derived from sea salts, via sea plants and mollucs. It can also be derived from the breakdown of clay minerals, particularly under differing pH in conditions where bio-decay seems to have been common. A slightly reduced pH may account for the corroded micro-fossils in some of the Kent samples. Glauconite is also favored by very slow sedimentation rates.

Iron Pyrite

Add a further indication of bio-decay, iron-rich, anoxic conditions and we can complete a picture. There are similarities to the Westbury Shales and Rhaetic Bone Bed in terms of possible topography. The low sedimentation rate appears to be that ushering in Chalk depositions. Layers of phosphate nodules at the top of the Gault indicate an erosion surface. The erosion was followed by a period of erratic erosion and deposition across a vast tidal delta of mudflats and cut-off meres, and we may well have a source of the anoxic conditions leading to bio-decay.

The Glauconitic Marl occupies the fossil zone of *Hypoturrilites carcitanensis*. At the Barrington pit the lower part of this zone appears to be missing. Also, in the underlying Gault, the zone of *Stoliczkaia dispar* is also missing (**see Hart 1973**). There seems to be a long period of erosion towards the end of the Albian period of the Cretaceous. My samples from Barrington were taken from the marl and produced a good micro fauna. Those from Folkestone were taken mainly from the high Glauconite concentration and have mostly corroded micro-fossils, apparently of the *dispar* zone. The corrosion may be due to a slightly lowered pH in the anoxic conditions. However, not having any good marl samples from Folkestone, or Culand does not allow me to make a good comparison with Barrington, regarding the favoured, normal pH conditions.



However, I would still hesitate to call the Glauconitic Marl a volcanic deposit, but more a bed marking a change in sedimentations. That said, the studies by **Jeans et al** reveal widespread events in the Jurassic and Lower Cretaceous that reveal a volcanic occurrence. In the past I have cited such occurrences in the Chalk, although the origins of the emplaced materials, I still find a little enigmatic.

References:-

Hadland. P. *Fossils of Folkestone, Kent*. Siri Scientific Press.

Hart, M. B. *Foraminiferal Evidence for the age of the Cambridge Greensand* 1973. Proceedings of the Geologists Association. Vol 84 pt 1.

Jeans, C. Wray, D. Merriman, R. Fisher, M. *Volcanogenic clays in Jurassic and Cretaceous strata of England and the North Sea Basin*. The Mineralogical Soc., 2000
Tucker. M. *Sedimentary Petrology*. Blackwell Scientific. 1981

Size matters, or does it?

Tony Mitchell

It is well known that the animal life on small islands is smaller than animal life on larger islands and continents, especially when the islands in question are far from other land. Elephants are found on huge land areas, India and Africa, while pygmy elephants inhabit some large islands of the East Indies and there are no elephants on the smaller islands, the size of Britain. But. The largest tortoises only occur on tiny islands, one species in the Indian Ocean, on Aldabra island, and several species on some of the Galapagos Islands, almost as far from Aldabra as possible on the other side of the Pacific. The largest Lizard is also an island species, this time Komodo.

It is partly a question of not comparing like with like. Here we are comparing mammals with reptiles. Does this matter? Changing the subject. Thalidomide. Thalidomide is a drug that, like all drugs, was rigorously tested, first on animals, then, when all seemed safe, on volunteer humans. In those days, western pharmaceutical companies derived all their volunteers from local sources, mostly white males. Pregnant females did not volunteer, and if they did could well have been rejected. So, a drug thought to have been thoroughly tested on humans, wasn't. They were not comparing like with like. Nowadays drugs are tested on old and young, male and female, black and white before release.

If the animal life in the first paragraph is categorised as Mammal, Bird, Amphibian Reptile, insect etc. the rule still holds, but with the reptiles standing out as anomalous. This is what needs explaining.

Mammals [and birds] are what are called 'warm blooded' while all other groups are 'cold blooded'. What this actually means is that warm blooded animals burn their food internally to create heat as well as energy. They then regulate their heat loss to remain at a high temperature [around 36^{o}C]. Cold blooded animals may also keep their body temperature at about 36^{o}C, but they do it by basking in the sunshine and regulating heat gain. As a result, reptiles require far less food than mammals, some lasting for months between meals.

On anisland, carnivorous animals need prey, which can run away and require extra energy just to catch them. These prey animals breed slowly so there is a limited food supply. Large carnivores can't survive, but small ones might. As there is always a degree of variation in a family, the runt seldom survives because of the competition for food, while the largest can't get enough, so there is a selection pressure for an overall reduction in size. The smaller individuals stand a better chance of surviving to breed and pass on their genes for less size. For mammals this is particularly likely. Result; There is a tendency for islands to have a small population of small mammals and small, weakly flying, birds. There is a similar food-restriction pressure on herbivores. Pygmy elephants, and hippos live on islands with plenty of food but, dense jungle, and deep valleys makes movement difficult, so their effective island is even smaller than their actual island. The result is smaller animals, a product if less food and difficulty in movement.
Reptiles, on the other hand, can get by on a much smaller food intake, plant, or animal, so that there is less pressure to evolve a smaller size.

Another factor is more subtle. Mammals grow rapidly for a short time, then stop growing for the rest of their lives. Humans have, according to skeletal records, become taller in the last few years. However there always were some tall people. In times of food shortage, children grow less, not because of a genetic constraint but an environmental constraint. I was told, while on a holiday in China, that the seats in one building had required replacing by larger ones, since the one child per family rule. The Chinese are getting bigger. Reptiles grow for their whole lifetime, given enough food. On an island with no other hunters, there is less chance of being killed, so reptiles can continue to live, and grow, for much longer than mainland species where large size, and slower movement, make them a sitting target.

It has been pointed out that here is another problem with the size 'rule'. Giant birds on Madagascar and New Zealand. Both of these became extinct, along with the giant pigeon, the Dodo, another small island dweller, with the environmental upset caused by hungry men. The explanation for the extinction of Moa, Aepyornis and Dodo is that they were not 'good enough' to compete with men. But they were 'good enough' to compete with conditions before men arrived. So why get so big? In many cases, it is the female birds that select a mate and do their selection, based, as far as we can determine, on display, song, and fitness, which could have included size. Certainly, there seem to have been several species of Moa. The smallest being turkey size and the largest 12 feet tall. Mating preference could well have been for size and/or display, but we will never know [probably].

With pre-human predation, only by a species of eagle, selection for large size could well have been important to being ‘good enough’ in open areas and small with a ‘seductive’ song , in bushy areas. Again, we may never know.

There is an ‘experiment’ going in various parts of the world, creating large numbers of new islands in the middle of continents. By logging and forest clearing for agriculture, man is removing the natural environment, leaving refuges of uncut forest as islands. Only time will tell if the smaller refuges eventually contain small species derived from the evolution of larger ones, now made extinct.

Planetary Models

by Gary Woodall

OK so this article is only loosely connected to geology but then that could be said of most of my articles, nevertheless I hope it may be of interest to you. Some of my other articles have talked about dinosaur models but there are also planetary models around the country. Indeed in February 2020, just before lock-down 1, the 'Museum of the Moon' could be seen in Rochester Cathedral. This was a touring exhibition of a huge model of the moon, some 7 metres in diameter. Calling it a model doesn't really do it justice as the surface is formed from an exact image of the moon put together by NASA accurate in every respect. Some 1cm on the model representing 5km of the moons' surface.

Our side of the moon

Dark side of the moon

It was good to see the aisle of the cathedral was packed with interested children who were undertaking activities that were a key part of the exhibition. Who would have thought that only a month later I wouldn't dream of getting within 10 feet of a child in-case I caught Covid from them.

The exhibit is a touring one and has appeared all over Britain, including Hull, Blackpool, Leeds, Coventry and of course the NHM in London, but it has also been shown in hundreds of other cities worldwide. Each looks good, but I do think the setting in the ancient cathedral was particularly spectacular. It was due to next appear in Dubai but who knows if that will be able to go ahead as planned, so you have now missed your chance to view it. But there are

Sun Model

Information Panel

a couple of other 'models' that are permanently situated in Britain.

On holiday in Somerset a couple of years ago we had just visited a craft centre and decided to drive along the

Bridgewater and Taunton canal to find a place to stop for a cup of tea. (out of our huge flask we always carry). Upon rounding a bend I was confronted by a huge orange sphere looking like a giant peach. James was not around (ref Roald Dahl).

Upon examination I found out that it was a model of the sun and an information plaque informed that it was part of the 'Somerset Spacewalk' and there was actually a complete solar system model stretching out (in both directions) from the sun. Each model is 7 miles long making the dual model 14 miles. All the planets are to scale of 1:530,000,000, meaning that one millimetre on the model equates to 530 kilometres.

I mentioned this to Tony Mitchell when I saw him at the club next, (remember those days when we actually used to speak face-to-face). He told me of a perhaps more spectacular model at Otford, Kent.

Sun, Mercury and Venus at the Otford Solar System model.

Here starting in the recreation sports field is a complete scale model of the planets of the solar system. Moreover they are in the relative positions as they were at the eve of the millennium. The sun and each planet is on a short concrete plinth at a scale of 1:4,595,700,000 (ie 1mm = 4,595.7km).

Information panel

Sun model

Finding the Sun was easy as it could be seen on the other side of the football pitch, where a match was going on, this sun was much smaller than the Somerset one, around 6 inches across. Mercury, Venus and Earth followed quickly. But then I couldn't locate Mars, I could estimate where it should be, about as far again as the Earth from the Sun. In the end I asked one of the parents watching the football who looked at me blankly! Luckily one of the adult coaches then told me that Mars wasn't on a plinth but set flat with the ground so as not to be a hazard to the football players!

So I found Mars then had a walk to the far side of the recreation ground to see Jupiter. Saturn was down the road and up a cul-de-sac in someone's front garden. Uranus was back the other way and further along the main road. Neptune was difficult to find as it was away from the main road. I was about to give up when a met a family walking down the road. The father hadn't a clue but the son knew exactly where it was and took me to it. At this point I decided to call it a day as it had started to rain and Pluto was about a mile away down a muddy footpath. But I contented myself that I had 'done' the true planets, Pluto now only having Dwarf Planet status. In any event to complete seeing all the model I would have to visit Los Angeles, as on the same scale a model of the star Proxima Centauri can be seen there. Further there are now also stars in Sydney Australia, Christchurch New Zealand and Port Stanley in the Falkland Islands. This makes the Otford Solar system the largest scale model in the world.

Geology, the sum of the parts.

Nick Baker

Geology is the sum of the parts. And the parts can morph into sciences, a long way detached from the 'centre'. As where aspects of **evolution** can seem a long way from **metamorphic chemistry**, or where evolution wanders into **behaviourism** - human or otherwise.
On the other hand I like to think of the connection between the distant star and the rabbit tooth.
Calcium atoms formed in a distant star - in time and as well as space - maybe a predecessor to the sun.
Astro-chemistry.
The calcium atom ends up in Calc-Feldspar (**igneous and metamorphic**)
This is eroded to limestone or chalk (**sediments**)
The limestones form hills (**Geoporphology**)
Grass grows– absorbing the calcium (**Botany**)
A rabbit eats the grass (**Biology**)
Humans may eat the rabbit (**Gastronomy**)
Now, if your pet dog ate the rabbit, the dog can digest bone—so the dog gets the calcium atom, but not the humans! Of course, the calcium is not limited to bones and teeth. No calcium in the blood means cardiac arrest!
Of course, to be honest, the geology begins with the primary rocks and ends with geomorphology, but the palaeo is somewhere in between.
But, palaeo as **'form and function'** - that's where I always used to fall asleep!

But if, instead of calcium, we were to use, as an example, some of those 'heavies' up beyond iron– gold, platinum, tin, zinc, uranium- we would need a supernova somewhere, way back, when..!