

# Newsletter

**Watch out!....a sinkhole in the  
Bedfordshire hills**

**T**he seemingly incessant recent rains have propelled geology into the news recently, with holes opening up dramatically beneath roads and houses in our neighbouring chalk counties.

Not to be outdone by the big one in a Hemel Hempstead housing development, and rather less newsworthy, Pegsdon Hills also has a new sinkhole which the BGG visited on our walk on February 22nd led by Anne Williams and Derek Turner (*Derek has written a very informative review of the walk—see his article on page 2*).

Our Pegsdon sinkhole was 1m wide at the surface and double that at the base. The soil had dropped by 1.5m but it was impossible to tell how deep down the collapse had begun. The exposed sections and the geology map confirmed that we were peering into the Clay with Flints layer that covers the chalk plateau here.

We consulted 'Hertfordshire Geology & Landscape' (John Catt 2010) for an explanation of its formation. It describes how in similar areas, subsidence of glaciofluvial gravels can be attributed to solution pipes in the underlying soluble chalk which extend down to the water table. Movement is most often triggered by heavy rain and oversaturation of the topsoil.



Pegsdon sinkhole with our Chairman's feet for scale

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**Don't forget to re-new  
your BGG membership?  
See page 9**

# A Pegsdon Hills Perambulation Saturday March 22nd

by Derek Turner

On a bright, sunny morning in February, we visited the beautiful Pegsdon Hills, a fine place from which to see how geology affects southern Bedfordshire's landscape with the Gault Clay lowlands separating the Chalk and 'Greensand' ranges.

Frustratingly few exposures of the underlying chalk occur at Pegsdon but the thin alkaline soils support a rich flora- protected in a Wildlife Trust Nature Reserve- and a wealth of archaeological features.



We set out from Pegsdon across an invisible outcrop of Totternhoe Stone and the Lower Chalk slope, where a long defunct quarry had been reclaimed for farming. Another, earlier example of farmers being even more desperate for extra arable land was visible on Deacon Hill where striped shadows picked out medieval cultivation terraces or strip lynchets. *(See photo opposite)*

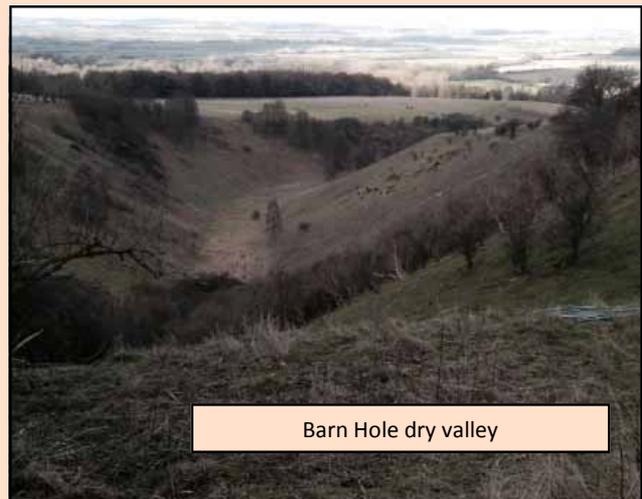
Our path levelled out as we reached Melbourn Rock level before rising abruptly to cross the Middle Chalk scarp. Near the summit, we entered a 30m long, 3m deep gash

in the surface. Clearly a manmade excavation, this pit had recently been occupied by a badger whose sett construction had created a fan of orange clay and flints, suggesting that we were in a hoggin pit.

At the summit of the hill, we came across the Pegston sinkhole *(see front page)* which illustrated so well how the recent torrential rain had triggered a local geological event. This could clearly be seen as a danger to animals, farm machinery and even walkers like us!

Skirting the nearby Icknield Way, we descended along the lip of Barn Hole, an archetypal example of a dry valley in chalk, showing a flat bottom where glacial head deposits had slumped. *(See photo opposite)*

I first became aware of this magnificent "coombe" when I saw a picture of it in my 1966 edition of "The Face of the Earth" written by geomorphologist expert, George Dury. He realised that such features were formed when the water table was much higher than today so springs issued at a higher elevation and undermined the unstable, thawing permafrost soils as the grip of the last Ice Age retreated.



Barn Hole dry valley

At the end of our walk, we retired to the Live and Let Live pub for much needed refreshments.

*Thanks to Anne for explaining the geology and to Derek for his local knowledge and for pointing out agricultural features and their influence on the landscape.*

## *The Galapagos Islands—a holiday of a lifetime* by John Pitts

I had always wanted to see the Galapagos Islands and their diversity of fauna and flora so in 2013 as I was heading for a notable lifetime event, my 70th birthday, I decided that this was the perfect time to satisfy my curiosity. I had attended the BCN WildlifeTrust Ecology Conference in February 2013 and had picked up a brochure from their 'Wildlife Travel' company (<http://www.wildlife-travel.co.uk/>) and discovered that they had a trip going at end of April 2013 and I could afford it, well almost. I discussed this with my wife and she seemed keen too so off we went on this amazing journey. It was truly just like being with David Attenborough in one of his movies!



Marine Iguanas at Punta Espinosa

One of the youngest Galapagos islands, Isabela, is located on the western edge of the archipelago near the Galápagos hotspot. At approximately 1 million years old, the island was formed by the merger of 6 shield volcanoes - Alcedo, Cerro Azul, Darwin, Ecuador, Sierra Negra and Wolf.

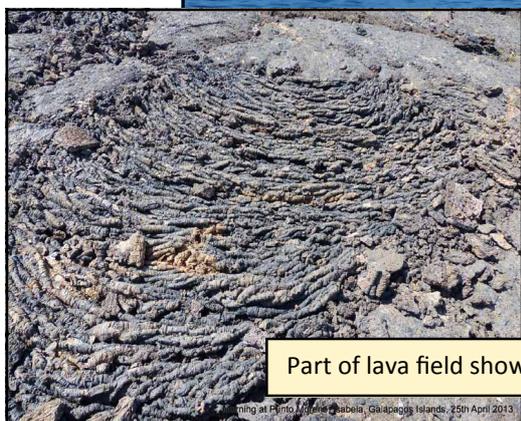
All of these volcanoes except Ecuador are still active, making it one of the most volcanically active places on earth. Two of them, Volcan Ecuador and Volcan Wolf (the island's highest point with an altitude of 5,600 feet or 1,707 metres), lie directly on the equator.

The islands are primarily noted for their geology, providing excellent examples of a geologic occurrence that created the Galapagos Islands including uplifts at Urvina Bay and the Bolivar Channel, tuff cones at Tagus Cove, and Pulmace on Alcedo and Sierra Negra - one of the most active volcanoes in the world.

View of volcano Cerro Azul on Isabela



Galapagos Islands, 25th April 2013

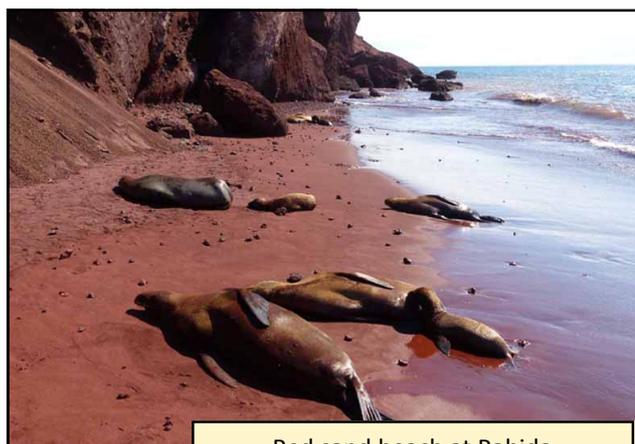


Part of lava field showing ropy lava

ming at Punta Espinosa, Isabela, Galapagos Islands, 25th April 2013

The island of Rabida is located in the eastern Pacific Ocean, approximately 600 miles (965 km) west of Ecuador. The island has a total area of 4.9 km<sup>2</sup> and a maximum altitude of 367 metres. The island has red sand beaches and a saltwater lagoon inhabited by flamingos and a bachelor sea lion colony. The landscape is studded with small volcanic craters along sharp slopes and cliffs.

*What a fantastic place to visit, a real geological feast! —thank you John for sharing this with us.*



Red sand beach at Rabida

# The Snowball Earth Theory by Ron Elverson

Following on from Ron's talks to our Group on this topic, he has kindly written a piece to explain the theory.

Geologists studying rocks of the Neoproterozoic (Precambrian 542 - 1000 mya) around the world came across several horizons of what has been called diamictite, a highly disordered conglomerate similar to glacial boulder clays of the Pleistocene Ice Age, but lithified into a greywacke type rock.

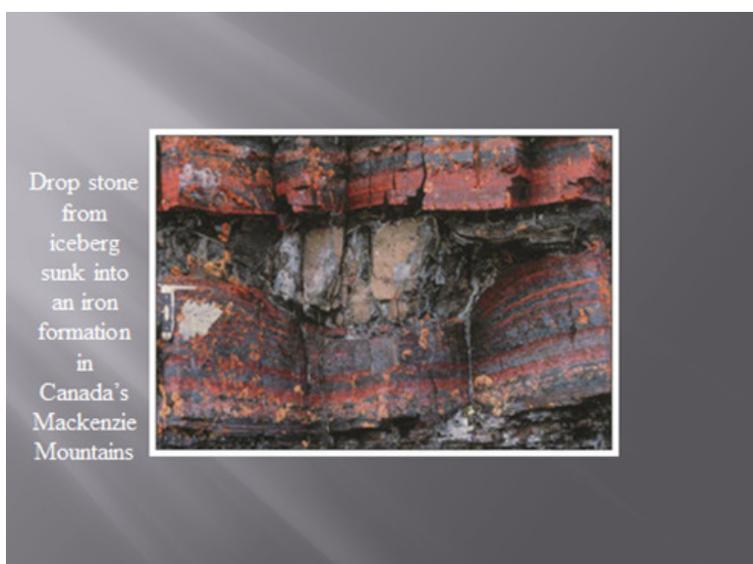
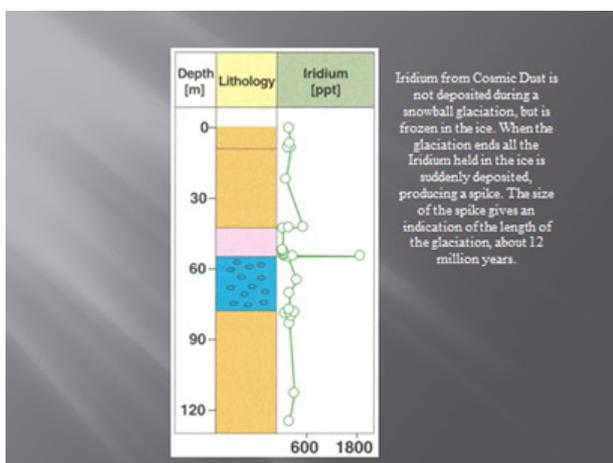
These rocks have been found in places all around the world including Norway, where in my undergraduate mapping project in 1971, I mapped and studied two horizons.

Palaeomagnetic tests done on these diamictites have shown that they formed at sea level in tropical or equatorial latitudes, suggesting that there must have been times when the whole land surface of the earth was glaciated.

In 1998 a group of geologists from Harvard working on the geochemistry of these glacially rocks in Namibia looked at the relative proportions of  $C^{13}$  to  $C^{12}$  isotopes. Carbon dioxide with the  $C^{12}$  isotope is preferentially taken up in photosynthesis by plants, algae and cyanobacteria, leaving the sea, with an enriched ratio of  $C^{13}$  to  $C^{12}$ . The Harvard geologists, looking at carbonate rocks below and above the glacial horizon found that the ratio of the isotopes dropped sharply leading up to the glaciation, indicating that virtually all photosynthesis stopped. Global glaciation appeared to have not only stopped the photosynthesis on the land, but also in the sea, suggesting that the oceans may have been covered with thick ice, at least 50 metres thick, even in the tropics.

Iridium, a rare element in the earth's crust, is also found in asteroids and is a constituent of cosmic dust. In sedimentary rocks there is generally a small, constant, amount of iridium due to cosmic dust included in sedimentation. When iridium levels were measured around these glacial horizons they were found to be nearly zero at the time of the glaciation but spiked at the end of glaciation. Suggesting that both land and sea were covered with ice preventing any iridium being deposited during glaciation. When the ice melted all the Iridium that had been falling during glaciation was dumped at the same time, producing the spike. The size of the spike was equivalent to 12m yrs worth of normal iridium deposition, suggesting that for 12 m yrs the earth was completely glaciated.

The rocks immediately above the glacial horizons also have an interesting story to tell. Often glacial rocks are followed by several metres of dolomite or limestone, known as a Cap Carbonate. The amount of carbon dioxide in the atmosphere needed to end the Snowball period has been calculated to be 150 times higher than present levels. With this amount of  $CO_2$ , and with much bare rock exposed to weathering by the melting ice sheets, the formation of carbonate rocks could take place. The sedimentary structures in these rocks are unusual; they could be a nonbiological precipitation or possibly bacterial.



Also found in the rocks immediately above the glacial rocks are layered ironstones. During the glaciation  $Fe^{2+}$  ions would have been dissolving in the sea from mid-ocean ridge basalts. Normally the oxygen dissolved in the sea would have converted this to insoluble  $Fe^{3+}$  forming haematite. However during the Snowball Earth time the oxygen in the atmosphere was kept from dissolving in the sea by a layer of sea ice 50 metres thick, so the concentration of dissolved  $Fe^{2+}$  ions would have increased significantly. Once the ice had melted, these  $Fe^{2+}$  ions would have been oxidised and deposited as magnetite,  $Fe_3O_4$ , at depth and as haematite,  $Fe_2O_3$ , in the more oxygen rich shallower waters.

So what caused these Snowball Earth events to occur?

- Less energy from a younger less luminous sun (85%? Less than today).
- Albedo effect due to reflection of solar energy by tropical ice sheets. The more ice, the more solar energy reflected into space, so even more ice formation.
- The break up of the Rodinia supercontinent leading to increased weathering of silicate rocks.
- The break up of Rodinia also lead to an increase in shallow seas providing many repositories for carbonate deposition, – increased carbon burial.
- Increased shallow seas for photosynthesis. Stromatolites were responsible for most of the photosynthesis, occurring only in shallow seas. Increased photosynthesis takes more CO<sub>2</sub> out of the atmosphere reducing the greenhouse gas levels even more.



## *Thoughts and communication from the Chair on BGG projects & activities*

Following my 'Thoughts from the Chair' in our last Newsletter, and my November email about projects, I thought it might be of interest to members to have an update of what the Committee is actually doing to promote Bedfordshire Geology. Although Bedfordshire Geology is our primary interest, we also encourage geological understanding and education outside of the County. Hence some of the events we organise, and articles that are provided in our newsletters.

A list of potential projects has been created by the Committee, a number of which have been started, but with our limited resources some are yet to get going.

Current projects involve, *The Higgins (formerly the Bedford Museum)*, which we have been involved with for a number of years, *Biddenham gravel pit*, *Houghton Regis quarry*, *Landpark chalk quarry*, and *Clophill Church*, which is very encouraging, because a non-Committee Member, Bev Fowlston is leading this project, and giving a welcome breathing space for Committee Members to concentrate on other BGG projects.

Current project activities include the creation of interpretation boards, community meetings, liaison with various bodies, education, leaflet creation, through to organising exposure face clean-ups.

An example of a recent project is the re-printing of the Jurassic Village Walks leaflet, where we have taken the opportunity to add more geology detail, whilst adding the BGG Logo. The updated version is now on our website.

Future projects will involve obtaining funding for geology leaflets, investigating potential site exposures and liaising with other organisations for joint projects.

Should you wish to hear more about the projects, or wish to be involved, either contact me, Committee Members, or better still attend one of our events, and take the opportunity to discuss thoughts over a cup of tea, or a coffee.

*Peter Lally*

Chair

## **BGG Programme of Events**

<b>Landpark – walk and clearance</b>	A clearance working party in Landpark Quarry and a walk across the Downs	<b>12 April</b> Meet at car park on Whipsnade Heath, map ref.: TL 015 180 10.30 am
<b>Deepdale Quarry</b>	A chance to revisit the RIGs – Lower Cretaceous Woburn sandstone formation.	<b>10 May</b> Map ref.: TL 212 487 10.30 am
<b>Jordans Mill, Biggleswade</b>	Joint event with BNHS to see Jordan's Mill and natural history barn. Displays and leaflets will be available, plus members needed to help identify specimens	<b>18 May</b> Map ref.: TL 184 430 10.30 am
<b>Mundays Hill Quarry</b>	A further visit to the working quarry to experiment with sandpulling techniques	<b>June</b> Date to be advised
<b>The Bradwell to Newport Pagnell Geotrail</b>	A walk to explore the exposures of Blisworth clay and limestone on the Newport Pagnell railway	<b>July</b> Date to be advised
<b>AGM and visit to Houghton Regis Quarry</b>	Join us for a walk in the old quarry workings and then our AGM.	<b>21 September</b>
<b>Biddenham – walk and face maintenance</b>	A chance to see Deep Spinney at Biddenham. This site is owned by the Wildlife Trusts and BGG are developing an interpretation board.	<b>11 October</b>
<b>Day trip to Oxford University</b>	An opportunity to see the Earth Sciences department plus possible visit the newly refurbished Ashmolean Museum	<b>November</b> Date to be advised
<b>Christmas Social</b>	Our annual get-together to review the year and have some fun	<b>11 December</b> Husborne Crawley Reading Rooms 7.30 pm

*For further information please contact Frances, BGG Events Coordinator.  
Lindsay will send out details on each event in time for you to book a place.*

## Shillington History Society visit

to Ravensburgh Castle *by Anne Williams*



On 1st March, several members of the BGG joined the members of the Shillington History Society to explore the Ravensburgh Castle hill-fort at the invitation of one of our members, Derek Turner, who also represents the Shillington History Society.

On a lovely sunny morning we parked in Hexton, and then walked through the woods to the fort which is on private land, and not accessible as a general rule. But on this occasion the landowner, Mr Patrick Ashley-Cooper, led the party, in conjunction with Derek and archaeologist Gil Burleigh.

This is where Archaeology meets Geology. The massive earthworks of this Iron Age hill-fort on the top of the chalk escarpment are surrounded on three sides by steep-sided dry valleys (coombes), making a good defensive site; the largest Iron Age hill fort in the east of England, most of them such as Maiden Castle in Dorset, being in the west. A series of steep earth banks and ditches surrounds a central flat area where there would have been a settlement. There would also have been wooden balustrades on top of the embankments, raising them to as much as 20 metres in height. An archaeological dig took place in the 1960's and there may be another in the future to verify the dating of the site and possible occupation by the Romans after the defeat of Cassivellaunus during a battle in 54BC. It was also suggested that where the land flattened to the south there had been a zigzag defensive entrance to the fort.

After walking around this very impressive and rarely visited ancient earthwork, we walked down the dry valley to examine the springs which emerge from the permeable chalk at the foot of the slope, springs which are found all along the foot of the Chiltern Hills and influenced the siting of many spring-line settlements such as Hexton and Barton-le-Clay.

*Thank you very much to Derek and Gil for a fascinating tour and to Patrick Ashley-Cooper for allowing us access.*

### **Lyme Regis fossil walk discovers an old BGG Committee member.....**

by Henrietta Flynn

Whilst on a recent visit to Lyme Regis in search of Jurassic ammonites, I looked up one of the original BGG committee members—Chris Andrew (yes, he still has his long pony-tail!).

Chris now works for Lyme Regis Museum (*having previously worked as Geological curator at Bedford Museum*) and amongst other educational activities conducts fossil walks along the famous beaches of Lyme Regis.

An early start with the low tide to maximise beach exposure however did not produce too many significant finds, but within our group we discovered small fossil vertebrae, gryphaea and of course lots of ammonites—many in large boulders, however, too large to fit in my rucksack!!

*Chris sends his regards to all at BGG.*



Chris with large ammonite boulder

## Thinking of where to go for your next holiday?

### How about the Pyrenees ? *by Peter Lally*

Last year I decided to explore the Midi Pyrenees, which lie between the Atlantic in the east, and the Mediterranean in the west. Although I had walked in the Pyrenees and the coast of both east and west before, I knew nothing about this middle section, and looked forward to the exploration, and wasn't disappointed.

My interest lies in both geology and history, which for me go hand-in-hand. This area provides both with historical Bastide fortified towns built from a variety of mountain stones, and its natural geological landscape. An easy way to explore the Pyrenees is to drive as high as possible, park then walk through the valleys cut by numerous glaciers.



A good example of this is to visit Pont D'Espagne, which I did during the middle of June via Lourdes, which incidentally was flooded with snow melt-water 3 days later. Snow was still around, and illustrated how valleys are formed by the work of glaciers. Quite large boulders were being dragged down the mountain amongst the snow, some ending up in the melt-water Rivers, rolling along forming smooth round boulders.



An advantage of being in popular sections of the Pyrenees is to enjoy the mountain restaurants providing both good food and refreshments whilst enabling one to enjoy the snow capped mountains, and watch dramatic white crystal clear snow melt waterfalls.

I drove from Calais to the Pyrenees, but there are various towns in the region which have airports, and the north Spain ferry ports are only a few hours drive away.

*If you have a good holiday experience to share, why not write an article for the next Newsletter.*

## Who's who on the BGG Committee 2013 - 2014

Chairperson	Peter Lally	<a href="mailto:plally65@gmail.com">plally65@gmail.com</a>
Secretary	Glynda Easterbrook	<a href="mailto:g.easterbrook@open.ac.uk">g.easterbrook@open.ac.uk</a>
Treasurer/Membership Sec	Lindsay Hiles	<a href="mailto:bgg.membership@btinternet.com">bgg.membership@btinternet.com</a>
LGS Manager	Anne Williams	<a href="mailto:annew36@hotmail.com">annew36@hotmail.com</a>
Events Coordinator	Frances Maynard	<a href="mailto:fmaynard@btinternet.com">fmaynard@btinternet.com</a>
Chalk area rep/Events Org	Janet Munro	<a href="mailto:jan.munro1@ntlworld.com">jan.munro1@ntlworld.com</a>
<b>General Projects</b>	<b>POSITION VACANT *</b>	
BNHS rep	Janet Munro	<a href="mailto:jan.munro1@ntlworld.com">jan.munro1@ntlworld.com</a>
Newsletter Editor	Henrietta Flynn	<a href="mailto:henriettaflynn@btinternet.com">henriettaflynn@btinternet.com</a>
Public Relations/Fundraising	Glynda Easterbrook	<a href="mailto:g.easterbrook@open.ac.uk">g.easterbrook@open.ac.uk</a>
Information Officer	Anne Williams	<a href="mailto:annew36@hotmail.com">annew36@hotmail.com</a>
Committee Member	Martin Day	<a href="mailto:francis.day@btinternet.com">francis.day@btinternet.com</a>

*We are all volunteers and bring together an assortment of skills, interests, experience and geological knowledge (or not, as the case may be!). If you feel we could benefit from your skills and ideas too, we would love to hear from you.* **[www.bedfordshiregeologygroup.org.uk](http://www.bedfordshiregeologygroup.org.uk)**

**\* The position of General Projects co-ordinator is currently vacant.  
Please talk to Peter if you would like to join the committee in this very interesting post.**

**Y**our BGG membership is up for renewal on April 1st. Your subscription goes towards the annual running costs of the Group and keeps the Group viable. Membership subscriptions for 2014/2015 will remain at **£7.50** per person for the year.

To renew your membership, please send payment to Lindsay at the following address :

**Mrs Lindsay Hiles, BGG Membership Secretary,  
4 Phoenix Close  
Leighton Buzzard, Beds, LU7 3YW**

(cheques payable to **BGG**)

Alternatively, you can make an on-line payment to the Group's bank account. (If you do decide to renew your membership this way, just drop me an email after making payment so that I can keep a look out for it).

**Account name: Bedfordshire Geology Group  
Bank & branch: HSBC, Leighton Buzzard  
Branch sort code: 40.28.12  
Current account no: 21507427**

*Many thanks, Lindsay*

This newsletter is not the only benefit of remaining a member of the BGG; all our events for members are **free of charge**, non-members pay £2.00 to attend.  
Group membership is £25.00 per annum.(For organisations with 4 or more employees or members wishing to join BGG).

Newsletter compiled and edited by Henrietta Flynn  
If you have any comments or wish to include an article in the next issue, then please contact me by email at  
[henriettaflynn@btinternet.com](mailto:henriettaflynn@btinternet.com)