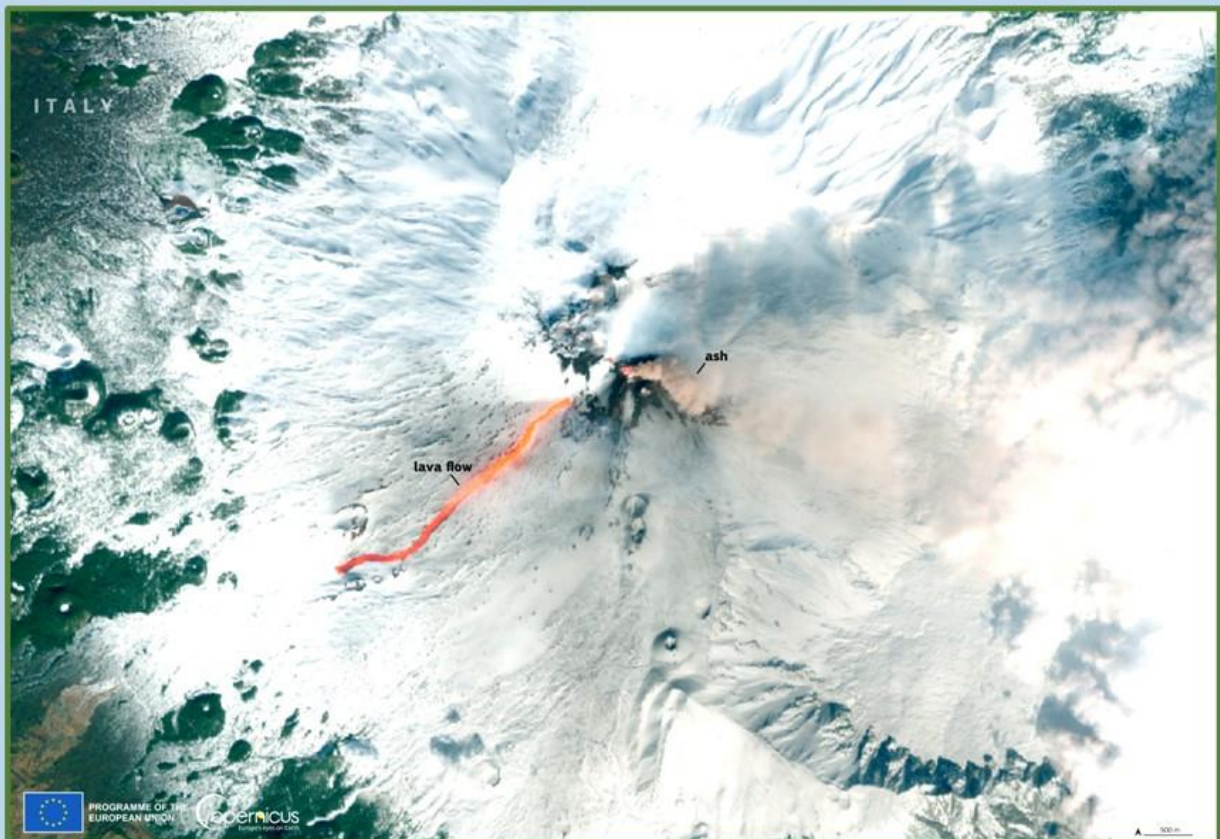


Newsletter of The Farnham Geological Society

Volume 28, Number 2, May 2025



***Eruption of Mount Etna, Italy
(Credit: European Union, Copernicus Sentinel-2 imagery)***



*Farnhamia
farnhamensis*



*A local group
within the GA*

Volume 28, No. 2

Newsletter

Issue No. 128

May 2025

www.farnhamgeosoc.org.uk

Editorial

Welcome to the latest edition of the FGS Newsletter. I hope you are all fit and well and enjoying The Methodist Hall for our in person monthly meetings. If there are **any issues with our new location** please feel free to let either myself or any of the FGS Committee know.

Our next talk will be at **The Methodist Hall** on **Friday, 9 May** when we welcome **Cindy Howells** from the **National Museum of Wales** who will be talking to us about **"Dinosaurs & Deserts in Wales"**. Cindy, I am sure, will provide us with an exceedingly interesting presentation.

This will be followed at **The Methodist Hall** by **"Fluorescent Minerals"** by **Michael Doel** of the **Sussex Mineral & Lapidary Society** on **Friday, 13 June**.

Then on **Friday, 11 July** we will welcome **FGS Member Nick Stronach** to **The Methodist Hall** to talk to us about **"What Makes a Good Carbon Sequestration Reservoir?"**

In addition, at **2:00pm** on **Saturday, 14 June** at the **Churt Village Fete**, **Peter Luckham** (together with other members of the FGS) will be manning a display outlining the local geology of the area, as well as promoting the Society. Details of the fete can be found at <http://churfete.org/>. **If you would like to help on the day please contact Peter** (p_luckham@yahoo.co.uk).

Are you good at **designing poster displays**? Could you help with the design of the FGS display for the **GA Festival of Geology** to be held in Burlington House, Piccadilly on **1 November 2025**? **If you can please contact Janet Catchpole** (janetcatchpole47@gmail.com).

We are still looking for members to both join the FGS Committee, as well as help with organising the Societies various activities. Please contact our Chair Mick Caulfield if you would like to help.

If there are any items you wish to be included in forthcoming Newsletters please feel free to forward them to myself, Mick Caulfield (newsletters@farnhamgeosoc.org.uk), for inclusion.

Front Cover

Credit: European Union, Copernicus Sentinel-2 imagery

This month's **Front Cover** shows the **Eruption of Mount Etna, Italy** on the **12 February 2025**.

Mount Etna, located on the east coast of Sicily, Italy, is known as the most active stratovolcano in the world, with regular, ongoing volcanic activity. As of 8 February 2025, a new eruptive phase of Etna has begun. The volcano spewed out ash clouds and a lava flow extending approximately 3

kilometres. As a result of the volcanic activity, parts of Catania Airport were closed temporarily, although overall airport operations have remained unaffected.

This image, acquired by one of the Copernicus Sentinel-2 satellites on 12 February 2025, shows the lava flow descending from the volcano.

The Copernicus Sentinel satellites provide essential data on volcanic activity around the globe, providing authorities and researchers with insights into eruptions and their impacts on human activities.

Reference:

<https://www.copernicus.eu/en/media/image-day-gallery/eruption-mount-etna-italy>

All of the information contained herein, both graphics and text, is for educational purposes only, as part of the Society's objective. There is no commercial gain for their use.

The views and opinions represented in the articles do not necessarily represent the views of the FGS Editorial Board or the FGS Committee.

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Farnham Geological Society

Committee 2025

Chair	Mick Caulfield
Treasurer	Mike Millar
Secretary	Vacant (<i>Judith Wilson</i>)
Programme Secretary	Janet Catchpole
Membership Secretary	Sally Pritchard
Field Trip Secretary	Tessa Seward
Newsletter Editor	Mick Caulfield
Web Manager	Bob Rusbridge
Advertising	Peter Crow
IT/Sound	Vacant (<i>Mike Millar</i>)
Without portfolio	Peter Luckham
Ad Hoc Member	Liz Aston

Meeting Programme 2025

Please note **The Methodist Hall** and **Zoom** meeting times:
7.30 pm for 8.00 pm start.

Dinosaurs & Deserts in Wales

Cindy Howells Friday, 9 May
National Museum of Wales

Fluorescent Minerals

Michael Doel, Friday, 13 June
Sussex Mineral & Lapidary Society

What Makes a Good Carbon Sequestration Reservoir?

Nick Stronach, Friday, 11 July
FGS

Field Trip Programme 2025

(book via the FGS website)

DAY TRIPS

- **National Museum Wales, Cardiff**
Leader: *Cindy Howells* 10 June
- **Dryhill Quarry** nr Sevenoaks
Leader: *Simon Drake* 27 July

- **Lambourn Valley**
Leader: *Lesley Dunlop* 31 August

RESIDENTIAL TRIPS

- **Isle of Anglesey** 15 – 19 October
Leader: *Robert Crossley*

Please let our **Field Trip Secretary, Tessa Seward** (wessa2006@hotmail.co.uk) know if you have other ideas for places of geological interest to visit.



Geologists' Association Lecture Programme 2025

<https://geologistsassociation.org.uk/lectures/>

Hybrid Meeting, AGM Awards & Dinner
Presidents Address: Little things can make a big difference
GA President,
Dr. Liam Gallagher Friday, 9 May

Zoom only
The Great Glen Fault Zone - Back and forth for longer than we thought
Dr. Eddie Dempsey,
Hull Friday, 6 June

Zoom only
Here be sea monsters: new perspectives on fossil marine tetrapods
Dr. Rebecca Bennion,
North Craven Life Museum Friday, 4 July

Reading Geological Society Lecture Programme 2025

<https://readinggeology.org.uk/lectures.php>

Uncovering the Dinosaur Highway
Dr. Emma Nichols, Mon, 12 May
Oxford University Museum of Natural History

The Late Devonian Mass Extinction - the terrestrial story

Prof. John Marshall

Mon, 2 June

University of Southampton

Places available on Reading Geological Society's Field Meetings

(book via the RGS website

<https://readinggeology.org.uk/fieldtrips.php>):

- **Long Field Meeting in Kent** 6-9 May
Leaders: Simon Drake, Geoff Downer & Ken Cole.
- **Ogmore & Southerndown, South Wales**
Leader: Prof. Paul Wright 11 June
- **Harrow Weald Common** 10 July
Leaders: Daina Clements, Liz Chui & Alan Wheeler

Mole Valley Geological Society Lecture Programme 2025

<http://mvgs.org.uk>

Horsham Geological Field Club Lecture Programme 2025

<http://www.hgfc.org.uk/>

AGM

Rare-earth minerals

Bill Walbank

Wed, 14 May

West Sussex Geological Society Lecture Programme 2025

<https://www.wsgs.org.uk/>

Sustainable Groundwater Management

Simon Cook,

Fri, 16 May

South East Water

Reconstructing the Lives of Dinosaurs

Dr. Darren Naish,

Fri, 20 June

Tetrapod Zoology

Next Lecture

Friday, 9 May 2025

7.30 pm for 8.00 pm

The Methodist Hall

Dinosaurs and Deserts in Wales

Cindy Howells,

Curator: Palaeontology, National Museum of Wales



(Credit: National Museum of Wales)

Cindy Howells currently works at the Department of Natural Sciences, National Museum Wales.

Cindy carries out research in Palaeontology as well as the History of Geology.

Her most recent publication is 'A catalogue of the ichthyosaurs of the Charles Moore collection'.

<https://museum.wales/staff/172/Cindy-Howells/>

<https://museum.wales/articles/2712/Welsh-Dinosaurs/>

FGS Field Trip Report

Northern Ireland

23 – 26 September 2024

Leader: Karen Parks, Belfast Geologist's Society.

Day 1

Monday, 23 Sept 2024

by Tessa Seward

On 23rd September a group of 6 FGS Members flew out to Belfast City Airport to “rock” around the North Antrim coast! Our leader was **Karen Parks**, retired former teacher of GCSE and A level Geology at the Methodist College Belfast and events organiser for the **Belfast Geologist's Society**. She was not only our leader but also driver of our minibus throughout the four-day trip. Having met us at the airport, Karen then drove us from Belfast to our first location of the day – **Dunluce Castle**. Dunluce Castle is situated on the Antrim coastal cliffs, west of Portballintrae, on a promontory of the Lower Basalt.

Geological background for the locations

The Lower Basalt is the oldest formation of the Antrim Lava Group. The Antrim Lava Group erupted between approx. 56 – 66 Ma, is mostly basaltic and forms the Antrim Plateau. Below it is an unconformity and then the Cretaceous Ulster White Limestone Formation (we would later see the chalk from this formation at stop 3).

The origin of the Antrim Plateau lies in the opening of the North Atlantic Ocean during the end stage break up of Pangaea, as the Eurasian and North American Plates separated. Firstly, the Lower Jurassic Lias marine mudstones and then the Cretaceous Ulster White Limestones were deposited as sea flowed into the basins caused by the crust stretching. The formation of the mantle plume which caused the basalt outpourings of the North Atlantic Igneous Province then followed during the Palaeocene (Fig. 1-1).

LOCATION 1

GR 905 415

Dunluce Castle

The earliest standing remains of Dunluce Castle date from the 1500's and were built by the MacQuillans. The castle (Fig. 1-2) was seized by the MacDonnell clan in the 1550's. During the reign of Cromwell, the castle went to ruin as portions of Dunluce Town and surrounding lands were granted to soldiers who had fought on his side in Ireland. The MacDonnell clan regained the estate on the Restoration of Charles the Second but no longer used it as their main residence and so it fell into disrepair before coming into State guardianship in 1928.

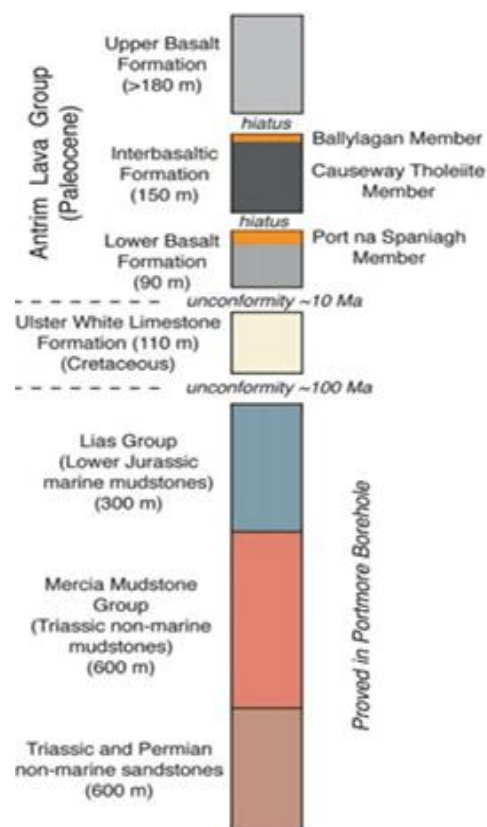


Figure 1-1: Stratigraphic nomenclature for the Antrim Lava Group (Simms, 2021). The underlying strata was proved in the Portmore Borehole (Wilson and Manning, 1978).



Figure 1-2: Dunluce Castle

The 150 ft cliff on which Dunluce Castle stands and those surrounding it exhibit compound basalt lava flows (Fig. 1-3), a vent, faulting and volcanic agglomerate. The underlying agglomerate and unstable nature of the geology at Dunluce Castle probably contributed to the fatal incident in 1639 when the castle kitchens collapsed into the sea during a storm and several staff members died.

Various work has been done to stabilise the castle foundations and cliff faces including reinforcement anchors and rock netting (Fig. 1-4).



Figure 1-3: Compound lava flows.

The castle is built from carboniferous sandstone (from Ballycastle) and also basalt. We were able to spot a number of hexagonal and polyhedral stones which definitely originated from columnar jointed basalt (Fig. 1-5).

Faulting has altered the relative heights of the basalt here and the chalk to the west. The basalt has been pushed down whilst the chalk was lifted.



Figure 1-4: Rock netting.



Figure 1-5. Building blocks within the castle walls made from columnar basalt.

LOCATION 2

GR 902 413

Magheracross Viewpoint

Our second stop was at Magheracross Viewpoint on the way to White Rocks Beach. Here we had excellent views west towards White Rocks (Stop 3) and east towards Dunluce Castle (Stop 1). We could see the impacts of weathering and erosion forming wave-cut platform caves, arch and stacks (Fig. 1-6).



Figure 1-6. View from Magheracross Viewpoint looking west.

LOCATION 3

GR 884 407

White Rocks

We then travelled west from Magheracross Viewpoint to White Rocks where we were able to inspect the white chalk cliffs of the Cretaceous Ulster White Limestone Formation capped by the Lower Basalts. The chalk is much harder than in England and forms caves and stacks which we could view from the beach.

Also exposed were Palaeocene vents of basaltic and chalky agglomerate which cut through the chalk and passed into the overlying Palaeocene Lower Basalt (Fig. 1-7). The chalk was often highly brecciated in places and embedded with basalt bombs, evidencing the localised explosive activity that occurred periodically during the outpouring of the Antrim Lava Group (Fig. 1-8).

The Lower basalts are rich in olivine (unlike those of the Giants Causeway). They are often amygdaloidal or vesicular with various zeolite minerals infilling the vesicles (Fig. 1-9).



Figure 1-7. Basalt vent (grass vegetated area) with chalk either side. A basalt bomb is visible in the chalk stack on the left at the edge of the photograph. The remains of another volcanic vent can be seen in the immediate foreground.



Figure 1-8. Chalk, highly brecciated in places and embedded with basalt bombs.



Figure 1-9. Chalk embedded with basalt bombs, rich in olivine.

LOCATION 4 **GR 859 40816.57 to 17.12**

Portrush Sill near the Portrush Countryside Centre

The Portrush Sill is one of the largest intrusive bodies in Northern Ireland. The town of Portrush is mainly built on it. The Sill forms the headland of Ranmore Head and continues offshore as The Skerries, a small chain of rocky islands 2km away (Fig. 1-10).

The sill is a coarse dolerite and was intruded approximately 60Ma ago into Jurassic Lias mudstones. The surrounding mudstone was thermally metamorphosed into a highly resistant hornfels called **porcellanite**. Near the Countryside Centre we were able to scramble down onto the foreshore and view the contact between the dolerite and the country rock. Despite the metamorphism, we were able to see that, in places, the altered mudstone contains many ammonites (Fig. 1-11).

This site was the focus of much controversy in the 18th century between two schools of thought – **the Neptunists** who believed that all rocks crystallised from sea-water and **the Vulcanists** who believed that the rocks they recognised as crystalline had a volcanic origin. The fossiliferous porcellanite was originally mistaken by the Neptunists to be igneous due to its grain size and because they failed to identify the contact zone between it and the dolerite. The Neptunists therefore argued that the presence of the ammonites was compelling evidence in support of their beliefs. The mistake was recognised by the early 19th Century when the porcellanite had been correctly identified and the beliefs of the Neptunists then finally lost credence.

The Portrush Sill was our last stop of the day, and we then made our way to our hotel in Coleraine.



Figure 1-10. View from Ranmore Head to The Skerries.



Figure 1-11. Metamorphically altered mudstone contains many ammonites.

Day 1 References

1. Extracts from Day One of '**Rock around the North Coast**' collated by Karen Parks

2. Rockin' the Causeway Coast and Glens – A visitors' guide to the Geology of the Causeway Coast and Glens. **The Causeway Coast & Glens Heritage Trust**. www.ccght.org. 2012.
3. Simms, M.J. 2021, Subsidence, not erosion: Revisiting the emplacement environment of the Giant's Causeway, Northern Ireland, **Proceedings of the Geologists' Association**, **132**, 537-548.
4. Wilson, H E, and Manning, P I. 1978 Geology of the Causeway Coast. **Memoir of the Geological Survey of Northern Ireland, Sheet 7. HMSO, Belfast**.

Day 2 **Tuesday, 24 Sept 2024** *by Tessa Seward with Janet Catchpole & Liz Aston*

LOCATION 1

Giant's Causeway

Our first visit of the day was to the iconic Giant's Causeway - a designated UNESCO World Heritage Site.

The large-scale volcanic activity responsible for the Antrim lava group, which erupted between approximately 56-66Ma, heralded the opening of the north Atlantic Ocean. The Antrim Lava Group has a maximum thickness of about 800m. It consists of the Lower Basalt Formation and the Upper Basalt Formation - two periods of volcanism separated by a drop in activity during which the Interbasaltic Formation was laid down. During this time, erosion and weathering of lava in a warm, wet climate resulted in a rich soil high in iron ore and bauxite which is today represented as a distinctive orange to red laterite. We were able to view one of the laterite outcrops (the Port na Spaniagh laterite) in the cliffs near the Visitor Centre as we made our way down the path to the Causeway. This marked the top of the Lower Basalts with the first flow of the Causeway Basalts above it (Fig. 2-1).



Figure 2-1. The Port na Spaniagh laterite

Walking eastward along the path down towards the Causeway we saw good examples of spheroidal weathering in the Lower Basalt (Fig. 2-2).



Figure 2-2. Spheroidal weathering in the Lower Basalt.

We then walked down to the main Causeway itself. This is a three lobed promontory made up of thousands of regular polygonal to hexagonal columns that formed in the first flow of basalts that erupted after the Lower Basalts - the Causeway Tholeiite Member. (Figs. 2-3 and 2-4).



Figure 2-3. The Giant's Causeway.



Figure 2-4. The Giant's Causeway.

We were also able to see very good examples of the horizontal shrinkage fractures that occur in columnar jointing called ball and socket joints (Fig. 2-5).



Figure 2-5. The surfaces of ball and socket joints.

We continued along the path, past the Causeway for about 200 metres , until we reached The Giant's Organ (Fig. 2-6).

The Giant's Organ is a good example of the three-part subdivisions that often occur in large basalt flows: a colonnade of regularly spaced near-vertical columns, the relatively chaotic rubble entablature layer above, topped by an upper colonnade of widely-spaced columns.

Until recently the accepted theory was that the basaltic lava of the Giant's Causeway flooded an already existing valley and then slowly cooled forming the columns. This theory is now being challenged with a new alternative model put forward by Mike Simms, curator at Ulster Museum, who has suggested that subsidence, due to deflation of the magma chamber as the lavas had erupted, caused a caldera like depression into which the erupted lava pooled and cooled.



Figure 2-6 The Giant's Organ. The Upper colonnade is not visible in this photograph.

LOCATION 2

Mussenden Temple

Mussenden Temple is a folly overlooking Downhill Beach on the County Londonderry North Coast (Fig. 2-7). It was built in the 18th century as a library for the Earl Bishop on his estate which also included the family home. The house itself burnt down in 1851 although the ruins remain.

Cliff stabilisation work was carried out in 1997 to prevent the building being lost to coastal erosion. The limestone floor which sits over a brick vault also suffered damage due to earth movements causing some slabs to shatter. They have been replaced using Portland Limestone. The site is managed by The National Trust.

LOCATION 3

IC716 342

Gortmore Viewpoint

At Gortmore Viewpoint we were able to overlook Lough Foyle, Magilligan Strand and Point below us, with the cliffs of Binevenagh Mountain to the west of us.

The six-mile-long plateau and cliffs of Binevenagh Mountain, 385m at the summit, form the westernmost end of the Antrim Plateau. The basalt lava flows (approximately 100 – 150m) overlie the Cretaceous chalk. Erosion and steepening of the western escarpment during the last Ice Age has resulted in large rotational landslips where blocks of basalt and chalk have slumped onto the Jurassic clays below.

Below us we could see an upland area which gave way to a flat triangular shaped alluvial plain of rich chocolate soil farmland with Magilligan Point at its apex. Magilligan Point is the tip of Magilligan Strand, a nature reserve comprising a seven-mile stretch of sand backed by one of the largest dune systems in the UK. The post glacial landscape at Magilligan Strand, was created as a result of the changing sea levels which followed glaciation (Fig. 2-8).



Figure 2-7. Mussenden Temple. (Credit: Karen Parks)



Figure 2-8. Magilligan Point and the alluvial plain.

Beyond Magilligan point and on the other side of Lough Foyle, we could also see across to the Inishowen Peninsula in Donegal.

An impressive sculpture also gazes over this wonderful view. This is Manannan Mac Lir, the Celtic god of the sea, son of the Irish sea god Lir. He stands in a boat with his arms outstretched surveying the landscape before him (Fig. 2-9).



Figure 2-9. Manannan Mac Lir with Binevenagh Mountain and Lough Foyle in the background.

Day 2 References:

1. Extracts from Day One of '**Rock around the North Coast**' collated by Karen Parks
2. Rockin' the Causeway Coast and Glens – A visitors' guide to the Geology of the Causeway Coast and Glens. **The Causeway Coast & Glens Heritage Trust**. www.ccght.org. 2012.

Day 3

Wednesday, 25 Sept 2024

by Angela Snowling

Report on FGS field meeting to White Park Bay, Ballintoy, Carrickarede, Colliery Bay and Ballycastle

Aims:

- To note the geology and history of White Park Bay, enroute to Ballintoy.
- To explore the stratigraphy, evidence for faulting and current day weathering at Ballintoy.
- To view the Larry Bane Quarry and the volcanic plug at Carrickarede.
- To view the terraces of Fair Head.
- To understand the history of coal mining in the Lower Carboniferous at Colliery Bay.
- To discuss the origin of the 50Ma dolerite North Star dyke at Colliery Bay.
- To view way up structures in the Carboniferous sandstones at Colliery Bay.
- To understand the history of salt panning at Pans Rock, Ballycastle.
- To identify erratics in Ballycastle Bay.

LOCATION 1

w3w///showdown.juggles.sadly

White Park Bay viewpoint

Due to the exceptionally fine weather numerous Scottish islands were visible from this viewpoint (Rathlin Island, Jura, the Mull of Kintyre and Arran) (Fig. 3-1).



Figure 3-1. View across to the Scottish islands.

Basalt from the Antrim Plateau was visible in the fields behind the viewpoint and the chalk of the Ulster White Limestone formation was visible in the cliffs below it. Basalt dykes are also visible in the Jurassic mudstone at the shoreline (Fig. 3-2).

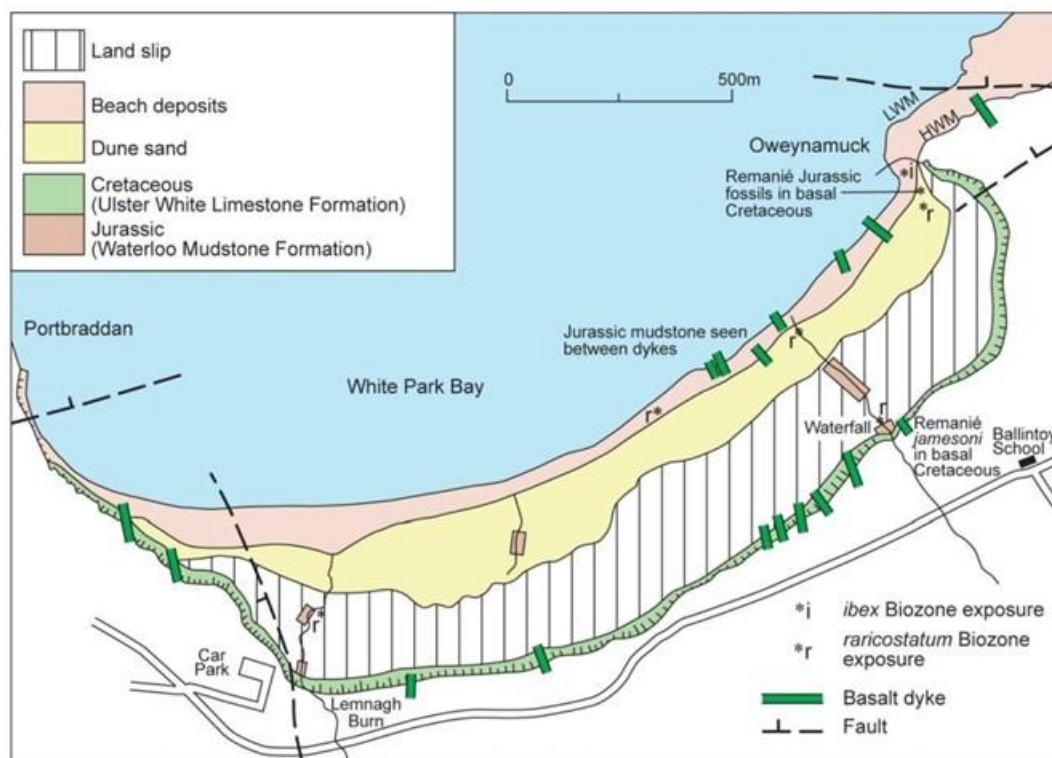


Figure 3-2. Geological map of White Park Bay.

There is a sedimentary gap of 100Ma years between the Jurassic Liassic mudstones and the Cretaceous Ulster White Limestone above. A series of Cretaceous dykes cross-cut the mudstones and the Hibernian Greensand Group can be seen underlying the Ulster White Limestone at the northeast corner of the bay. During this period the area was most likely dry land.

Karen explained that the slumping in the chalk cliffs was due to movement in the Jurassic (Liassic) Waterloo Mudstone beneath.

The Portbraddon fault post-dates the Ulster White Limestone Chalk Member and can be seen to the west at Portbraddon and to the east where it joins onto the end of the Ballintoy fault near the harbour.

Karen noted that this is an area of national scientific and historical importance. Fossils from the Lias clay, such as gryphaea and ammonites and neolithic finds from this area are now in the Ulster Museum. Neolithic settlers used the Cretaceous flints for Bronze age implements and the Liassic clay for making moulds. They built numerous burial mounds in the slumped areas

LOCATION 2 **GR 037454, BT54 6NA** **w3w///keyboards,flamed.crouching**

Ballintoy Harbour car park

Discussions covered:

- The lithostratigraphy of the area (see Fig. 3-3).
- The evidence for faulting (NB The succession ages from west to east due to the faulting which downthrows to the west).
- Biostratigraphic evidence.
- Evidence of current weathering in each of the units.

The lithostratigraphy for the area was compiled from boreholes and detailed maps can be found in the GSI link in the references.

Our first traverse was along the harbour wall to the east. We overlooked outcrops of the lower and causeway basalts to the north of the quay. Here the lower causeway basalt member showed wider jointing whereas the joints in the upper basalt were more random, reflecting the rapid cooling noted previously in the 'entablature' at the Giants Organ.

Opposite the quayside on the harbour side was a series of shallow dipping limestones from the Ulster White Limestone Formation. These showed evidence of fault drag, being tilted at 250NE towards the northeast at the edge of the Ballintoy fault.

Lias clay underlies the chalk visible in the harbour. Evidence for the contact lies further west towards White Park Bay and is marked by a spring.

The chalk of the Ulster White Limestone Formation is present in the cliffs to the south of the harbour. The rubbly chalk has been dated as 90Ma. Prominent bands of flint clasts within it dip down towards the left of the first main cave into a brecciated zone. A more extensive brecciated zone marks the Ballintoy fault to the right of the entrance. The chalk quarried here was used for liming fields and is notably harder than that found in other parts of the UK (Fig. 3-4).

The Ballintoy fault downthrows to the northwest and is parallel to the coast at the harbour. It meets the Portbradden fault to the southwest. Here it downfaults the tuffs below the interbasaltic bed to align with Liassic shales. Slickensides, evidence of fault drag and brecciation mark the location.

It was notable that the former quarries in the caves at Ballintoy are raised some 10m above the current highest sea level and Karen explained this was due to isostatic rebound as the pressure of glacial ice reduced when the ice melted some 15,000-13,000 years ago.

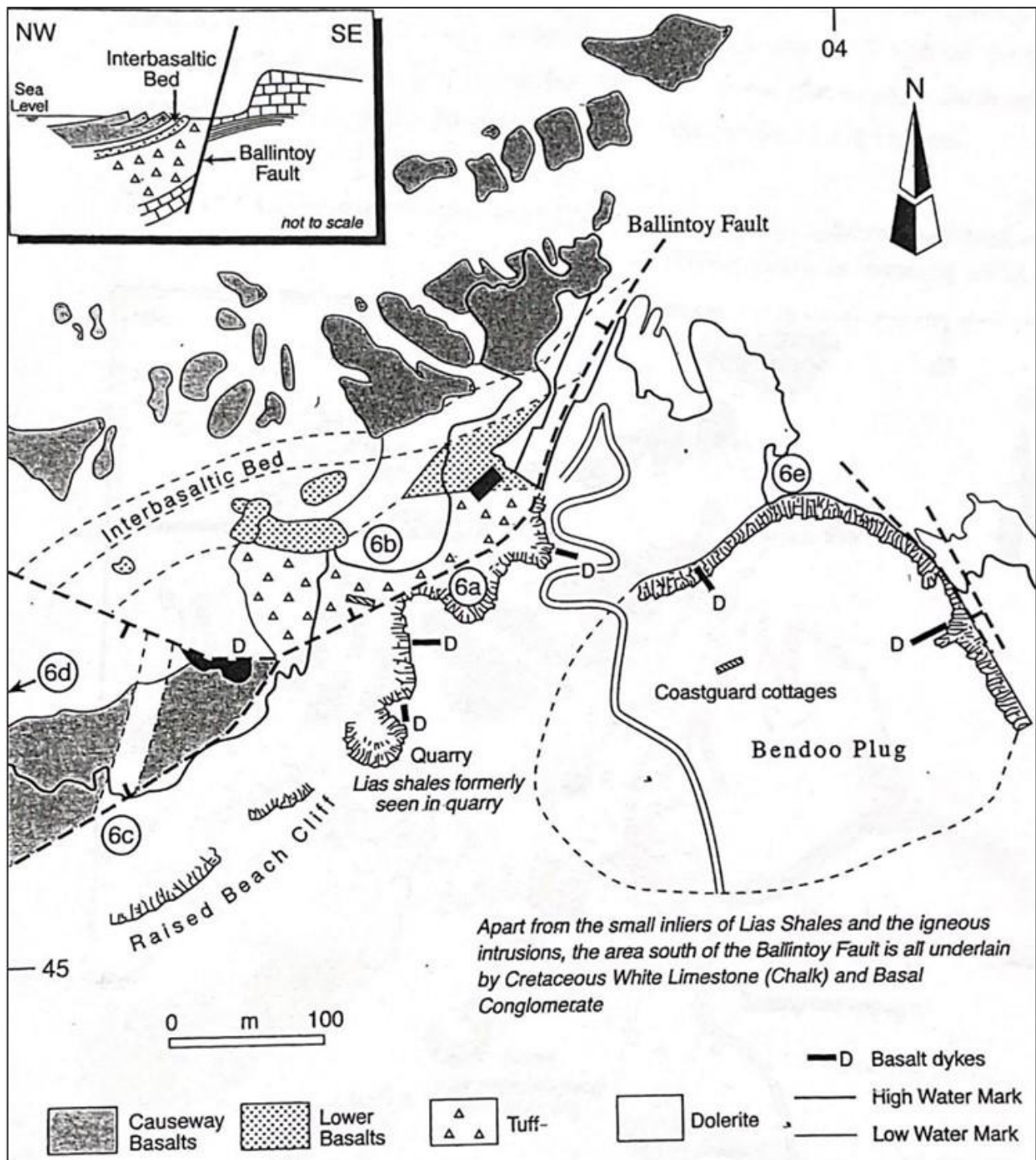


Figure 3-3. Sketch map of geology of Ballintoy.

The position of the raised beach is noticeable along the entire length of the coastline walk to the Giants Causeway. Raised arches provide further evidence along the coast and can be seen both in the Causeway basalt and in the chalk.

On the beach at Ballintoy, we explored the difference between the interbasaltic lateritic red bed as shown in the rear of Fig. 3-5 and the red tuff found in foreground. The ash in the foreground is a lapilli tuff whereas the rear is an outcrop of the interbasaltic red laterite (Port na Spaniagh) from a period of weathering between basalt lava flows. We also looked at the green tuffs (Fig. 3-6).



Figure 3-4. Evidence of the fault and the raised beach at Ballintoy.



Figure 3-5. Stacks, flat rocks and raised beach on the eastern side of Ballintoy Harbour (Credit: Eric Jones).



Figure 3-6. The two different red beds at Ballintoy.



Figure 3-7. Green tuff from Ballintoy.

LOCATION 3

w3w///somewhere.fillers.advising

Evidence of modern-day weathering at the 'hidden' bay

We walked along the road towards the 'hidden' bay to the east. Here modern-day weathering effects can be seen in the form of blowholes in the limestone member. Karen also showed us belemnites and ammonites in the limestone.

Evidence of stylolites were found in the chalk stack in the centre of the bay, but these differ from those found in limestone elsewhere. Karen noted that stalagmites and stalactites also form in the chalk caves further along the coast.

Fig. 3-8 shows the effect of seasonal sandblasting at the base of the chalk stack. (In winter all the sand in the bay is removed and returns in the summer). Here honeycomb weathering could be seen at sea level.

The cliff at the rear of the 'hidden' bay is formed from the Bendoo plug; made of dolerite it is a medium grained mafic rock and cylindrical in outcrop with a diameter of 350m. The outcrop shows evidence of 'onion peel' weathering. The surface appeared dark blue in the sunlight shown in Fig. 3-9, but the unweathered surface is black.

It was a short-lived intrusion and did not feed the causeway basalt flows. It has around a metre of contact metamorphism with the surrounding chalk.



Figure 3-8. Modern sandblasting effects on the chalk stack

LOCATION 4

BT54 6LR

w3w///dockers.broth.drag

Portaneevy viewpoint for the car park and viewpoint of the Carrickarede rope bridge and basalt vent.

This site gives a spectacular view of the Carrick-a-rede rope bridge which links the causeway basalts to the volcanic plug of vent agglomerate. The vent is 600m in diameter and the V shaped gap was formed after, due to glacial activity as the vent agglomerate was surrounded by softer fine-grained ash and therefore was weathered and eroded to form this gap.

LOCATION 5

BT54 6LS

w3w///admires.keyboards.taunting

Carrickarede National Trust car park serves the entrance to the rope bridge.

The coastline from here to Fair Head in the east exposes the Upper Carboniferous coal measures. At lunch at the National Trust car park, we saw evidence of the last working quarry in Northern Ireland –

the Larry Bane quarry which had been mined for coal from the 13th Century up to the late 1960's. We also could see a good view of Sheep Island.



Figure 3-9. Onion ring weathering on the surface of the Bendoo plug outcrop.



Figure 3-10. Carrick-a-rede rope bridge to the vent agglomerate.

We then drove to Ballycastle where Karen pointed out that the walls in the grounds of the Ballycastle golf club **(at w3w//skidding.marine.painted)** are the protected remains of the Viking settlement adjacent to the former Viking harbour.

LOCATION 6

w3w//tucked.originate.decay

Colliers Bay, Marconi's Cottage

We drove to the end of the Carrickmore Road at Colliery Bay to the cottage from which Marconi first sent a radio signal across to America.

To the east Karen noted that the Fair Head terraces (otherwise called Benmore or Great Peak) consisted of 100m thick red sandstone separated from the dolerite sill above by a gabbro sill. This is not accessible by road (Fig. 3-11).



Figure 3-11. Fair Head with the Isle of Arran in the background.

We then walked back towards the North Star Dyke on the foreshore (Fig. 3-12) **(w3w//stopped.blizzard.instincts)**. Named for its northerly orientation this dyke is formed from two separate dyke injections and has a central band of finer grained dolerite and shows more closely spaced jointing representing a second intrusion within the larger intrusion that cooled more rapidly. Fair Head Sill in the photograph is a Palaeogene sill aged 50Ma injected into Lower Carboniferous sandstones and coals aged c.350Ma.



Figure 3-12. The North Star Dyke with Rathlin island in the background.



Figure 3-13. Way up structure in Ballyvoy sandstone.

We observed a way-up structure in the Ballyvoy sandstone formation east of this dyke (Fig. 3-13).

In the ditch beside the road near the North Star dyke, we noted an old adit (one of many in the cliff used to access the subbituminous coal found there). Various mines along the road (now closed) show the deltaic nature of Lower Carboniferous sediments in which fossil ferns and trees can be found (Figs. 3-14 and 3-15).



Figure 3-14. White mine colliery with remains of a *Stigmaria* (the fossil root remains of *Lepidodendron*) ([w3w//galoped.stammer.shampoo](https://www.galoped.stammer.shampoo)).



Stigmaria

Figure 3-15. Close up of the *Stigmaria* in the quarry.

LOCATION 7

w3w///resemble.motion.gathering

We drove back towards Pans Rock beach at the eastern end of Ballycastle Bay. Here we explored the archway and Victorian bathing area cut into the sandstone. The bathing area was formerly part of a salt panning industry (Fig. 3-16).



Figure 3-16. Pans Rock salt pan and bathing pool entrance.

On the way back to the car park we collected erratics such as the Ailsa Craig microgranite and samples of the green tuff. These will be used in outreach work with schools.

Day 3 References:

1. Extracts from Day One of '**Rock around the North Coast**' collated by Karen Parks.
2. **GSI index maps** available at https://mapapps2.bgs.ac.uk/GSNI_Geoindex/home.
3. Eric Jones ... D0345: Stacks, flat rocks and raised beach on the eastern side of Ballintoy Harbour, <https://www.geograph.ie/photo/3706545>.

Day 4

Thursday, 26 Sept 2024

by Nick Stronach

Overview and aims:

Half day trip prior to travel back to the UK, conducted at various locations on the A2 road from Ballycastle to Larne (Fig. 4-1). Locations of stopping points and/or features are identified by Grid References, derived as accurately as possible from the OSNI Spatial NI – Map viewer (<https://maps.spatialni.gov.uk/>).

The objectives of this part of the trip were to view:

- Key parts of the pre-Carboniferous stratigraphy, not covered elsewhere on the excursion.
- Glacial landforms of the Antrim Coast.
- Effects and mitigations of coastal mass movement.

Note that extremely inclement weather (wind and rain) on this day limited activity.

LOCATION 1 320540, 436040

Ballypatrick Forest and Loughareema

Upland area of “Dalradian”, south of the Carboniferous outcrop viewed at Ballycastle. It consists mostly of rolling terrain, in contrast to the “trap” topography of the Palaeogene basalts, created by glacial and post-glacial erosion.

Loughareema (the Vanishing Lake) itself lies on the edge of a Cretaceous-Tertiary outlier and is underlain by Chalk and possibly older Cretaceous sandstones. Fracturing and permeability lead to a poor basal aquitard, thus the lake “vanishes” during dry weather. Despite recent rain, it was empty on the day we visited and was flooded by meandering channels.

Distant views can be seen to the south of Tievebullagh (318850, 426690) a conical Palaeogene microgabbro intrusion, associated with contact metamorphism and porcellanites, used in Neolithic stone tool making.

LOCATION 2 325100, 432650

Cushendun and Glendun

Glendun is one a series of west-east trending glacial valleys, U-shaped with a broad, flat base. Cushendun village is at its mouth.

Outcrop viewed is at Cushendun Caves, on the shore to the south-east of the village, and consists of Lower Devonian alluvial conglomerates (Fig. 4-2). Clast size is generally on decimetre scale, and they are extremely well rounded. Compositionally they are mostly quartzite,

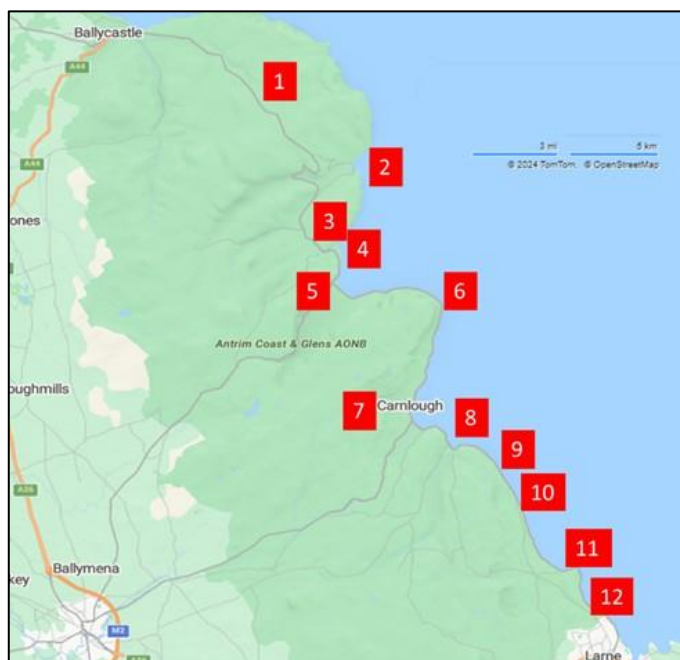


Figure 4-1. Approximate locations of stops described.



Figure 4-2. Cushendun Caves. Lower Devonian conglomerate (Cushendun Formation). Red scale bar is approximately 0.5m.

but also with other metasediments, and porphyritic dacite with conspicuous zoned feldspars. The latter is inferred to be sourced from the underlying Cushendall Formation, of lowermost Devonian age. There is an outcrop (not visited) of this lithology, south of Tiveragh. Minor bedded red sandstone units are inferred as representing lower energy sheet floods and occur as metre-scale lenses. There is some indication of fining-upward trends in clast size, but there is otherwise little fabric in the conglomerate.

Caves and arches in the cliffs are forming at the present day but also mark at least two raised beach levels higher in the face (Fig. 4-3).

LOCATION 3 323090, 428440

Tiveragh Hill viewed from road to west

No stop was made here but the feature can be viewed close to the road (Fig. 4-4). It is a conical hill, associated in folklore with a dwelling place of fairies, composed of Palaeogene microgabbro, that were intruded into Lower Devonian sediments and volcanoclastics. Very tentatively, the “roche moutonnée” shape would suggest a south to north ice flow.

LOCATION 4 324330, 426110

Cushendall, Red Arch

No stop made. The A2 road continues south along a prominent raised beach. Outcrop passes from Devonian volcanics to red Triassic conglomeratic sandstones and mudstones. These form the outcrop at the Red Arch itself. The unconformity is mapped on the foreshore at the southern edge of the town

LOCATION 5 323950, 425510

Waterfoot, Glenariff

No stop made. Waterfoot lies at the mouth of the Glenariff River which occupies another classic U-shaped glacial valley. Southern and Northern slopes consist of “hanging” cliffs of Palaeogene basalt, with waterfalls. The valley floor is occupied by the Triassic Mercia Mudstone Group.



Figure 4-3. Cushendun Caves, showing Holocene and Present-Day beach erosion.



Figure 4-4. Tiveragh Hill.

LOCATION 6

330190, 424120

Garron Point viewed from layby to south

Large, rotated blocks of chalk capped by basalt are detaching on the underlying Lower Jurassic mudstones (Waterloo Formation) in a zone extending approximately 1km along the coast. There is no major movement reported at present, but secondary slumping and landslips can be seen.

LOCATION 7

328710, 418130

Carnlough

Lunch stop made at Twilight Café. The town is an important location because of the previous industrial activity of chalk mining, processing into lime and export to Scotland for use in steel making. The course of the railway and bridge can be seen above the harbour, along with one preserved lime kiln.

Road continues south along a raised beach across Glencloy, another broad, low U-shaped valley floored by the Mercia Mudstone Group. Hummocky moraines can be seen on the southern side of the valley.

LOCATION 8

331270, 415350

Glenarm

Another important industrial site with previously active chalk quarries in and above the town (Fig. 4-5), along with harbourside warehouses. Brief stop was also made at Steenson's Jewellers.

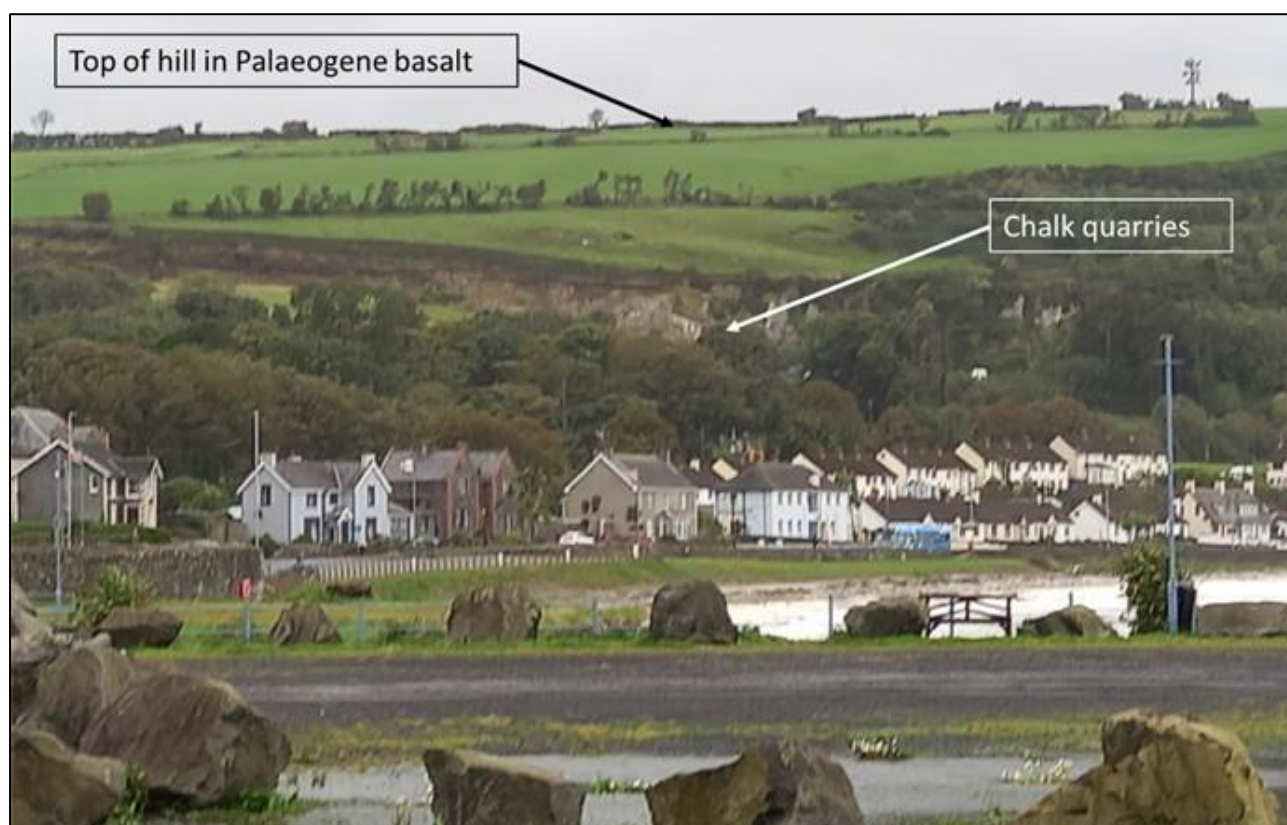


Figure 4-5. Glenarm. Position of chalk quarries above town.

All along this section of road can be viewed evidence of mass movement, including debris flows comprised of chalk blocks, mud flows of the Lower Jurassic and Triassic mudstones, and landslips. Various remedial measures have been adopted including netting and bolting of higher slopes, and concrete and sabion barriers to prevent encroachment of material onto the road. Southeast of Glenarm, there was a particular problem with rockfalls from heavily jointed chalk above an overhang

onto the road. This has necessitated a wholesale relocation of the road seawards. Potential erosion by the sea had to be combatted by creation of a deep piled (4m) sea wall, protected by 5-6 tonne “rip-rap” boulders.

LOCATION 9

332760, 415170

White Bay

Excellent view can be made from the car park of the Chalk and Basalt stratigraphy. Large flat fracture faces can be seen in massively bedded chalk, which control the cliff (Fig. 4-6). These run into an orthogonal slope where one appears to control a small doline in the karsted Top Chalk surface. The resultant fill comprises red ash overlain by rubbly basalt, underneath a cap of more extensive basalt. Other depressions along strike appear to be filled by concentrations of flint pebbles (clay-with-flints) or by more extensive rubbly basalt. With more time, and subject to safety considerations, it would be worth climbing to obtain a closer view of this outcrop.

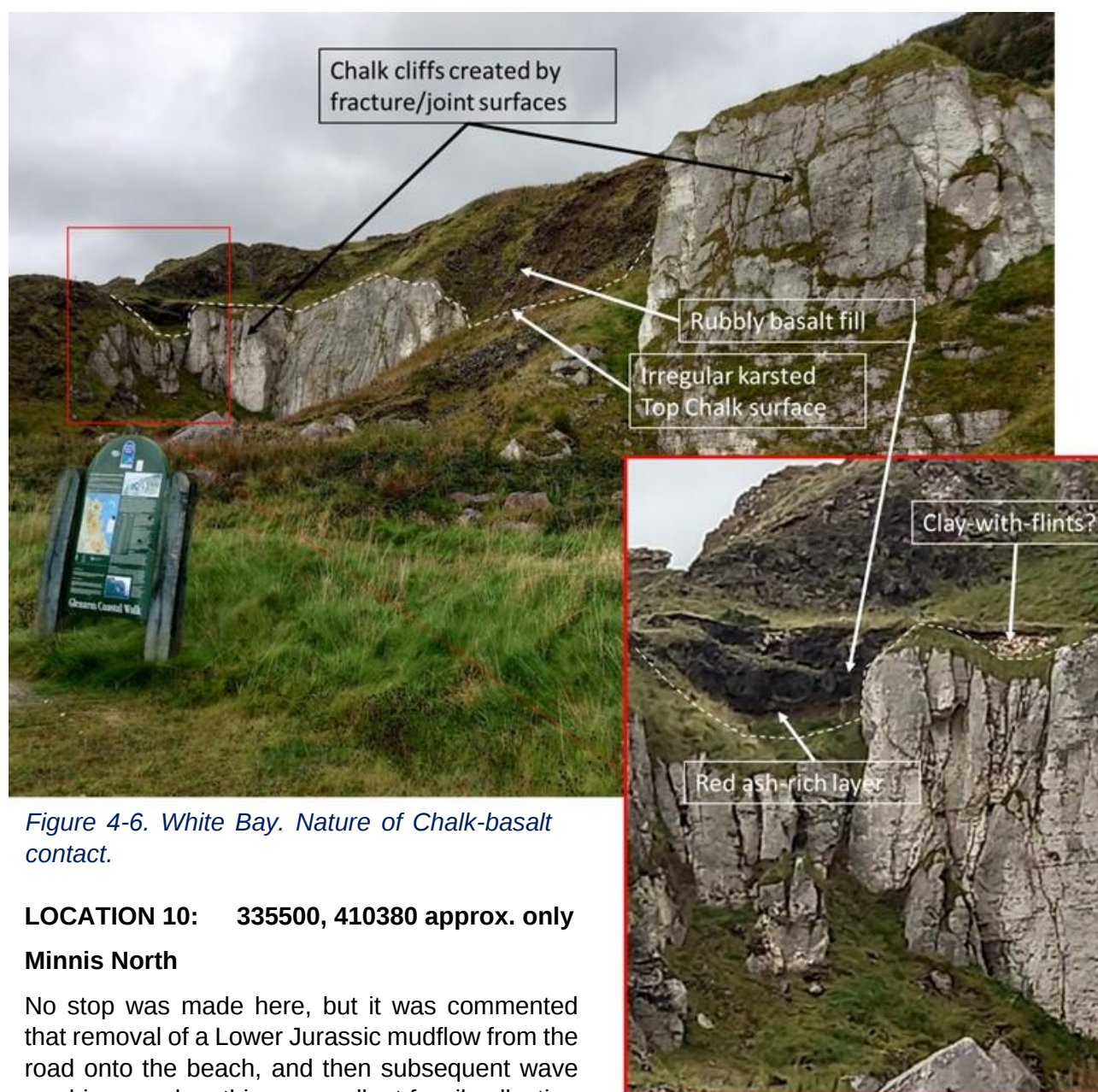


Figure 4-6. White Bay. Nature of Chalk-basalt contact.

LOCATION 10: 335500, 410380 approx. only

Minnis North

No stop was made here, but it was commented that removal of a Lower Jurassic mudflow from the road onto the beach, and then subsequent wave washing, renders this an excellent fossil collecting spot (Gryphaea, crinoids, ammonites, other bivalves, etc.).

LOCATION 11: **338310, 448020**

Ballygally Head

No stop made here, but the outcrop could be seen as an intrusive sill / dyke, with extremely wide, estimated up to 1m, columnar joints. The geological map records this as a Palaeogene microgabbro.

LOCATION 12: **339870, 405220**

Black Arch / Black Cave

Again, no stop made, but it was observed that the road here is suffering from the same frequency of rockfalls as at Glenarm, although of basalt, rather than chalk, and it is likely that rebuilding the road seawards may need to be contemplated in the near future.

Conclusion

The last stop concluded the field trip, and we were able to be taken in good time to flights departing to London from the International and then the City airports. I would like to record that the entire FGS group was extremely pleased with the trip. Karen Parks provided excellent leadership, with an extensive knowledge of both the geology of Northern Ireland and its history, and she was always spot-on with all of the logistical arrangements. A very warm thank you to her!

Note: All figures / photos taken by the authors unless stated.

Report on FGS Devil's Punch Bowl walk.

By Mick Caulfield

Date: 29 March 2025

Leader: Mick Caulfield

The walk mainly followed "The Sailors Stroll" trail, described by the National Trust as an easy walk with only gentle gradients and reasonably flat surfaces. It traversed Lower Cretaceous rocks and provided views of geological and geomorphological features.

Attendees:

Angela and Philip Snowling, Janet Catchpole, Gillian Collins, Rosemary Cozens, Nick Stronach, John and Anita Heward.



View from the Landscape Sculpture looking North. (Credit: Mick Caulfield)

References:

- https://www.farnhamgeosoc.org.uk/newsletters/2023_2028/v28n1feb2025.pdf Pages 11-14.
- Cosgrove, J. W. 2020 'The deformation history of southern England, and its implications for ground engineering in the London Basin'. *Quart J Eng Geol & Hydrogeol* 55, qjagh2020-144; <https://doi.org/10.1144/qjagh2020-144>
- Local Walks in: <https://www.haslemere.com/vic/pdf/2020/devilspunchbowlwalk.pdf>
- NT Devil's Punch Bowl: https://www.nationaltrust.org.uk/hindheadcommons-https://www.nationaltrust.org.uk/visit/surrey/hindhead-commons-and-the-devils-punch-bowl/explore-hindhead-and-the-devils-punch-bowl-with-historyscapes?campid=email_REG_TACLSE_29012025_NT290125A1TACSE-JOBID208710-COL1
- https://www.farnhamgeosoc.org.uk/newsletters/2023_2028/v28n1feb2025.pdf page 11.

FGS Lecture Summary

14 February 2025

On Friday, 14 February 2025, 36 participants of the FGS plus members of other associated societies including Reading, Harrow & Hillingdon, & Mole Valley welcomed Dr. Maurice Tucker via Zoom.

Viruses – the New Frontier in Earth Sciences?

Dr. Maurice Tucker, School of Earth Sciences, University of Bristol, BRISTOL, BS8 1EJ

maurice.tucker@bristol.ac.uk

Viruses and medical matters are frequently in the news these days, unfortunately, but what about viruses in the Earth Sciences? Are viruses even preserved in the fossil record? If so, how does that happen and how far back do they go? And what about the roles of viruses in the environment? Are they significant or are they just the nasty invisible parasites we regard them to be today? Or are they both – good and bad? This article explores some of these issues raised in Maurice Tucker's zoom-talk to the Farnham Geological Society.



Figure 1. *An extensive area of microbial mats covering many 10s of km² along the shoreline of Abu Dhabi. (Image: Maurice Tucker)*

Viruses and bacteria are often discussed together since they are both pathogens, that is they cause infections, and they both depend on each other. But there are significant differences between the two. **Bacteria** are single-celled, prokaryote organisms (that is with no nucleus), but they have a cell wall within which there is cytoplasm containing DNA and organelles. The latter are structures that enable the organism to function, that is to generate energy from the environment (as through photosynthesis) and to reproduce, mostly asexually, by a process known as binary fission (dividing into 2 daughter

cells). **Viruses**, on the other hand, are somewhere between living organisms and non-living biological entities. They consist of a protein shell (called a capsid) within which there is nucleic acid (i.e. RNA or DNA) which carries genetic information. However, viruses are dependent solely on a suitable host for replication; hence they are frequently referred to as **obligate intracellular parasites**.

Viruses are extremely small, mostly between 30 and 300 nanometres (1000 nm = 1 µm, i.e. a micron) in diameter, only visible with an electron microscope. Viruses are around a tenth to a hundredth of the size of bacteria, which vary in size from less than a micron (i.e. 1/1000th of a mm) to several 10s of microns (the largest being 750 µm). Viruses exist in a wide range of shapes, spheroidal, rod-shaped or helical (spiral). However, many are symmetrical with an **icosahedral shape**, that is spheroidal with sides or faces, like an old-fashioned football.

Bacteria are present in practically all environments, shallow to deep water in the oceans, lakes, rivers, hot and cold climates, within sediments, soils, in fractures in rocks of all types, and indeed in rocks themselves, down to several 1000m where fluids are present. They also occur in rain as well as in extreme environments, like hot springs. And, of course, bacteria occur in all animals (and plants), and us. However, wherever there are bacteria, there are viruses. **Viruses** need the bacteria to replicate, injecting them with their RNA/DNA, and then the new viruses grow within the bacterial cell. In time, the viruses burst out, a process referred to as **lysis**. These viruses associated with bacteria are referred to as **bacteriophages**, or simply **phages**. Other types of virus attack the cells of plants and animals, including humans of course, and some of these are the ones causing mild to serious illnesses, such as flu and covid.

Bacteria are commonly present in enormous numbers: seawater for example typically contains one million per milli-litre (a teaspoon holds around 5 ml) and up to 10 billion bacteria may occur in a gram of soil in the vicinity of plant roots. **BUT, the number of viruses is 10 or more times** these figures. Viruses are the most abundant of biological entities on Earth but in terms of volume or mass, viruses constitute a much smaller amount

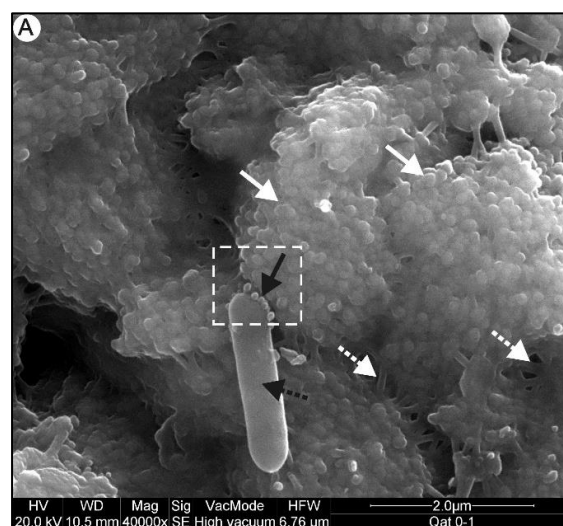


Figure 2. SEM image of nanospheres, interpreted as viruses, attached (black arrow) to a rod-shaped bacterium (dashed black arrow) and forming clusters (white arrows) where they are mineralised. EPS (mucus) dashed white arrows. From the top mm of a microbial mat from Qatar. Scale bar 2 microns. (Image from Perri et al. 2018)

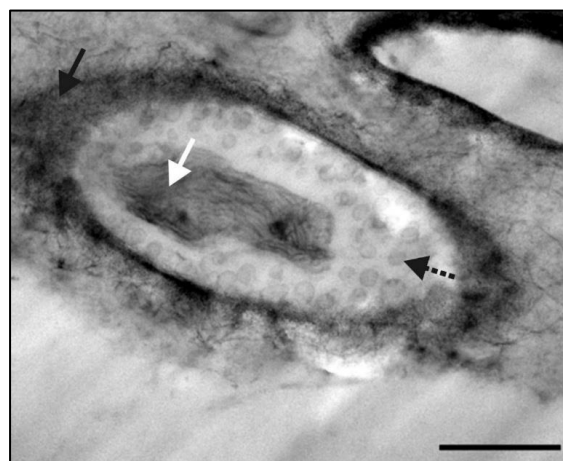


Figure 3. TEM image of a coccoid bacterium from the uppermost layer of a microbial mat in Qatar containing numerous nanospheres (black dashed arrow), all a similar size (80 nm), interpreted as viruses. Their darker colour (more electron dense) indicates early mineralisation, which is also the case for the EPS (black arrow), with its thread-like texture around the bacterial cell. EDS shows the dark areas contain Ca, Mg, Si, S, Al and Fe. The white arrow indicates the thylakoid structure (for photosynthesis). Scale bar = 500 nm. (From Perri et al. 2018)

than bacteria. To illustrate this: the number of bacteria in the human body (average weight 70 kg) is around 38 trillion, but of viruses, around 380 trillion; the weight of bacteria in the human body is estimated to be 200 gm, but the weight of viruses would be less than 10 gm (= 10 raisins!).

Fossilisation of modern viruses

One particular modern environment where bacteria and viruses are abundant is the **microbial mat**. Well-publicised examples occur in the Middle East (Trucial Coast, UAE), the Bahamas, Western Australia (e.g. Shark Bay), and elsewhere. They mostly occur along low-latitude shorelines, in shallow-subtidal lagoons and across tidal flats, in some cases covering 10's of km² (Fig. 1). Microbial mats are composed of many different types of bacteria, but especially cyanobacteria, sulphur and sulphate-reducing bacteria and archaea, along with their associated phages (viruses). In addition, many of these bacteria produce a mucilage of **extracellular polymeric substances (EPS)**, which protects them in their quite hostile location of extreme temperatures and variable degrees of exposure. The bacteria, viruses, EPS and other micro-organisms (such as fungi, algae and diatoms) constitute a **biofilm** across the sediment surface, commonly black in colour, which may be several to many cm thick.

Of great interest is the realisation that viruses are being mineralised within microbial mats, as in Qatar (Fig. 2; Perri *et al.* 2018). Viruses, as well as the EPS around bacteria, have a net negative charge from their hydroxyl and carboxyl functional groups, and these can attract cations, such as Ca²⁺, Mg²⁺, Si⁴⁺ and Fe²⁺. Within the water around the bacteria there will be anions (e.g. CO₃²⁻, HCO₃⁻, SO₄²⁻), that can combine with the cations to precipitate minerals such as calcite, aragonite, dolomite and Mg-silicate clay. Ultrathin sections of the bacteria observed with the transmission electron microscope (TEM) show viruses and the EPS becoming mineralised, from their darker appearance, i.e. being more electron dense (Fig. 3). EDS (Energy-dispersive X-ray spectroscopy) confirms the presence of elements within the EPS/viruses, and in time, amorphous material develops into more crystalline minerals, the type depending on pore water chemistry, alkalinity, pH, redox etc.

The mineralised viruses recognised within microbial mats, as well as within tufa and travertine (i.e. cold and hot springs), are distinctive: they are all of a similar size (50-150 nm in diameter) and shape, approximately spheroidal (Fig. 2 and 3). However, if looked at carefully they are not perfectly spheroidal but are more **icosahedral**, i.e. with faces/flat sides or **hexagonal** in cross-section (Fig. 4). These **nanospheres** commonly form clusters, a feature seen with living viruses, that is, they coalesce. Rarely, viruses are observed attached to a bacterium (Fig. 2).

Silicified viruses have been described from hot-spring deposits in Japan, where they occur within and around bacterial cells, and ferruginised viruses have been recorded in an acid-mine drainage system in Spain. Experiments have also been undertaken to precipitate calcium carbonate in the presence of viruses and vaterite (a metastable polymorph of calcite) is the dominant precipitate. The nanospheroidal precipitates (mineralised viruses) coalesce to produce clusters and larger crystal forms.

Thus, it is clear that viruses can be mineralised, replaced by calcite, silica and iron minerals, that is **viruses can be fossilised**. The distinctive shape (icosahedral) of the virus would be lost if the viruses were coated by the mineral or if the mineral continued to precipitate using the nanoparticle as a

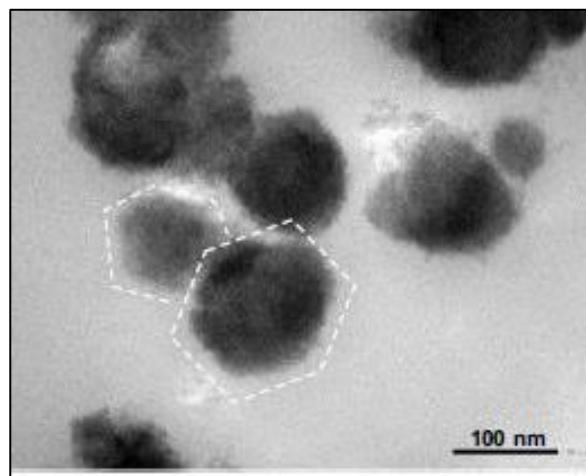


Figure 4. TEM image of calcified viruses from tufa (cold spring deposit), Italy. Scale bar = 100 nm. (Image from Perri *et al.* 2022)

nucleus, or if the mineral first precipitated was metastable (like amorphous CaCO_3 (ACC) or vaterite) and then it recrystallised. Hence, there can be difficulties in recognising viruses in the geological record, their tiny size for one thing, but also their preservation. Nevertheless, they should be (or have been!) there.

Fossil viruses in the geological record

Stromatolites, formed by the lithification of microbial mats, are relatively common throughout the geological record, but especially in the Precambrian and in some cases fossil bacteria have been recognised there; one would expect mineralised viruses to be present as well. Indeed, in published SEM images, one can see nanospheres of the right size and shape for them to be considered now as fossilised viruses; see Fig. 5 from an early Proterozoic chert (1.88 Ga) from Labrador.

Life itself is thought by many to have evolved in extreme environments, like volcanic hot springs on land and alkaline hydrothermal vents on the deep seafloor, both variations of the ‘warm little pond’ envisaged by **Charles Darwin**. Here, incipient proteins and nucleic acids (precursors to RNA-DNA) could have been generated, along with the ability to replicate, the essential precursors to the evolution of life. The oldest likely fossil microbes (~3.5 Ga), generally preserved in chert, commonly silicified stromatolites, are spheroids and filaments, some at least likely to be cyanobacteria. The origin of viruses has been much debated and since they infect cells from all divisions of life (Archaea, Bacteria, Eukarya) and they share homologous features, it is frequently suggested that they formed very early in the evolution of life, in the pre-cellular stage. There are other hypotheses, however. Thus, it could be that viruses were likely present from earliest times and their fossilised forms should be present in the appropriate sedimentary rocks, like stromatolites and hot spring deposits, which escaped any later serious deformation.

The contribution of viruses to the environment

In the marine realm one of the major roles of viruses is in the recycling of organic matter through infection of bacterial cells. This results in the release of nitrogen, carbon and phosphorus as dissolved organic matter (DOM), which stimulates further microbial growth, as well as particulate OM. Hence, bacteriophages have an enormous influence on the biogeochemical cycles in the oceans, increasing the efficiency of the biological pump, as well as controlling bacterial populations, and allowing a broad diversity of species to coexist. In this sense too, it is very likely that viruses were involved in **background extinctions**, which have been on-going through time since life evolved, not the 5 (or is it 6?) mass extinctions that receive all the attention related to catastrophic events. Viruses could induce the demise of specific species and encourage the evolution of new species in response to subtle changes in environment. Thus, viruses, the smallest of biological entities, are arguably the most significant aspect of life in natural environments.

However, in respect to geological processes, the possible roles of viruses have been totally neglected. Apart from their involvement in biological evolution and nutrient regeneration, they may well have played a major part in processes such as carbonate precipitation and metal-sulphide mineral-deposit formation, along with bacteria. As an example, mineralised viruses could well have provided the nuclei

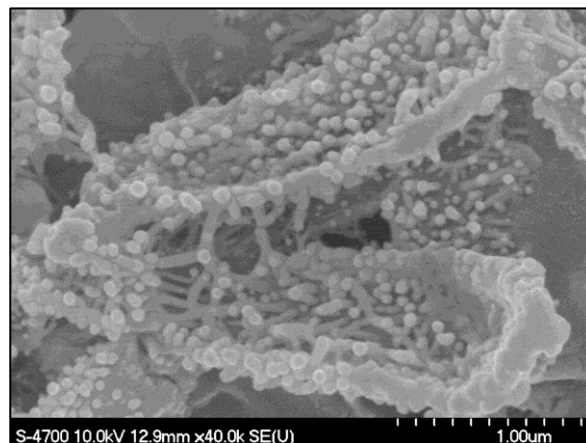


Figure 5. SEM image of Precambrian chert from Labrador, Canada (1.88 Ga), showing microbial filaments and numerous nanospheres, all a similar size (around 50-70 nm) but not perfect spheroids, possible viruses. (Image courtesy of Cole Edwards)

for extensive carbonate precipitation in the oceans, since fine-grained limestone and dolomite, with no clear evidence of origin, are ubiquitous throughout the sedimentary record.

Viruses are the new frontier in geology today there is still much to learn!

Suggestions for further reading (all available on the internet):

- Perri et al. (2018) Microbial mats, bacteria and viruses, Qatar. **Sedimentology**, 65.
 - Perri et al. (2022) Viruses in tufa. **Sedimentology**, 69.
 - Słowakiewicz et al. (2023) Viruses in travertine. **Nature Sci. Repts.** 13, 11663.
 - Słowakiewicz et al. (2021) Experiments with viruses. **Geochim. Cosmochim. Acta**, 292.
 - Tucker, M.E. (2020) Fossil viruses. **Geology Today**, 36.
-

AGM Summary

11 April 2025

On Friday, 11 April 2025, 31 attendees in The Methodist Hall and a further 20+ via Zoom welcomed our Chair Mick Caulfield, along with the FGS Committee members, in holding our AGM.

This was followed by a very interesting talk by FGS Member Jonathan Hannam.

Report by Mick Caulfield, FGS Chair

There were 51 attendees and 4 apologies for absence from Tessa Seward, Peter Luckham, Liz Aston & Sally Pritchard (although Peter, Liz & Sally were able to join [via Zoom](#)).

The 2024 AGM minutes were approved with the matters arising to be discussed in the various Committee Reports.

FGS Treasurer Mike Millar gave a brief report on FGS Society accounts. Total operating costs were low. The bank accounts have been simplified into a single online “Student” account. An interim financial statement (from 1 Dec 2024 to 31 Mar 2025) to bring the financial reporting in line with the revised AGM date was presented and a credit balance of £2,675.73 was reported.

Subscriptions for 2025 have been kept at existing levels.

As required by the FGS Constitution auditors for the coming year, Mike Mitchell and Liz Aston, were unanimously approved.

Committee members reported on their areas of responsibility. The key items were:

Mick Caulfield, Chair: 2024 was a reasonably successful year in terms of

- the monthly talks continue to be of a very high standard,
- finances are in good shape,
- membership is down but we are recruiting new members at the same time,
- our Field Trips are varied and in areas of great geological interest, with reasonable attendances.

Mick also mention that the change of venue was one that the Committee took reluctantly, as The Maltings made it very difficult for us to remain due to them not being able to provide us with our preferred “2nd Friday of the month” slot. Due to Janet Catchpole and Judith Wilson, we have found what we all hope will be an excellent venue at The Methodist Hall.

Mick gave a special thanks to Judith Wilson, who will be stepping down from the Committee after 10 years as Secretary.

Judith Wilson, Secretary: 2024 saw 11 meetings, 4 by Zoom and 7 in The Maltings where attendance varied between 14 to 30, with an average of 25. These include attendees from other geological societies (particularly via Zoom) such as Reading, Mole Valley, Harrow & Hillingdon and Horsham. In addition, 3 committee meetings were held in the year.

Looking for a volunteer to take over this role. Please contact **Mick Caulfield** (newsletters@farnhamgeosoc.org.uk) if you are interested.

Janet Catchpole, Programme Secretary: in a similar way to the previous year, 2024 started on Zoom but moved to The Maltings in April with Zoom an option for members who were unable to get to The Maltings.

Topics ranged across a variety of geological subjects:

- Mick Caulfield (FGS) - "The Great Dying: The end Permian Mass Extinction".
- Prof. Emrys Phillips (BGS) - "What did the last Ice Age do for us? – Scotland during the last Ice Age".
- Dr. Stuart Archer (Harbour Energy) - "Glacial history of Deeside, Aberdeenshire".
- Dr. Andrew Hart (Atkins Realis) - "Remote monitoring of an active urban mud volcano".
- Lesley Dunlop (Consultant) - "From Chalk to Peat – 100 million years in the Lambourn Valley".
- Colin Prosser (English Heritage) - "Conservation: past, present, and future".
- Sally Pritchard (FGS) – "Travels in Peru and its geology".
- Paul Kuin (MSSL) - "Exploration and exploitation of the Moon".
- David Bone (Consultant) - "The enigmatic Ice Age boulders of the West Sussex Coastal Plain".
- Dr. Jason Canning (Nuclear Waste Services) - "The UK Search for a Geological Disposal Facility – The Role of the Geosphere in Deep Nuclear Waste Disposal".
- Prof. Nick Schofield (University of Aberdeen) - "The History of Oil and Gas Exploration, West of Shetland".

Zoom has worked well, benefiting older and more distant members but is a disappointment for others. Janet found it easier to get a wider selection of speakers. The committee decided that it is prudent to continue to use Zoom for November to March inclusive and then to hold hybrid meetings at The Methodist Hall and on Zoom for the other months. We continue to have a good relationship with the local geological societies of Reading, Harrow & Hillingdon, Mole Valley and Horsham which will continue in 2025.

Sally Pritchard, Membership Secretary: membership stands at 59 having gained 4 new members since 1st March 2024. This represents a 12% decrease from last year's AGM. Sadly, we have to report the death of ex-member, **Derek Jerram**. We enjoyed Derek's company on many field trips, and he also gave talks to the society. Our sincere condolences go to his wife Margaret who joined him on his geological ventures.

Tessa Seward, Field Trip Secretary: the **2024 field trips** were well received. We ran **3 one-day field trips & one residential trip**:

- In **April** we visited **Folkestone Warren**, where we explored the historic & current landslips with Dr. Simon Drake. In **May**, Alan Holiday led us on a fossil walk at **The Fleet Lagoon** in Dorset. We also visited the **Etches Collection** at Kimmeridge on the same day and were able to see the complete Pliosaur skull which was featured in the BBC programme "Attenborough and The Giant Sea Monster". In **July 2024** and **March 2025** Mick Caulfield led us on a walk at the **Devil's Punch Bowl**. We also ran a **residential trip** to the **Antrim Coast in Northern Ireland** in late **September**. This trip was led by Karen Parks and was very much enjoyed.
- We have a number of trips planned for 2025:

- 10 June **National Museum Cardiff**, Palaeontology / Geology section. Leader/Curator - Cindy Howells
- 27 July **Dryhill Quarry** led by Dr. Simon Drake
- 31 August **Lambourn Valley** led by Lesley Dunlop
- 16 - 19 October Residential trip to **Anglesey** led by Robert Crossley

We usually have an attendance of about 7 members per trip.

Tessa is having discussions with Ross Garden, Field Trip Secretary of **Reading Geological Society** regarding greater collaboration and organising joint trips, as both societies are experiencing relatively low attendance on field trips. Providing the discussions are successful, this would probably start in earnest in 2026.

Note, Tessa has planned the trip to Cardiff in June to dovetail with a **Reading** trip to **Ogmore & Southerndown, Glamorganshire**, the following day. Currently, members of both societies are generally welcome on each other's trips **where space allows**.

Tessa would like to thank the Committee for their support this year and also our members in general.

Mick Caulfield, Newsletter Editor: the Newsletter is published quarterly with news of Society events, technical and geological news items and the occasional crossword, quiz, etc. Mick is pleased to receive articles and summaries of FGS talks and field trips and other geological news from members so please continue to send them.

Bob Rusbridge, Website Report: the new look **website**, the work of **FGS Member Walter Bonnici**, has now been fully operational at <https://farnhamgeosoc.org.uk> for **a couple of years**. During 2024, routine updates – newsletters, flyers for talks, field trip updates, etc. – have been applied to the website, but no significant issues have been recorded. Use of the **contact form** by visitors continues and is again dominated by people trying to sell us web services. However, a few genuine enquiries have been received and dealt with. The home page now includes a Google Map indicating the new venue.

Hosting arrangements have changed from Microsoft to Linux technology, allowing continued use of PHP, e.g. by the contact form, but we continue with the existing hosting provider. This was purely internal and does not result in any change to website content, functionality or appearance.

Mike Millar, IT/Sound: in 2024 we replaced both the projector and laptop (with Peter Crow) and have bought a new projector screen for The Methodist Hall.

Mike continues to update the **forthcoming meeting flyer** for Bob Rusbridge to add to the website, as well as set-up Zoom meetings and audio-visual equipment in The Maltings. He also liaises with speakers regarding meeting arrangements and forwards meetings notifications to Sally for distribution to members and friends.

Looking for a volunteer to take over this role. Please contact **Mike** (mike.millar27@btinternet.com) if you are interested.

Peter Crow, Publicity Report: over last summer, a new FGS tri-fold publicity leaflet was designed, along with a second version intended for email distribution. The redesign was intended to be more eye-catching and colourful. A new colour version of the FGS logo was produced as part of the process. 400 copies of the Tri-fold leaflet were produced, with copies distributed via members of the society and left in the Farnham Tourist Information, Library and Adult Education Centre. Electronic copies were sent to Farnham, Farnborough and Alton colleges. Following suggestions from other FGS members, contact was made with both the 'local clubs' section of the "Farnham Herald" and the "Round & About" magazine. Both have offered to support FGS and have received copies of the updated leaflets and the current programme of talks.

The 2025 Committee was elected by a clear majority of the members present:

- Chair Mick Caulfield
- Secretary *vacant (Judith Wilson)*
- Treasurer Mike Millar
- Programme Secretary Janet Catchpole
- Membership Secretary Sally Pritchard
- Field Trip Secretary Tessa Seward
- Newsletter Editor Mick Caulfield
- Website Manager Bob Rusbridge
- IT/Sound *vacant (Mike Millar)*
- Publicity Peter Crow
- Without Portfolio Peter Luckham
- Ad-hoc Member Liz Aston

Should anyone else like to be considered to serve on the 2024 Committee, **particularly Secretary & IT/Sound**, please contact Mick Caulfield (newsletters@farnhamgeosoc.org.uk).

Under **AOB** there was a proposal to make the following FGS members **Honorary Members**:

- Peter Luckham former Treasurer
- Liz Aston former Newsletter Editor & Chair
- Janet Catchpole current Programme Secretary

All three of the proposed Honorary Members have given exceptional service to the Society over an extended period of time ... in Peter's case over 53 years of service!

All three were voted by the vast majority of the FGS members present to become Honorary Members.

Thanks was given to **Janet Burton** for providing refreshments throughout the year. And volunteers were asked to help with the Churt Fete on 14 June 2025 and the GA Festival of Geology on 1 November 2025

Date of next AGM: Friday, 10 April 2026

FGS Lecture Summary

11 April 2025

On Friday, 11 April 2025, 51 attendees both in The Methodist Hall and via Zoom welcomed Jonathan Hannam, FGS Member to present the post-AGM talk.

The Suez and Corinth Canals – a short history

There are obvious connections between the Suez and the Corinth canals, in that they were both constructed in the nineteenth century and neither require locks. However, there are also some surprising historical parallels as the origins of both canals can be traced back to ancient times.

In the case of the Suez Canal, the ancient Egyptians in circa 1850 BC first thought about a canal to link the Nile to the Red Sea via the Bitter Lakes, although it wasn't until the late 7th century BC that it was actually dug. This was maintained through Roman and Byzantine times but was filled in by the Arab rulers in the 8th century AD for military reasons.

Subsequently, the Venetians in the 15th century and the French in the 17th and 18th centuries considered creating a link to the Mediterranean but nothing happened until the French again, under Napoleon, took up the idea seriously and surveyed a route. However, nothing came of this either, due

to the prevailing belief that the Mediterranean and Red Seas were at different levels and so locks would be needed.



Figure 1: *Suez Canal – the Serapeum.*

In the case of the Corinth Canal, the first known attempt was made back in the 7th century BC, when the local ruler Periander of Corinth wanted a short cut to take boats from the Saronic Gulf in the Aegean Sea to the Gulf of Corinth in the Ionian Sea. He decided against a canal, however, but instead created a paved trackway that could be used to drag boats across the isthmus. This was called the Diolkos and parts of it are still visible today at the western end of the canal. In 67 AD, the Romans under Nero started to build a canal but work stopped when Nero died shortly afterwards. As with the Suez Canal, the Venetians also showed an interest, this time in the 17th century but nothing materialised.

It wasn't until the mid to late 19th century that the canals that we know today were actually constructed.

In Egypt, Ferdinand de Lesseps took up the idea again in 1854. He was the son of a French diplomat and, as a child in the early part of the century, had lived in Egypt as his father had been posted there. During that time, he became acquainted with the son of the Turkish Viceroy of Egypt, Sa'id Pasha. Ferdinand subsequently became a diplomat as well and was posted to Alexandria in 1832, where he read a book written by one of Napoleon's engineers about the proposal for a Suez canal and became inspired by the concept. In 1854, by which time his diplomatic career had ended, he was contacted again by Sa'id Pasha, now newly appointed as Viceroy, with the suggestion that the canal proposal be revived. De Lesseps was given the concession to build and operate a canal and by 1858 had produced a plan and persuaded the public to subscribe the capital required.

Work started in 1859. It involved excavating 64km through soft alluvium and sand to link up with 96km of existing depressions. The work started in the north, where Port Said now stands and was originally done by hand, with large numbers of locals being used as forced labour. There was no fresh water in the area so initially it was brought in by camels. To solve that problem, a side canal was dug to bring

fresh water from the Nile delta, using the route the Ancient Egyptians used and extending it north to Port Said and south to Suez.

After a few years of suffering from labour problems, mechanical dredgers and steam shovels were introduced which speeded up the construction. It was found that the dredgers were more economical than dry excavation, so sections of the route were deliberately flooded where possible, using water from the side canal, which was routed at a higher level. Once the line of the canal was flooded, a dredger was brought in to gradually lower the ground to create the main canal bed. By this means the three main obstacles to the route were successfully cut through, being the El Guisr ridge in the northern section (max. 18m (59ft) above sea level), the Serapeum plateau just north of the Bitter Lakes (max. 11m (35ft) above sea level) and the El Chalouf ridge near Suez (max. 11m (36ft) above sea level).

The canal was officially opened in 1869. At this stage it was only 8m deep and 22m wide at the bottom, with passing bays to allow ships to go both ways. Since then, the canal has been widened and deepened many times and between 2014 and 2016 a completely new side channel was constructed north of the Bitter Lakes that allows two-way traffic in the central part of the route.

Dredging still continues today (Fig. 2), as does fishing (Fig. 3), which seems to be perilously close to the shipping lanes.

Access across the canal varies from the sophisticated, as evidenced by the new railway swing bridge at El Ferdan (Fig. 4) to the more basic motorised pontoon bridge (Fig. 5).



Figure 2: Dredger.



Figure 3: Fishing.



Figure 4: Railway swing bridge.



Figure 5: Motorised pontoon bridge.

Back in Greece, the idea of a canal across the Corinth isthmus revived after independence was achieved in 1830. After a few missteps, the success of the Suez Canal led to a French consortium

being given a concession to build the canal. They used the same line as the Romans, even reusing the exploratory shafts that had been excavated in the middle of the isthmus to check the geology.

Work started in 1881 but stopped in 1888 after the original builders went bankrupt. A new consortium was formed in 1890, and the canal was finally opened in 1893. It is 6.4km long but only 24.6m wide, which restricts the commercial shipping that can use the route.



Figure 6: The Corinth Canal.

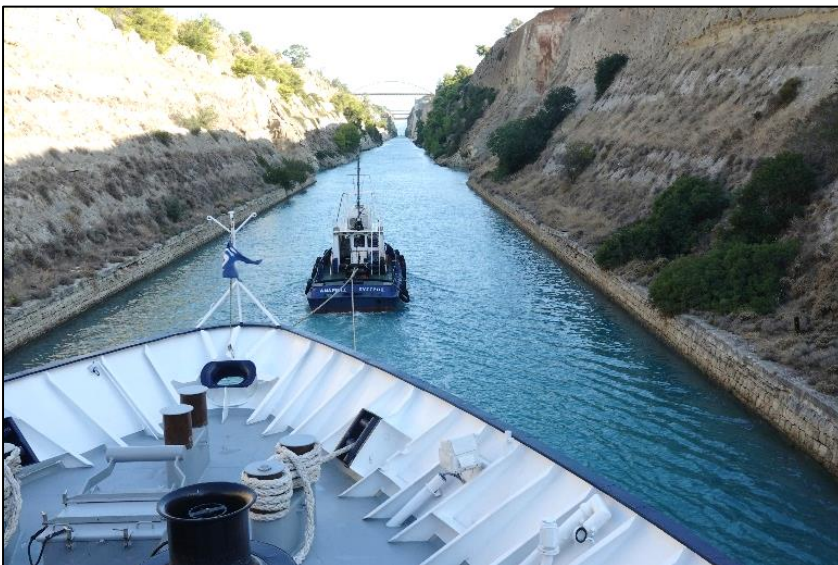


Figure 7: Tug guiding ship through the Corinth Canal.

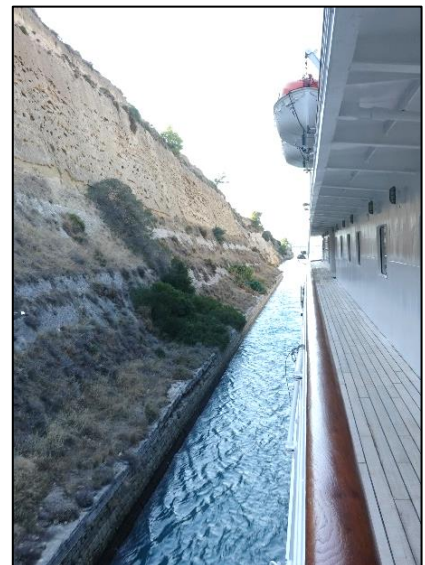
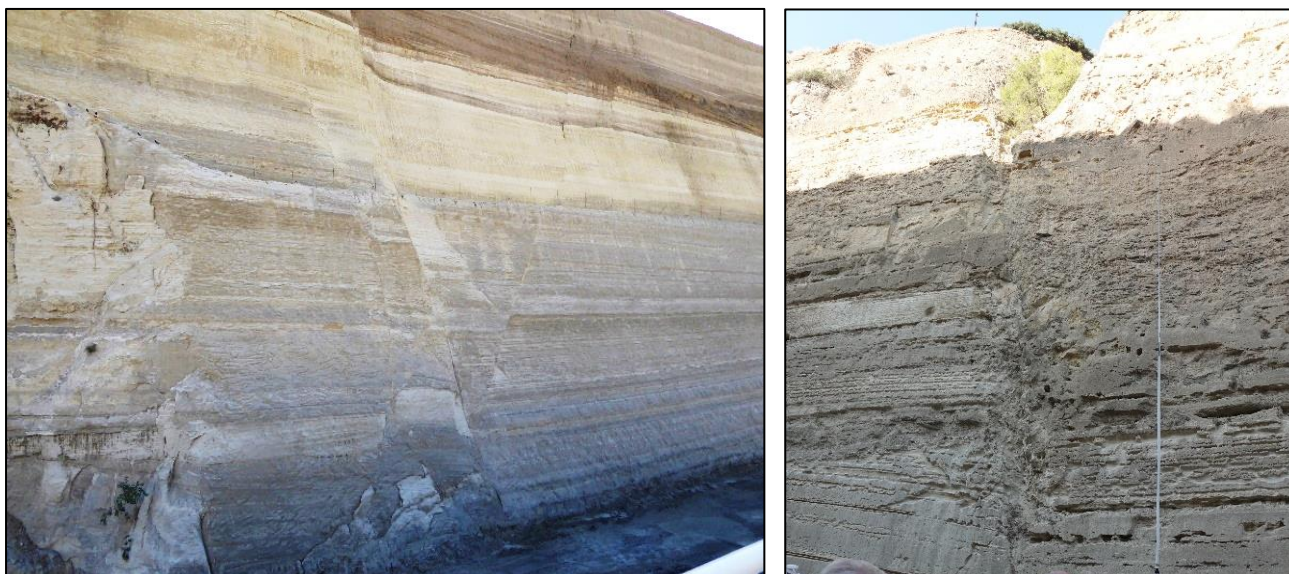


Figure 8: Close to the edge!

Our ship was 17m wide and therefore had to be guided through the canal by a tug at the front (Fig. 7). As can be seen (Fig. 8), there wasn't a lot of room at the sides.

Throughout its history, the canal has suffered from landslips as the isthmus is in an active seismic region and the limestone that the route traverses is heavily faulted (Figs. 8 and 9).



Figures 8 & 9: *The sides of the canal showing numerous faults.*

In addition, the wash created by the passing ships eroded the sides of the canal, causing further landslips and requiring additional works to reinforce the banks with masonry walls and, latterly, sheet piling. The most recent landslip was in January 2021, with the canal reopening in June 2022. Since then, it has been closed regularly over the winter period to allow restoration works to continue.



Figure 10: *Submersible road bridge.*

One interesting new feature is that submersible bridges were added to both ends of the canal in 1988. These are lowered down to the seabed when boats want to use the canal.



Figure 11: Tourists line the bridge.

In conclusion, the main difference between the two canals is that whereas the Suez Canal is a commercial success, the Corinth Canal was a commercial failure and is now primarily used as a tourist attraction, both for those on the boats and those lining the bridges (Fig. 11).

References:

1. https://en.wikipedia.org/wiki/Suez_Canal
2. <https://www.britannica.com/topic/Suez-Canal>
3. <https://www.suezcanal.gov.eg/English/About/SuezCanal/Pages/CanalHistory.aspx>
4. https://en.wikipedia.org/wiki/Corinth_Canal
5. <https://www.britannica.com/topic/Corinth-Canal>
6. <https://corinthcanal.com/the-canal/the-history-of-the-canal/?lang=en>

Image Of The Day 1

'Planet parade' photo captures 7 planets in a line over Earth — possibly for the 1st time ever

Ben Turner, LiveScience

28 February 2025

A stunning photo has captured all seven of our neighboring planets in Earth's sky at the same time, possibly for the first time ever. The composite image, captured by astrophotographer Josh Dury, shows Mars, Jupiter, Uranus, Saturn, Venus, Neptune and Mercury in alignment thanks to a rare "planetary parade" taking place this weekend for the first time since 1982.

While spacecraft, such as NASA's Voyager 1, have snapped all the planets in the sky from space, terrestrial cameras have only recently become advanced enough to capture them from the ground — meaning Dury's photo is likely the very first of its kind.

"Seven (arguably, 8) is a feat that to my prior knowledge has not been achieved before," Dury told **Live Science** in an email — suggesting that if we include Earth itself, visible in the foreground, the image's planet total comes to eight.

"This image could hold a record for being the first of its kind to photograph all the planets of the solar system, blended into a stitched panoramic image."



The composite image shows seven of the solar system's planets from Earth, after sundown on Feb. 22. (Image credit: Josh Dury)

Dury captured the image just after sundown on Feb. 22 from The Mendip Hills — a range of limestone hills in Somerset in the U.K.

To achieve this photographic feat, Dury created a composite shot made up of several panes, with each pane captured in multiple exposures. To locate Saturn, Neptune and Mercury, which were dimmer and closer to the western horizon, Dury used astronomy software to generate models of the night sky and match planetary locations to nearby star fields. He then used a high dynamic range (HDR) camera setting to capture the planets' faint light.

"I noted that when I took the image that it would not, of course, be possible to photograph the lowest planets at the moment of sunset — glare from the sun rendering this task impossible," Dury said. "Therefore, this image is a record of the first possible glimpse of the planets as light from the sun diminished." The night-sky models enabled him to later identify the planets in the image.

Planetary conjunctions occur when two or more planets appear to be close together in the sky. Of course, this is only from our perspective of the cosmos on Earth — in reality the planets remain extremely far apart.

These conjunctions aren't rare, but they get rarer with each planet added to the chain. For example, the three innermost planets — Mercury, Venus and Earth — align within 3.6 degrees in the sky every 39.6 years. For all of the solar system's eight planets to align as closely, it would take 396 billion years, something that has never happened and won't happen before the sun becomes a red giant, consuming Mercury, Venus and likely Earth in the process.

However, it is a little less unusual for all seven planets to appear spread out on the same side of the sun, as they do in Dury's image and in the night sky right now. Another seven-planet parade is expected to be visible from Earth in 2040.

Reference:

https://www.livescience.com/space/astronomy/planet-parade-photo-captures-7-planets-in-a-line-over-earth-possibly-for-the-1st-time-ever?utm_term=8DEBC9E5-6C7F-4337-AFFF-D9A51CC6C2C0&lrh=840a98cbe34ba22d824f6df096d90a0be8fe4763876a779b0361304855882d8f&utm_campaign=368B3745-DDE0-4A69-A2E8-62503D85375D&utm_medium=email&utm_content=DA2E5F4C-3DA4-4CB6-8A08-B5F4FCABC464&utm_source=SmartBrief

News

Giant horned dinosaur's fossils were destroyed in WWII — but photos reveal it was an unknown species

Patrick Pester, *LiveScience*

16 January 2025

Scientists have unveiled a giant horned dinosaur from Egypt called *Tameryraptor markgrafi* after discovering lost photos of fossils destroyed in WWII.

Researchers have identified a giant new dinosaur species after uncovering lost photos of fossils destroyed in World War II.

The newly named species, *Tameryraptor markgrafi*, or "thief from the beloved land," roamed Egypt 95 million years ago, and at 33 feet (10 meters) long, it is one of largest known land carnivores to ever roam the planet.

German scientists first discovered the fossilized remains of this Cretaceous dinosaur in the Bahariya Oasis in Egypt's Western Desert in 1914. They were then held at the **Bavarian State Collection for Paleontology and Geology (BSPG)** in Germany until 1944, when the building they were in burned down during a WWII bombing raid, destroying the fossils, according to a BSPG statement released on Tuesday (Jan. 14).

Researchers recently found previously unknown photographs of the fossils in the Huene Archive at the University of Tübingen in Germany, which showed them on display in the 1940s. At the time of the photos, the fossils were thought to belong to a large theropod dinosaur called ***Carcharodontosaurus*** — but closer inspection of the photos revealed a prominent horn, an enlarged frontal brain and other features absent on other *Carcharodontosaurus* fossils.

"At first I was a bit confused when we found the new photos, and then I was super excited," study first author Maximilian Kellermann, a doctoral student at the BSPG, told **Live Science** in an email. "The more we looked, the more differences we found."

The researchers published their findings on Tuesday in the journal **PLOS One**.

The Egyptian fossils were first categorized by German paleontologist Ernst Stromer (1871-1952), who thought the fossils matched a dinosaur unearthed in Algeria that was only known by its teeth,



Artist reconstruction of *Tameryraptor markgrafi*.
(Image credit: Joshua Knüppe)

according to the study. Stromer named a new group, *Carcharodontosaurus*, to encompass both sets of fossils, and the Egyptian specimen was considered the prime example of the group.



Skeletal remains of Tameryraptor markgrafi in Alte Akademie before they were destroyed in WWII. (Image credit: University Archives Tübingen)

Over the years, paleontologists have unearthed more members of the *Carcharodontosaurus* group. In the 1990s, a relatively complete carcharodontosaurid skull from Morocco became the type specimen to represent the group, given that the Egyptian fossils were gone. Comparing the newfound photos of the lost fossils, along with Stromer's old descriptions and illustrations, with this type specimen, it became very clear that the former didn't fit within the *Carcharodontosaurus* group.

"Exceptional case"

Researchers don't normally introduce a new species of dinosaur without observing fossils directly, but the study authors said that this was an "exceptional case." The new genus, *Tameryraptor*, combines the ancient name for Egypt, "Ta-Mery," or "promised land," and raptor, which is Latin for "thief." The species name *markgrafi* honours the German fossil collector Richard Markgraf, who excavated the dinosaur from the Bahariya Oasis in 1914, according to the study.

The new study suggests that dinosaur life was richer across North Africa than previously thought, but also that more research is needed to fully understand the region's dinosaurs.

"There are some other taxa that are also seemingly shared between Egypt and Morocco, such as *Deltadromeus* or the famous *Spinosaurus*, which I suspect are also quite distinct if one takes the time to go through Stromer's old texts and the old Archives," Kellermann said.

Reference:

https://www.livescience.com/animals/dinosaurs/giant-horned-dinosaurs-fossils-were-destroyed-in-wwii-but-photos-reveal-it-was-an-unknown-species?utm_term=8DEBC9E5-6C7F-4337-AFFF-D9A51CC6C2C0&lrh=840a98cbe34ba22d824f6df096d90a0be8fe4763876a779b0361304855882d8f&utm_campaign=368B3745-DDE0-4A69-A2E8-62503D85375D&utm_medium=email&utm_content=063F8492-6876-40E3-884F-5C02A3E7C454&utm_source=SmartBrief

Image Of The Day 2

Saharan dust transported over the Mediterranean Sea

Date: 04/02/2025

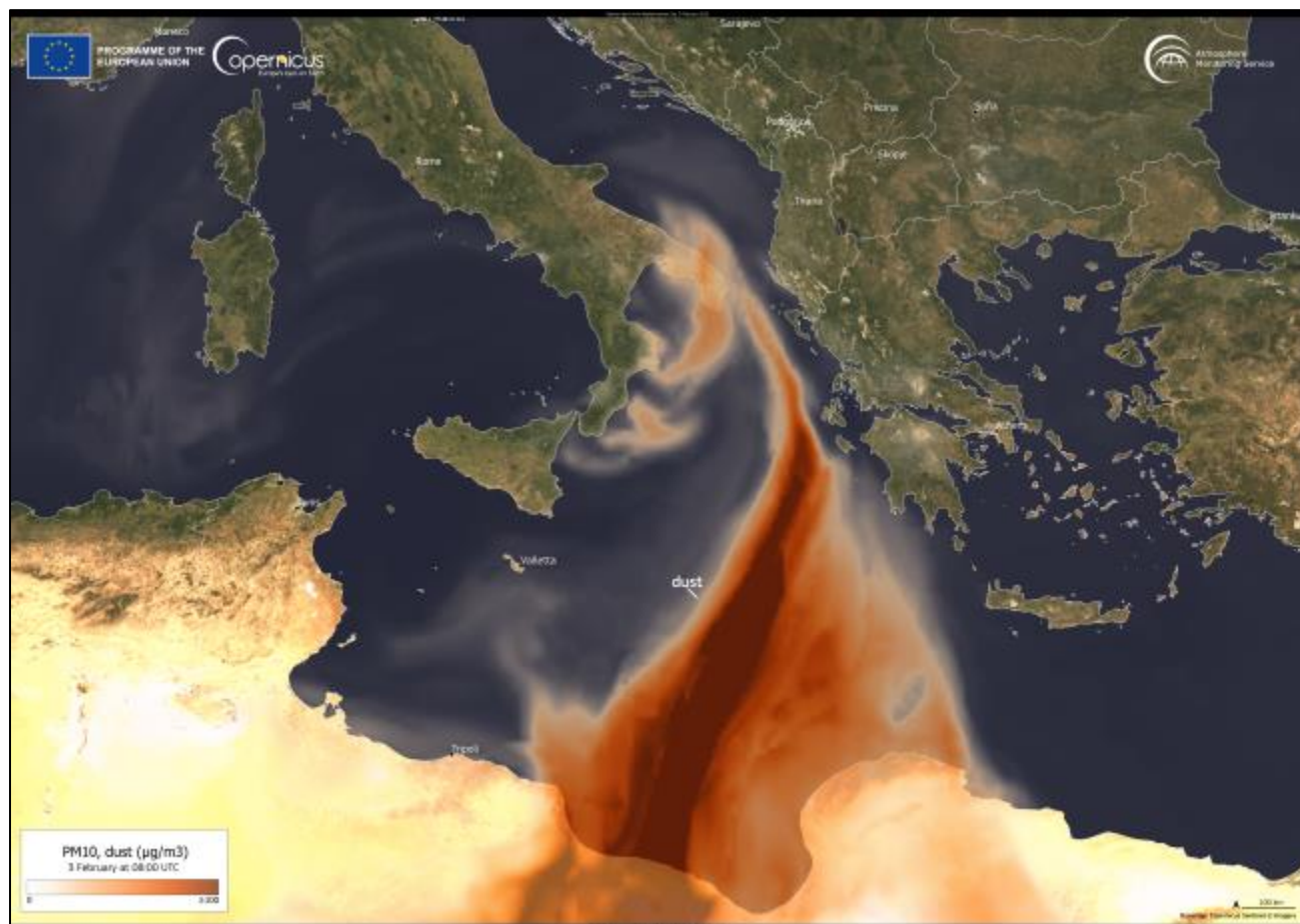
Location: Mediterranean Sea

Credit: European Union, Copernicus Atmosphere Monitoring Service Data

On 2 February 2025, residents in southern Italy were affected by a cloud of Saharan dust transported there by a cyclone originating in North Africa. The dust was carried by strong gusts of wind to Sicily and Calabria, where the sky turned a yellowish hue. The suspension of dust in the atmosphere can affect air quality, visibility, and respiratory health.

The following day, the dust was transported eastward into Greece. This Copernicus data visualisation, generated with data from the Copernicus Atmosphere Monitoring Service, depicts the dust plume southeast of Italy and approaching Greece as of 3 February at 8:00 UTC.

The Copernicus Atmosphere Monitoring Service (CAMS) monitors and forecasts air quality on a global scale, assessing the concentration and dispersion of atmospheric pollutants and aerosols and informing actions to keep affected communities safer.



Reference:

<https://www.copernicus.eu/en/media/image-day-gallery/saharan-dust-transported-over-mediterranean-sea>

News

The Bungle Bungles: Towering domes in the Australian outback that contain traces of the earliest life-forms on Earth

Sascha Pare, LiveScience

17 January 2025

The Bungle Bungle Range in Western Australia is a collection of rock domes forged from ancient seabeds and flanked to the northeast by a prehistoric meteor impact crater.



The Bungle Bungles were deposited approximately 360 million years ago. (Image credit: Anja Hennern/Getty Images)

The Bungle Bungles are a collection of sandstone towers with distinctive orange and dark-grey stripes in Western Australia. Although Indigenous people have inhabited the area since time immemorial, the towers only came to the attention of the rest of the world in the 1980s, when filmmakers recorded them while shooting a documentary.

The Bungle Bungles are the main feature of **Purnululu National Park**, a protected area spanning almost 600,000 acres (240,000 hectares) in the Kimberley region. Due to its areas of "incredible natural beauty" and "outstanding geological value," Purnululu National Park was named a **UNESCO World Heritage Site** in 2003.

The sandstone towers at Purnululu National Park (Purnululu means "sandstone" in the local Indigenous language) are a stunning example of cone karst — landscapes made up of beehive-shaped hills and rocky ground connected to form an area structured like an egg box.

They rise about 980 feet (300 meters) above the grassy plains that surround the Bungle Bungles and sit around 6 miles (10 kilometres) southwest of the Piccaninny crater, a meteor impact structure that formed less than 360 million years ago, according to NASA's Earth Observatory.

The sandstone itself was deposited roughly 360 million years ago and eroded through the joint action of wind and water over the past 20 million years to form the relief we see today, according to Western Australia's Department of Biodiversity, Conservation and Attractions (DBCA).

The orange and dark-grey stripes are evidence of the Bungle Bungles' ancient oceanic origins, with each band resulting from a layer of historic seabed. The alternating colours are caused by the presence of either ancient microscopic algae (grey) in moister layers or oxidized iron compounds (orange) in dry layers of rock. In the orange layers, the rock dried out too quickly for the microscopic algae — also known as cyanobacteria, the earliest known form of life on Earth — to grow, according to the DBCA.

The Bungle Bungles are accessible to the public, with several hiking routes available through the gorges between the striped sandstone domes. The landmark is home to 130 bird species and myriad other native animals, including nail-tail wallabies (*Onychogalea*) and short-eared rock wallabies (*Petrogale brachyotis*).

Reference:

https://www.livescience.com/planet-earth/geology/the-bungle-bungles-towering-domes-in-the-australian-outback-that-contain-traces-of-the-earliest-life-forms-on-earth?utm_term=8DEBC9E5-6C7F-4337-AFFF-D9A51CC6C2C0&lrh=840a98cbe34ba22d824f6df096d90a0be8fe4763876a779b0361304855882d8f&utm_campaign=368B3745-DDE0-4A69-A2E8-62503D85375D&utm_medium=email&utm_content=87DD7340-162B-4CA2-96A9-EEB7F839173E&utm_source=SmartBrief

Centrica may close UK's largest gas storage site. Is the energy system really ready?

Nils Pratley, *The Guardian*

21 January 2025

The risks need accessing as a renewables-heavy set-up would make demand for gas more volatile and unpredictable

Monday was another of those *dunkelflaute* days when the wind barely blows, the sun doesn't shine and it's cold. At times, gas-fired power stations were generating 70% of the UK's electricity while windfarms and solar facilities were contributing as little as 7% combined.

It was a reminder of why, even under the government's rapid programme to decarbonise the electricity grid by 2030 by expanding renewables, the current gas-fired capacity of 35GW will be retained as backup. The fossil-fuelled plants may stand idle most of the time – they are scheduled to account for only “up to 5%” of generation over a full year in 2030, versus 34.7% in 2023 – but, when they're needed, they will sometimes still be operating at full pelt.

So here's a question: what is the right level of gas storage for an energy set-up that will have to be more flexible in future?

It is also a pressing question because Centrica, having partly reopened the large Rough storage facility off the Yorkshire coast as recently as 2022, is already suggesting it may close it again. The chief executive, Chris O'Shea, revealed at a City presentation last month that Rough would make an operating loss of between £50m and £100m in 2025. “Making material losses is not something that is either sustainable or will be sustained by us,” he said.

The economics of gas storage, the company says, only work when the difference, or spread, between summer and winter prices is wide. That was the case in the two years after Russia's invasion of

Ukraine, but not now. Centrica has not ruled out closure of Rough, which currently represents half the UK's gas storage capacity, before next winter.

One reaction to such warnings-cum-threats is to say Centrica is engaged in self-interested lobbying in search of its long-desired long-term deal with the government that would also cover eventual conversion of Rough to store hydrogen, the coming energy source (possibly) for the UK's industrial plants in the 2030s.

Thus its comments a couple of weeks ago, during another dunkelflaute event, that gas storage levels in the UK were "concerningly low", met with a chorus of scepticism. They sounded to some as too self-interested. The Department for Energy Security and Net Zero said it had "no concerns" about supplies this winter.

Yet it is also true that outright closure of Rough would – possibly – change the calculations in future. Talk to energy system experts and they make two detailed points. First, the one that doesn't suit Centrica's case: the importance of Rough is overstated because it can't pump huge volumes when they are most needed (the site was only partly reopened in 2022, so its pressures are low); the facility is really more of a balancing mechanism, alongside other sources such as liquefied natural gas shipments and interconnectors from Norway; the UK coped during the "beast from the east" in 2018 when Rough was shut.

But then there's the second point: the real issue, they say, is whether the UK needs an expanded Rough as a strategic gas reserve, or a form of insurance against future geopolitical and supply shocks. On that score, even many advocates of maximum wind and solar, as soon as possible, would agree that the case for storing more gas is strong because the backup system has to be secure.

While most gas in the UK is used for heating, a renewables-heavy system makes demand for gas for generation more volatile and unpredictable. To protect consumers from price spikes, runs the argument, a strategic reserve becomes more important than in the past – to avoid, for example, paying the nose-bleed rate of £5,000 a megawatt hour (MWh) to a couple of gas power station owners, as happened this month.

There are pros and cons, in other words. But you will search in vain for a clear assessment in the major strategic documents produced at the end of last year – the Clean Power 2030 advisory report by Neso, the national energy system operator, and the government's own 2030 Action Plan. Gas storage barely got a mention. Meanwhile, the immediate future of Rough is regarded as only a commercial matter for Centrica.

That feels like an oversight. The UK already has some of the lowest levels of gas storage in Europe. If capacity could soon halve, shouldn't somebody be modelling the risks? Renewables are the exciting stuff, but the gas side will still matter for a while yet.

Reference:

<https://www.theguardian.com/business/nils-pratley-on-finance/2025/jan/21/centrica-may-close-uk-largest-gas-storage-site-is-the-energy-system-really-ready>

First dinosaurs may have evolved in northern Africa and South America

James Ashworth, NHM

23 January 2025

The remains of the earliest dinosaurs could lie beneath the Amazon rainforest and the Sahara Desert.

New research suggests that dinosaurs evolved in a much hotter and drier part of the world than realised, with many early fossils still to be uncovered.



Herrerasaurus is one of the earliest known dinosaurs - but the group are thought to have been evolving for millions of years by the time it appeared. (© Danny Ye / Shutterstock)

The origins of the dinosaurs are shrouded in mystery – but new research might have revealed the best places to look for clues.

At the moment, the oldest known definitive dinosaurs are 230-million-year-old fossils from Argentina and Brazil, including species such as **Eoraptor** and **Herrerasaurus**. However, these animals are already recognisably dinosaurs, which suggests that they had already been evolving for millions of years before.

The hunt for these missing ancestors has so far been largely unsuccessful, but a study published in **Current Biology** has suggested a possible reason. It might be that palaeontologists haven't been looking in the right place.

By assessing the fossil record and the dinosaur family tree, the researchers' models suggest that the **first dinosaurs** evolved in the dry savannahs and hot deserts of the ancient supercontinent Gondwana. This region would go on to form the Amazon, the Congo Basin, and the Sahara Desert.

Joel Heath, a PhD student who led the new research, says that the finding could “change everything” about the origins of the dinosaurs. “Until recently, it was thought dinosaurs must have evolved in southern Gondwana, in what is now Brazil and Argentina, because the oldest dinosaur fossils have been found there,” Joel explains.

“However, the fossil record has large gaps, so it can't be taken at face value. Our modelling suggests that the earliest dinosaurs might have originated in low-latitude Gondwana instead. While no dinosaur fossils have yet been found in these places, this might be due to a mix of inaccessibility and a relative lack of research efforts in these areas.”

Finding the missing dinosaur ancestors

Scientists have named hundreds of species of dinosaurs, but our knowledge of where they came from is still quite shaky. Large parts of the dinosaur fossils record are still missing, especially from the Triassic Period when dinosaurs first evolved.

“While Europe and North America generally have a pretty good fossil record, it's not the case in other areas of the world,” says Joel. “While some countries, like Brazil, Argentina and China are catching



While some scientists believe Nyarasaurus could be a very early dinosaur, others believe it's a close relative. (© The Trustees of the Natural History Museum, London)

up, there are many places where there only a few fossils have ever been found.” This makes it very difficult to understand the dinosaurs’ origin and key moments in their evolutionary history.”

In the past, palaeontologists have tried to understand the relationships of early dinosaurs by assembling a **phylogeny**, or family tree. By working out how different species relate to each other and where they were found, scientists can track the family tree back to the start to get an idea of where the first dinosaurs might have lived.

However, when the tree is full of gaps there’s a risk that the results might not reflect reality. To address this, Joel and the authors of the new study needed to tell apart where dinosaurs never lived and where their remains simply haven’t been found yet.

“We examined different areas to see what land vertebrate fossils from the Triassic and Jurassic had been found there,” Joel explains. “It’s really unusual if there are no fossils at all, so we took this as a red flag that it might not be a genuine absence. There are two main possibilities. On the one hand, it could mean that the region’s rocks just might not preserve fossils from this time. On the other, it could represent a lack of research.”

By taking this into account, the team have laid out a new scenario for the rise of the dinosaurs.

A new dinosaur evolution timeline

The new theory begins near the equator in an arid region of equatorial Gondwana around 250 million years ago following the end-Permian mass extinction event that decimated much of life on Earth.

In the wake of this event, a group of reptiles known as the archosaurs began to evolve into a variety of different forms. This included the ancestors of the dinosaurs, pterosaurs and the crocodile-like pseudosuchians.

While the ancestors of the pterosaurs and pseudosuchians moved north, the predecessors of the dinosaurs stayed in Gondwana. These reptiles eventually evolved into the first dinosaurs. These are thought to have been small, dog-sized omnivorous animals that walked on two legs.

At first, all dinosaurs are thought to have looked quite similar. Major differences only started to appear when they diverged into three main groups – the ornithischians, the theropods and the sauropodomorphs.

Out of these three groups the origin of the ornithischians, which includes species such as *Triceratops* and *Ankylosaurus*, is least understood. Rather mysteriously, members of this group don't appear in the fossil record until long after the other two groups. But Joel and his colleagues think that the answer to this mystery might be hiding in plain sight.

They believe that a group of fossil reptiles called the silesaurids, generally thought to have been the closest relatives of dinosaurs, might actually be the direct ancestors to the ornithischians.

"Our models supported placing the silesaurids at the base of the ornithischians much more than any alternatives," Joel says. "It doesn't necessarily mean it's correct, but it does a better job of filling in this crucial gap in the history of the dinosaurs than other theories."

While the dinosaurs were already diverging in their early history, their biology confined them to this region of Gondwana for millions of years. Having evolved in a warm climate, the cooler regions north and south of the equator might have hindered their ability to spread further.

Dinosaurs eventually adapted to these cooler regions. It is this that may have allowed them to spread south into Gondwana, where they would eventually become species such as *Eoraptor* and *Herrerasaurus*, and north into the Laurasian supercontinent.

"The ultimate test of our models will be if early dinosaurs remain are found in the Amazon, the Sahara Desert and other former parts of low-latitude Gondwana," says Joel. "Finding them would revolutionise our understanding of Triassic ecosystems, and offer key insights into the evolutionary story of the group."

Reference:

<https://www.nhm.ac.uk/discover/news/2025/january/first-dinosaurs-evolved-northern-africa-south-america.html>

Podcast 1

Energy costs and economic growth

Prof. Dieter Helm

21 January 2025

The UK government's number one mission is to grow the economy, by building more houses and sprinting to net zero by 2030. On the energy side, we're told that investment in renewables will lower our electricity bills – costs come down, investment goes up. But despite the UK's claim to be world leader in tackling climate change, the reality is that it has amongst the highest energy costs in the developed world and global warming is still rising. This podcast examines the challenges that the government is facing that run counter to its objective to reduce energy costs. These include the massive demands on the system that come from the new data centres that need to run 24/7, the back-up supplies required when the wind doesn't blow and the sun doesn't shine, and the materials



needed to build the new green infrastructure, much of which needs to be imported and paid for by whatever it costs as a result of the sprint to achieve net zero in just 60 months. These high costs are making the UK a much less attractive place for investors, who are not flocking to its shores for its claimed low-cost electricity.

Reference:

<https://podcasts.apple.com/gb/podcast/energy-costs-and-economic-growth/id1535180456?i=1000684847152>

News

UK to dispose of radioactive plutonium stockpile

Victoria Gill, Science correspondent, BBC News

24 January 2025



140 tonnes of plutonium is currently being stored at Sellafield, the nuclear site in Cumbria. (Image source: Getty Images)

The government says it will dispose of its 140 tonnes of radioactive plutonium - currently stored at a secure facility at Sellafield in Cumbria. The UK has the world's largest stockpile of the hazardous material, which is a product of nuclear fuel reprocessing. It has been kept at the site and has been piling up for decades in a form that would allow it to be recycled into new nuclear fuel. But the government has now decided that it will not be reused and instead says it wants to put the hazardous material "beyond reach" and made ready for permanent disposal deep underground.

When spent nuclear fuel is separated it into its component parts, one of the products is **plutonium**.

Successive governments have kept the material to leave open the option to recycle it into new nuclear fuel.

Storing this highly radioactive material - in its current form - is expensive and difficult. It needs to be frequently repackaged, because radiation damages the containers it's kept in. And it's guarded by armed police. All that costs the taxpayer more than £70m per year.

The government has made the decision that the safest - most economically viable solution - is to "immobilise" its entire plutonium stockpile. That means that a facility will be built at Sellafield where the plutonium can be converted into a stable, rock-like material, which can eventually be disposed of deep underground.

In a statement, energy minister Michael Shanks, said the objective was "to put this material beyond reach, into a form which both reduces the long-term safety and security burden during storage and ensures it is suitable for disposal".

Nuclear materials scientist Dr. Lewis Blackburn from the University of Sheffield said the plutonium would be "converted into a ceramic material" which, while still radioactive, is solid and stable so it is deemed safe to dispose of. "The type of ceramic remains to be decided [and selecting the right material] is the subject of ongoing research."

Nuclear waste expert Prof. Claire Corkhill from the University of Bristol said the government's decision was a "positive step". She told BBC News that it paved the way to removing the cost and hazard of storing plutonium at Sellafield "by transforming it and locking it away into a solid, durable material that will last for millions of years in a geological disposal facility". "These materials are based on those we find in nature - natural minerals, that we know have contained uranium for billions of years."

The government is currently in the early stages of a long technical and political process of choosing a suitable site to build a deep geological facility that will eventually be the destination for all of the country's most hazardous radioactive waste. That facility will not be operational until at least 2050.

Reference:

<https://www.bbc.co.uk/news/articles/cjr8lzyg299o>

Mysterious Mars mounds may bolster case for ancient Red Planet ocean

Keith Cooper, Space.com

25 January 2025

"It's possible that this might have come from an ancient northern ocean on Mars."

Thousands of hills and mounds on Mars have been found to contain layers of clay minerals, which formed when running water interacted with the rocks during a period when Mars' northern reaches were flooded.

"This research shows us that Mars' climate was dramatically different in the distant past," Joe McNeil of the Natural History Museum in London said in a statement. **"The mounds are rich in clay minerals, meaning liquid water must have been present at the surface in large quantities nearly four billion years ago."**



Some of the Martian buttes and mesas on the Red Planet's northern plains. Inside these eroded mounds are layers of clay formed by liquid water. (Image credit: ESA/DLR/FU Berlin)

Mars is a planet of two halves. To the south are ancient highlands, while to the north are eroded, mostly low-lying plains where it is believed a large body of water once existed. Indeed, the evidence

is now overwhelming that Mars was once warmer, and wet, with rivers, lakes and possibly even oceans that existed almost four billion years ago.

Now researchers led by McNeil have found further supporting evidence for a northern sea, in the form of more than 15,000 mounds and hills up to 1,640 feet (500 meters) tall that contain clay minerals.

On Earth — for example, in the western United States — we find such hills in the form of buttes and mesas in desert areas, where rock formations have been eroded by the wind for millions of years.

On Mars, we also find buttes and mesas. McNeil's team studied a region about the size of the United Kingdom that is filled with thousands of these mounds. They are all that remain of a highland area that has retreated by hundreds of kilometers and been eroded away, by water and wind, in Chryse Planitia to the north and west of the southern highland area known as Mawrth Vallis. Chryse Planitia was the landing site of NASA's Viking 1 mission in 1976 and is a vast lowland region formed by an ancient impact.

Using high-resolution images and spectral composition data from the HiRISE and CRISM instruments on NASA's Mars Reconnaissance Orbiter, as well as the European Space Agency's Mars Express and ExoMars Trace Gas Orbiter, McNeil's team showed that the Martian buttes and mesas are made from layered deposits, and among those layers are up to 1,150 feet (350 m) of clay minerals, which form when liquid water soaks into and interacts with rock for millions of years.

"[This] shows that there must have been a lot of water present on the surface for a long time," said McNeil. "It's possible that this might have come from an ancient northern ocean on Mars, but this is an idea that's still controversial."

Immediately below the clay layers are older layers of rock that contain no clay; above the clay layers are younger layers of rock that also contain no clay. It seems clear that the clay layers are from a specific wet period in Mars' history during the Red Planet's Noachian era (spanning the time between 4.2 and 3.7 billion years ago), which is a geological period characterized by the presence of liquid water on Mars.

"The mounds preserve a near-complete history of water in this region within accessible, continuous rocky outcrops," said McNeil. "The European Space Agency's upcoming Rosalind Franklin rover will explore nearby and could allow us to answer whether Mars ever had an ocean and, if it did, whether life could have existed there."

The area containing the clay-bearing mounds is geologically connected to Oxia Planum, which is where Rosalind Franklin will be headed when it launches in 2028 in search of past life on Mars. It now seems promising that Rosalind Franklin is indeed heading to a location that gives it the best chance of finding evidence for past Red Planet organisms.

The findings were published on January 20th in the journal **Nature Geoscience**.

Reference:

https://www.space.com/the-universe/mars/mysterious-mars-mounds-may-bolster-case-for-ancient-red-planet-ocean?utm_term=8DEBC9E5-6C7F-4337-AFFF-D9A51CC6C2C0&lrh=840a98cbe34ba22d824f6df096d90a0be8fe4763876a779b0361304855882d8f&utm_campaign=58E4DE65-C57F-4CD3-9A5A-609994E2C5A9&utm_medium=email&utm_content=431177AD-3D71-4F48-ACC7-807C87AC6E4F&utm_source=SmartBrief

Earth from space: Italy's 'ticking time bomb' plays peek-a-boo through a mysterious hole in the clouds

Harry Baker, *LiveScience*

28 January 2025

This stunning satellite photo shows one of the world's most famous and potentially dangerous volcanoes, **Mount Vesuvius**, playing a game of peek-a-boo with an orbiting spacecraft through a strangely shaped hole in the clouds.

Vesuvius is a 4,203-foot-tall (1,281 meters) stratovolcano located next to the city of Naples along the western Italian coastline. It is most famous for a massive eruption in A.D. 79, which destroyed the Roman cities of Pompeii and Herculaneum, and killed around 2,000 people, around half of which were perfectly preserved by the pyroclastic flows, along with their homes and possessions.

Today, around 800,000 people live on the volcano's slopes and up to 3 million people reside within the potential danger zone of future eruptions, making Vesuvius **"one of the world's most dangerous volcanoes,"** according to **NASA's Earth Observatory**.



The caldera at the summit of Mount Vesuvius was perfectly aligned with a hole in the clouds when the Landsat 8 satellite passed overhead in 2022. (Image credit: NASA/Landsat/Joshua Stevens)

In the image, Vesuvius' caldera — a large bowl-like depression caused by the collapse of the mountain's summit during a previous eruption — appears to peer up through a gap in the clouds like a giant eye.

A large, curved ridge can also be seen near the top of the cloud gap. This is the remnant of Mount Somma — an ancient volcano that once stood in the same spot as Vesuvius, before the newer volcano's cone grew from its centre.

It is unclear exactly what caused the gap in the otherwise thick clouds covering Vesuvius and Naples.

However, the circular shape of the hole is similar to circular holes punched in the clouds by airplanes, known as "fallstreak holes." It is, therefore, plausible that a plane taking off or landing from Naples International Airport could have created the hole.

"Ticking time bomb"

Vesuvius is part of the Campanian volcanic arc — a string of volcanoes in Italy, including the currently active Mount Etna, that sits on a boundary between the African and Eurasian tectonic plates.

The volcano's last major eruption concluded in 1944. Since then, the region surrounding Vesuvius has experienced several earthquake swarms, most recently in 1999, according to the Global Volcanism Program at the Smithsonian Museum of Natural History.

Scientists also believe that the next big eruption may not be too far around the corner.

In a 2011 paper published in **Nature**, researchers described Vesuvius as "Europe's ticking time bomb" and warned that scientists and the civil authorities can't agree on how to prepare for a future eruption.

Reference:

https://www.livescience.com/planet-earth/volcanos/earth-from-space-italys-ticking-time-bomb-plays-peek-a-boo-through-a-mysterious-hole-in-the-clouds?utm_term=8DEBC9E5-6C7F-4337-AFFF-D9A51CC6C2C0&lrh=840a98cbe34ba22d824f6df096d90a0be8fe4763876a779b0361304855882d8f&utm_campaign=368B3745-DDE0-4A69-A2E8-62503D85375D&utm_medium=email&utm_content=F72C097C-1F88-44F5-9817-5EF616A2C0BF&utm_source=SmartBrief

Asteroid contains building blocks of life, say scientists

Rebecca Morelle, Science Editor and Alison Francis, Senior Science Journalist, BBC

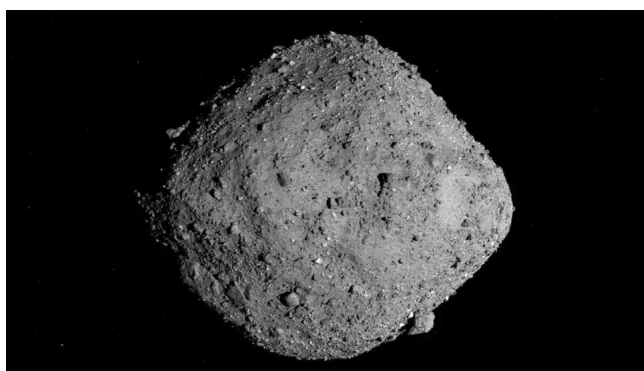
29 January 2025

The chemical building blocks of life have been found in the grainy dust of an asteroid called Bennu, an analysis reveals. Samples of the space rock, which were scooped up by a Nasa spacecraft and brought to Earth, contain a rich array of minerals and thousands of organic compounds. These include **amino acids**, which are the molecules that make up proteins, as well as **nucleobases** - the fundamental components of DNA.

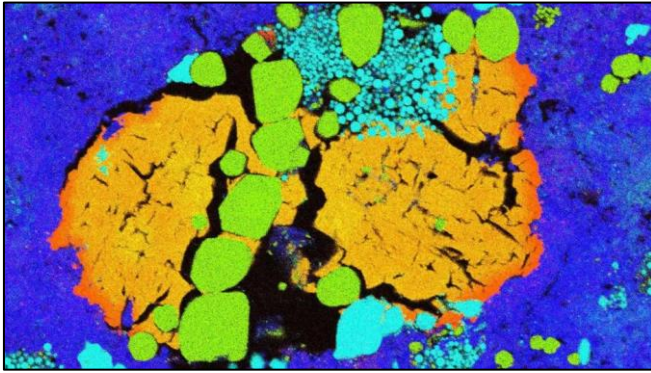
This doesn't mean there was ever life on Bennu, but it supports the theory that asteroids delivered these vital ingredients to Earth when they crashed into our planet billions of years ago.

Scientists think those same compounds could also have been brought to other worlds in our Solar System. "What we've learned from it is amazing," said Prof. Sara Russell, a cosmic mineralogist from the Natural History Museum in London. "It's telling us about our own origins, and it enables us to answer these really, really big questions about where life began. And who doesn't want to know about how life started?"

The findings are published in two papers in the journals **Nature** and **Nature Astronomy**.



Asteroid Bennu is a 500m-wide pile of boulders, rocks and rubble. (Image source: NASA/Goddard/University of Arizona)



Scanning electron microscopes revealed the minerals in the Benu sample. (Image source: Natural History Museum/Tobias Salge)

Grabbing a bit of Benu has been one of the most audacious missions Nasa has ever attempted. A spacecraft called **Osiris Rex** unfurled a robotic arm to collect some of the 500m-wide space rock, before packing it into a capsule and returning it to Earth in 2023. **About 120g of black dust** was collected and shared with scientists around the world. This might not sound like much material, but it's proved to be a treasure trove.

"Every grain is telling us something new about Benu," said Prof. Russell, who's been studying the tiny specks. About a teaspoonful of the asteroid was sent to

scientists in the UK.

The new research has shown that the space rock is packed full of nitrogen and carbon-rich compounds. These include **14 of the 20 amino acids** that life on Earth uses to build proteins and **all four of the ring-shaped molecules that make up DNA** - adenine, guanine, cytosine and thymine.

The study has also found an array of minerals and salts, suggesting water was once present on the asteroid. Ammonia, which is important for biochemical reactions, was discovered in the sample too.

Some of these compounds have been seen in space rocks that have fallen to Earth, but others haven't been detected until now.

"It's just incredible how rich it is. It's full of these minerals that we haven't seen before in meteorites and the combination of them that we haven't seen before. It's been such an exciting thing to study," said Prof. Russell.

This latest study adds to growing evidence that asteroids brought water and organic material to Earth. "The early Solar System was really turbulent and there were millions of asteroids like Benu flying about," explained Dr. Ashley King, from the Natural History Museum.

The idea is that these bombarded the young Earth, seeding our planet with ingredients that gave us the oceans and made life possible. But Earth wasn't the only world getting hit by space rocks. Asteroids would have been colliding with other planets too.

"Earth is unique, in that it's the only place where we have found life so far, but we know asteroids were delivering those ingredients, the carbon and the water, throughout the Solar System," said Dr. King. "And one of the big things that we're trying to understand now is, if you have the right conditions, why do we have life here on Earth - and could we potentially find it elsewhere in our Solar System?"

It's a key question that scientists will continue to try and answer. They have decades of research ahead on the dust brought back from Benu, and parts of our cosmic neighbourhood still to explore.

Reference:

<https://www.bbc.co.uk/news/articles/c7vd1zjlr5lo>

Ancient duck-like creature discovered in Antarctica may be the oldest modern bird ever discovered

Kristel Tjandra, LiveScience

5 February 2025

A new and nearly complete skull of Vegavis iaai discovered in Antarctica suggests that modern birds originated before the end-Cretaceous mass extinction.

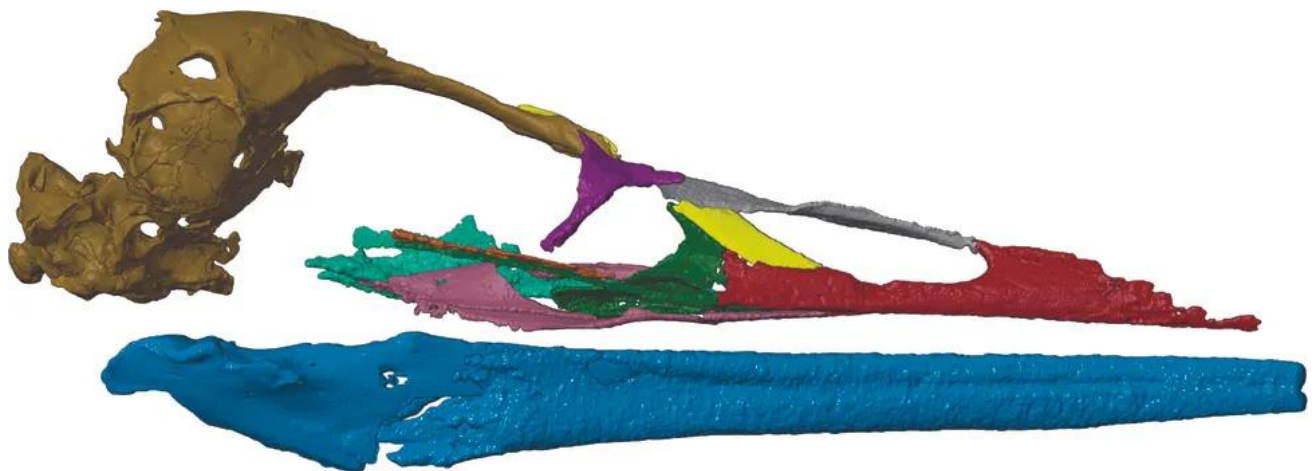
Scientists in Antarctica have discovered what may be the oldest modern bird ever found. The **69-million-year-old** fossil could finally put a longstanding debate about the origin of modern birds to rest.

The nearly complete skull belongs to *Vegavis iaai*, a waterfowl species believed to be the ancient relative of modern-day ducks and geese. The species lived at the same time as dinosaurs like *Tyrannosaurus rex* and may have survived the end-Cretaceous mass extinction, the new study suggests.

Study co-author Julia Clarke, a palaeontologist at the University of Texas, Austin reported the first *V. iaai* fossil found on Vega Island in Antarctica in 1992. The fossil was around 66 million to 68 million years old. She proposed that the species is linked to modern birds, especially waterfowl. But not everyone was convinced as scientists were missing a key piece of the puzzle — the creature's skull.

"[The initial fossil] was just a completely different part of the skeleton. And when it comes to birds, the skull has a lot of phylogenetic or informative characteristics that tell you what it is," study co-author Patrick O' Connor, an evolutionary biologist at Ohio University, told **Live Science**.

The new *V.iaai* fossil, estimated to be **68 million to 69 million years old**, was found during an expedition in 2011, but has only now been analysed. The study was published Wednesday (Feb. 5) in the journal **Nature**.



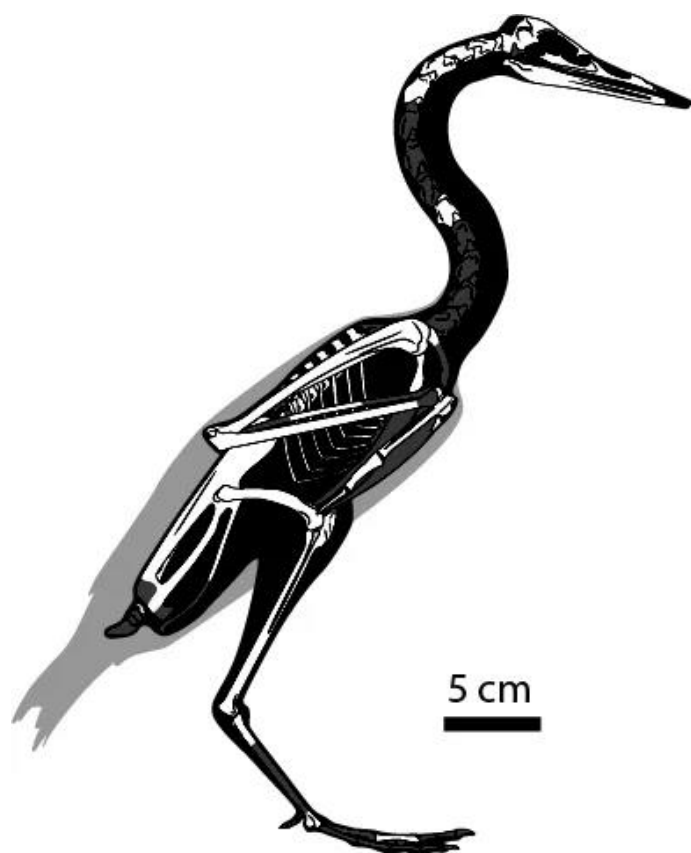
Digital reconstruction of the complete Vegavis skull showed its resemblance to modern birds (Image credit: Joseph Groenke / Ohio University and Christopher Torres / University of the Pacific)

The discovery of the new skull enabled scientists to learn more about this species and how it fits in the bird family tree. They found that, unlike pre-modern birds that existed during the Jurassic and Cretaceous periods (201.3 million to 66 million years ago), *V. iaai* has features that are similar to birds that exist today — including a brain shape typical of modern birds, and a unique bone in the upper beak. The upper beak of most pre-modern birds is made of a single bone, called the maxilla, with a little bit of another type of bone, pre-maxilla, at the tip.

"When we looked at the *Vegavis*, it's the pre-maxilla all the way. The maxilla is tiny, which is exactly what we expect from modern birds," study co-author Christopher Torres, a palaeontologist at The University of the Pacific in Stockton, California, told **Live Science**.

Using a 3D reconstruction, the scientists showed that the bird had a long, narrow beak enhanced with powerful jaw muscles, much like modern diving birds use to catch fish.

"Seeing how specialized the skull was, for me, the most impactful," Juan Benito Moreno, a palaeontologist at the University of Cambridge who was not involved in the study, told **Live Science**. "It was surprising to see an incredibly niche ecological feature so early in the evolution."



Skeletal drawing of the crown bird Vegavis iaai that lived in Antarctica 69 million years ago. (Image credit: Christopher Torres / University of the Pacific)

The giant asteroid that hit Earth at the end of the Cretaceous period (145 million to 66 million years ago) drove all non-avian dinosaurs to extinction. Land fowls (Galliformes) and waterfowls (Anseriformes) were among the earliest modern birds that existed in the age of dinosaurs.

While rapid evolution took place after the mass extinction, "studies that look at genomic comparisons of modern birds predict that the earliest divergence happened prior to that mass extinction," Torres said. "But their fossil record is extraordinarily scarce."

While the evidence pointing to *V. iaai* being associated with modern birds is strong, it's still not clear whether it really is a relative of modern ducks and geese, he said.

Daniel Ksepka, a palaeontologist at the Bruce Museum in Connecticut who was not involved in the study, agreed. "*Vegavis* seems to have been a bit of an odd duck," he told **Live Science** in an email. "Provided the phylogeny is correct, a duck-

like bill must have either evolved during the Cretaceous Period but been lost by *Vegavis* or evolved multiple times independently. It will be interesting to see if future fossils confirm one of these scenarios."

V. iaai existed when global temperatures were far higher than they are today, and when Antarctica had a temperate climate and was covered in vegetation. Its distance from the asteroid impact may have provided the species with some protection from the devastation that followed.

For O' Connor, this study is the beginning of more discoveries to be found in the Cretaceous rocks of Antarctica. "The bird story is great, but we have other group[s] of animals, and, importantly, plants, that we can track through that mass extinction event that really let us get a better handle on ecosystem response to a global environmental perturbation," he said.

Reference:

https://www.livescience.com/animals/birds/ancient-duck-like-creature-discovered-in-antarctica-may-be-the-oldest-modern-bird-ever-discovered?utm_term=8DEBC9E5-6C7F-4337-AFFF-D9A51CC6C2C0&lrh=840a98cbe34ba22d824f6df096d90a0be8fe4763876a779b0361304855882d8f&utm_campaign=368B3745-DDE0-4A69-A2E8-62503D85375D&utm_medium=email&utm_content=5F450B46-84B6-4568-A466-DA3DEFEBBC2B8&utm_source=SmartBrief

Tourists leave after earthquakes rock Santorini, but resilient locals remain

Nikos Papanikolaou, BBC News

8 February 2025

On a calm summer day on Santorini in July 1956, disaster hit. "I remember our dog and bird acting strangely. Then, the earthquake struck," 83-year-old Eirini Mindrinou recalls. "The house split open before closing again. Through the crack in the roof, I could see the sky."

The **7.8-magnitude earthquake**, which hit between Santorini and the nearby island of Amorgos, destroyed much of the island, and a powerful aftershock 12 minutes later caused further damage. Fifty-three people died.

The island, then just a quiet fishing village, was scarred and its people fled. It is much different today, rebuilt into one of Greece's most coveted tourists destinations – but this week, another mass exodus unfolded as a new wave of earthquakes hit the island.

Subtle tremors that had begun in June 2024 turned into full-fledged quakes, shaking homes and unsettling the island's residents. Families rushed to leave by air and sea, desperately seeking respite as the ground shook once again.

But not everyone is fleeing. Those that remain display the mix of courage, necessity, and a deep connection to the land that has come to define the locals of this island. They endure sleepless nights, haunted by memories of the past and the terrifying unknown of what's yet to come.



After an earthquake hit Santorini in 1956, residents took to the sea to row to safety. (Image source, AP)

"The noise from the earthquake... it's unbearable. Even in my house, it's become overwhelming," says Margarita Karamolegkou, a local businesswoman. "I've felt tired, day after day, with no end in sight... But I haven't felt fear. I can't leave my home, and I can't leave the people who've stayed behind."

This resilience is nothing new. People have withstood both social change - about 3.4 million visited the island last year, according to Mayor Nikos Zorzos - and seismic shifts. Now, as always, they have come together in solidarity.

"We're doing our best to support the vulnerable," says Matthaïos Fytros, a local volunteer and merchant. "People with disabilities, the elderly - many struggle to get around, and their homes are hard to reach. If a major earthquake hits, I know exactly where they live, and I'll get to them as fast as I can, alongside the firefighters."

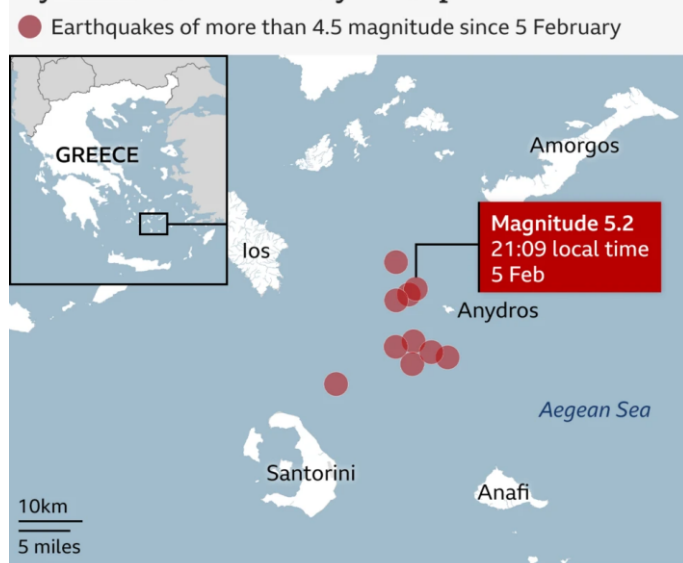
Matthaïos and others patrol the island, ensuring abandoned properties aren't looted and helping anyone in need. "I'm not afraid," he says with quiet conviction. "We're proud of our island. I just hope everything works out and that this ordeal ends soon. We'll be happy to have our visitors back with us."

The response of the state has been swift, with measures taken to address the crisis. Beneath the gratitude for the government's intervention, however, lingers a quiet bitterness. Many islanders recall the years when their cries for better infrastructure and support went unheard.

"For years, we've been asking for a better port, something to help us manage the growing number of tourists," Margarita says, her voice tinged with frustration. "We need help preserving the island's

identity - its unique environment, the seismic and volcanic forces that shape it. We're grateful for the tourists, but we also need to protect what makes Santorini special."

Cyclades Islands hit by multiple shocks



A map of Greek islands, with red dots showing the locations of 4.5 magnitude or higher earthquakes between Santorini, Ios, Anydros, Amorgos and Anafi in the Aegean Sea since 5 February. One is labelled as magnitude 5.2.

Tourism has become the lifeblood of Santorini's economy. The island contributes around 2.5% to Greece's GDP, approximately 5.9 billion euros (£4.9 billion) each year.

As the tremors continue, the future of Santorini's economy remains uncertain. Will its prosperity withstand the shaking ground? The people of Santorini worry that the island's fragility may soon extend beyond the land itself. "I regret how haphazard the island's development has been with the rise in tourism," says Eirini, who is temporarily in Athens, not out of fear, but for routine medical tests. "We've damaged the natural environment here. Now, with the earthquakes continuing, there's a real risk we could lose the entire tourist season."

Scientists may not know when the shaking will stop, but instead of succumbing to fear, some residents have chosen to understand the phenomenon, hoping that

will bring them reassurance in the face of the unknown.

"I try to think of what's happening with kindness," Margarita says thoughtfully. "It feels like something is settling down there. Everything we admire about Santorini today - the beauty, the character - has been shaped by the volcano and its seismic forces."

"We are the most beloved island," says Matthaïos, his voice full of pride. "And I believe we're the most beautiful of all the islands in Greece. We will get out of this stronger."

Reference:

<https://www.bbc.co.uk/news/articles/c8059mny2g3o>

Tremors hitting Santorini reach new strength

Nikos Papanikolaou and Robert Greenall, BBC News.

10 February 2025

Santorini has been hit by a powerful, **shallow 5.3 magnitude earthquake**, which is the strongest to strike the Greek island during recent seismic activity in the area. The tremors were felt in Athens on Monday evening and measured a focal depth of 17km (10.6 miles).

Residents of the neighbouring island Amorgos remain on high alert after the latest tremor, which followed a moderate 5.0 magnitude earthquake between the islands on Sunday evening.

The tourist hotspot has been rocked by seismic activity since January and **more than 12,800 quakes** have been detected by the University of Athens' Seismological Laboratory.

Some residents have been seen patrolling dangerous areas to deter tourists from taking photos on cliffs. Landslides have occurred in many parts of Santorini due to the frequency and intensity of the tremors and experts have not ruled out a major earthquake. Seismologists were optimistic about the intensity of the quakes starting to subside but are now concerned they are worsening.

A state of emergency will remain in place on Santorini until at least 3 March.

Sunday's quake was preceded by three smaller ones of more than 4.0 magnitude, while the three on Monday morning were also more than 4.0. Inspections found no damage to buildings in Santorini or Amorgos.

No injuries have been reported as a result of the earthquakes, which have numbered in the thousands since 26 January, but more than 11,000 people have left the islands.

Schools will remain closed on Santorini, Amorgos and several other islands on Monday and Tuesday.

A team of the Special Disaster Response Unit has set off for Amorgos from Patras with a special earthquake rescue vehicle, and technical teams are expected to inspect the electricity network on the island.

Kostas Papazachos, a professor of seismology at the Aristotle University of Thessaloniki, told Greek broadcaster ERT that the authorities had to allow for the situation to continue for most or all of February. "Let's hope that we will slowly move towards a gradual de-escalation," he said. "We will have to be a little patient and see. Let's hope that after a couple of weeks the phenomenon will start to subside." He said the possibility of a major earthquake had not been completely ruled out.

Meanwhile the cruise ship Viking Star, with 893 passengers and 470 crew, docked at the port of Souda in Crete early on Monday morning. It was due to be the first cruise ship of the season in Santorini. The ship changed its route mainly to avoid cable car overcrowding in Santorini during the seismic activity.

The previous strongest quake since the activity started was a 5.2 magnitude on Thursday. **Six and above is considered severe.**

Greece is one of Europe's most earthquake-prone countries, but scientists are puzzled by the current "clusters" of quakes which have not been linked to a major shock.

Santorini is on what is known as the Hellenic Volcanic Arc, which is a chain of islands created by volcanoes, but the last major eruption was in the 1950s.

Greek authorities have said the recent tremors were related to tectonic plate movements, not volcanic activity.

Scientists cannot predict the exact timing, size or location of earthquakes.

From 26 January to 8 February 2025, the Seismology Laboratory (SL) of the University of Athens registered **more than 12,800 earthquakes** in the Santorini-Amorgos zone.

Reference:

<https://www.bbc.co.uk/news/articles/cy485dz15qyo>

Podcast 2

Likely Cause Of The Santorini Seismic Swarm: Geologist Analysis

Shawn Willsey: Geology Explained

10 February 2025

As suggested by Angela Snowling

“Here is an easy to listen podcast from Shawn Willsey that explains the mechanism of earthquake swarm development in Greece with details of slab roll back and from 20 minutes to the end brings in comparisons in Idaho and in Yellowstone”.

Reference:

<https://www.youtube.com/watch?v=4jREQ3EdEAY>

Image Of The Day 3

January 2025, the warmest January on record globally

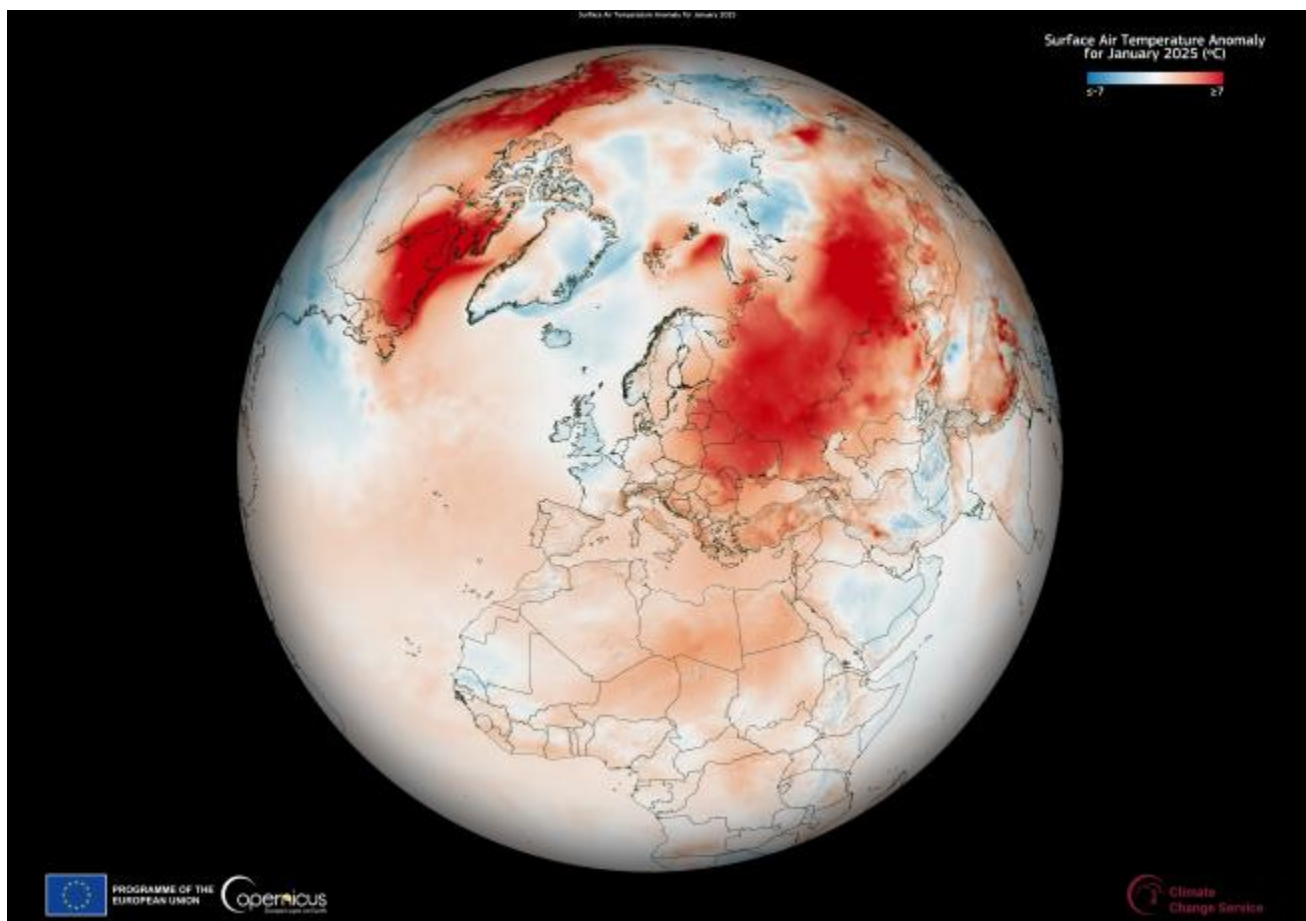
Date: 09/02/2025

Location: Europe

Credit: European Union, Copernicus Climate Change Service Data

The Copernicus Climate Change Service (C3S) has published its latest monthly Climate Bulletin, focused on key climate trends in January 2025.

The bulletin reports that **January 2025 was the warmest January on record globally**, with an average surface air temperature of 13.23°C, which is 0.79°C higher than the average for the month between 1991 and 2020. Furthermore, January 2025 reached 1.75°C above the pre-industrial level.



This data visualisation, based on C3S data, shows Europe, where the average temperature over land in January 2025 was 1.80°C, 2.51°C above the 1991-2020 average for the month.

Data from C3S is essential for monitoring trends in the global climate. These insights support decision-makers in creating and implementing climate strategies for the future.

Reference:

<https://www.copernicus.eu/en/media/image-day-gallery/january-2025-warmest-january-record-globally>

News

Scientists discover Earth's inner core isn't just slowing down — it's also changing shape

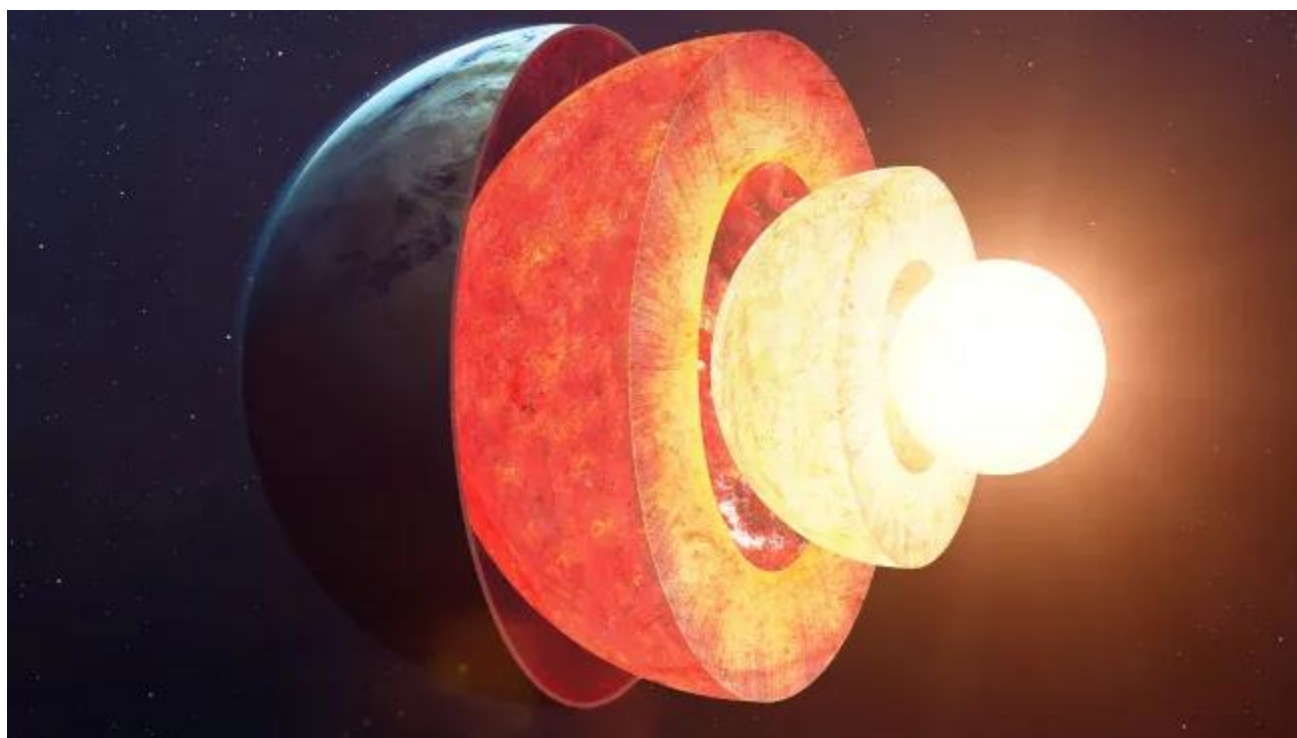
Stephanie Pappas, LiveScience

10 February 2025

The surface of Earth's inner core appears to be dynamic, changing shape as it rotates, earthquake waves reveal.

The surface of Earth's inner core may be shape-shifting, new research suggests.

The study, published Feb. 10 in the journal **Nature**, looked at earthquake waves that have skimmed the edge of the inner core, 3,200 miles (5,150 kilometres) deep. It revealed that, even when the core had rotated into a previously observed position, there were often subtle differences. These differences suggest that the inner core's surface, while solid, could be quite changeable over short periods.



Earth's core does not rotate at a consistent rate, and now scientists have discovered its shape may change too. (Image credit: forplayday/Getty Images)

"The most likely thing is the flow in the outer core is stirring up the outermost inner core a little bit and changing the topography," said John Vidale, the leader of the study and a seismologist at the University of Southern California Dornsife.

The outer core is molten metal — mostly iron and nickel. It cushions the solid inner core, which is also mostly iron and nickel. Each year, a tiny bit of the liquid outer core crystallizes and adds to the solid inner core, which is growing at a rate of about a millimetre per year.

At this border between the outer and inner core, though, the inner core hovers right at its melting point. It's solid, but not stiff. That may be why it seems to ooze around a bit in the new study, though figuring out the precise dimensions of the shape change is a challenge, Vidale told **Live Science**.

"We sort of expect that the motion could be on the order of hundreds of metres, maybe a kilometre or two," he said, "and we don't know how broad. It could be hundreds of kilometres across."

In an earlier study co-authored by Vidale, he and his collaborators found that the inner core is not rotating at a consistent rate. It rotated faster than the rest of the planet up until about 2010, when it started to slow. It now lags behind the rest of Earth's rotation.

From that research, the scientists could figure out when the same spot on the core passed under the same spot on Earth between 1991 and 2023. To measure the core, they used pairs of earthquakes that originated in the same spot in the South Sandwich Islands, in the South Atlantic Ocean, and generated waves that travelled through the core before being picked up by receivers in South and North America.

Using 168 pairs of these earthquakes, the researchers saw little change in waves that went through the same spot of the core at different times when those waves travelled into the core's interior. But they did see changes in the same spots in waves that just glanced the surface of the core, elucidating its outermost layer.

Studies into Earth's inner core

Since the first studies of the inner core in the 1990s found evidence of movement, there has been debate over whether the inner core rotates or simply experiences some shifts in its boundary, said Bruce Buffett, a geoscientist at the University of California, Berkeley, who was not involved in the work. "Maybe everyone's a little bit right," Buffett told **Live Science**.

The distinction might seem largely academic, Buffett said, but the inner core's solidification is the major driver of heat movement in the liquid outer core, which creates the planet's magnetic field. No one knows when the inner core started to solidify or how the magnetic field might have worked before that solidification. "The hope is we might be able to use the texture of the inner core and its structure and dynamics to say something about the history of the dynamics of the deepest part of the planet," Buffett said.

There are a lot of possibilities as to what could be disturbing the inner core. These ideas include "volcanoes" off-gassing material and underground landslides, Vidale said. But the most likely possibility to Vidale is that the outer core's churning motion ruffles up the inner core below.

"The interesting thing is that the surface of the inner core is dynamic," Vidale said. "It seems to be responding to the changing forces from the rotation and probably rising and falling a noticeable amount."

This interpretation is plausible, said Yi Yang, a geophysicist at Nanjing University who coauthored the first work finding changes in the core's rotation. However, Yang told **Live Science**, the data is still limited to just a fraction of the outer layer of the outer core. "We'll need to keep accumulating the data and keep searching for the inner core behaviours," Xiaodong Song, a geophysicist at Peking University who coauthored the earlier work with Yang, told **Live Science**. "I won't be surprised by future surprises about the inner core behaviours as we keep searching."

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<https://www.bbc.co.uk/news/articles/c4qx37ky3gyo>

[https://www.science.org/content/article/earth-s-inner-core-might-harbor-volcanoes-and-landslides?fbclid=IwY2xjawlYZ-](https://www.science.org/content/article/earth-s-inner-core-might-harbor-volcanoes-and-landslides?fbclid=IwY2xjawlYZ-VleHRuA2FlbQlXMQABHbFcyo6Bst0BAy4Cci6VUpZ8NrsJfYV7TPSaBymTcfh itiTAX99cZI cA ae m PgiFtZ99NaiuEdsMMsFu5Q)

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[https://www.space.com/the-universe/earth/scientists-accidentally-discover-earths-inner-core-is-less-solid-than-expected?utm_term=8DEBC9E5-6C7F-4337-AFFF-](https://www.space.com/the-universe/earth/scientists-accidentally-discover-earths-inner-core-is-less-solid-than-expected?utm_term=8DEBC9E5-6C7F-4337-AFFF-D9A51CC6C2C0&lrh=840a98cbe34ba22d824f6df096d90a0be8fe4763876a779b0361304855882d8f&utm_campaign=58E4DE65-C57F-4CD3-9A5A-609994E2C5A9&utm_medium=email&utm_content=57B1388B-E7EE-44B6-B8DF-5CA480144802&utm_source=SmartBrief)

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Incredible footage captures eruption of snow-capped Mount Etna

Jo Wade, Broadcast Journalist, BBC Weather

12 February 2025

It's a story of fire and ice in Sicily as lava spews from a snowy Mount Etna.

An explosive eruption of lava is emerging from a fracture at the base of the Bocca Nuova crater, cutting the side of the volcano in two. Lava and ash emissions from the volcano increased on Monday evening, primarily from the summit craters.

Mount Etna is continental Europe's most active volcano and over the last few days just over 30cm of fresh snow has fallen on the volcano with more expected, particularly through the weekend.



Explosive eruption from snow-capped Mount Etna. (Credit: BBC & BBC Weather)

Italian media are reporting that there is no cause for alarm, with authorities closely monitoring the situation.

Reference:

<https://www.bbc.co.uk/weather/articles/c20p9j2z3gyo>

ka (kilo-annum)	=	thousand years (10^3)	One thousand seconds	=	16.67 minutes
Ma (mega-annum)	=	million years (10^6)	One million seconds	=	11.57 days
Ga (giga-annum)	=	billion years (10^9)	One billion seconds	=	31.71 years
Ta (tera-annum)	=	trillion years (10^{12})	One trillion seconds	=	31,709.79 years

Exmoor ponies reintroduced to countryside spots

BBC News

17 February 2025

Five of the UK's oldest breed of pony have been reintroduced to the Surrey countryside. The young Exmoor ponies have been released at **Hindhead Commons** and **Devil's Punch Bowl**, which is popular with hikers.

The project is part of the National Trust's conservation efforts in the area. The ponies graze in areas of grass and gorse, which is of significant environmental benefit, maintaining different vegetation and preserving other wildlife, the trust said.

The endangered animals came from Exmoor National Park in Somerset and Devon and were purchased by Blackdown and Hindhead Supporters Group. The charity protects Exmoor ponies and works to ensure they continue to thrive. It also provides funds for the ponies in order to restock the National Trust site in Surrey.



The young Exmoor ponies have been released at Hindhead Commons and Devil's Punch Bowl. (Image source: National Trust)

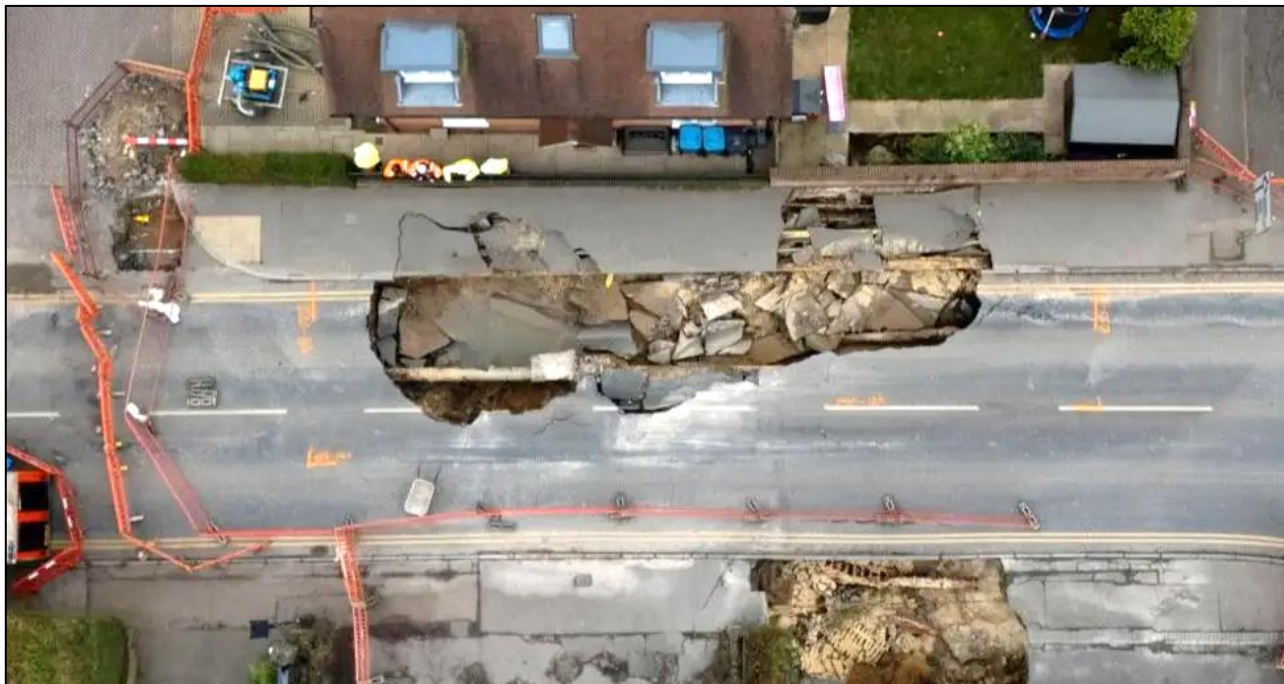
Reference:

<https://www.bbc.co.uk/news/articles/c3w8vj8v0lzo>

What is a sinkhole and how are they formed?

Esme Stallard, Climate and science reporter, BBC News

19 February 2025



A drone view shows a large sinkhole in Godstone, southern Britain, February 19, 2025, with the gaping hole extending for metres along the high street with large areas taped off.

(Image source, PA Media)

Residents in the Surrey village of Godstone have been evacuated after two sinkholes opened up this week along large parts of the high street.

The original hole first appeared late on Monday night, growing to at least 65ft (20m) long by Tuesday lunchtime.

Sinkholes are not uncommon in the UK but can sometimes appear suddenly. What might be the causes, and should we be more worried about them?

What is a sinkhole?

A sinkhole is a depression in the surface because the underlying rock has collapsed. They can be saucer-shaped or appear deeper more like shafts. If they occur in built-up areas they can appear more irregular as a road, or another structure above can distort the shape. In Godstone, the collapsed ground is under a road which is partially concealing the size of the depression.

How are they formed?

Sinkholes can appear for many different reasons - it is often due to the geology, but human factors can also be a cause.

One of the most common reasons for a sinkhole is when rocks like limestone or chalk break down. This happens because carbon dioxide from the air dissolves in rainwater to form carbonic acid - this then percolates through the rock and reacts with it, causing it to dissolve.

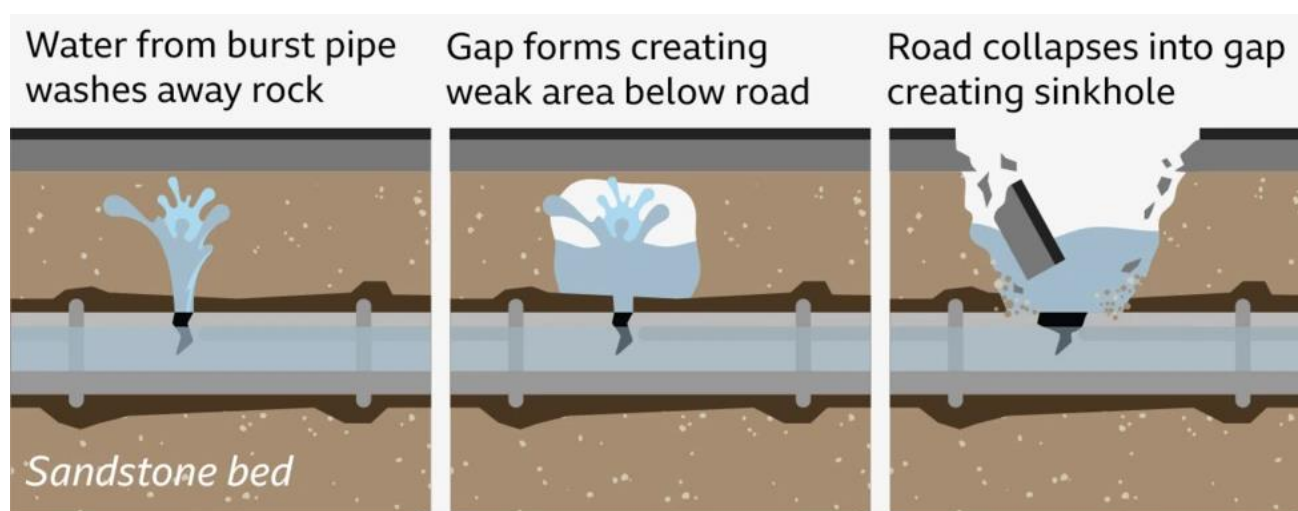
Sometimes this process can happen gradually, where the depression becomes larger over time. In other instances, the limestone sits below another layer of rock, which means that as it gets dissolved there are no immediate signs at the surface.

The overlying rock, sometimes clay or sandstone, will then suddenly collapse into the depression beneath - called a '**collapse sinkhole**'. These are most common in South Wales where sandstone rocks lie above caves in the limestone.

But human activities can also accelerate the formation of sinkholes or cause the ground to collapse in a similar way. Dr. Andrew Farrant, **British Geological Survey regional geologist** for south-east England, suspects that is what has happened in Godstone, and it is not a true sinkhole.

He said that one theory is that a burst water main has caused a sudden influx of water into the sandstone bed and has "flushed" weak sand out the way.

How huge sinkhole may have formed



Source: British Geological Survey



Pete Burgess, of the **Wealden Cave and Mines Society**, said a quarry marked "sand pit" can be seen on 19th century maps of land directly under the sinkhole. He added that sand from the pit was dug out and used for building and gardening purposes.

Dr. Farrant said that sand pit had been filled in, but he added unrecorded underground sand mines may be present in the area, and it is possible that a leaking pipe may have triggered the collapse of these underground mines and allowed sediment to be flushed out from beneath the road.

How common are sinkholes in the UK?

They are common in the UK because of the abundance of limestone and chalk rock and historic mining activities.

Limestone and chalk are formed from the deposit and compression of micro-organisms found in shallow warm seas. Millions of years ago the UK was located further south towards the equator and was much warmer with parts of the country submerged - creating the ideal conditions for these rock types to form.

Dr. Vanessa Banks, expert in shallow geohazards and risks at the **British Geological Survey**, told the BBC's Radio 4 PM programme: "Sinkholes occur in spates but many are not recorded as they occur in remote areas." She added that meteorological conditions play a role as extreme downpours can flush water through the rocks or put pressure on infrastructure like water mains.

Last December, about 30 homes were evacuated in Merthyr Tydfil after the ground collapsed, and in 2014 sinkholes occurred at five to ten times the normal rate across south-east England after intense storm conditions.

Are they dangerous?

"Collapse sinkholes" which can appear suddenly and without any warnings at the surface, like cracks or subsidence, can be dangerous. In 2010, a sinkhole measuring 20m in diameter and 90m deep, appeared in Guatemala City which resulted in the death of one person. In this case heavy rains and poor drainage are thought to have weakened the underlying rock. And in January a truck cabin was swallowed by a sinkhole in the Japanese city of Yashio, apparently as the result of a sewer rupture. The truck's 74-year-old driver was reported missing.

In the case of dissolution sinkholes geologists can indicate which areas are more at risk if the underlying rock is made up of chalk or limestone. For any new development in the UK the local planning authority does review the geology and any potential risks.

But Dr. Collins, reader in geology and geotechnical engineering at Brunel University, said that in this case where water infrastructure plays a role it is harder to predict potential ground collapses. "The pipe rupture does highlight the challenge that comes with having buried infrastructure as they are often buried at depths in excess of a metre. The depth is to reduce the impact of deep freeze during a very cold winter. Unfortunately, this makes them hard to monitor and repairs can be difficult, including the replacement of soil in the excavated hole once the repair is complete" he said.

Reference:

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Podcast 3

The Infinite Monkey Cage

Series 32

19 February 2025

Brian Cox and **Robin Ince** slice deep into the lesser-explored world beneath us. To join them on the journey from the crust to the core they are joined by seismologist **Ana Ferreira**, geologist **Chris Jackson** and comedian **Phil Wang**.

School children learn about the make-up of the Earth with an image depicting the Earth's core, mantle and crust layered neatly on top of each other, but is this an oversimplification? Our experts reveal that the Earth's innards are less uniform than we might think and mysteries still abound, including the make-up of some continental-sized blobs deep inside the Earth. We learn about the incredible heat and pressure as we descend and why that has limited how far humans have been able to explore these deep realms first-hand. We explore the chemistry of the interactions between the Earth layers and how they influence the formation of continental plates and volcanoes. Phil has an existential crisis about falling inside gaps between the plates but is reassured his worries are unfounded as Ana explains the latest techniques being used to understand the world deep beneath us.

Reference:

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Image Of The Day 4

Jan Mayen island, Norway

Date: 27/02/2025

Location: Norway

Credit: European Union, Copernicus Sentinel-2 imagery

Jan Mayen is a Norwegian island situated in the North Atlantic Ocean, around 600 km northeast of Iceland and 950 km west of Norway. The island, with an area of 373 km², is home to **the world's northernmost active volcano above sea level**, called the **Beerenberg**.

Its Arctic environment is characterised by cold temperatures, strong winds, and limited vegetation, making it a fascinating but challenging location for exploration.

Although it has no permanent population, Jan Mayen is an important site for scientific research and is home to one of the Ground Sensor Stations of the EU Space Programme.

The island of Jan Mayen is visible in this Copernicus Sentinel-2 image acquired on 16 July 2024.

The Copernicus Sentinel satellites are essential to monitoring Arctic regions. They deliver insights which help researchers and decision-makers to better understand the impacts of climate change on these important areas while informing strategies to protect the Arctic environment.



Reference:

<https://www.copernicus.eu/en/media/image-day-gallery/jan-mayen-island-norway>

Australia's 'upside down' dinosaur age had two giant predators, 120-million-year-old fossils reveal

Patrick Pester, *LiveScience*

26 February 2024

A new study has revealed that "hug of death" megaraptorids and previously unknown carcharodontosaurs shared Australia's unique Antarctic dinosaur ecosystem during the Cretaceous.

Researchers in Australia have discovered fossils of two enormous predators that lived alongside one another, upending ideas about how the ancient ecosystem operated down under 120 million years ago. This cache of fossils included the oldest large **megaraptor** ever found.

Megaraptorids were a group of fearsome predators in the Cretaceous period (145 million to 66 million years ago). They lived in the ecosystems of Australia and South America, which were joined together via Antarctica as part of a massive southern landmass called **Gondwana**.

Study lead-author Jake Kotevski, a paleontology doctoral candidate at the Museums Victoria Research Institute and Monash University in Australia, described megaraptorids as a "hands first predator" with muscular forearms and long, curved claws for catching prey — they effectively bring their prey in for a "hug of death," he said in a video released by **Museums Victoria**.

The fossils discovered by Kotevski and his colleagues belonged to an unspecified 120-million-year-old megaraptorid that was 20 to 23 feet (6 to 7 meters) long — making it one of the largest theropods (a bipedal group of mostly meat-eating dinosaurs) ever discovered in Australia. It also predates megaraptorids in South America by around 30 million years.

In the new study, published Feb. 19 in the ***Journal of Vertebrate Paleontology***, researchers also identified fossils from another group of large, predatory dinosaurs called *Carcharodontosauria*, which are also found in South America but have never been identified in Australia before.

The carcharodontosaur fossils suggest that in Australia, these dinosaurs grew up to 13 feet (4 m) long, which is significantly shorter than their counterparts in South America, which grew up to 43 feet (13 m).

In other words, the roles of the two predatory dinosaurs seem to have been reversed in Victoria, with megaraptorids acting as the larger apex predators and carcharodontosaurs acting as smaller, secondary predators. Australia's unique Cretaceous ecosystem therefore had an "upside-down" dynamic, according to a statement released by Museums Victoria.

The newly identified fossils were found in what were the banks of a large river, like the modern-day Ganges or Amazon, Kotevski told **Live Science** in an email. Southern Australia was close enough to the South Pole that it was within the Antarctic Circle during the Cretaceous, although the region was much warmer then than it is today.

The team identified the fossils, collected from the upper Strzelecki rock formation on the coastline of Victoria in southern Australia between 1988 and 2022, with modern 3D imaging techniques, including micro-computed tomography. The technique involves taking X-rays of an object as it rotates 360 degrees so that it can be studied in greater detail.

The fossils revealed that giant megaraptorids and carcharodontosaurs were living near the river, which Kotevski said was situated within a vast rift valley created as Australia pulled away from Tasmania and Antarctica.

"In the Antarctic circle, it has been proposed that Cretaceous [Victoria] experienced long periods of dark/light that the poles experience today," Kotevski said. "Thick forests lined this fast-flowing river, where [a] myriad [of] small dinosaurs thrived, seemingly dominated by our ... apex predator megaraptorid."



The megaraptorid (right), carcharodontosaur (left) and unwillingne (bottom) depicted here shared an ancient ecosystem in what is now Australia. (Image credit: Artwork by Jonathan Metzger. Source: Museums Victoria)



"Hug of death" megaraptorids were southern Australia's apex predators during the Cretaceous period. (Image credit: Artwork by Jonathan Metzger. Source: Museums Victoria)

The discoveries add to evidence that dinosaurs were traveling across Antarctica to move between South America and Australia during the middle of the Cretaceous, according to the study. However, Kotevski noted that researchers still have a lot more to learn about the Australian dinosaur ecosystem.

"More discovery, collection and research is fundamental to further unlocking these secrets and building a picture of how these animals looked, differed, and behaved within their environment," Kotevski said.

References:

https://www.livescience.com/animals/dinosaurs/fossil-discovery-in-australia-reveals-upside-down-dinosaur-ecosystem-with-2-giant-predators?utm_term=8DEBC9E5-6C7F-4337-AFFF-D9A51CC6C2C0&lrh=840a98cbe34ba22d824f6df096d90a0be8fe4763876a779b0361304855882d8f&utm_campaign=368B3745-DDE0-4A69-A2E8-62503D85375D&utm_medium=email&utm_content=850B1198-8EB2-4B8A-83F7-9B68FDF1A8EA&utm_source=SmartBrief

<https://www.tandfonline.com/doi/full/10.1080/02724634.2024.2441903#abstract>

Elgol dinosaur fossil found in 1973 finally extracted from Scottish cliff

The fossil dates from the Middle Jurassic period and is preserved in fragments, and experts believe it is an ornithomimid

Sarah Ward, *The Standard*

6 March 2025



Dr. Elsa Panciroli of National Museums Scotland with the Elgol Dinosaur. (Credit: The Standard)

A Jurassic dinosaur fossil has been extracted from the base of a cliff on the **Isle of Skye** where it was found more than 50 years ago. The fossil known as the Elgol dinosaur was discovered in 1973 near

Elgol, in the south of the island, and is Scotland's earliest recorded dinosaur. It was not fully identified and remained uncollected until a team led by Elsa Panciroli returned in 2018.

Initially researchers believed it was too difficult to extract the fossil, however it has now been achieved with the help of a local boat company, and scientists are hopeful there will be further discoveries on the island.

The Elgol dinosaur dates from the Middle Jurassic period and is preserved in fragments, but researchers have identified part of the spine, ribs and a hip bone, making it the most complete dinosaur skeleton found to date in Scotland.

Bone analysis has led researchers to believe it is an **ornithopod dinosaur**, a group which includes notable later dinosaurs such as Iguanodon, Parasaurolophus and Edmontosaurus. It is one of the earliest known ornithopod body fossils, as that group of dinosaurs became far more prominent in the later Cretaceous period.

Analysis of the bone structure indicates the dinosaur, which would have been roughly the size of a pony, was at least eight years old.



The Elgol dinosaur dates from the Middle Jurassic period (Maija Karala/PA)

The new description of the Elgol dinosaur is published in the ***Earth and Environmental Science Transactions of the Royal Society of Edinburgh***.

Ms Panciroli, the lead author and Natural Environment Research Council independent research fellow at **National Museums Scotland**, said: "This was a really challenging extraction, in fact we'd previously felt it was too difficult to collect the fossil, but I thought it was really important to study it. I was able to persuade the team to give it a try. It took a lot of hard work from a lot of people, but we did it: finally, we can confirm and publish Scotland's first recorded and most complete dinosaur, and that makes it all worthwhile."

The excavation was possible with the support of a specialist team from Research Casting International, based in Canada, while a crew from Elgol's Bella Jane Boat Trips piloted the rigid inflatable boat and dingy to the shore at the foot of the cliff, where the specimen was loaded and taken back to port.

Stig Walsh from National Museums Scotland said: "This is a wonderful addition to the rapidly growing set of Jurassic finds from the Isle of Skye which are enabling us to learn more and more about the rich ecosystem of the time. We've known there were dinosaurs there for a while, most obviously from the famous footprints at An Corran, Brother's Point and Duntulm and individual bones, but it's exciting to see a more complete, if still partial, skeleton. We're delighted to add it to the other amazing finds now in the national collection."

Other Jurassic discoveries from Skye include the description of adult and juvenile mammals of the same species, *Krusatodon*, which revealed the mammals grew more slowly than mammals today, and the world's largest Jurassic pterosaur fossil, *Dearc sgiathanach*.

Professor Susie Maidment, of the Natural History Museum and the University of Birmingham, said: "The Elgol dinosaur was a challenge to collect, and has proven perhaps an even bigger challenge to identify. Some aspects of the bones indicate that the specimen may be an ornithomimid, a group of plant-eating dinosaurs that are best known from the Cretaceous. This specimen, however, would already have been a fossil by the time the better-known ornithomimids like *Iguanodon* and *Hypsilophodon* were walking the Earth. Recent research on the fossils of Elgol has revealed a diverse ecosystem of extraordinarily preserved Middle Jurassic animals, and I'm sure there are more exciting discoveries to come."

Professor Rob Ellam, editor of Earth and Environmental Science Transactions of the Royal Society of Edinburgh, said: "I would like to congratulate Dr. Panciroli and her international team of co-authors. Having this exceptional piece of work on the Elgol dinosaur – both Scotland's earliest and most complete dinosaur fossil – in the pages of Transactions is a highlight for the journal. It is a privilege to be able to publish a world-class study led from Scotland which illustrates why the Scottish palaeontological community is held in such high esteem."

Reference:

<https://www.standard.co.uk/news/uk/elgol-dinosaur-fossil-skye-national-museums-scotland-b1214975.html>

Naples earthquake: Residents forced to sleep in cars after 4.4 magnitude tremor damages buildings

Firefighters pulled at least one man from rubble after house collapsed as quake forces schools to close

Josh Salisbury, *The Standard*

13 March 2025

Residents in Naples were forced to camp outside or sleep in their cars after a powerful **4.4 magnitude earthquake** struck the city early on Thursday. Italian seismologists said the tremor struck at 1.25am local time (00.25am GMT) and a depth of about two miles, disrupting power supply in parts of the city.

In the nearby town of Pozzuoli, the ceiling of a home collapsed, seriously injuring a man who was pulled out of the rubble by firefighters, Italian newspaper *Corriere Della Sera* reported.

In the seaside district Bagnoli, rescuers worked to free people trapped in their homes, with some residents climbing out windows, according to news agency ANSA.

Schools in the town and nearby areas will be closed for structural stability checks.

Josi Gerardo Della Ragione, mayor of the Naples municipality of Bacoli, urged local residents to "remain calm" and to get their information and updates from official channels.

Naples sits on the **Campi Flegrei**, or **Phlegraean Fields**, a volcanic basin that makes the area in southern Italy prone to earthquakes.

Thursday's quake was the same intensity as a quake last May, which was the strongest to hit the Campi Flegrei area in 40 years. It also comes after a magnitude 3.9 earthquake near Naples last month.

The quake was followed by at least two weaker aftershocks, Italian media reported. Officials in the city have established a rescue coordination centre to assess the damage to buildings.

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<https://www.standard.co.uk/news/world/naples-earthquake-damage-campi-flegrei-b1216394.html>

<https://www.bbc.co.uk/news/articles/cgkm8dxky82o>

<https://www.mirror.co.uk/news/world-news/breaking-naples-earthquake-horror-tourist-34850650>

https://www.livescience.com/planet-earth/volcanos/italys-campi-flegrei-volcano-may-unleash-devastating-eruptions-more-often-than-we-thought-ancient-outburst-suggests?utm_term=8DEBC9E5-6C7F-4337-AFFF-D9A51CC6C2C0&lrh=840a98cbe34ba22d824f6df096d90a0be8fe4763876a779b0361304855882d8f&utm_campaign=368B3745-DDE0-4A69-A2E8-62503D85375D&utm_medium=email&utm_content=DA2E5F4C-3DA4-4CB6-8A08-B5F4FCABC464&utm_source=SmartBrief

Image Of The Day 5

February 2025 was the third warmest February on record globally

Date: 11/03/2025

Location: Europe

Credit: European Union, Copernicus Climate Change Service Data

The Copernicus Climate Change Service (C3S) has published its latest monthly Climate Bulletin, focused on key climate trends in February 2025.

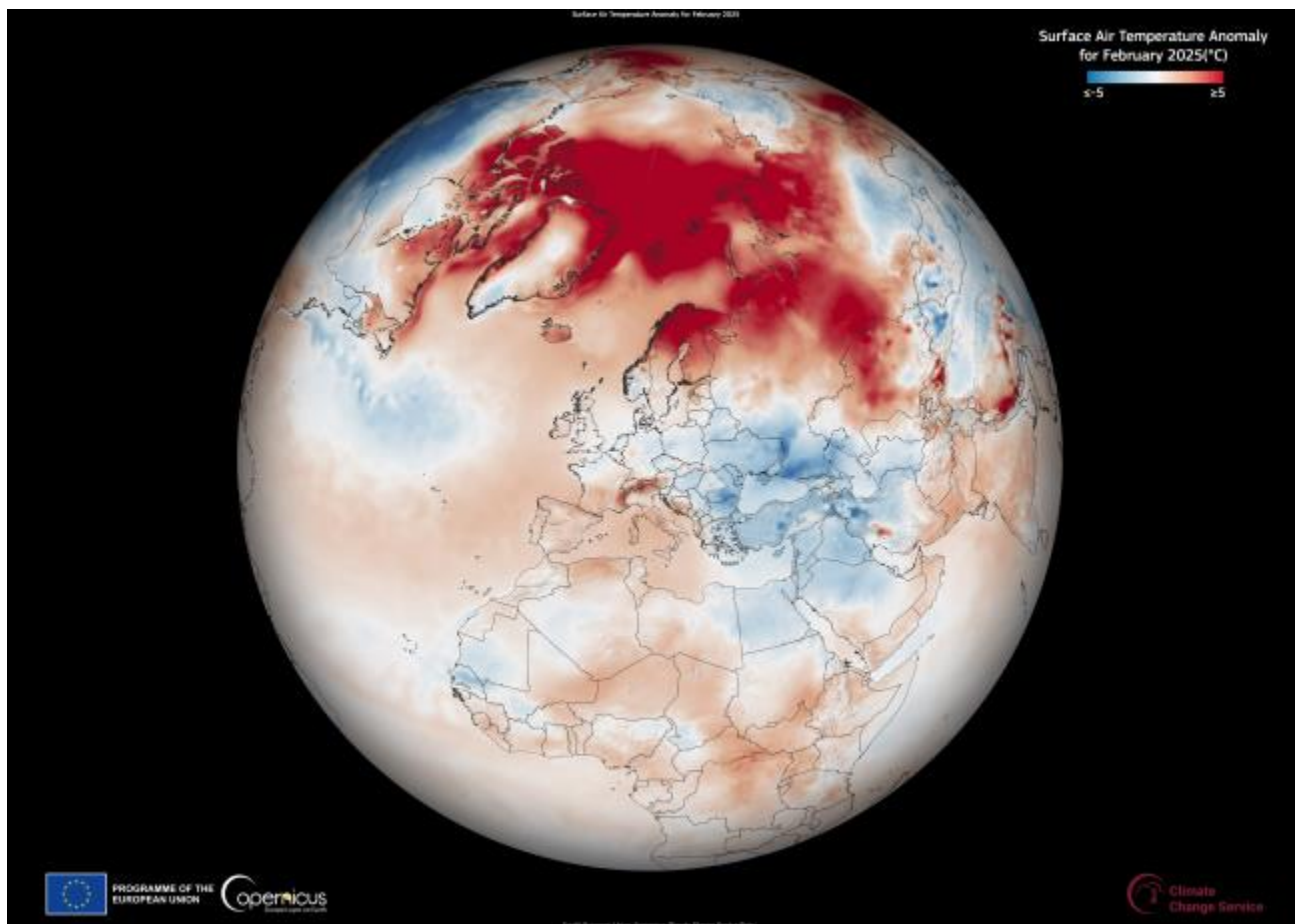
The bulletin reports that February 2025 was **the third warmest February on record globally**, with an average surface air temperature of 13.36°C, 0.63°C above the 1991-2020 average for the month. Furthermore, February 2025 measured 1.59°C above the pre-industrial average.

This data visualisation, based on C3S data, shows Europe, where the average temperature for February was 0.44°C, 0.40°C above the 1991-2020 average. Outside of Europe, temperatures were above average in large parts of the Arctic, particularly over Greenland, Svalbard (Norway), and Canada.

C3S provides open data which is essential for monitoring global climate trends. This information provides evidence-based insights for the creation and implementation of climate strategies.

Reference:

<https://www.copernicus.eu/en/media/image-day-gallery/february-2025-was-third-warmest-february-record-globally>



Further Reading

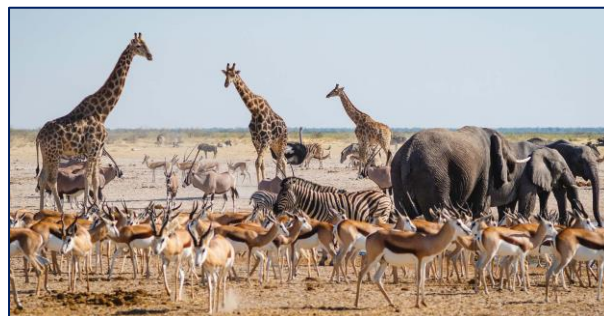


What is a species, and how many species are there?

By James Ashworth, NHM

A species is a distinct group of organisms, and the most basic unit used to measure life on Earth. However, there's no single definition of a species, meaning this vital concept in biology can be difficult to understand.

Find out the different ways scientists have of describing what species are, how they form and how many there are on Earth.



There are millions of species on Earth but defining them is not straightforward. (© RM Nunes/ Shutterstock; Credit: NHM)

https://www.nhm.ac.uk/discover/what-is-a-species.html?utm_content=pod2-cta&utm_campaign=news&utm_medium=email&utm_source=2578466_ma_sciencestories_20250127&utm_term=&ID=840a98cbe34ba22d824f6df096d90a0be8fe4763876a779b0361304855882d8f&dm_i=2XEG,1J9K2,6L3SCQ,65TGG,1

Pioneering geologist and Rice professor emeritus Peter Vail remembered for 'passion for discovery'

Alexandra Becker, Rice University

7 January 2025



13 January 1930 – 28 December 2024

<https://news.rice.edu/news/2025/pioneering-geologist-and-rice-professor-emeritus-peter-vail-remembered-passion-discovery>

<https://www.bradshawcarter.com/tributes/Peter-Vail>

<https://www.legacy.com/us/obituaries/houston-chronicle/name/peter-vail-obituary?id=57142507>

https://en.wikipedia.org/wiki/Peter_Vail

Walking With Dinosaurs - BBC Factual releases roarsome first look pictures

More than 25 years after it first stomped across our TV screens, a new six-part series is coming to BBC iPlayer and BBC One

BBC

23 January 2025



Albertosaurus (Image: BBC/PBS/ZDF/France Télévisions)

<https://www.bbc.com/mediacentre/2025/bbc-factual-releases-roarsome-first-look-pictures-from-walking-with-dinosaurs>

Earth's crust is peeling away under California

Stephanie Pappas, LiveScience

1 February 1, 2025

A section of the upper mantle and crust under the Sierra Nevada mountains is peeling away, in a process that may mimic how the continents were formed.

https://www.livescience.com/planet-earth/geology/earths-crust-is-peeling-away-under-california?utm_term=8DEBC9E5-6C7F-4337-AFFF-D9A51CC6C2C0&lrh=840a98cbe34ba22d824f6df096d90a0be8fe4763876a779b0361304855882d8f&utm_campaign=368B3745-DDE0-4A69-A2E8-62503D85375D&utm_medium=email&utm_content=3112061F-F998-48FC-96FF-B006ED9D650E&utm_source=SmartBrief

Determining the relative scientific and cultural “value” of the UK's in-situ dinosaur track sites

Kirsty M. Edgar, Richard J. Butler, Jonathan G. Larwood, Joshua J.P. Smith

<https://doi.org/10.1016/j.pgeola.2024.12.003>

Proceedings of the Geologists' Association
Available online 17 January 2025

https://www.sciencedirect.com/science/article/pii/S0016787824000695?fbclid=IwY2xjawllqa1leHRuA2FibQlXMAABHS5IBK_nAvGMU2b1ZCkGaKGRsnMJxjTHr0qbp-UqXx6iSYLEiVpGL8zyig_aem_4ie7pDCRsHL1CwyfAlo1Gg

Prehistoric bone bitten by croc-like creature found



The vertebra of the young dinosaur is much smaller than that of a fully grown pterosaur. (Credit: University of Reading)

Ethan Gudge, BBC News 2 February 2025

<https://www.bbc.co.uk/news/articles/ckgqnlwkw5ppo>

Multi-billion projects at stake: Another blow for UK's largest untapped oil & gas duo but Shell, Equinor, and Ithaca remain upbeat

Melisa Cavcic, Offshore Energy

3 February 2025

In the wake of a new court ruling, the development of two hydrocarbon projects – said to be the largest undeveloped oil and gas fields off the coast of the United Kingdom (UK) – has suffered another setback for the sake of the climate. However, the battle does not seem to be over, as confirmed by environmental activists and the operators, Britain's Shell and Norway's Equinor, alongside the latter's partner, Ithaca Energy. Which side will come on top is not yet clear, but it is

unlikely that either will throw in the towel at this late stage in the UK's oil and gas saga without a fight.



FPSO Petrojarl Knarr for Equinor's Rosebank oil field in UK waters. (Source: Aker Solutions)

https://www.offshore-energy.biz/multi-billion-projects-at-stake-another-blow-for-uks-largest-untapped-oil-gas-duo-but-shell-equinor-and-ithaca-remain-upbeat/?utm_placeholder_value=&cdmwt=QQAaAAMGABAUQ1NtWPQNxZ4MwJIngliJGIBCq

Is the moon still geologically active? Evidence says it's possible

Keith Cooper, Space.com 3 February 2025

The moon is still shrinking as it cools off, causing its surface to wrinkle.

https://www.space.com/the-universe/moon/is-the-moon-still-geologically-active-evidence-says-its-possible?utm_term=8DEBC9E5-6C7F-4337-AFFF-D9A51CC6C2C0&lrh=840a98cbe34ba22d824f6df096d90a0be8fe4763876a779b0361304855882d8f&utm_campaign=58E4DE65-C57F-4CD3-9A5A-609994E2C5A9&utm_medium=email&utm_content=C21B1DC1-38F0-4649-8B16-B728174F2C42&utm_source=SmartBrief

Ocean plate from time of Pangaea is now being torn apart under Iraq and Iran

Stephanie Pappas, LiveScience

4 February 2025

What was once the floor of an ancient ocean is still shaping the landscape between Arabia and Eurasia.

https://www.livescience.com/planet-earth/geology/ocean-plate-from-time-of-pangaea-is-now-being-torn-apart-under-iraq-and-iran?utm_term=8DEBC9E5-6C7F-4337-AFFF-D9A51CC6C2C0&lrh=840a98cbe34ba22d824f6df096d90a0be8fe4763876a779b0361304855882d8f&utm_campaign=368B3745-DDE0-4A69-A2E8-62503D85375D&utm_medium=email&utm_content=02662C1A-C14B-4E9B-ADA1-FE522F1654AC&utm_source=SmartBrief

Jupiter's 'tormented moon' Io just unleashed the most powerful volcanic event ever seen

Harry Baker, Space.com 4 February 2025

NASA's Juno spacecraft has discovered a giant volcanic hot spot on the surface of Jupiter's hellish moon Io. The eruptions in this area are chucking out six times the energy being produced by all Earth's power stations, researchers say.



Io is the most volcanic world in the solar system, with around 400 volcanoes. Its extreme activity is driven by "tidal flexing" from Jupiter's crushing gravity. (Image credit: NASA/JPL-Caltech/SwRI/MSSS; Image processing by Gerald Eichstädt)

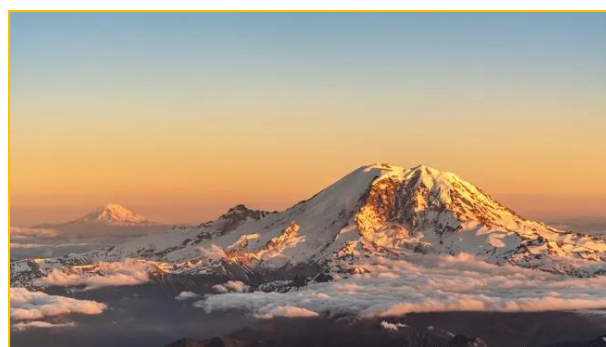
https://www.livescience.com/space/planets/jupiters-tormented-moon-io-just-unleashed-the-most-powerful-volcanic-event-ever-seen?utm_term=8DEBC9E5-6C7F-4337-AFFF-D9A51CC6C2C0&lrh=840a98cbe34ba22d824f6df096d90a0be8fe4763876a779b0361304855882d8f&utm_campaign=368B3745-DDE0-4A69-A2E8-62503D85375D&utm_medium=email&utm_content=02662C1A-C14B-4E9B-ADA1-FE522F1654AC&utm_source=SmartBrief

Scientists find giant magma reservoirs hidden beneath dormant volcanoes in the Cascades

Stephanie Pappas, LiveScience

5 February 2025

The magma system beneath volcanoes may persist even after recent eruptions, a new study finds.



Dormant volcanoes in the Cascades mountain range have large magma reservoirs sitting beneath them, scientists discover. (Image credit: aaaaimages/Getty Images)

https://www.livescience.com/planet-earth/volcanos/scientists-find-giant-magma-reservoirs-hidden-beneath-dormant-volcanoes-in-the-cascades?utm_term=8DEBC9E5-6C7F-4337-AFFF-D9A51CC6C2C0&lrh=840a98cbe34ba22d824f6df096d90a0be8fe4763876a779b0361304855882d8f&utm_campaign=368B3745-DDE0-4A69-A2E8-62503D85375D&utm_medium=email&utm_content=02662C1A-C14B-4E9B-ADA1-FE522F1654AC&utm_source=SmartBrief

'Stunning' 100-million-year-old fossil found in rock



The ammonite would have been quite similar to squid or cuttlefish. (Image source, Jack Wonfor)

BBC News

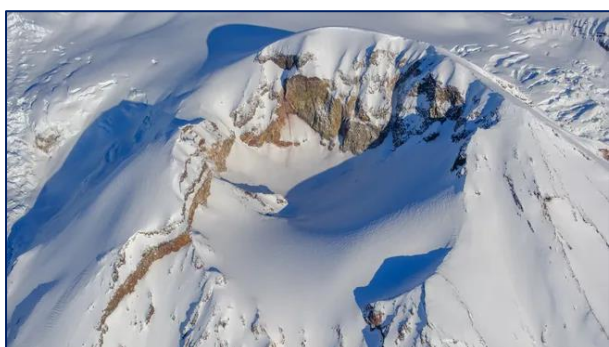
7 February 2025

<https://www.bbc.co.uk/news/articles/cz7e28ne383o>

Earthquakes at massive Alaska volcano Mount Spurr ramp up again — and there's now a 50-50 chance of an eruption

Stephanie Pappas, LiveScience

11 February 2025



Mount Spurr's Crater Peak, as viewed from the south on Feb. 7 during a helicopter based gas and photo survey. (Image credit: AVO/USGS)

Ten months of unrest at Mount Spurr could be a sign of an upcoming eruption from a

side vent or, less likely, from the main crater.

Creepy 'ghost lanterns' in South Carolina are not what they seem, study suggests

Pandora Dewan, LiveScience

15 February 2025

The Summerville ghost lanterns have mystified locals for generations. But geologists may have finally cracked the case.



Small ghostly lights appear along a dirt track. (Image credit: David Wall/Getty Images)

https://www.livescience.com/planet-earth/earthquakes/creepy-ghost-lanterns-in-south-carolina-are-not-what-they-seem-study-suggests?utm_term=8DEBC9E5-6C7F-4337-AFFF-D9A51CC6C2C0&lrh=840a98cbe34ba22d824f6df096d90a0be8fe4763876a779b0361304855882d8f&utm_campaign=368B3745-DDE0-4A69-A2E8-62503D85375D&utm_medium=email&utm_content=8CEB32C3-1603-46DC-9E32-0AF8D7637F27&utm_source=SmartBrief

Sites of Special Scientific Interest: Their role and importance in conserving England's geoheritage

Colin D. Prosser, Hannah C. Townley

Proceedings of the Geologists' Association

<https://doi.org/10.1016/j.pgeola.2025.101095>

See also:

https://www.farnhamgeosoc.org.uk/newsletters/2023_2028/v27n3aug2024.pdf



North Sea Transition Authority

Emissions Reduction Technology Roadmap

19 February 2025

The NSTA has partnered with the Net Zero Technology Centre on a new report highlighting more than 50 solutions which can reduce emissions from production activities, including low carbon alternative fuels, efficient flare combustion and advanced digital solutions.

The Emissions Reduction Technology Roadmap was developed through extensive industry consultation to evaluate current approaches and identify gaps in technology and investment. It provides a structured approach to deploying technologies, identifying operational modifications and process improvements which can help the industry meet and surpass key emissions reduction targets on the path to net zero by 2050.

<https://www.netzerotc.com/wp-content/uploads/2025/02/NSTA-Emissions-Reduction-Roadmap-2025.pdf>

Microbial mound origin for enigmatic, sea-floor, circular structures? Purbeck Limestone Group, offshore Dorset, U.K.

Dan Bosence, Jenny Collier, Arnaud Gallois, Ian Watkinson, Chris Dunkerley, Simon Fleckner, *Proceedings of the Geol Assoc*, 2025.

<https://www.sciencedirect.com/science/article/pii/S0016787825000021>

Podcast



Ruth Siddall on Urban Geology

20 February 2025

In the podcast, Ruth Siddall explains the kinds of geology on display in the building stone of cities and takes us on one of her favorite urban geology walks in London. She has developed nearly 50 urban geology-themed walks and built up a database of over 4,300 urban localities of geological interest.

Siddall is a postdoctoral researcher at Trinity College, Dublin, studying the social history and geological provenance of stone in 18th century buildings in Britain and Ireland.

<https://www.geologybites.com/ruth-siddall-1-1>

Urban Geology

Self-guided, accessible building stone walks by Ruth Siddall

Siddall, R., Urban Geology:

<http://ruthsiddall.co.uk/UrbanGeology.html>

Date accessed 21/02/2025

Isabel Montañez on the Late Paleozoic Ice Age as an Analog for Present-Day Climate

8 March 2025

The late Paleozoic ice age began in the Late Devonian and ended in the Late Permian, occurring from 360 to 255 million years ago. It was similar to the present day in two key respects: rising atmospheric CO₂ and recurrent major ice sheets. In the podcast, Isabel Montañez explains how we can use proxies to learn about the climate and ocean conditions that prevailed then. And with the help of a model, she says that we can also

learn about sensitivities and feedbacks of Earth systems to rising CO₂. Among other things, the model suggests that when the atmosphere reaches the present-day level of CO₂, significant parts of the ocean may become anoxic and ocean circulation patterns alter.

Montañez is a Distinguished Professor in the Department of Earth and Planetary Sciences at the University of California, Davis.

<https://www.geologybites.com/isabel-montanez>

Joeri Witteveen on Golden Spikes

16 March 2025

The geological timescale is organized as a hierarchy of time spans. When we talk about the ages of rocks, or when certain events in the geological past took place, we need to use a system that unambiguously defines a time in geological history. This is by no means a trivial problem. In the podcast, Joeri Witteveen describes the various approaches that have been adopted in the past, and explains the system based on golden spikes that we use today.

Witteveen is Associate Professor of History and Philosophy of Science at the University of Copenhagen.

<https://www.geologybites.com/joeri-witteveen>

Lindy Elkins-Tanton on the Origin of Earth's Water

27 March 2025

The planets formed out of a cloud of gas and dust around the nascent Sun. Within the so-called snow line, it was too hot for liquid water to exist. Since the Earth lies well within this line, why does it have water? Did it somehow manage to retain water from the outset or did it acquire its water later? In the podcast, Lindy Elkins-Tanton explains how these two scenarios might have played out but she says the evidence strongly favors one of these theories.

Elkins-Tanton has concentrated much of her research career on the formation and evolution of planets, and especially the role of water. She is a Professor in the School of Earth and Space Exploration at Arizona State University and Principal Investigator of the NASA Psyche mission.

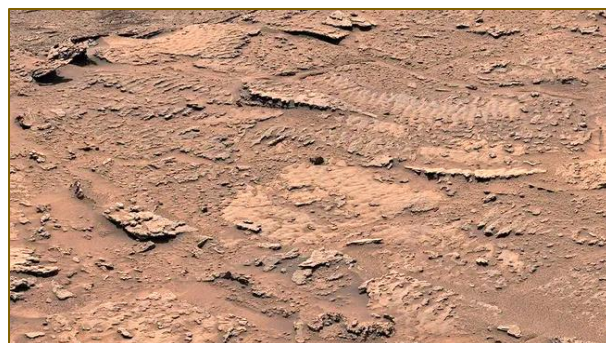
<https://www.geologybites.com/lindy-elkins-tanton>

NASA's Curiosity Mars rover discovers evidence of ripples from an ancient Red Planet lake

Stefanie Waldek, Space.com

20 February 2025

The ripples suggest that the lake was free of ice at one point.



NASA's Curiosity rover imaged these ripples on the edge of a (now dry) Martian lake bed on Sol 3642 (Nov. 4, 2022). (Image credit: NASA/JPL-Caltech/MSSS)

<https://www.space.com/space-exploration/mars-rovers/nasas-curiosity-mars-rover-discovers-evidence-of-ripples-from-an-ancient-red-planet-lake-images>

https://www.livescience.com/space/mars/nasa-rover-discovers-liquid-water-ripples-carved-into-mars-rock-and-it-could-rewrite-the-red-planets-history?utm_term=8DEBC9E5-6C7F-4337-AFFF-D9A51CC6C2C0&lrh=840a98cbe34ba22d824f6df096d90a0be8fe4763876a779b0361304855882d8f&utm_campaign=368B3745-DDE0-4A69-A2E8-62503D85375D&utm_medium=email&utm_content=CFEEA993-2034-431B-B9E0-BE550EF190E6&utm_source=SmartBrief

What makes Mars the 'Red' Planet? Scientists have some new ideas

Victoria Corless, *Space.com*

25 February 2025

"Mars is still the Red Planet. It's just that our understanding of why Mars is red has been transformed."

https://www.space.com/the-universe/mars/what-makes-mars-the-red-planet-scientists-have-some-new-ideas?utm_term=8DEBC9E5-6C7F-4337-AFFF-D9A51CC6C2C0&lrh=840a98cbe34ba22d824f6df096d90a0be8fe4763876a779b0361304855882d8f&utm_campaign=58E4DE65-C57F-4CD3-9A5A-609994E2C5A9&utm_medium=email&utm_content=B235B4DF-D529-4819-B44A-4B5B573B6F7E&utm_source=SmartBrief

Author, presenter and palaeontologist Richard Fortey dies aged 79



Lauren Brown, *The Bookseller*

10 March, 2025

<https://www.thebookseller.com/obituaries/author-presenter-and-palaeontologist-richard-fortey-dies-aged-79>

Richard Fortey obituary

Palaeontologist at the Natural History Museum who was also a bestselling science writer and accomplished TV presenter

Stephen Moss, *The Guardian*

13 March 2025

<https://www.theguardian.com/science/2025/mar/13/richard-fortey-obituary>

Golden scaleless cave fish discovered in China shows evolution in action

Patrick Pester, *LiveScience* 6 March 2025



The previously unknown Xingren golden-line fish appears to be still evolving for cave life. (Image credit: Xiao M-Y, Wang J-J, Luo T, Zhou J-J, Xiao N, Zhou J (2025), Zoosystematics and Evolution (CC BY 4.0).)

The discovery of a golden scaleless fish in China is helping scientists understand how animals evolved to live in caves.

<https://www.livescience.com/animals/fish/golden-scaleless-cave-fish-discovered-in-china-shows-evolution-in-action>

52-foot-high 'megaripples' from asteroid that killed the dinosaurs mapped deep beneath Louisiana in 3D

Tom Howarth, *LiveScience* 10 March 2025

Buried "megaripples" — some the size of five-story buildings — are helping scientists piece together the devastation following the impact that wiped out the nonavian dinosaurs.

https://www.livescience.com/planet-earth/geology/52-foot-high-megaripples-from-asteroid-that-killed-dinosaurs-mapped-deep-beneath-louisiana-in-3d?utm_term=8DEBC9E5-6C7F-4337-AFFF-D9A51CC6C2C0&lrh=840a98cbe34ba22d824f6df096d90a0be8fe4763876a779b0361304855882d8f&utm_campaign=368B3745-DDE0-

[4A69-A2E8-62503D85375D&utm_medium=email&utm_content=6D652B02-CD0F-4D76-8EBD-473BC8546753&utm_source=SmartBrief](https://www.livescience.com/planet-earth/fossils/refuge-from-the-worst-mass-extinction-in-earths-history-discovered-fossilized-in-china?utm_term=8DEBC9E5-6C7F-4337-AFFF-D9A51CC6C2C0&lrh=840a98cbe34ba22d824f6df096d90a0be8fe4763876a779b0361304855882d8f&utm_campaign=368B3745-DDE0-4A69-A2E8-62503D85375D&utm_medium=email&utm_content=BDC5B349-CC28-4D72-818F-0AC976CF0FA6&utm_source=SmartBrief)

Refuge from the worst mass extinction in Earth's history discovered fossilized in China

By Stephanie Pappas, LiveScience
March 14, 2025

The End-Permian mass extinction killed an estimated 80% of life on Earth, but new research suggests that plants might have done okay.

https://www.livescience.com/planet-earth/fossils/refuge-from-the-worst-mass-extinction-in-earths-history-discovered-fossilized-in-china?utm_term=8DEBC9E5-6C7F-4337-AFFF-D9A51CC6C2C0&lrh=840a98cbe34ba22d824f6df096d90a0be8fe4763876a779b0361304855882d8f&utm_campaign=368B3745-DDE0-4A69-A2E8-62503D85375D&utm_medium=email&utm_content=BDC5B349-CC28-4D72-818F-0AC976CF0FA6&utm_source=SmartBrief

NASA rover spots hundreds of 'spider eggs' on Mars — and scientists have no idea how they got there

Damien Pine, LiveScience 29 March 2025



A close-up of an unusual Martian rock made up of hundreds of dark, round spheres stuck

together, taken with the Mars Perseverance rover's SuperCam Remote Micro Imager. The spheres that make up the rock are about 1 millimeter in diameter. Some are broken and slightly weathered, and some have tiny holes in them. (Image credit: NASA/JPL-Caltech/LANL/CNES/IRAP)

On March 11, NASA's Perseverance Mars rover spotted a mysterious rock made of hundreds of tiny spheres that resemble spider eggs. Studying its formation could help us look for fossilized remains of microbial life on Mars.

<https://www.livescience.com/space/mars/nasa-rover-spots-hundreds-of-spider-eggs-on-mars-and-scientists-have-no-idea-how-they-got-there>

Could an almighty eruption destroy a dreamy Greek island?



A huge eruption in 1600 BCE left the crater rim and central depression that formed Santorini (Image source: Kevin Church/BBC)

Georgina Rannard, Tom Ingham, Kevin Church, BBC Climate and science team

Reporting from Santorini 21 April 2025

Perched on top of Santorini's sheer cliffs is a world-famous tourist industry worth millions. Underneath is the fizzing risk of an almighty explosion. A huge ancient eruption created the dreamy Greek island, leaving a vast crater and a horse-shoe shaped rim. Now scientists are investigating for the first time how dangerous the next big one could be.

<https://www.bbc.co.uk/news/articles/cm25lz56rezo>



Prehistoric Planet: Discovering Dinosaurs at Lightroom is a celebration of our natural world through captivating storytelling, breathtaking visuals and groundbreaking technology, in collaboration with Apple TV+.

Evoking a feeling of wonder, you will be guided on a once in a lifetime adventure, exploring the fascinating role dinosaurs have played in shaping our world from 66 million years ago until now.

Through this epic journey, viewers will step inside some of the most beloved scenes from seasons one and two of Apple TV+'s Emmy Award-nominated series ***Prehistoric Planet***, and encounter a vast array of dinosaurs (from *Ammonites* to *Mosasaurs*, *Adaltheriums* to the *Tyrannosaurus rex*) at the most pivotal moments of their lives.

Prehistoric Planet brought the dinosaurs to your living room. From **9 July**, Lightroom will take you to the dinosaurs.

Reference:

https://lightroom.uk/whats-on/prehistoric-planet/?dm_i=7HSG,8N6O,1WZ2B0,12S6D,1