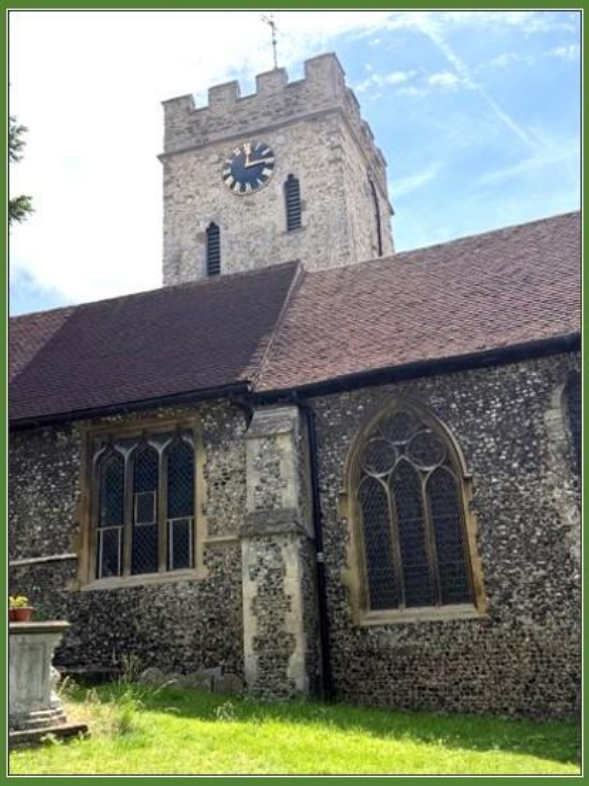
Newsletter of
The Farnham Geological Society

Volume 29, Number 4, November 2026







Building Stones,
Guildford & Chichester.
Photos by
Tristan Aspray,
Katherine Rusbridge
& Mick Caulfield

Farnhamia farnhamensis

FARNHAM GEOLOGICAL SOCIETY

Founded 1970

GEOLOGISTS' ASSOCIATION 1858

A local group within the GA

Volume 29, No. 4 **Newsletter** November 2026

Issue No. 134

www.farnhamgeosoc.org.uk

Editorial

Welcome to the latest edition of the FGS Newsletter for 2026.

This month's Newsletter brings you some interesting stuff, including reports from our recent field trips and monthly lectures, as well as news items and stories from the world of geology.

Don't forget to join us on **Zoom** for our next talk on **Friday**, **13 November** when **Geoff Downer**, who is a member of the **Kent Geologists' Group**, will present **"The Geology of the Great Pyramid of Giza".**

This will be followed **via Zoom** on **Friday**, **11 December** by **Dr. Richard Swarbrick,** a GeoPressure Consultant, presenting **"Mud Volcanoes".**

We are still looking for members to both join the FGS Committee, in particular as IT/Sound, as well as help with organising the Societies various activities. Please contact Mick Caulfield as soon as possible if you are able to help.

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

Also, if you would like to have a talk on a particular subject or by a particular person please feel free to contact our Programme Secretary **Janet Catchpole** (janet.catchpole47@gmail.com) with your suggestions.

Could you help man the **FGS display** at the **GA Festival of Geology** to be held in Burlington House, Piccadilly, London on **7 November 2026**? If you can help in any way please contact **Mike Millar** (mike.millar27@btinternet.com).

Although we are still in November, the next newsletter is in February, so this is my last chance to wish you all a **Very Merry Christmas** and a brilliant, peaceful and **Happy New Year**.

Front Cover

This month's **Front Cover photographs** are provided by **Tristan Aspray** (Guildford … top left), **Katherine Rusbridge** (Chichester … top right) & **Mick Caulfield** (Chichester … bottom right) showing building stones from our recent Building Stones walks.

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 Members, FGS Editorial Board or the FGS Committee.

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In Memory of Peter Luckham

It is with great sadness that we have to report the untimely death of **Peter Luckham**, a founding member of the FGS and former Treasurer for over 50 years, who died at the age of 88 on Friday, 18 September 2026.

On behalf of the Society, I would like to extend our heartfelt sympathy and condolences to his wife Mary, to his sons Philip and Shaun and all his family and to all his many friends.

Peter became a founding member of the Farnham Geological Society in 1970 along with a number of others including Ted Finch, Stanley Smith, Audrey Hewins and Julian Bentinck.

The Inaugural Meeting was held on Monday, 6 April 1970 in the Council Hut, South Street, Farnham. There is no record of how many people attended that meeting or how many joined the Society.

The Society was "officially" established on 1 January 1971. The first Chairman was Stanley Smith, Secretary Audrey Hewins and Field Trip Secretary Ted Finch. The first newsletter was edited by Roger Ashcroft in the Autumn of 1970 and was "optimistically numbered one".



Peter was awarded the "Freedom of the Parish of Churt" in June 2024.

Janet Burton and Liz Aston have provided us with some wonderful memories of Peter …

Janet Burton

"I first knew Peter when we were both members of Surrey Young Farmers Club in the late 1950's. He was Farnham, I was Guildford and we bumped into one another quite frequently at County competitions, dances and the like – they were enjoyable times. Into the 1980's, we met again when I joined the FGS, by which time Peter was well established as Honorary Treasurer.

Peter was the member any organisation would welcome with open arms. He was always there, prepared to contribute, making things tick, no fuss, no histrionics. I thoroughly enjoyed his company – there was always something to chat about and have a chuckle and our monthly FGS meetings were the more enjoyable for him being there.

Peter's fifty plus years of unbroken service as Treasurer, until 2024, must surely be unique in any society, locally at least – a record unlikely to be broken!

The success of FGS over the years has been due, in no small measure, to Peter's contribution. Apart from the financial side of our Society, he has also been custodian of the rock collection for many years. He gave them an outing each year at the Churt Fete, which I know has always been really appreciated and, who knows, may well have sparked lifelong interests in some of the attendees into the world of geology.

Thank you Peter for being part of our lives - we are going to miss you."

Liz Aston

"As one of the oldest members of the FGS I feel I am able to share some of my many memories of Peter.

He was one of the founding members of the Society in 1970 and took on the role of Treasurer keeping several different accounts running without any mix-ups for well over 50 years.

The accounts at the end of the very first month showed income was £3.3s.0d of which £3.0s.0d was a donation and the cash-in-hand to carry forward at the end of the first month was 1s.0d. Total subscriptions that year were £23.0s.0d.

He was always cheerful and rarely missed a meeting and enjoyed providing the speakers with their 'thank you gift' … usually a bottle of wine!

He took responsibility for the vast rock and mineral collection which FGS has by storing the specimens in a shed on his 'farm land' until earlier this year. He always supported his local community at the annual Churt Fete. He sometimes took a geological specimen that he had, or that he had been given, with him to show 'the local children'.

He will be sorely missed – not just by his family and by us at FGS but by his community - he was a man who 'gave' and 'contributed' to all who knew him."

Rest In Peace Peter

Farnham Geological Society

Committee 2026

Chair	**Mick Caulfield**
Treasurer	**Mike Millar**
Secretary	**Katherine Rusbridge**
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** *(Mike Millar)*
Ad Hoc Member	**Liz Aston**

Meeting Programme 2026

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

The Geology of the Great Pyramid of Giza
Geoff Downer Friday, 13 November
Kent Geologists' Group

Mud Volcanoes
Dr. Richard Swarbrick Friday, 11 December
GeoPressure Consultant

Field Trip Programme 2027

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

Geologists' Association

Lecture Programme 2026

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

Critical conundrums: a UK perspective on critical minerals
Dr. Holly Elliott Friday, 4 December
BGS

Reading Geological Society

Lecture Programme 2026

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

Past environments, past climates and impacts of major environmental change
Prof. Stuart Robinson Monday, 2 November
Oxford University

Adventures in Volcanoland: from fuming volcanic vents to extinction events
Prof Tamsin Mather Monday, 7 December
Oxford University

Mull Dyke Swarm
Prof Joe Cartwright Monday, 1 February
Oxford University

Places may be available on **RGS' Field Meetings**
(book via the RGS website https://readinggeology.org.uk/fieldtrips.php*):*

Puddingstones of Bucks and Oxfordshire Saturday, 14 November
Leader: Dr. Ross Garden (RGS) et al

Oxford Natural History Museum – Redisplay Wednesday, 16 December
Leader: Duncan Murdock (OUMNH)

Mole Valley Geological Society

Lecture Programme 2026

http://mvgs.org.uk

In Search Of Siberian Gold Mammoths (Ore Bodies, Not Pachyderms)
Dr. A Guryanov Thursday, 12th November
Universal Exports

Horsham Geological Field Club

Lecture Programme 2026

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

Geology in art and art in geology
Roger Smith Wednesday, 11 November
Retired engineering geologist

West Sussex Geological Society

Lecture Programme 2026

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

The Groundwater Resources of Namibia
Nigel Hoad Friday, 20 November

Reconstructing the Cretaceous Greenhouse **Zoom**
Prof. Andy Gale Thursday, 10 December
Portsmouth University

Found and lost – a story of Baltic amber
David Bone Friday, 11 December
WSGS

Out of the frying pan into the freezer: Fieldwork tales from extreme environments around the world
Dr. Ian Carr Friday, 15th January 2027
The College of Richard Collyer

OUGS Wessex Branch

Programme 2026

https://ougs.org/events/

Day of Talks *[London Branch]*
All Saints Parish Church, Margaret Street, London W1W 8JG
Saturday, 14 November
Please register via
https://forms.gle/oXYMiGqgjFdiKPzt7

The Dolaucothi Roman Goldmines: Wales
Norman Moles **Saturday, 5 December**
Retired from the Geology Department at Brighton University

THE FGS NEEDS YOU!



We need a new IT/Sound committee member. We also need help with our Website and our Advertising / Outreach programmes .

Would you be able to help us?

Please contact our Chair, Mick Caulfield,

if you would like to help.

Newsletters.fgs@gmail.com

Next Lecture

Friday, 13 November 2025

7.30 pm for 8.00 pm ***Zoom only***

The Geology of the Great Pyramid of Giza

Geoff Downer, Kent Geologists' Group

The Great Pyramid of Giza is one of the premier tourist destinations in the world and has its place on most people's travel bucket list. While much about its construction remains in dispute, what can the geology of the pyramid tomb of the pharaoh Khufu add to our



The Great Pyramid of Giza by Douwe C. van der Zee - Own work, CC BY-SA 4.0, https://commons.wikimedia.org/w/index.php?curid=138278511

understanding of ancient Egyptian knowledge, technology and achievements.

This talk will look at the geology and building materials associated with this iconic structure and the story of the construction of the Great Pyramid on a more rock-solid foundation.

Geoff Downer is now retired from his day job and as a local geologist has led field trips, given talks and taught geology to adults for over 20 years. He has been a member of the Kent Geologists' Group for over 30 years, a member of the GeoConservation Kent team and latterly a Geopark Ambassador for the UNESCO Cross-Channel Geopark bid. He has published four books on aspects of local Kent geology and was the South East Branch Organiser of the Open University Geological Society for ten years.

Lecture Summary

Friday, 11 September 2026

On Friday, 11 September *some 27+ FGS attendees in The Methodist Hall & via Zoom, together with other society members, welcomed FGS member* ***Tristan Aspray*** *in presenting our external lecture.*

How Geoscience is Critical in the Transition to a Lower Carbon Energy Future

Report by Tristan Aspray

Today, coal, oil and natural gas provide three-quarters of global energy needs. Their use has transformed global economies and standards of living over the last two centuries. However, when burned they emit carbon dioxide (CO_2), which is the principal greenhouse gas responsible for climate change. In an effort to reduce emissions, many countries have begun a shift away from fossil fuels to lower-carbon forms of energy, in particular nuclear power and renewables (which include wind, solar, hydropower and geothermal energy). Nuclear and renewables meet less than a fifth of global energy demand today but are growing rapidly. They do not emit CO_2 when operating but do have other challenges which must be overcome if we are to get more of our energy from them. Geoscience - and geoscientists - are central to addressing many of these challenges. The move to lower carbon energy sources is often referred to as the "Energy Transition". It will take many decades to unfold and proceed in different ways in different countries. To be successful, it will need to meet the growing demand for energy, particularly from developing economies, while reducing greenhouse gas emissions.

Global investment in **nuclear power** has grown steadily in recent years and is expected to reach a record £60 billion in 2026. Here in the UK, the giant Hinkley Point C plant is being built in Somerset and will generate 3.3 GW of electricity when operational – about 10% of average national power demand. China is building 36 new nuclear reactors, more than the rest of the world combined. This investment boom is being driven by the ability of nuclear energy to provide large-scale, low-carbon electricity, which is in turn driven by the very high energy density of the technology: the fission of 1 kg of uranium fuel can provide as much heat as burning 3 million kg of coal! This heat is used to turn water into steam that drives turbine generators. However, the splitting of uranium atoms also generates radioactive waste products which must be carefully stored for thousands of years. The preferred approach to this is to bury the waste deep underground in Geological Disposal Facilities (GDFs). Geoscientists are heavily involved in the selection and assessment of such sites. Factors such as tectonic stability, groundwater potential, host rock properties and even the impact of future sea level changes and glacial events have to be taken into consideration. Geoscientists also play a key role in communications with stakeholders about site feasibility, be they local communities, regulators or decision makers. Only one such site has actually been constructed: the Onkalo GDF in Finland (Fig 1). It will store waste 400 meters below ground level in tunnels cut through the 1.9-billion-year-old gneiss host rock and will start operating at the end of 2026.

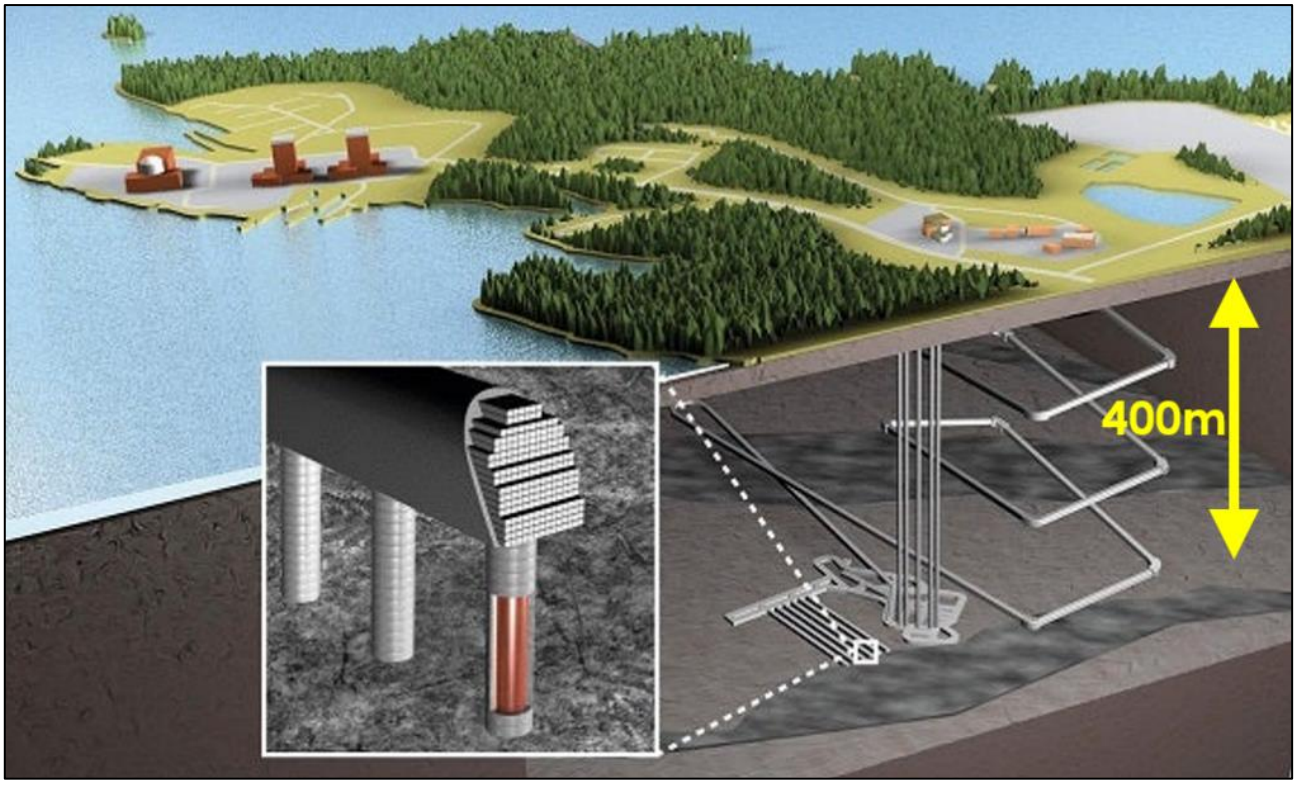


Figure 1: Schematic diagram of Onkalo GDF project, Finland. (Image: Posiva)

Solar and wind are the world's fastest growing energy sources. Deployment of solar photovoltaic panels ranges from home rooftop installations numbering a dozen or so panels, to vast solar farms covering tens of square kilometres, with millions of panels capable of generating multiple GW of power. Off-grid solar is proving to be an effective way of bringing energy to remote communities, particularly in Africa, where half the continent's population - some 600 million people - still have no access to electricity. Wind power has grown tenfold in just the last fifteen years. The largest turbines are installed offshore, where there are fewer construction constraints and where winds are more powerful and blow more consistently. A typical modern 12 MW offshore turbine rises 250m above the sea and weighs over 1,500 tonnes. These giant machines need secure foundations, and geoscientists use sea bed cores and shallow reflection seismic data to map seafloor geology and plan installations of the foundations for each turbine, as illustrated in Fig 2, from RWE's Arkona Sudost wind farm offshore Germany. Geoscientists also map the seabed in detail to plan routes for the cables that will bring power to shore.

The growth in low carbon technologies, in particular wind, solar and electric vehicles, is increasing demand for a wide variety of 'critical minerals': mostly metals such as copper, lithium and cobalt, but also silicon and graphite. For example, by 2040, the International Energy Agency estimates that copper demand will grow by 30%, cobalt by 50% and lithium by 500%. Many critical minerals are mined and/or refined in only a few countries, with China in particular dominating global supplies of battery-grade lithium (70% of supply) and rare earth elements (92%), to name just two examples. Security of supply fears have catalyzed new efforts in exploration and production of critical minerals in Europe and North America. These efforts rely on strong geoscience expertise, from initial identification of prospective areas to detailed quantification of resources at new finds, such as the Per Geijer ore body in northern Sweden, discovered in 2023. Here, geoscientists have integrated 3D seismic data, airborne gravimetric surveys and the analysis of thousands of metres of core to map the deposit and estimate an in-place resource of over 2 million tonnes of rare earth oxides, a significant boost to meeting European demand. Their detailed mapping is also being used to help mine planning.

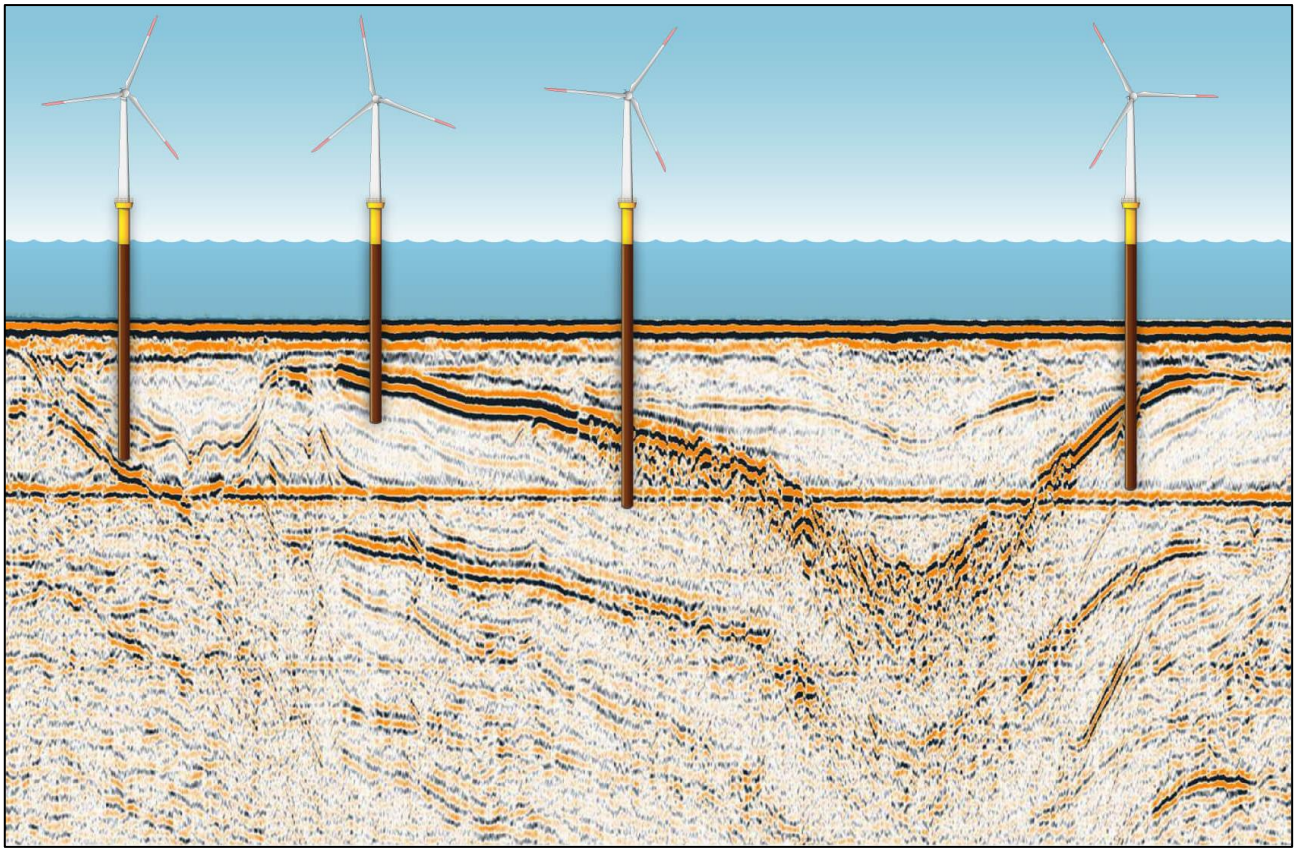


Figure 2: Seismic data used for wind turbine foundation placement, Arkona Sudost wind farm, Germany. (Image: RWE)

The UK government's 2024 Critical Minerals Strategy identified 34 critical minerals and called for 10% of the country's demand to be met domestically by 2030 (this low percentage highlighting how little is produced in the UK at the moment). Pilot production of lithium began in Cornwall in 2025 at the Trelavour project, sited in an abandoned clay pit (Fig 3), and tin mining is set to resume at the South Crofty mine in 2028. It remains to be seen how much domestic production of these vital materials can be achieved, but geoscience is central to the many activities underway, for example in building modern geological models of ore deposits from mine plans and records that often go back centuries.

Another key challenge with wind and solar energy is their inherent intermittency … the wind does not always blow, and the sun does not always shine. As power grids incorporate more and more wind and solar capacity, they are subject to greater variations in overall power generation. In many countries today, including the UK, gas-fired power fills lows in wind and solar output. To reduce the use of gas in this way, excess wind and solar power can be stored, either in massive, grid-scale battery clusters or in pumped storage hydro (PSH) facilities. In the latter case, the surplus power is used to pump water from a lower reservoir to a higher one, from where it can flow back down to generate hydropower at times of higher demand. Many new PSH projects are being built to help store wind and solar power. One of the largest potential new projects in the world is Coire Glas, in Scotland. Here, geoscientists have supported the project design by mapping the rocks within the mountain range above Loch Lochy, inside which would be excavated over 14 kilometres of tunnels and two giant caverns to house the power station.

Geothermal energy, which uses the natural heat within the Earth's crust, is currently only significant in countries which lie on tectonic plate boundaries, where magma, and therefore high temperatures, approach or reach the surface. Iceland, situated on the mid-Atlantic rift, is a classic example; it meets two-thirds of its energy needs from geothermal sources, from both hot water (for heating) and steam (for power generation). Despite being a much smaller contributor than wind and solar to global energy



Figure 3: Trelavour Project site, Cornwall. (Image: Cornish Lithium)

supplies today, geothermal has one huge advantage over them … it generates continuously, 24 hours per day, whatever the weather. Hence there is strong interest in finding locations away from plate boundaries where geothermal projects might be economic, and many geoscientists are involved in exploring for, and developing projects in such regions. One area of interest is Cornwall, which is underlain by a massive batholith (intrusive body) of granite that is hotter than typical continental crust due to the radioactive decay of some of its constituent mineral elements. Geothermal Engineering Limited (GEL) began operations at the United Downs project, the UK's first commercial geothermal power station near Redruth in February 2026. The project involved drilling a very deep (5 km) well into fractured granite where fluid temperatures reach 180 degrees Celsius. This hot water is brought to the surface, used to generate power, then returned underground via a shallower well (Fig 4). While modest in power output (3 MW), the project represents an important step in establishing a domestic geothermal energy industry.

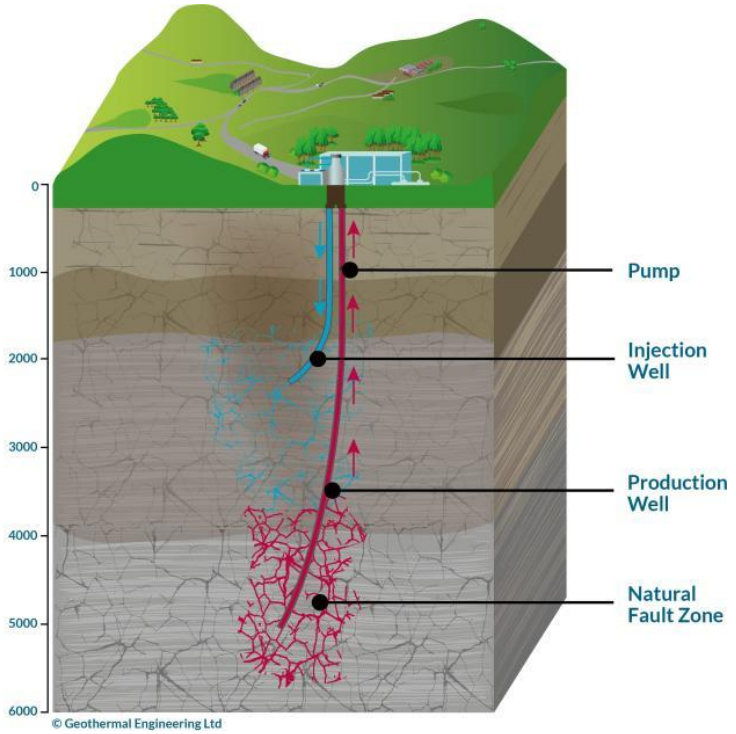


Figure 4: Schematic diagram of GEL United Downs project, Cornwall. (Image: GEL)

A key theme of the Energy Transition is to electrify as much of

society as possible with low-carbon power. However, some economic activities are hard to electrify; these include high-temperature industries such as steel and glass making, heavy transportation (long-distance road and rail freight, ships) and aviation. These activities collectively account for about a quarter of all greenhouse gas emissions.

Hydrogen is emerging as one potential solution. It burns at a similar temperature to natural gas and emits only water vapour in the process, making it suitable as a low-carbon heat source for heavy industry. In fuel cells, hydrogen can power transportation, again emitting only water vapour, and is currently being trialled in a number of demonstration projects featuring converted railway locomotives and lorries. Most hydrogen used today is made from natural gas or coal in processes which emit CO_2. It can also be made by electrolyzing water with renewable power, but this is currently expensive. Hydrogen has to be manufactured because it rarely occurs in nature. This paradigm is beginning to be challenged, however, and hydrogen exploration activities are ramping up in many countries. Geological models for how hydrogen is generated within the crust, for example by the serpentinization of mafic intrusions, are being refined. Dedicated wildcat wells are being drilled in several countries to test hydrogen prospects, driven by the economic incentive of rising demand for this low-carbon source of energy.



Figure 5: Basalt core from carbon dioxide injection trials, Iceland, showing precipitated calcite (white mineral). (Image: Tristan Aspray)

Despite the growing use of lower carbon energy sources, global greenhouse gas emissions continue to rise. **Carbon capture and sequestration** (CCS) projects aim to remove carbon dioxide from industrial waste streams and inject it underground for long-term storage. Geoscience plays an important role in the selection and evaluation of suitable storage locations. In the UK a number of CCS initiatives are moving forward, including the East Coast Cluster Project, which will take CO_2 from industrial facilities on the Tees and Humber estuaries and inject it into an anticline structure, christened Endurance, under the North Sea. Geoscientists have used reflection seismic data combined with wireline logs and cores from wells to assess the storage potential of the Endurance structure and to evaluate the quality of the top seal above it. In active CCS projects, such as Norway's Sleipner, geoscientists monitor the spread of CO_2 within its storage reservoir using changes in seismic images over time, to demonstrate that it is staying where intended. Other CCS projects rely on mineralization reactions to sequester carbon permanently in host formations, such as basalt. In Iceland, the Mammoth Project captures CO_2 from the atmosphere, dissolves it in water and then injects this into basalt hundreds of meters below the surface, in which it precipitates out as calcite and

siderite (Fig 5). Key to the success of such projects is understanding the mineralization in the basalt, and how features such as natural fractures may impact the process.

Concluding Remarks

A transition to lower carbon energy sources is now underway in many countries. There are many different scenarios and predictions of what the future global energy mix may look like, produced by individual companies, industry associations, academics and inter-governmental bodies. They all project huge increases in low carbon energy over the coming decades. The fastest growing sources will be solar, wind and nuclear. Geothermal energy and hydrogen, though less important today, look set to grow in importance, as will projects that capture carbon dioxide and sequester it underground.

Geoscientists are playing a central role in delivering all of these technologies, and in meeting the surging demand for the critical minerals needed in batteries, renewable power projects and electricity grids. Oil and gas will continue to be used as the transition unfolds; oil will increasingly serve as a source of materials such as carbon fibre, and gas will help replace coal in power generation and back up renewables while storage capacity builds out. Geoscientists will continue to play a role in maximizing the recovery of oil and gas from existing fields to help meet these needs. The opportunities for the energy geoscientist have never been so diverse!



As suggested by Janet Catchpole.

Reference: *Geoscientist magazine … April 2008*

https://www.stonechatproductions.co.uk/page2.html

FGS Field Trip Reports

Guildford Building Stones walk

Thursday, 18 June 2026

Led by Maurice Curry & Mick Caulfield

Report & photos by Tristan Aspray

Meeting Point: ***The White House pub, Guildford***
grid reference SU 994 493
address: High Street, Guildford, GU2 4AJ

Six members of the society joined leaders Maurice Curry and Mick Caulfield on the morning of June 18 for an exploratory walk up and down Guildford High Street. The aim of the trip was to look at the variety of stones used, both in buildings and as paving. Over just two hours we encountered an incredibly broad range of rock types; sedimentary, igneous and metamorphic groups were all represented, they came from all over the UK and across Europe, and their ages spanned almost half a billion years!



Figure 1: Millstone grit flagstones with plan view of ripples, outside Halifax bank, base of Guildford High Street (toe of shoe for scale).

Within metres of the start, outside Halifax bank at the base of Guildford High Street, Maurice directed our attention downwards to the "Yorkshire flags" paving stones on which we were walking (Fig. 1). Made of Carboniferous millstone grit, many exhibited plan views of ripples and cross-bedding, evidence of their deposition in rivers and delta channels, and we were to walk on these for much of the trip.

Moving up the right hand (southern) side of the High Street, we identified a variety of rock types used as facing stone for shop fronts. Next to ProCook (48 High Street), the intrusive igneous rock larvikite was observed (Fig. 2), complete with its characteristic shimmering feldspar crystals. It is quite common in facings and counter tops, often going by the trade name "Black Pearl Granite", and formed 300 million years ago. A little further on, outside Mappin and Webb (96 High Street), beautiful green serpentinite was used as the facing on both pillars and window surrounds (Fig. 3). Heavily veined, this metamorphic rock formed from low-temperature hydration of deep crustal or even upper mantle igneous rocks such as peridotite. The group speculated on the origin of the serpentinite, noting it was present in the Lizard area of Cornwall.

Another metamorphic rock observed on the trip was Carrara Marble, from Tuscany. It formed when limestone was buried deep in the crust and subjected to very high temperatures and pressures, before being returned to the surface by tectonic movements, allowing quarrying. We found it at several locations, including around the side windows (i.e. viewed from The Shambles side street) of the iFix repair shop at 66 High Street. Prominent were many stylolites … jagged dark bands of insoluble material concentrated under pressure during the metamorphism process (Fig. 4).



Figure 2: Larvikite, 48 High Street.



Figure 3: Serpentinite, 96 High Street.

Continuing up the High Street, we reached the impressive neoclassical Tunsgate Arch, built in 1818 as a corn exchange, and constructed of Jurassic-aged Portland limestone, the same material used by Christopher Wren in the rebuilding of London after the Great Fire of 1666. Mick noted that the two inner columns had actually been moved apart in 1937 when the arch became the entrance for a car park, the exchange beyond having been demolished. The group examined the columns closely and identified lags of oyster shell fragments within this fine-grained oolitic rock (Figs. 5a & 5b), which has been quarried extensively along the Dorset coast for hundreds of years.

From the rocks of southern England to those of the northwest … our next stop brought us to the now-closed BOSS shop at 128 High Street, and its impressive facing made from Borrowdale Volcanic rock. Maurice had come equipped with water to wet the dusty surface, to reveal the ash and tuff beds deposited in the Ordovician Period, some 450 million years ago, when the Lake District was a major centre of volcanic activity. The base of the pillar on the right-hand side of the entrance had the clearest bedding (Fig. 6).



Figure 4: Stylolite in Carrara Marble, 66 High Street.

Moving on to Barbour at 158 High Street, Maurice pointed out the distinctive pillars of travertine limestone, formed in hot spring environments, with its characteristic high porosity and water escape features (Fig. 7).





Figure 5a: Fabric of Portland Limestone in Tunsgate Arch columns; Figure 5b: close up showing oyster shell fragments and spherical oolite grains.



Figure 6: Tuff and ash layering in Borrowdale Volcanics; facing stone at 128 High Street.

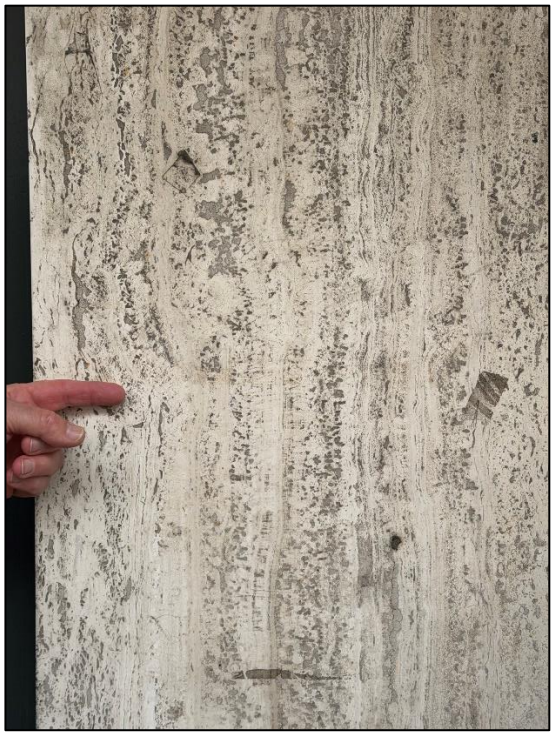


Figure 7: Travertine limestone column at 158 High Street: depositional "up" is to the right; finger points to a water escape feature.

The group next reached Holy Trinity Church, where a wide variety of rock types have been used. Turning right along the passageway at the western end of the church, we walked over Purbeck Limestone, deposited in freshwater and full of gastropod snails (Fig. 8). The church dates from the 1300s but was mostly rebuilt after 1760 in brick.



Figure 8: Purbeck Limestone full of snail fossils.

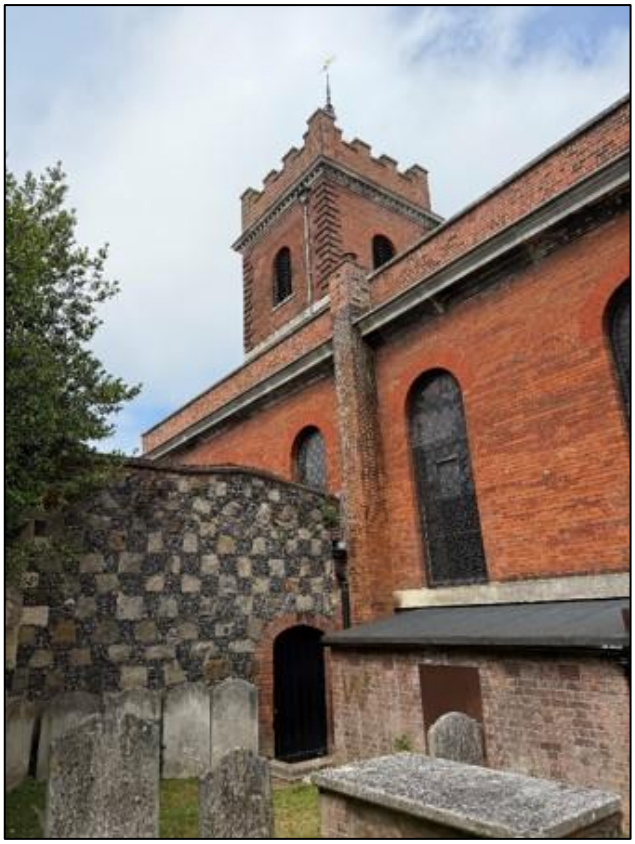


Figure 9: Location of 14th Century Weston Chantry Chapel on the south side of Holy Trinity Church.





Figure 10a: "Chequerboard" wall of Weston Chantry Chapel: Sarcen stones alternating with groups of flint, while windows are framed with Bathstone (hand for scale); Figure 10b: flakes of flint inserted into mortar as gallets, just below 20p piece.

However, a small section of the original building remains – the Weston Chantry Chapel on the southern side of the church (the side away from the High Street, Fig. 9). Its walls were built in a "chequerboard" motif, with dressed Sarcen stones of early Tertiary age alternating with groups of flints from late Cretaceous chalk deposits. These sat between windows framed with golden-coloured

Jurassic “Bathstone”, another oolitic limestone (Fig. 10a). Maurice also pointed out the placement of small, sharp flakes of flint within the mortar surrounding the flint cobbles and sarcens – a practice known as “galletting". The group could not decide if this was done for decorative or more practical mortar-strengthening purposes (Fig. 10b). Subsequent research indicates that it could have been either or both. All agreed that this was an optimal group photo location (Fig. 11).



Figure 11: Group photo by the walls of the Weston Chantry Chapel.

We retraced our steps back to the High Street and, after a brief viewing of more Portland Stone outside “Posh Pawn” at number 164, we crossed and began our descent on the other side. The group first came to the distinctive George Abbot’s Hospital, still used as a home for local elderly people. We only investigated the exterior of the building, the highlight of which were excellent flagstone examples of the Lower Cretaceous Paludina Limestone, named for its distinctive *Viviparus paludina* gastropod fossils and sourced from the High Weald of Sussex and Kent (Fig. 12). Maurice pointed out that this rock also went by the name “Weald Marble”, though geologically it is not a marble; it was given this name as it could be given a polished finish. The group had got its collective eye firmly in by now and quickly identified the Portland Limestone in the hospital’s balustrade and slightly further down around the front of NatWest Bank, at 151 High Street.

Igneous rocks were to dominate the rest of the walk, starting with the pairing of a K-feldspar-rich granite and an overlying band of gabbro, seen just above street level at 135 High Street (Fig. 13). These two intrusive rock types have very different chemistries and form in very different settings, so this building design brought together two igneous rocks not usually seen in such proximity!

In the entrance to Prestons jewellery store, at 115 High Street, we stopped to examine tiles made from a very coarse-grained granite / pegmatite (Fig. 14a). The feldspar crystals within this ranged up

to 5 cm across and displayed spectacular zoning: different coloured layers formed from different chemical compositions; pale grey to white crystal cores were surrounded by pinker borders, likely having more potassium. Some also contained a single band of a much darker mineral, which the group speculated could be mica or amphibole (Fig. 14b). While we debated evolving melt chemistries, Maurice reassured the security guards that our interest lay in these phenocrysts, not the Rolexes on display in the window!

Further down we reached one of Guildford High Street's most iconic buildings, the Angel Hotel. Mick recounted that it was the last of five coaching inns that had once bordered the High Street, providing a night's rest and stabling on the London to Portsmouth road. The last coach called in 1849. Of particular interest here, within the archway that leads off the High Street, was the variety of cobblestones and larger, flanking paving stones, made from several different types of granite, which ranged in colour from pink to grey to white (Fig. 15).



Figure 12: Paludina limestone, or "Weald Marble", flagstone outside George Abbot's Hospital (20p piece in centre for scale).

The entranceway to Marks and Spencer at 61 High Street brought together sedimentary, igneous and metamorphic rocks. Adjacent to the street we studied pillars of a pale limestone containing Rudist fossils (Fig. 16). This rock was deposited in the Cretaceous, in warm sub-tropical seas. Rudists were important reef-building organisms of their time, and, as bivalves, are related to modern-day clams. They went extinct at the end of the Cretaceous. Within the shaded confines of the entrance, we then looked at a dark marble flanking the doors (Fig. 17) and a band of coarse-grained gabbro below the glass.



Figure 13: Facing of gabbro (dark) above K-feldspar-rich granite (light), 135 High Street.

Our final stop on the High Street was at the entrance to Phoenix Court, where we observed a distinct red granite, often called "Peterhead Granite", rich in dark pink K-feldspar crystals. Maurice then led the group off the High Street and down Quarry Street to St. Mary's Church. The group viewed its predominantly flint exterior walls, also noting that in the uppermost part of the tower, above the level of the clock, the flint gives way to locally quarried Lower Greensand Bargate stone (Cretaceous) that continues up to the castellated top (Fig. 18). The flint portion of the tower dates to late Anglo-Saxon times, around 950 to 1040 AD, and is one of the oldest surviving structures in Guildford.

This marked the end of the tour. We were all impressed by the variety and quality of rock types that were so easy to observe over the course of a leisurely two-hour stroll. The group thanked Maurice for his leadership of the trip and Mick for his historical context.





Figure 14a: Tiles of coarse granite at 115 High Street; Figure 14b: large phenocrysts of zoned feldspars within this rock.



Figure 15: Granite cobblestones, Angel Hotel.



Figure 16: Rudist Limestone outside M&S.

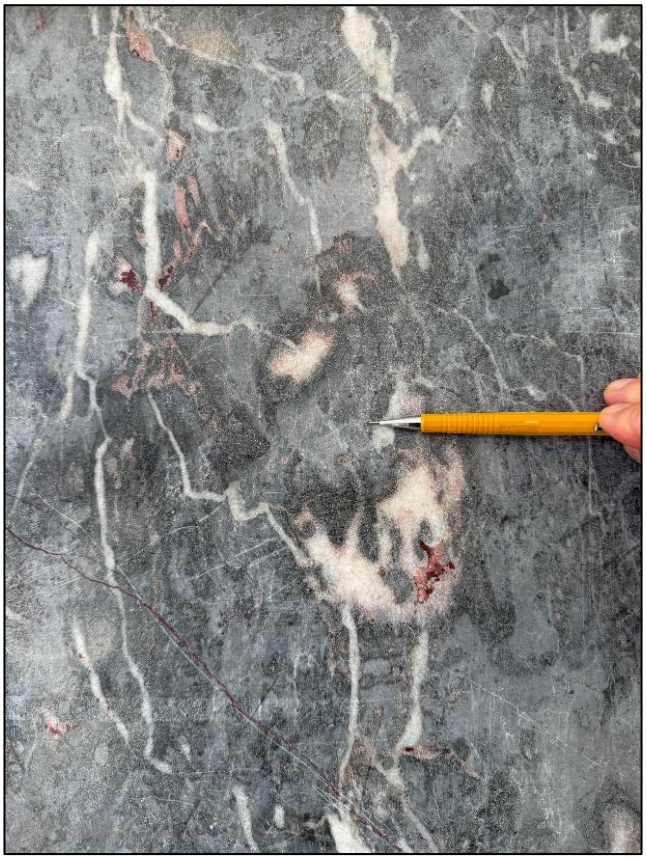


Figure 17: Dark marble outside M&S.



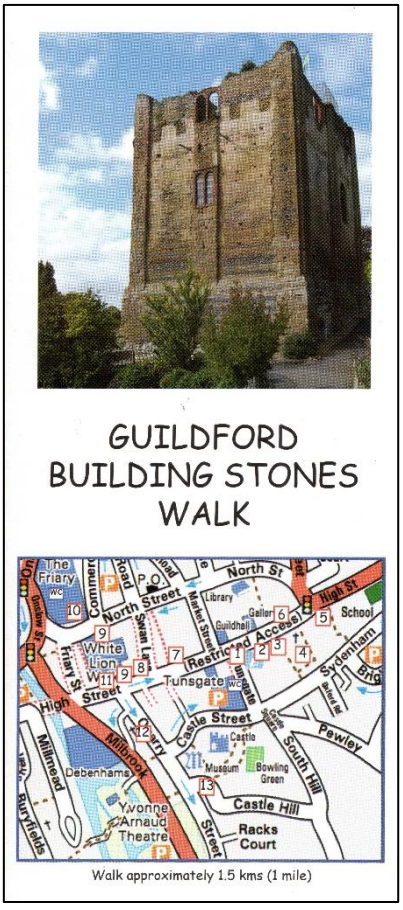
Figure 18: St. Mary's Church, Guildford.

Reference:

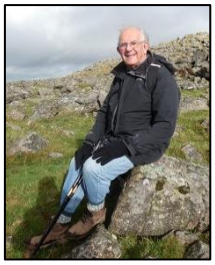
At the start of the trip, Maurice handed out copies of the pamphlet "Guildford Building Stones Walk", which covers many of the stops made on this trip (and several others on North Street and by the castle), and has additional background information on local geology and building materials. It was compiled by Surrey RIGS Group, part of a network of schemes across the UK aimed at conserving "Regionally Important Geological and Geomorphological Sites" and was published with the support of Surrey County Council.

Age	Geological Period	Building Stone
0 - 2	Quaternary	Travertine
23 - 65	Tertiary/Eocene	Sarsen
65 - 99	Upper Cretaceous	Flint Chalk Rudist Limestone
99 - 142	Lower Cretaceous	Gault Clay Carstone Bargate Stone Weald Clay Purbeck Limestone
142 - 147	Upper Jurassic	Portland Limestone Oolitic Limestone
248 - 290	Permian	Larvikite
290 - 354	Carboniferous	York Stone
417 - 443	Silurian	Peterhead Granite
443 - 495	Ordovician	Borrowdale Volcanics
495 - 545	Cambrian	Welsh Slate

THE AGE (in million years) OF SOME OF THE BUILDING STONES



Building Stones walk around Chichester



Sunday, 26 July 2026

Leader: David Bone

Report & photos by Katherine Rusbridge

The leader for our walk round Chichester was David Bone – a non-professional but expert geologist and archaeologist with a near-encyclopaedic knowledge of Chichester, its building stones and the history of the quarries for those stones. He gave us a very interesting and informative tour around some of the major sites in Chichester and some of the lesser known ones too. There was a wealth of knowledge in the tour and it would be impossible to include it all in this review. Hopefully this will cover most of the key material and entice you to visit Chichester.

We assembled at the **Market Cross** (Fig. 1) in the centre of the city being grateful, rather surprisingly in this very hot dry summer, for some shelter from a persistent drizzle. Market Cross is thought to have been built around 1500 from Caen Stone, a limestone imported from the Caen region of Normandy. This was our introduction to the key fact about buildings in Chichester; the local stone is mainly chalk, too soft to be used externally for buildings so David's tour included information about the sources of the various imported stones. Chichester Cathedral, a short stroll from the Market Cross, was built largely from Caen Stone as well as Quarr Stone and Ventnor/Bonchurch Stone during the 11th and 12th centuries.



Figure 1 : Chichester's Market Cross.

Before entering the cathedral area, we stopped at **St Peter-the-Great** building (Fig. 2), immediately in front of the Cathedral. It was originally a church now a pub. This building illustrated what can go wrong using sedimentary rocks. It had been built in 1854 from



Figure 2: St Peter The Great showing poor state of some of the stonework.



Figure 3: Bell Tower mainly encased in netting.

Caen stone but much of the stonework was already in a poor state. The builders seem not to have understood the importance of placing a stone block with the same bedding orientation as quarried. If the block is in effect rotated by 90° to sit "end-on", then rainwater and subsequent weathering can become a big issue, leading to spalling. It is also important to understand case-hardening. This occurs

in the freshly exposed surface of a quarried rock. As water moves to the surface and evaporates, it leaves a mineral deposit which hardens into a protective layer. The worst thing to do with such stones is to sand-blast them in an effort to clean them. It does clean them but also removes the case hardened layer, exposing the rock beneath to weathering. Modern methods use talc suspended in water which cleans without being abrasive. The building was definitely looking, literally, "the worse for wear".

Opposite the St-Peter-the-Great building stands the **Bell Tower** (Fig. 3) whose stonework is also in a poor state. Built in the 15th century, it is detached from the Cathedral as it was feared that the weight of the bell tower and bells could cause subsidence if located at the Cathedral itself. It is made from blocks of Ventnor Stone, a type of Upper Greensand. The state of the stonework is so bad that it is encased in netting to prevent spalling material falling onto pedestrians below. As far as we could see through the netting, it did have an attractive green tinge from the presence of glauconite. The base used Chilmark Stone.

Walking towards the main west entrance of the cathedral, we looked at its **North West Tower** (Fig. 4). Most of this had collapsed in 1636 and was not re-built until 1901. David pointed out the join between the original surviving section of the tower and the more recent part made from Chilmark Stone which runs, of course, the full height of the tower.

The Cathedral has not been lucky with its towers! The South West Tower was damaged during a storm in 1210. It was repaired with Caen Stone. Most dramatically, the central tower and its spire pancaked down into the nave on February 21st 1861, fortunately when the building was empty. It was five years before it would be back in use.

David gave us some interesting facts about the pillars around the doorway. They are purely decorative rather than load-bearing being slotted in once the surroundings are completed. Some of them are made from Purbeck Marble, so called as it is hard enough to take a polish even though it is correctly identified as a limestone.

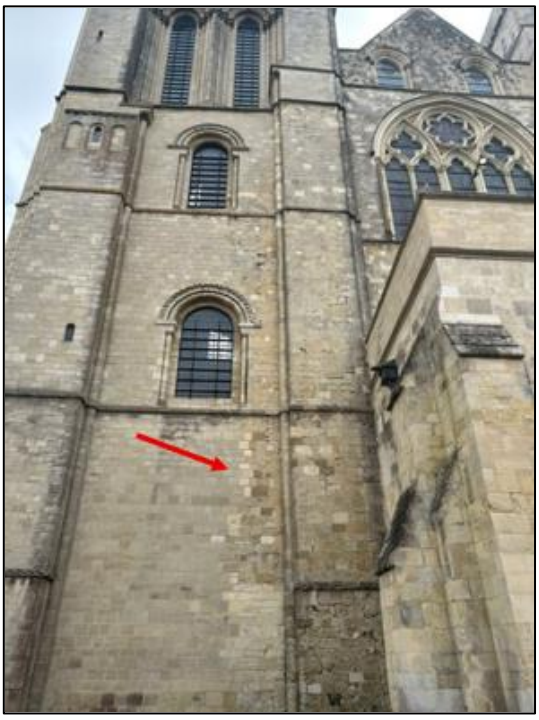


Figure 4: North West Tower of Cathedral. There is a clear distinction between the original stonework to the right and the stonework of the re-construction in 1901 on the left.



Figure 5: Multi-rock wall near Cathedral.

Moving past the Cathedral, we inspected the wall at the back of the green. At first glance, it was just a complete jumble of rock, stuffed together seemingly with little thought for its appearance or structure. David suggested that maybe a call had gone out to the citizens of Chichester to provide stones for the wall and this is the mish-mash received. For him, it is a **treasure trove of fifteen rock**

types, including all of those we would be meeting later in the tour. One day, he plans to compile a "spot the rock" activity for visitors.

Next stop was **The Cloisters**. During recent renovation work, David had been tasked with identifying the material of all of the flagstones. A few were easy to identify, such as the Sussex Marble with its dark colouring and fossiliferous appearance. There were also some ledger stones, where the name of the person buried beneath was just about distinguishable. Most had been identified by David but there were a few which defeated even him. From the Cloisters we moved to the café for lunch. Even this room had geological interest as David told us to look out for ammonites and belemnites in the paving stones.

In the afternoon, we visited various sites round the city. These are not described in the following in sequence. Rather this part of the report will focus on the building stones used and the quarries they came from.

Quarr Stone: this is a pale grey freshwater limestone from the Isle of Wight, near Binstead. It is durable and was used in the early stages of building the Cathedral, before Caen Stone was imported. The deposit was not large so it was mainly exhausted in the 1400s. David pointed out that this makes it very useful in dating a building. Yes, there are clues about the age of the building such as its style etc. However, the presence of Quarr Stone means it was very likely to pre-date the 1400's.

Mixon Stone: described as a bioclastic limestone or calcareous sandstone. It was quarried from an off-shore reef near Selsey. The quarrymen would go out to the reef on a high tide, wait for the low tide to expose the rock, quarry what they could and wait for the next high tide to return to shore. By the start of the 19th century, a huge tonnage of this stone was being quarried to such an extent that there were concerns about coastal erosion. After a stand-off between the Admiralty and the quarrymen anxious about losing their livelihood, the Admiralty prevailed and banned further quarrying in 1837. It was used mainly for rubble-built walls.

Lavant Stone: this is a coarse grained partially cemented chalk in the Upper Cretaceous of the South Downs, named because of the proximity of the quarry to the village of Lavant, north of Chichester. It was used in various medieval buildings around Chichester, including the Guildhall in Priory Park dating from the early 13th Century. Surprisingly, it was only in 1991 that the stone work was recognised as a distinct stone and subsequently given its name by no less a person than our guide David Bone!

The key event that started David and his wife Anne on their research into this stone and its quarry location was a visit to the Chichester District Museum by the consultant archaeologist at Chichester Cathedral. He noticed that a stone sample at the museum looked very similar to a building stone found in the Cathedral, specifically it had sharks' teeth in it, identical to those of the Cathedral. "The stone was apparently a form of chalk, but unusually rich in siliceous sponge spicules and grains of brown phosphate that when weathered give a distinctive surface texture*" (Text in quotes taken from David's published work in the **Proceedings of the Geological Association 111**, p193-203)*

The Lavant Stone quarry was near Stoke Clump just north of Chichester. It had probably stopped production of stone by the mid-1300's.

Malmstone: this is a calcareous siltstone from the Upper Greensand Formation. It has been found in many medieval buildings in and around Chichester. David thought it might have been pilfered by later builders, taken from the Roman walls where it had been used as cladding. The location of the Malmstone is on the north side of the South Downs escarpment; getting it up and over from there to Chichester would have been a very arduous route in Roman times. Maybe there was another source of it, easier to get at. David is now working on two papers for publication, one on identifying the Roman quarry site and the other using statistics on the stone dimensions to prove the medieval re-use of Roman material.

Flint: we saw several walls and buildings with the familiar style of flint and mortar. One redundant church had the added feature of "galletting". This is where flakes of flint are embedded into the mortar,

sticking out like mini gargoyles to divert rain away from the wall. There were many thousands of them. This is not a wall you would like to lean against!



Figure 6: Galletting. Flint church wall with flakes of flint embedded.



Figure 7: Close up to show flint flakes more clearly.

Many thanks to David Bone for giving us such a wide-ranging insight into the building stones of Chichester - and to Tessa Seward for coordinating the trip.

Since the trip, I have wondered why it was decided in 1901 to re-build the North West tower of the Cathedral, some 250 years after it collapsed. Maybe it was in honour of Queen Victoria who died that year.

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News

Storms that built a graveyard: ancient monsoons created a spectacular dinosaur fossil site

Alfio Alessandro Chiarenza, Royal Society Newton International Fellow in Palaeontology, UCL
22 July 2026

Around 80 million years ago, a stretch of tropical coastline in what is now north-eastern Italy was lashed by monsoon rains and tropical cyclones. Those storms swept dinosaur carcasses, crocodiles, plants and river mud onto a tidal flat, where the tides and a film of microbes sealed everything away with extraordinary preservation.

My colleagues and I have published a new study that reconstructs the violent tropical climate behind the **Villaggio del Pescatore Lagerstätte** near Trieste and reveals it preserves just four decades of life, recorded almost day by day.

The Villaggio del Pescatore site near Trieste is one of the most important Late Cretaceous fossil localities in the Mediterranean. It is the only known site in the region to preserve large land animals, including dinosaurs such as *Tethyshadros insularis*, from the final 15 million years or so of the age of dinosaurs.

Tethyshadros insularis was a plant-eating, duck-billed dinosaur that lived in what is now north-eastern Italy around 80 million years ago. It was initially interpreted as a dwarf island species, shaped by the "island rule" – that large animals evolve smaller bodies in environments with limited space and resources.

However, the discovery of larger specimens challenged this idea. Up to 11 individuals are potentially preserved in this succession of rocks, with at least three other fairly complete skeletons still waiting to be extracted from the hard (and expensive to cut) limestone rock. Geological evidence has also revealed that the site was about 10 million years older than previously thought and was not part of a tiny, isolated island. Instead, it lay near a larger landmass connected through the ancient Mediterranean region.



Reconstruction of a Tethyshadros insularis skeleton, nicknamed Antonio, near his finding site. (Tiziana Brazzatti, CC BY-ND)

The fossils of tiny crocodilians named *Acynodon* (with shorter muzzles than modern crocodilians) have also been found at this site.

After years of research, Professor Federico Fanti of the University of Bologna and I led a multidisciplinary team of palaeontologists, physicists and geologists to determine exactly how this fossil treasure trove formed. Our findings overturn decades of competing interpretations.

In a study published in ***Global and Planetary Change***, we show that the site was not a quiet, isolated lake or sinkhole, as previously suggested. Our results suggest it was a storm-battered tidal flatland at the edge of a tropical sea.

Villaggio del Pescatore is not simply a place where fossils happen to be beautifully preserved. It is also a record of the weather that shaped the site. We can identify individual storms and floods in the rocks, almost day by day. Very few fossil sites on Earth allow us to do that.

Reading the rock like a calendar

The fossils at Villaggio del Pescatore are concentrated in a finely layered carbonate rock, marked by thousands of paper-thin light and dark bands. For years these were interpreted as annual layers (like tree rings) laid down season by season.

Our new analysis tells a different story. Using high-resolution X-ray scans at the Elettra Synchrotron in Trieste, alongside detailed geochemical and microscopic analyses, we showed that the bands were not annual but daily. A synchrotron accelerates electrons (particles with a negative charge) to almost the speed of light. This produces powerful X-rays that can penetrate dense materials such as rock. This allowed us to examine structures inside the rocks and bones at a resolution of fractions of a millimetre.

The scans revealed that the layers were deposited by ocean tides, two pairs each day. These tides varied according to the familiar fortnightly cycle of stronger and weaker tides that still happen today. We could count these tidal layers, thanks to this unparalleled resolution.

The entire fossil-bearing rock pile, our results calculate, accumulated in only about 40 years, a single human lifetime, frozen in stone. Most fossil deposits containing several individuals average together thousands or millions of years. Here, we're looking at a few decades.

Monsoons, cyclones and microbes

To explain why storms were so central to the preservation of the fossils, the team ran climate simulations. The models consistently placed the site at around 29° north, inside a powerful, summer-dominated monsoon belt. This was a tropical regime of intensely wet summers and recurring tropical cyclones, sustained by the greenhouse climate of the age.

Monsoon-driven floods and cyclone surges created pulses of sediment, nutrients, plant debris and animal carcasses onto the tidal flat. The tides trapped this material, and mats of microbes rapidly stabilised it. This encouraged the sediment to harden right after the carcass was deposited, before it started rotting or predators could scavenge its dead tissues. These storms were the main agents behind this preservation.

The site's three most important *Tethyshadros insularis* dinosaurs show a range of fates: one buried so quickly that soft-tissue outlines survive, another bearing the cracked, sun-dried bones of a carcass that lay exposed inland before being washed in by a flood. Crocodilians such as *Acynodon adriaticus*, fish and shrimps were also local residents, entombed close to where they lived and died.

We propose that this combination of "ingredients", monsoon floods, tidal trapping and microbial sealing, represents a recipe for creating exceptionally preserved fossil sites in hot, tropical greenhouse climates – precisely the kind of setting in which rapid decay would normally destroy organic remains.

The study also offers an ancient perspective on how intensifying monsoons and cyclones can reshape coastlines, ecosystems and what becomes preserved along tropical shores.

Villaggio del Pescatore has been studied for more than four decades, yet it still has new stories to tell. Understanding how extreme storms transformed this ancient coastline may also help us think about how modern coasts could respond to a warmer and more turbulent climate fuelled by high levels of CO_2.

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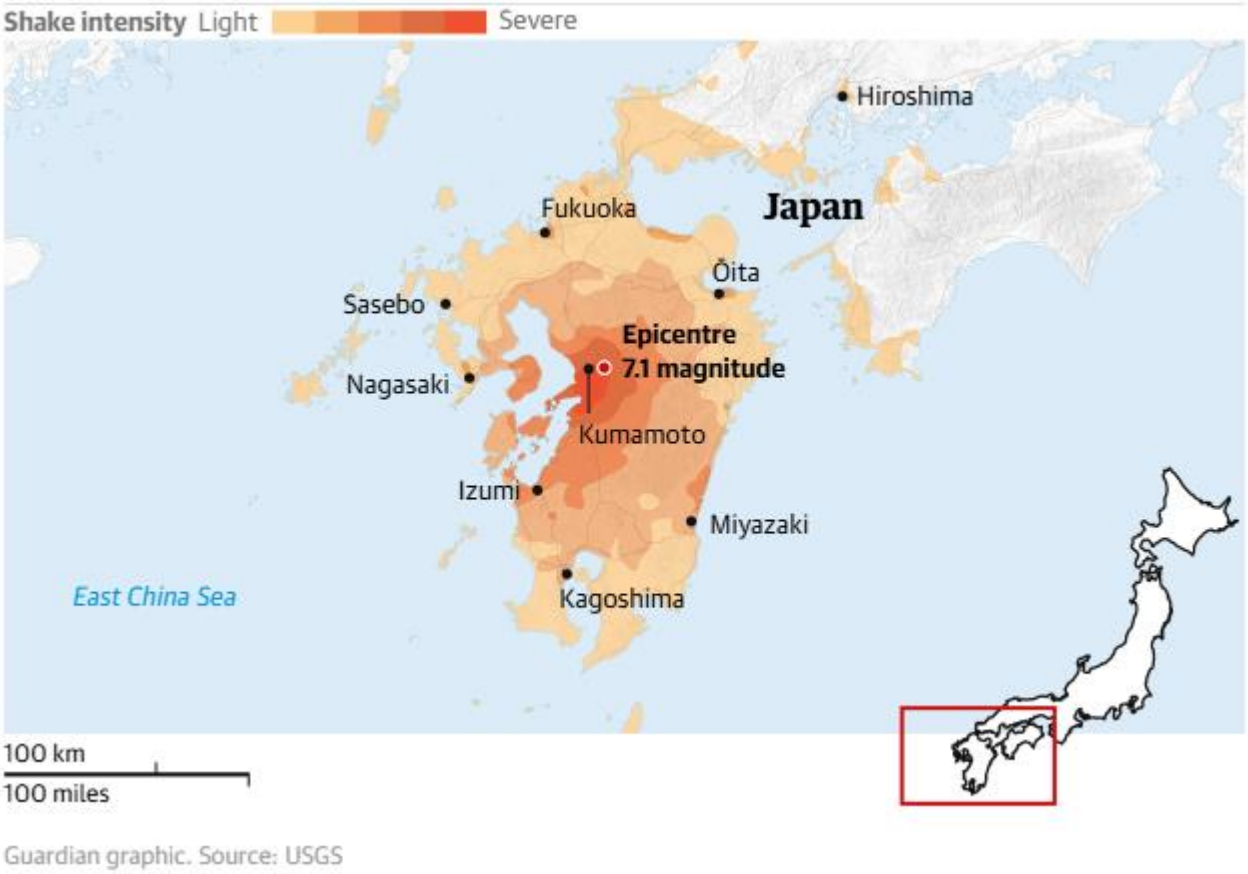
Japan earthquake injures at least 100 and traps many inside shopping mall

Deaths expected as Kumamoto shaken by 6.8-magnitude quake, knocking out power and damaging buildings

Rachel Hall, The Guardian ***28 July 2026***

A 6.8-magnitude earthquake has shaken south Japan, leaving at least 100 people injured. Some are trapped and presumed dead inside a shopping mall.

The earthquake hit Kumamoto prefecture on the southern Kyushu island late on Tuesday afternoon, knocking out power to thousands of homes and damaging roads, bridges and buildings.



Guardian graphic. Source: USGS

Japan's prime minister, Sanae Takaichi, told reporters authorities were still assessing the extent of the damage in the area, which was devastated by another deadly quake a decade ago.

“We have already been informed that people have been injured. Power outages and fires have occurred in some areas, and there has also been damage to roads and bridges and the collapse of buildings,” Takaichi said. “I ask everyone to take action to protect themselves, including evacuating to a safe location.”

About 300,000 people have been instructed to go to evacuation centres, the disaster management agency said. The areas with the biggest tremors will remain at risk of further strong quakes and landslides for about a week since the shallow earthquake is triggering active seismic activity in the area, according to the Japan Meteorological Agency (JMA).

So far there have been more than 60 aftershocks ranging in magnitude from 1 to 4, the agency said. A tsunami warning was issued immediately after the quake, but was lifted within two hours.

One person was killed in south-west Japan when a house collapsed during the earthquake, Kyodo News reported.

Two hospitals reported more than 50 injuries each, including 10 in a serious condition, the public broadcaster NHK said. “People are coming in with burns and fractures from being trapped under objects due to the earthquake, and ambulances are constantly bringing in injured people,” NHK quoted one hospital employee as saying. “Inside the hospital, there are water leaks and electrical system failures.”

Several people on a high-speed train at the time of the quake were also injured and multiple people were unaccounted for after a chimney collapsed at a Nippon Paper Industries factory, according to local media reports.

An explosion occurred in an Aeon shopping mall shortly after the earthquake, trapping “many people”, fire services said. The broadcaster TBS reported that police said “quite a few” were presumed dead. About 20 to 30 workers at the mall were unaccounted for, NHK said. Kyodo News reported that four people had been taken to hospital, all of them conscious.

An Aeon spokesperson said customers and employees were evacuated after the initial quake and the cause of the explosion remained unclear. A government official subsequently told reporters that Aeon Kumamoto reported a gas leak, though it had not yet been determined as the cause.

Footage showed one side of the mall, the prefecture’s largest with roughly 200 stores, was torn away, exposing steel beams and strewing debris across the neighbouring car park. Several ambulances and fire engines were parked outside as rescue teams searched for survivors.

Footage from NHK showed several other buildings on fire or partly collapsed, along with large fissures appearing on major roads, including an elevated highway. TSMC, the world’s largest contract chip maker, Sony and Fujifilm evacuated workers from their factories in the area.

The quake’s epicentre was about 12 miles (20km) south of Kumamoto, central Kyushu island’s largest city, with a population of about 700,000. The US Geological Survey initially said the earthquake had a magnitude of 7.1, but revised it later to 6.8. The tremor at 4.27 pm local time had a magnitude of 7.1, the JMAsaid, but reached the highest level of 7 on Japan’s shindo scale. A subsequent aftershock with a magnitude of 6.1 was registered at 5.08pm.

Japan, which is located along the “ring of fire” of volcanoes and oceanic trenches in the Pacific basin, is one of the world’s most earthquake-prone countries, with a tremor occurring at least every five minutes. The country accounts for about 20% of the world’s earthquakes of magnitude 6 or more.

The massive earthquake in Kumamoto 10 years ago killed 275 people and injured a further 2,739. It damaged thousands of buildings including the city’s castle, a popular tourist site. Some of the castle’s stone walls are said to have been damaged in the most recent quake.



A smokestack at Nippon Paper Industries' Yatsushiro mill collapsed in the 6.8m-magnitude earthquake. (Photograph: Kyodo News/AP)

Kyushu Electric Power said 48,000 homes had lost power, while the railway company JR Kyushu suspended services, including its high-speed bullet trains. Kumamoto airport also shut its runway as airlines diverted and cancelled flights.

The telecoms operators KDDI and NTT Docomo said there was disruption to their mobile phone services owing to power shortages and transmission-line failures. There were no irregularities reported at the nuclear power stations in the area, Japan's nuclear regulation authority said.

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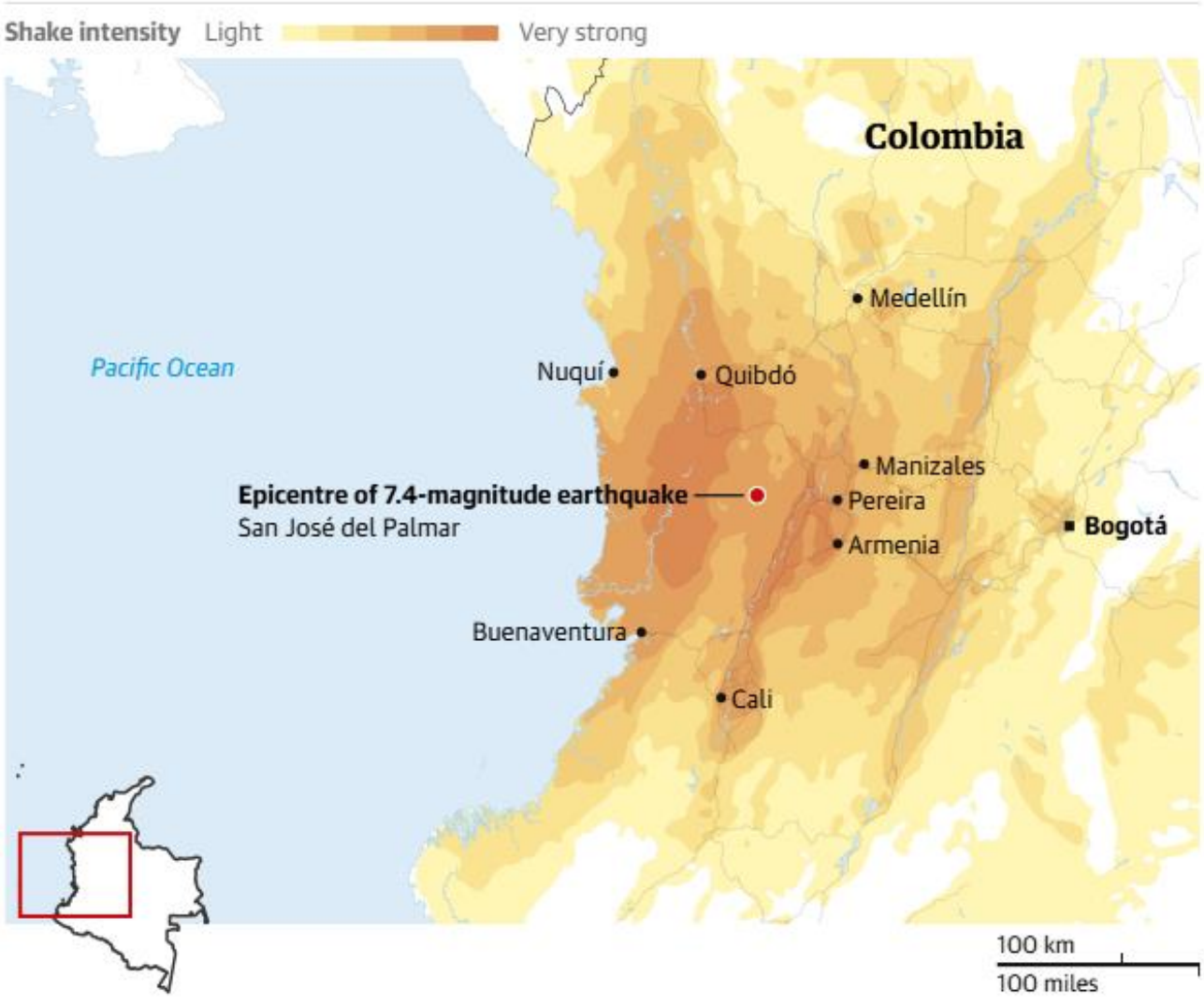
Scores dead in Colombia after powerful earthquake strikes west of country

Quake of 7.4 magnitude collapses and severely damages buildings in several major cities, including Cali and Pereira

Tom Phillips & Thomas Graham in Bogotá, The Guardian ***11 Aug 2026***

More than 100 people died after a powerful earthquake struck western Colombia, collapsing and severely damaging scores of buildings in major cities including Cali and Pereira.

The US and Colombian geological surveys reported that a 7.4-magnitude earthquake struck at 7.34am local time on Monday, with its epicentre in the western department of Chocó. It was felt in neighbouring Venezuela, still reeling from a deadly double earthquake on 24 June.



Guardian graphic. Source: USGS

Colombia's president, Abelardo de la Espriella, said 111 people had been killed and 87 injured, while 61 buildings had collapsed.

"The national government has all of its capabilities deployed to protect lives, assist affected communities and deliver aid wherever it is needed," he said in a national address at about 1pm local

time upon declaring a national state of emergency. “The first priority is rescuing the people trapped under the rubble.”

Western Colombia appeared to have suffered the most serious damage. Authorities reported 27 deaths in the Valle del Cauca department, 40 deaths in Pereira, the capital of Risaralda department, and at least two in Manizales, the capital of Caldas.

The mayor of Manizales, Jorge Eduardo Rojas Giraldo, said at least 12 buildings and 20 homes had been partially or completely or destroyed.

In a video post, he told citizens to be “completely ready” for aftershocks. “Do not go back into the buildings yet. I know this isn’t easy but stay outside for a little while at least because there could be an aftershock.”

Social media videos showed people searching for victims in the wreckage of a four-storey hotel in Cali and a woman sprinting from a building as it collapsed in Manizales. One video showed part of San José church in Pereira collapsing as palm trees around it shook. Another video published by the newspaper El Tiempo captured the moment a building gave way in Manizales.

The mayor of Cali, Alejandro Eder, said at least 20 buildings collapsed in his city and people were trapped inside. “Right now, we are trying to map out what has happened, firstly to protect lives and secondly to be able to push ahead with any kind of rescue that might be necessary,” he said, urging citizens to stay calm.

He told residents to check their buildings for structural damage. “If you do not feel safe, if you see very large cracks, please leave the building.”

In an interview, the mayor of Pereira, Mauricio Salazar, said 65 buildings had collapsed, with victims thought to be trapped in at least 15 of them. Five of the city’s hospitals were reportedly inundated with the injured.

Raúl Andrés Buitrago, the head of customer service at a business in Pereira, said he was leaving for work when the seismic alert on his watch went off. “There are often little tremors here,” he said. “But I’d never felt an earthquake like this. It started softly, softly, softly, then it felt like it was getting stronger every second.” He spoke of “horrible” scenes as he fled outside on to the street in the city centre, which is home to many old buildings. “The roofs started to fall in. The buildings collapsed in on themselves. The panic was terrible. They were the four longest minutes of my life.”

The governor of Chocó, Nubia Carolina Córdoba, said people had been injured and buildings severely damaged in the department’s capital, Quibdó.

De la Espriella, who took office on Friday, said he would lead the government response. “Colombia has a president whose heart aches for his people and who will do everything in his power to help them in the most difficult moments,” he said in a video post.

De La Espriella visited Quibdo where he promised rent subsidies for those who had lost homes and then travelled to Cali. Authorities in Cali, Armenia and Manizales announced curfews, with Cali’s mayor saying threats of looting had forced him to deploy police and military personnel to the streets. De La Espriella promised 1,000 additional security personnel for the city.

Aviation authorities said the airports were damaged in Pereira, Manizales, Quibdó, Cartago, Armenia and Buenaventura.

Neighbouring Venezuela was struck on 24 June by twin earthquakes that devastated the country’s northern coast, killing more than 6,000 people.

The US secretary of state, Marco Rubio, said the Trump administration – which has thrown its weight behind Colombia’s new right-wing president – would provide $15.5m in emergency aid.

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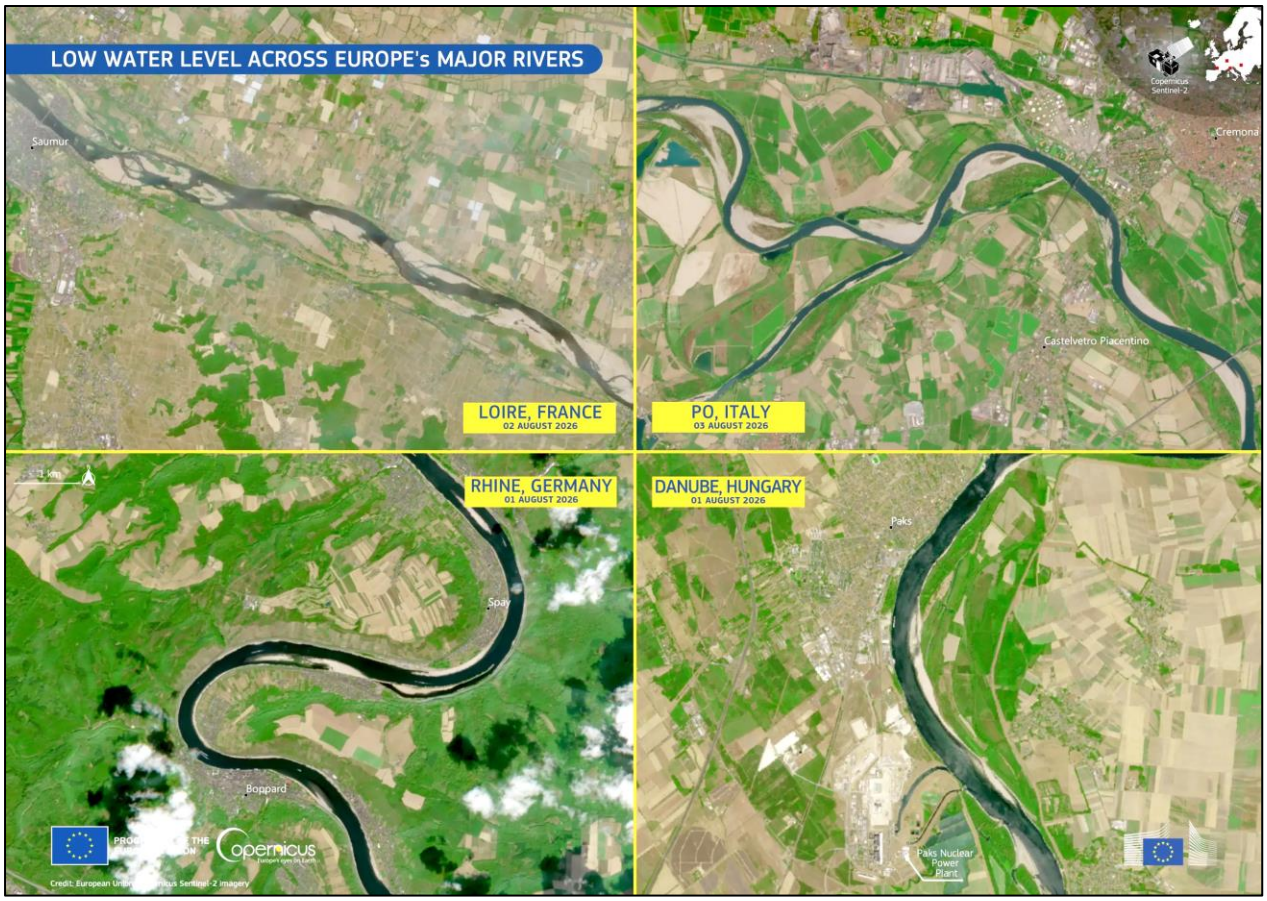
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Image of the Day 1

Europe's major rivers at record low water levels

05 Aug 2026

Location: France, Italy, Germany, Hungary
Credit: European Union, Copernicus Sentinel-2 imagery



Copernicus Sentinel-2 images acquired between 1 and 3 August 2026 reveal exceptionally low water levels along sections of four of Europe's largest rivers: the Loire near Saumur in France, the Po near Cremona in Italy, the Rhine near Boppard in Germany, and the Danube near Paks in Hungary. Extensive sandbanks and gravel bars, normally hidden beneath the water, are clearly visible in each scene, illustrating the widespread impact of the prolonged drought which is affecting much of Europe.

The consequences extend well beyond the riverbanks. On the Rhine, reduced water levels are limiting cargo transport and disrupting industrial supply chains across central Europe. Along the Danube, the image shows the Paks Nuclear Power Plant, where low river discharge is creating serious operational challenges for reactor cooling. In Italy, the level of the Po River continues to cause mounting pressure

on irrigation, hydropower generation, and freshwater availability, while the Loire reflects hydrological conditions consistent with the severe hydrological stress affecting large parts of western Europe.

The Copernicus product portfolio includes two Drought Observatories, managed by the Copernicus Emergency Management Service, which provide, respectively, drought indicators and early warning for droughts in Europe (EDO) and worldwide (GDO).

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News

Stunning fossil from Australian outback reveals pliosaur killed a sea monster that had just eaten a pterosaur

Using advanced neutron imaging, researchers scanning fossils from Queensland uncovered clues about the complex food chain of prehistoric Earth.

Kenna Hughes-Castleberry ***6 August 2026***

An ichthyosaur fossil found in Australia's outback may preserve a rare snapshot of a prehistoric food chain. Around 100 million years ago, the enormous marine reptile swallowed a flying pterosaur before being attacked by a giant ocean predator, new research suggests.

The fossil set, nicknamed "BOB" or "Bag of Bones," belonged to a 20- to 23-foot-long (6 to 7 meters) ichthyosaur, an animal that belonged to a group of dolphin-shaped marine reptiles that lived alongside the dinosaurs during the Mesozoic era, from about 250 million to 90 million years ago. But in a new study, researchers discovered fragments of a pterosaur's jaw — along with fish and cephalopod remains — preserved inside the animal's body cavity.



An illustration of an ichthyosaur eating a pterosaur, while a pliosaur lurks beneath. (Image credit: Peter Trusler)

The finding is the first confirmed evidence that ichthyosaurs ate pterosaurs, an extinct group of flying reptiles that ruled the ancient skies, according to the new study, published July 28 in the journal ***Gondwana Research***.

The fossils may also hint at the ichthyosaur's violent end. Its skeleton — discovered in 2019 in Queensland's outback — contains shattered bones, missing ribs and large crushing injuries. Researchers think the gruesome wounds may have been inflicted by *Kronosaurus queenslandicus*, a colossal crocodile-like apex predator that lived 120 million to 100 million years ago in the ancient Eromanga Sea in Australia.

A rare prehistoric meal

Fossilized stomach contents are a rare find because they can be preserved only under very specific conditions. "Rapid burial after death is essential to prevent decay and scattering of remains," study co-author Matt White, a research associate at the University of New England in Australia, told **Live**

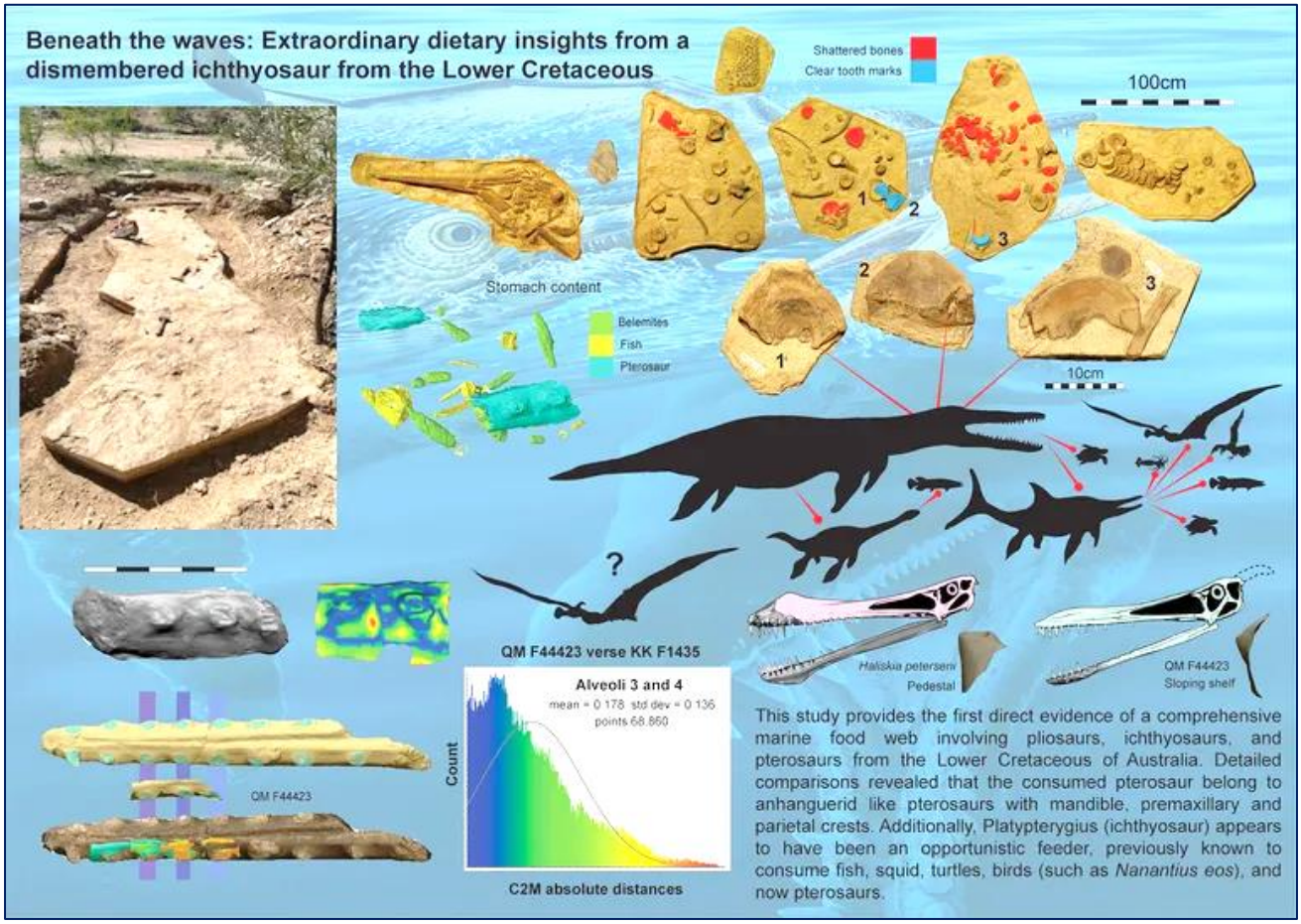
Science in an email. "The animal must have died soon after its last meal, so stomach acids don't fully digest the prey."

Researchers used advanced neutron imaging to peer inside BOB's stomach contents without breaking any of the fossilized formations. The scans revealed hidden bones and helped scientists determine that the remains were likely associated with the ichthyosaur's digestive system.

White said that advances in imaging technology are making it possible to uncover evidence that would previously have remained hidden inside fossils. "Scanning techniques have also improved, which has enabled us to see inside specimens and reveal what they potentially ate," White said. The methods can also reveal "the shape of various organs" and internal bone structures, he added.

The pterosaur remains were found near the front of the ichthyosaur's body cavity rather than in their expected position as digested prey, which White and his colleagues think may be because the ichthyosaur struck the seafloor headfirst shortly after its last meal, shifting some of its stomach contents forward.

"We believe the animal died in the water column — perhaps from a pliosaur (*Kronosaurus*) attack or natural causes — and then sank," White said. "It impacted the seafloor with its rostrum, and connected soft tissues kept most of the body in sequence."



A graphical abstract of the research showing the complex food web of Cretaceous Australia. (Image credit: White et al. (2026))

Reconstructing an ancient ecosystem

The fossil offers a rare glimpse into the food web of the ancient Eromanga Sea, which covered much of central Australia during the early Cretaceous period around 145 million to 100 million years ago.

Although ichthyosaurs are known to have eaten fish and squid like animals, evidence that they ate pterosaurs, a common predator of the ancient skies, has been elusive. The new fossil suggests that at least some ichthyosaurs may have fed on flying reptiles that landed on the water or died and floated to the surface.

"Such discoveries yield valuable information about trophic interactions and allow us to reconstruct ancient ecosystems in greater detail," White said.

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Uberaba Geopark: A time capsule from the Late Cretaceous period nestled in Brazil's tropical savanna

Uberaba Geopark, also known as the "Land of the Giants," is a region in Brazil's Cerrado biome that preserved thousands of prehistoric fossils.

Sascha Pare, LiveScience ***9 August 2026***

Nestled within Brazil's Cerrado tropical savanna — the second-largest biome in South America, after the Amazon rainforest — Uberaba Geopark is a time capsule from the Late Cretaceous period (100.5 million to 66 million years ago).

QUICK FACTS

Name: Uberaba Geopark (also known as "Terra dos Gigantes," or "Land of the Giants")

Location: Minas Gerais, Brazil

Coordinates: -19.71, -47.96

Why it's incredible: The park hosts prehistoric-fossil-bearing rock formations and overlies one of the world's biggest aquifers.

The geopark boasts abundant, well-preserved fossils from the last chapters of the nonavian-dinosaur era, according to UNESCO, earning it the nickname the **"Land of the Giants"** or "Terra dos Gigantes" in Portuguese. Palaeontologists have discovered more than 10,000 fossils belonging to dinosaurs, prehistoric crocodyliforms (a group encompassing living crocodiles, alligators, caimans and gharials, as well as their extinct relatives), turtles and other ancient creatures within the park's boundaries.

One of the best-known discoveries is the fossil of *Uberabatitan ribeiroi*, a titanosaur measuring 89 feet (27 meters) long and 33 feet (10 m) tall, according to UNESCO.

The finds were clustered in impressive geological features, including the Serra da Galga formation and Serra Geral mountain range. These structures formed from ancient basalt flows, which came

from giant volcanic eruptions that predate the breakup of the Gondwana supercontinent 180 million years ago.

The park has the ideal conditions to preserve fossils because it alternated between shallow lagoons and river systems when the dinosaurs roamed the region, meaning the animals' remains were conserved in mud when they died.



Uberaba Geopark is rich in fossils from the Late Cretaceous period.
(Image credit: © Luiz Carlos Borges Ribeiro)

Serra da Galga and Serra Geral also overlie one of the world's largest freshwater reservoirs, the Guarani aquifer, which supplies drinking water for more than 100 cities in Brazil, Argentina, Paraguay and Uruguay.

The Cerrado savanna, which houses the entire park, is a critical-yet-underprotected carbon sink that hosts more than 12,000 plant species and diverse animal life.

The "Land of the Giants" was added to UNESCO's list of geoparks in 2024 in recognition of the region's geological and natural heritage.

What is now the Uberaba Geopark was the birthplace of Brazil's modern livestock market, which is one of the biggest in the world. Farmers in the 19th century introduced zebu (*Bos indicus*) cattle from India because they are better suited to the climate in Brazil and require less food than common domesticated cattle (*Bos taurus*). Zebu cattle also produce lower greenhouse gas emissions than common domesticated cattle do, according to UNESCO.

Uberaba Geopark is open to visitors. There are several museums and trails to explore, including one that leads to the Vale Encantado, or "Enchanted Valley," which contains forests, waterfalls and prehistoric rock formations, according to the BBC.

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Powerful magnitude 7.7 earthquake kills at least 47 in Indonesia

Farida Susanty, BBC Indonesia, and Helen Sullivan ***15 August 2026***



The earthquake struck around 600 miles (1,000km) away from Bali. (Credit: BBC)

At least 47 people have been killed after a magnitude 7.7 earthquake struck Indonesia early on Saturday, the nation's disaster mitigation agency has said.

The official death toll has been rising as a search and rescue operation gets under way. The National Disaster Management Agency (BNPB) said several people had been injured to varying degrees. Hundreds of buildings in the region have been damaged by the quake and the dozens of aftershocks that followed.

The quake struck the island of Flores shortly before 05:00 local time on Saturday (22:00 GMT on Friday). It had a depth of 15km, Indonesia's meteorology and geophysics agency stated.

The shallower an earthquake is, the more destructive its effects on the surface tend to be. Aftershocks included a magnitude 6.4 earthquake in North Sumatra, located in western Indonesia, at a depth of 163km, BNPB announced. The US Geological Survey measured it at magnitude 6.9.

Video taken at the port in Maumere showed large chunks of concrete breaking off the terminal building onto passengers waiting to board an inter-island ferry. Some were thrown into the sea when the gangway to a ship collapsed.

Emanuel Melkiades Laka Lena, governor of East Nusa Tenggara province, told a news conference that they were killed in their sleep by collapsing rubble.

Arnold Welianto, who lives in Talibura, a village near the coastline in Sikka, East Nusa Tenggara, said he was awoken by the "very strong shaking". "I was startled awake and immediately went to my child's room." He told the BBC that many people had already fled into the hills. "Some other residents were standing along the roadside because the sea had also receded," he explained. "The water remained low for quite some time, so everyone panicked and ran - I went around to the community health centre, and the people there had already been evacuated."

A tsunami warning was issued but lifted around three hours after the initial jolt, when no significant sea level rise was detected.

A stream of people could be seen moving inland on motorbikes after authorities issued a tsunami warning. BNPB said 2,000 people had evacuated or relocated on their own.

Manggarai province is among the most affected areas, the disaster agency added. It said 24 fatalities had been recorded there, 17 in East Manggarai province, three in Sikka province, and at least one in each of the Ngada, Ende and West Manggarai provinces. At least two others had been seriously injured and 11 slightly injured.

Welianto said many residents of Talibura were choosing to remain outdoors as the aftershocks meant they were afraid to return to their homes.

Yulian Juita Ekalia, a university lecturer from Ruteng, a city to the west of the epicentre, said she had dragged her stove outside and was cooking there for fear of further tremors. "I have never felt an earthquake this big," she told news agency AFP. "It felt like we were on a trampoline - it was really scary."

It will take time to assess the full extent of the destruction in the region, which is remote and mountainous.

Preliminary reports indicated more than 150 houses had been severely damaged, as well as dozens of educational institutions, and a number of healthcare facilities, places of worship, offices, and several other public facilities. The BNPB said aid was being sent to the affected areas.

It also advised people to remain calm, and to stay away from coastal areas and structures showing signs of damage.

Indonesia is prone to earthquakes and volcanic activity, lying along the meeting point of three major tectonic plates.

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Consultation ending on controversial Rosebank oil field

Kevin Keane, BBC Scotland environment, energy and rural affairs correspondent

17 August 2026

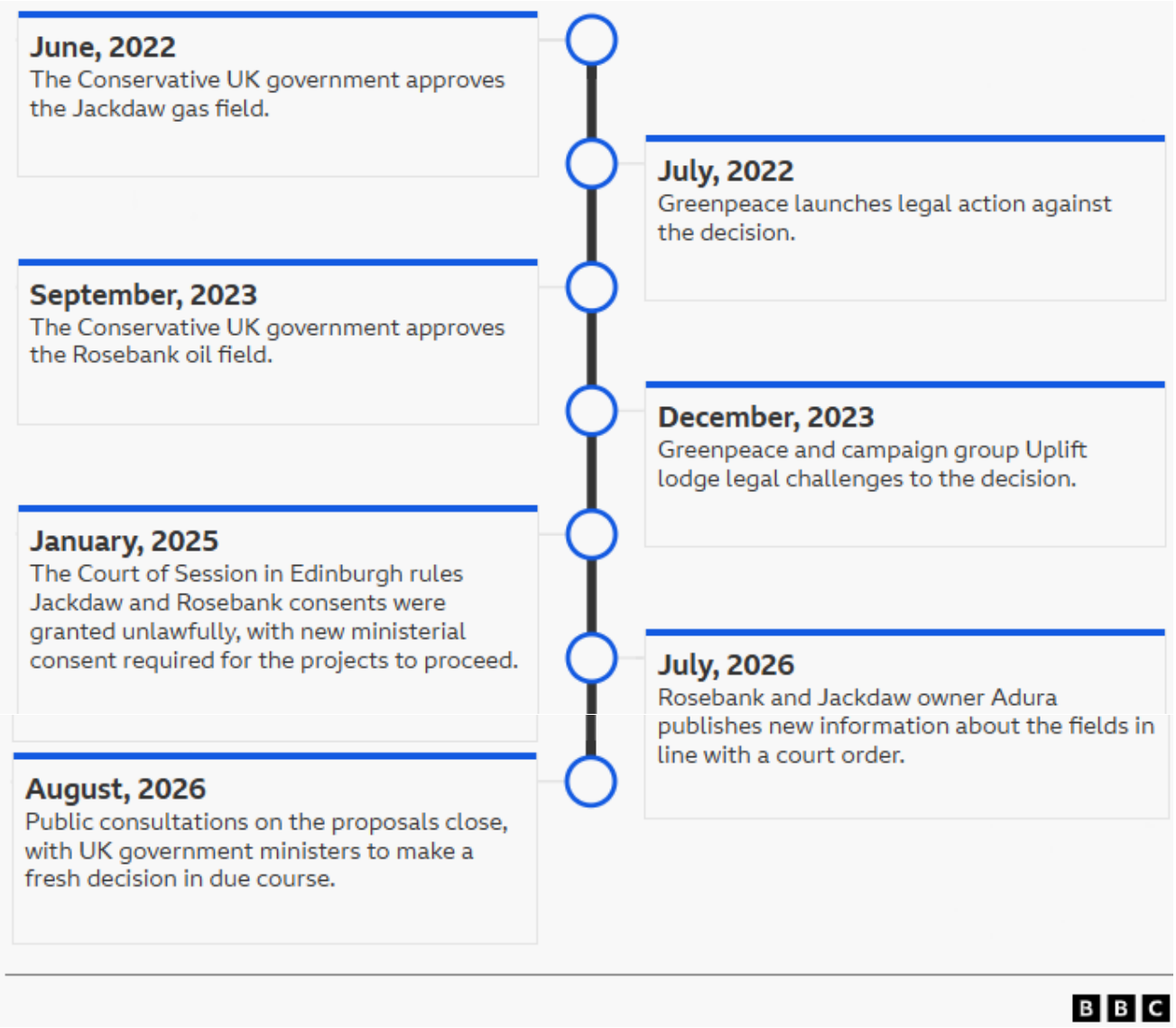
Supporters and opponents of the controversial Rosebank oil field have been making their cases as a consultation on the plans draws to a close.

The industry regulator is considering revised applications for the £8.7bn project off Shetland and the Jackdaw gas field after a court ruled that they had been unlawfully approved.

Environmental campaign group Uplift, which was behind the successful legal challenge, argues that recent extreme heatwaves and wildfires are evidence that more drilling will "wreck the planet". But the boss of oil company Adura, CEO Neil McCulloch, says fossil fuels will be needed for years to come and that producing them domestically will generate billions in tax revenues. He told BBC Radio Scotland the Rosebank field was of "low significance" compared with total production globally - but would be "very, very significant" in terms of the jobs it would provide in the north east of Scotland.

McCulloch said he was confident there was a "balance of advantages" in approving Rosebank and added: "The ball is back now in the government's court."

Isobel Reid from Uplift has called on the government to reject the applications, insisting that more drilling will "wreck our planet" and result in more extreme weather. "The prime minister must take urgent steps to deal with the root of the problem - burning fossil fuels is what feeds climate change," she said.



The Rosebank oil field and the Jackdaw gas field, 150 miles east of Aberdeen, had been approved under the previous Conservative government and construction is well under way. A legal challenge was brought at the Court of Session in Edinburgh in 2024 which argued that consent was given without fully considering the impact of burning the fossil fuels which will be produced. The previous decisions were ruled unlawful and sent back to the regulator Opred to be taken again. The judge ruled that the operators could continue preparatory work at the sites but must stop short of producing oil and gas until a final decision had been taken.

Rosebank is estimated to contain the equivalent of up to 300 million barrels of oil and at its peak will produce approximately 69,000 barrels a day. Most of that is oil which will be shipped to Europe for refining before being sold on the open market.

A fresh environmental impact assessment (EIA) concluded that the oil and gas it produces will generate about 250 million tonnes of planet warming greenhouse gases over its lifetime. That figure is equivalent to about two thirds of the UK's total emissions for 2024.

The industry argues that will simply displace imported oil rather than generate new emissions and the EIA - which was produced by Adura - concluded that the emissions were "not significant".

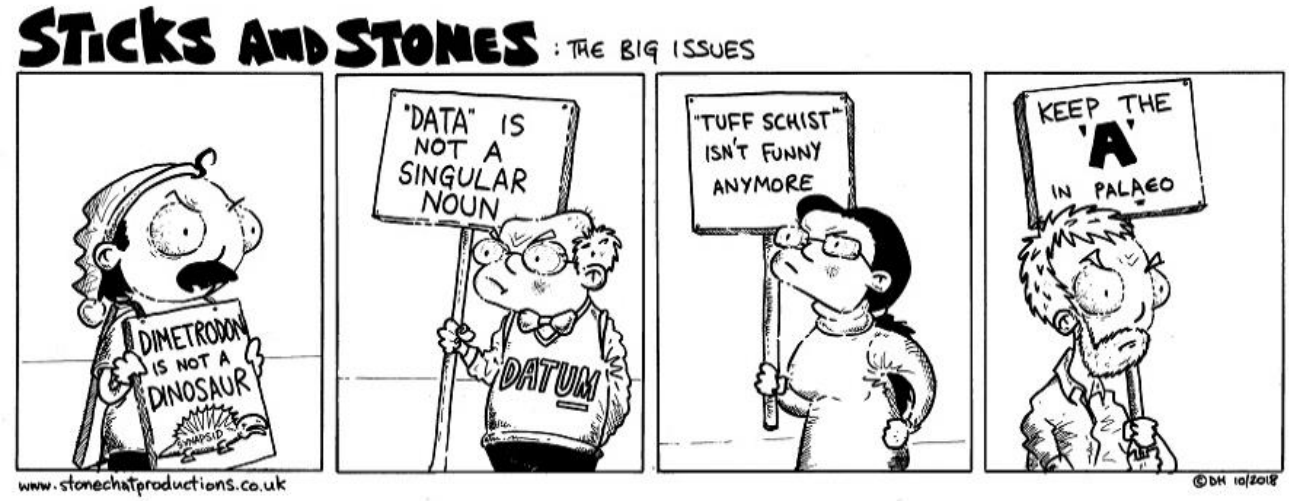
Prime Minister Andy Burnham is coming under pressure over the decisions about both Rosebank and Jackdaw. Visiting victims of the West Midlands wildfire on Friday, he told BBC Five Live that there needs to be a focus on adapting to the changing climate, including considering aerial firefighting resources. But he said there needs to be a "pragmatic approach" towards domestic oil and gas. He added: "We won't be able to stop using oil and gas for some time. That's just a fact. The question is whether we can accelerate use of it so that we pay for the transition."

The consultation on Jackdaw closed last week and the Rosebank consultation ends later on Monday.

Ultimately the decision is a quasi-legal one which will be taken by the regulator Opred and approved by the Energy Secretary Miatta Fahnbulleh. Although no timetable has been set for the final decision, the operator says a relatively quick decision could see the Jackdaw field producing gas by the winter.

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As suggested by Janet Catchpole.

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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**

Scientists stunned: Volcano cleans up after itself by removing methane from the air

Geology Page ***May 30, 2026***



The Hunga Tonga–Hunga Ha'apai-volcanic eruption on 15 January 2022. Image taken from a video of the eruption. (Source: Tonga Geological Services)

When the submarine volcano Hunga Tonga–Hunga Ha'apai in the South Pacific erupted in January 2022, it was not only one of the most violent volcanic eruptions in modern times. The volcano also did something completely unexpected: it helped clean up some of the methane pollution it released. This phenomenon could potentially be key to how humans can slow global warming.

Using advanced satellite measurements, researchers observed unusually high concentrations of formaldehyde in the massive volcanic plume following the eruption. This was crucial evidence: when methane is destroyed in the atmosphere, formaldehyde forms as a short-lived intermediate.

"When we analysed the satellite images, we were surprised to see a cloud with a record-high concentration of formaldehyde. We were able to track the cloud for 10 days, all the way to South America. Because formaldehyde only exists for a few hours, this showed that the cloud must have been destroying methane continuously for more than a week," explains Dr. Maarten van Herpen from Acacia Impact Innovation BV, first author of the study, which has just been published in **Nature Communications**.

"It is known that volcanoes emit methane during eruptions, but until now it was not known that volcanic ash is also capable of partially cleaning up this pollution" he adds.

Salt, sunlight and new chemistry

According to the researchers, everything points to a very special process taking place — one they first discovered in 2023, but in a completely different part of the world.

They found that when dust from the Sahara is blown over the Atlantic Ocean, it mixes with sea salt from sea spray, forming small particles known as iron salt aerosols. When sunlight hits these aerosols,

chlorine atoms are produced. These chlorine atoms react with methane and help break it down in the atmosphere. This discovery changed scientific understanding of tropospheric chemistry.

“What is new — and completely surprising — is that the same mechanism appears to occur in a volcanic plume high up in the stratosphere, where the physical conditions are entirely different,” says Professor Matthew Johnson from the Department of Chemistry at the University of Copenhagen, one of the researchers behind both discoveries.

The 2022 eruption hurled enormous amounts of salty seawater into the stratosphere along with volcanic ash. The theory is that when sunlight hit this mixture, highly reactive chlorine was formed, helping to break down the methane released during the eruption. The visible evidence of this methane breakdown was the large amounts of formaldehyde detected in satellite images.

Methane is currently responsible for one third of global warming. Over a 20-year period, methane is about 80 times as potent as CO2. However, methane breaks down relatively quickly in the atmosphere — typically within about 10 years.

This means that if we reduce methane emissions now it could have a noticeable impact on the climate within a decade. For this reason, researchers sometimes refer to methane reduction as an “emergency brake” on climate change — one that may help prevent climate tipping points in the coming decades. However, reducing CO_2 emissions remains essential to stabilise temperatures in the long term.

Inspiration for future solutions

The researchers behind the new study believe their findings could inform a growing field working on solutions to reduce methane emissions by artificially accelerating its breakdown in the atmosphere – similar to how the volcano effectively cleaned up after itself. Various methods are currently under investigation, but a key challenge is measuring and verifying how much methane is actually removed.

“How do you prove that methane has been removed from the atmosphere? How do you know your method works? It’s very difficult. But here we address that problem by showing that methane breakdown can in fact be observed using satellites,” says Dr Jos de Laat from the Royal Netherlands Meteorological Institute, senior author of the study.

The research was conducted with the advanced TROPOMI instrument aboard the European Space Agency’s Sentinel-5P satellite, which monitors air pollution and greenhouse gases worldwide on a daily basis.

“Retrieving formaldehyde from TROPOMI in a stratospheric volcanic plume is far outside the instrument’s standard operating conditions — we had to carefully correct the satellite’s sensitivity for the unusual altitude of the signal and account for interference from the exceptionally high sulfur dioxide concentrations. Getting these corrections right was essential to confirm that what we were seeing was real” said Dr. Isabelle De Smedt, Royal Belgian Institute for Space Aeronomy.

The researchers believe the new findings will inspire engineers in industry: “It’s an obvious idea for industry to try to replicate this natural phenomenon -— but only if it can be proven to be safe and effective. Our satellite method could offer a way to help figure out how humans might slow global warming” concludes Matthew Johnson.

Note: The above post is reprinted from materials provided by University of Copenhagen.

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Congratulations!

Our very own **Liz Aston** has received a very welcome email from **The Geological Society** informing her that a paper she co-authored on Quaternary Thames River terrace deposits in 2023 is one of the most read papers in August 2026. **Well done Liz!**

Monday, 07 September 2026

Dear Author,

Our heartiest congratulations, your paper was one of the most read in the **Quarterly Journal of Engineering Geology and Hydrogeology** in August 2026.

Rank	Author/s	Paper title
1.	J. Harrison, D. B. Walls and N. M. Burnside	Hydrogeological assessment of megawatt-scale low-carbon heat generation from a single mine water surface discharge
2.	Giles Hemmings, Kevin Briggs, Harry Saroglou, Kevin Raven and Simon Butler	Periglacial discontinuities observed in Jurassic mudstones between Buckinghamshire and Warwickshire
3.	Elizabeth Rosemary Aston and Philippa Jane Mason	The distributions and variations of Quaternary Thames River Terrace deposits of Greater London
4.	M. H. de Freitas and S. Parry	The generation and use of a ground model: a note on the similarities and differences between IAEG C25 and EC7 (2nd Generation) methods of working
5.	G. Farr, D. Mallin Martin, K. Watkinson, M. Fox, K. Parker, L. M. Wyatt and F. Todd	Mapping mine water heat opportunities in areas of abandoned underground coal mines in Great Britain

Kind Regards,

Sabrina Theaker

Customer Services Assistant, The Geological Society Publishing House, Unit 7 Brassmill Enterprise Centre, Brassmill Lane, Bath, BA1 3JN

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An ancient 'supervolcano' has been found hiding beneath eastern England. But experts say there's not enough evidence to call it that.

Geologists recently identified a 454.4 million-year-old volcano on England's east coast, but whether the structure can be considered a "supervolcano" remains an open question.

Sascha Pare, Live Science ***3 September 2026***



Scientists recently identified a 454 million-year-old "supervolcano" in eastern England. (Image credit: Pebi WMF / 500px via Getty Images)

Scientists have identified an ancient volcano on England's east coast that is so eroded, it took researchers three decades to piece together its enormous size and explosive past. What remains of the caldera system is located beneath the English counties of Norfolk and Lincolnshire.

However, while the volcano undoubtedly produced at least one huge-scale eruption, some experts don't think there is enough evidence for the structure to be called a **supervolcano**.

"It obviously must have been a very large eruption, but it would be very difficult to calculate the volume of the eruption given the poor preservation of the deposits," said Michael Poland, a research geophysicist with the Cascades Volcano Observatory and the scientist-in-charge of the Yellowstone Volcano Observatory. "This is part of the reason I really hate the term 'supervolcano,'" Poland, who was not involved in the discovery, told **Live Science** in an email.

In a recent analysis, published April 29 in the **Geological Society of America Bulletin**, scientists examined zircon crystals that were taken 80 years ago from boreholes 40 miles (65 kilometers) apart in Norfolk and Lincolnshire. Zircon crystals are smaller than the diameter of a human hair and form within molten magma underground before a volcano erupts. They contain uranium that decays into lead isotopes at a known rate, enabling researchers to precisely date eruptions.

The results showed an age match between the zircon crystals from Norfolk and Lincolnshire and counterparts taken from the Kinnekulle tephra, a thick layer of volcanic ash covering Scandinavia and the Baltic region. This suggests the ash plume from the volcano in what is now eastern England blew across the Tornquist Sea, a body of water that existed during the Ordovician period (488.3 million to 443.7 million years ago) and settled on what is now Scandinavia.

Researchers already knew that the Kinnekulle tephra was formed during a massive volcanic eruption. But the recent analysis shows for the first time how far the ash travelled and, therefore, how big the eruption really was.

The eruption would have also produced huge pyroclastic flows, or avalanches of rocky debris, ash and hot gas that race down the sides of some erupting volcanoes, said Peter Rowley, a volcanologist



The Kinnekulle tephra is visible next to train track north of Oslo in Norway. Dipping strata of the Arnestad Formation (Late Ordovician) contain thin beds of grey-green altered volcanic ash. (Image credit: © Tim Pharaoh)

and senior lecturer at the University of Bristol in the U.K. who was not involved in the analysis. "The last eruption of this kind of scale was the Oranui event at Taupō in New Zealand, over 26,000 years ago" he told **Live Science** in an email.

However, while the explosion would have been impressive and equivalent to the force of thousands of atomic bombs, experts said the definition of a supervolcano is vague and there are better ways to describe what happened.

"The scientific definition of a supervolcano varies a little; it's a term we tend not to use as volcanologists much" Rowley said. "In this case we would describe it as an **ultraplinian** eruption."

Ultraplinian eruptions are the most violent type of volcanic explosions, ejecting more than 240 cubic miles (1,000 cubic kilometers) of material. It's difficult to say exactly what the eruption that formed the Kinnekulle tephra would have looked like, but it likely lasted days to weeks and formed ash clouds taller than 25 miles (40 km) that reached into the stratosphere.

Geologists tend to reject the term supervolcano because it is imprecise, instead preferring to describe eruptions by the volume of material they eject.

Stephen Self, a physical volcanologist at the University of California, Berkeley, agreed that the term supervolcano can be too vague. "Supervolcano has become a kind-of buzz-word," he told **Live Science** in an email. "It's the deposits of the eruptions that are recognized, not the volcano."

Very little of the material ejected in England's ultraplinian eruption remains today, because most of it was eroded or buried. "The geological record is far from complete so it can be very difficult to say much about these eruption volumes with very old volcanoes," Rowley said.

Similarly, the Kinnekulle tephra has been degraded over time, Poland said. The analysis also found evidence for an earlier eruption of the volcano that occurred 453.7 million years ago. However, there is no trace of these eruptions at the surface today; the boreholes are located in some of England's

flattest landscapes, study first author Tim Pharaoh, a geophysicist with the British Geological Survey, said in a statement in August.

It's not surprising to find traces of big, ancient volcanoes in England. The recently identified volcano is part of a wider volcanic system that was active 450 million years ago and includes Eryri National Park in Wales and the Lake District in northwestern England, Rowley said.

"It's best not to imagine whole preserved volcanoes, but rather that we have deposits from their eruptions, or rocks which formed in the magma reservoirs beneath the original volcano," Rowley said. "These are often deformed and altered by tectonic events meaning that it takes some careful geological investigation to interpret the true picture."

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THE CONVERSATION
Academic rigour, journalistic flair

‘The Sun was dark and its darkness lasted for 18 months’ – what we can learn from worst volcanic eruptions in history

Alex Brown, Associate Professor of Medieval History, Durham University ***21 August 2026***

Europe was plunged into darkness and suffered from intense crop failures and famines in the years AD536 and AD1258, after massive volcanic eruptions.

When many people think of volcanic eruptions, they envisage deadly lava flows and suffocating ash fall. The fate of the inhabitants of Pompeii after the eruption of Mount Vesuvius in the year AD79 still resonates today. Yet, volcanic eruptions have more wide-ranging consequences than is often realised, and this is recorded in historical accounts.

Large volcanic eruptions emit gasses and ash particles into the atmosphere. Although the ash itself settles within weeks, the aerosols spread around the planet and can remain suspended in the atmosphere for years. Ice cores – long cylindrical samples drilled from glaciers – reveal these past sediment layers over hundreds of thousands of years.

What we can see from studying historic records is that volcanic eruptions can produce climatic changes, and rapid spread of disease such as plague. They can also effect weather systems far beyond the immediate vicinity of the volcano itself.



Eruption of Vesuvius by Pierre Jacques Volaire in 1771.

‘The worst year to be alive’

A massive volcanic eruption in AD536 has led historians to describe it as the “worst year to be alive”. Its exact location is unknown, though it might have been in Iceland. Europe, the Middle East and parts of Asia were plunged into darkness for 18 months. Temperatures in the summer months fell by 1.5˚C to 2.5˚C, initiating one of the coldest decades in the past two millennia.

Procopius, a Byzantine historian who lived in Rome, wrote that “the Sun gave forth its light without brightness, like the Moon, during this whole year, and it seemed exceedingly like the Sun in eclipse”.

From Constantinople, John Lydus, a Byzantine administrator and writer, reported that “the Sun became dim … for nearly a whole year”. Another contemporary writer (thought to be John of Ephesus) noted that “the Sun was dark and its darkness lasted for eighteen months; each day it shone for about four hours, and still this light was only a feeble shadow”.

Crop failures followed. The Annals of Ulster and of Inisfallen, two contemporary chronicles, reported a “failure of bread” in Ireland in AD536.

The eruption of AD536 was then followed by two more eruptions, in AD540 and AD547. These, in turn, were followed by a period of sustained cooling known as the Late Antique Little Ice Age. Researchers have suggested this cold period contributed to the emergence of the Justinianic plague (AD541–49), one of the worst outbreaks of bubonic plague in history. This was partly driven by migration, food shortages and the importation of grain shipments carrying infected rats and fleas.

‘There was no summer during summer’

The eruption of Samalas in Indonesia in AD1257 ranks as one of the most significant volcanic eruptions of the past two millennia. It produced twice the volume of sulphur deposits in ice cores compared to the Tambora eruption of AD1815, famous for causing the year without summer in AD1816.

Northern Europe was already experiencing hardships caused by heavy rain and poor weather. The volcanic eruption exacerbated this further, causing widespread crop failures and famine in AD1258.

Jean d'Essey, bishop of Coutances in Normandy, reported that “there was no summer during summer. The weather was very rainy and cold at harvest time, neither the crop harvest nor the grape harvest were good.”

The contemporary monk and chronicler Richer of Senones in France recorded that the warmth of the Sun was hardly able to reach the Earth. He noted that “so great a thickness of clouds covered the sky throughout that whole summer that hardly anyone could tell whether it was summer or autumn”.



A sketch of Vesuvius erupting by an unknown artist. (Credit: The Met, Robert Lehman Collection, 1975)

The effects are particularly well attested to in England. When summarising the year AD1257, the English Benedictine monk, Matthew Paris, described it as a “barren and wretched year”. He continued that “a great multitude of people died from hunger”. Paris thought it had produced “chronic illnesses”, scarcely allowing “one already afflicted to breathe at all”.

He continued that England experienced particularly cold weather during April, May and June, which did not allow crops to grow. “Owing to the scarcity of wheat, a very large number of poor people died; and dead bodies were found in all directions, swollen and livid … in pigsties, on dunghills and in the muddy streets.”

The large number of deaths in medieval England overwhelmed coroners. Coroners were supposed to hold an inquest to establish the causes of a person’s death. Yet, there were so many paupers “dying of starvation” that officials could not attend to them all. King Henry III sent word in April to suspend them where no foul play was suspected.

The contemporary Annals of Burton similarly recorded a high number of vagrants who died “of hunger and starvation” because of the “dearth of the times”. Many were drawn to towns and cities in hope of charitable alms. London drew in many such desperate paupers, exacerbating the situation there.

The Chronicles of the Mayors and Sheriffs of London, for example, recorded that: “In this year, there was a failure of the crops; upon which failure, a famine ensued, to such a degree that the people from the villages resorted to the City for food; and there, upon the famine waxing still greater, many thousand persons perished; many thousands more too would have died of hunger, had not corn just then arrived from Germany.”

The Tewkesbury Annals, a contemporary chronicle written by the monks of Tewkesbury Abbey, placed the number of dead from the famine at 20,000.



An etching of the eruption of Mount Etna in AD1669. (Credit: Welcome Collection)

Death and mass burials

Such was the scale of mortality that Paris reported "when several corpses were found, large and spacious holes were dug in cemeteries, and a great many bodies were laid in them together".

These "large and spacious holes" have since been found at the hospital of St Mary Spital in London. The Spitalfields site contains some 2,300 skeletons from the 1250s, connected to both the drought of 1252 and the famine of AD1257-58.

Volcanic eruptions have global consequences, shaping lives far beyond their immediate vicinity.

Volcanoes, even on the other side of the world, had the power to plunge medieval Europe into darkness, destroying crops and lives in the process, and that should not be ignored today.

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South American 'Pompeii': Volcanic eruption 22 million years ago preserved a snapshot of the Andes forming

An enormous volcanic eruption buried a snapshot of the baby Andes mountains, revealing a slow-and-steady growth rate.

Stephanie Pappas, LiveScience ***September 14, 2026***



Two young volcanoes located just to the east of the study area in Chile, and which sit atop ignimbrite deposits similar to those in the study. (Image credit: Jeremy Richards via Getty Images)

A volcanic eruption 22 million years ago froze a snapshot of the Andes in their youth, revealing a slow-and-steady formation of this formidable mountain range.

The eruption, which originated from the Lauca Caldera in what is now northern Chile, blanketed the landscape in a formation known as **ignimbrite**. This rock is left over after a pyroclastic flow — a mix of rock, volcanic gas and ash that sweeps over the landscape like a broiling tsunami. Pyroclastic flow is what buried the Roman town of Pompeii after the eruption of Mount Vesuvius in A.D. 79, preserving buildings and people where they fell.



Volcano deposits, known as ignimbrite, that were incised by the Lluta River in northern Chile. (Image credit: Frances J. Cooper)

Now, a new study published Sept. 11 in the journal **Science Advances** extrapolates the landscape under this Andean ignimbrite, revealing that it must have buried rolling foothills rather than craggy peaks.

"Pompeii shows how volcanic eruptions can freeze a moment in human history," Byron Adams, a geomorphologist at University College London, said in a statement. "This study shows that much larger eruptions can also freeze moments in Earth history, burying whole landscapes beneath volcanic deposits and preserving clues to how mountains were being built before the eruption. We cannot dig down to see the buried landscape, but we can use the shape of the volcanic blanket and what we know about how rivers shape mountains to infer what is hidden beneath it."

The original slope of the volcanic flow from Lauca Caldera was about 1.5 degrees, Adams and his colleagues wrote in the new paper. The researchers also calculated the erosion of the landscape to

figure out how fast the rocks in the area were rising as the oceanic Nazca Plate pushed under the continental crust of South America, which is how the Andes were built.

They found that prior to the eruption, the uplift of the crust was no more than 0.16 mile (0.26 kilometer) per million years — quite a sluggish process. This finding corresponds to earlier work that used the formation of certain minerals within rocks to determine when a particular rock rose through the crust and approached the surface.

"There is debate over whether the Andes grew slowly and steadily over 40 or 50 million years or whether they rose extremely slowly and then popped up more recently, in the last six to 10 million years," Adams said. "Our findings, which cover a large part of the middle of that history, support the slow but steady hypothesis."

The same method could be applied to other mountain ranges worldwide, the researchers added.

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Fossils of iconic long-necked dinosaur Diplodocus found in Europe for first time — and it may have travelled there via land bridge

Fossils of the long-necked dinosaur Diplodocus have been discovered in Spain, marking the first time remains of this iconic Jurassic-period dino have been found outside the U.S.

Kenna Hughes-Castleberry, LiveScience ***15 September 2026***

Palaeontologists have identified the first confirmed remains of *Diplodocus* — "Dippy," for short — outside the western U.S., revealing that the iconic long-necked dinosaur reached what is now Spain roughly 150 million years ago.

The findings show that the enormous sauropod didn't live only in North America, as was long thought. Instead, it may have rambled across a land bridge all the way to Europe, the new study suggests.

The discovery, made at the La Tejería site near the small village of El Castellar in eastern Spain, provides some of the strongest fossil evidence yet that dinosaurs could move between North America and Europe during the Late Jurassic, when the Atlantic Ocean was still in its early stages of opening after the breakup of the supercontinent Pangaea. The researchers published their findings Tuesday (Sept. 15) in the **Journal of Vertebrate Paleontology**.

"Palaeontological studies like this one help us better understand the history of life on Earth, reconstruct ancient ecosystems, and understand how they changed through time," study first author Sergio Sánchez Fenollosa, a doctoral student who studies biodiversity and evolutionary biology at the Joint Paleontology Foundation Teruel-Dinópolis (Dinópolis Foundation), a paleontological research institution, told ***Live Science*** via email.



Diplodocus, a long-necked dinosaur that lived during the Late Jurassic period 150 million years ago, didn't just inhabit North America, new fossils reveal. (Image credit: Warpaintcobra via Getty Images)

A sauropod in Spain

Dippy is one of the best-known dinosaurs. After its fossils made their grand debut at the Carnegie Museum of Natural History in Pittsburgh in the early 1900s, life-size fossil replicas of the towering herbivore were sent around the world, including to England, France, Spain, Argentina and Russia. But until now, *Diplodocus'* Late Jurassic fossils were known only from the Morrison Formation in the western United States — and the latest discovery shows that Dippy wasn't a homebody.

The newly unearthed *Diplodocus* specimen consists of 14 well-preserved tail vertebrae and several chevrons — bones that helped support blood vessels and muscles within the dinosaur's tail.

Study co-author and managing director of the Dinópolis Foundation, Alberto Cobos, said it was a friend who "thought he had spotted some bones on a mountainside," Cobos told ***Live Science*** via email. "That very day, I went to the site near El Castellar (a village in the province of Teruel). Sure enough, we saw a couple of sauropod vertebral centres."

Although only part of the skeleton has been recovered, the bones show a series of characteristics associated with *Diplodocus*, including large cavities corresponding to where air sacs would have been, along with deep grooves running alongside the underside of the tailbones.

"It was an exciting and continuous process of seeing the pieces of the puzzle gradually fall into place," Sánchez Fenollosa said in a statement. "From the early stages of the osteological study, we noticed strong similarities with several diplodocine sauropods … With each new result, the picture became clearer: we were looking at a *Diplodocus*."

It's unclear which species of *Diplodocus* the new specimen is, but like others of its genus, it was a huge dinosaur with an extremely long neck and whip-like tail.

"The *Diplodocus* from El Castellar was approximately 25 meters [82 feet] long (comparable in size to its North American relatives), making it another of the giant sauropods of the Spanish Jurassic," Cobos said in the statement.

An ancient bridge

Between 195 million and 170 million years ago, the supercontinent Pangaea broke apart as the Atlantic Ocean opened. But the ocean was much narrower than it is today, and the continents were not necessarily as isolated as their modern geography is now.

Evidence indicates that temporary land bridges may have allowed some animals to move between the two regions. The most famous prehistoric land bridge is the Bering Land Bridge that humans used to move between Asia and what is now Alaska. Previous research showed the Bering Land Bridge also existed around 68 million years ago, and it may have allowed an Asian ancestor of *Tyrannosaurus rex* to trek into North America.

One possible route for *Diplodocus* into Spain may have been a land bridge that connected what is now Newfoundland with the Iberian Peninsula.

Geological conditions may have allowed dinosaurs like *Diplodocus* to move between continents, Sánchez Fenollosa told ***Live Science*** in an email. "This interpretation is supported not only by the fossil record but also by geological evidence," he said.

The newfound *Diplodocus* fossils also suggest that the distribution of giant sauropods was more complicated than the fossil record previously indicated.

"More complete specimens will be essential to understand this story in greater detail, particularly to determine which *Diplodocus* species inhabited Europe: whether it was one already known from North America or a previously unknown species," Sánchez Fenollosa said. "This discovery reminds us that even for such iconic dinosaurs, there are still many unanswered questions about their evolutionary history and biogeography."

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Scientists finally figured out the temperature of T. rex's blood — and it was as hot as ours

Tooth analysis has revealed that the king of the dinosaurs was as warm-blooded as a human or an elephant

Chris Simms, LiveScience ***16 September 2026***

Tyrannosaurus rex was a hottie with a body temperature similar to our own, according to a new analysis of their teeth.

The finding supports the idea that *T. rex* was a fast, energetic predator and scavenger, not an animal that basked in the sun to gain energy like most modern-day reptiles.

T. rex, which lived between about 68 million and 66 million years ago, at the end of the Cretaceous period (143.1 million to 66 million years ago), was one of the largest carnivorous dinosaurs that ever lived.

Previous studies have already suggested that *T. rex* and its relatives were warm blooded, but now scientists have estimated the dinosaur's body temperature for the first time by studying different isotopes, or forms, of the same chemical elements in the enamel of three *T. rex* teeth from specimens found in the Hell Creek Formation in Montana.



One of the T. rex teeth used to measure the body temperature of T. rex, which involved using a dental drill to remove some enamel and dissolved the resulting powder to release carbon dioxide gas. (Image credit: UCLA)

Rare, heavy isotopes of carbon and oxygen bond together differently in growing tooth enamel depending on the temperature. The number of bonds formed between these rare isotopes is greater at cooler temperatures than it is at warmer temperatures, which means warm-blooded, or endothermic animals, that can regulate their own body temperature, have fewer of these chemical bonds in their teeth than cold-blooded, or ectothermic, animals, which rely on their environment for warmth.

By measuring the bonds in carbon dioxide (CO_2) given off when dissolving small samples from the *T. rex* teeth, Randon Flores, a geologist at the University of California, Los Angeles (UCLA), and his colleagues could estimate where on the scale of animal body temperatures *T. rex* sat.

They put the *T. rex* body temperature at 97.3 degrees Fahrenheit (36.3 degrees Celsius), comparable to that of a human or an elephant. Modern, cold-blooded reptiles tend to have lower body temperatures of about 82°-86° F (28°-30° C), while most birds — descendants from *T. rex's* branch of dinosaurs — tend to be much warmer at 104°-109° F (40°-43° C). Therefore, these findings, published Wednesday (Sept. 16) in the journal **Science Advances**, show how much this relative of modern birds had already diverged from cold-blooded dinosaurs like *Triceratops* and *Stegosaurus.*

"The temperature is about what I would have guessed — higher than a reptile or a slow mammal like a sloth, but lower than an avian," study co-author Robert Eagle, a geobiologist at UCLA, said in a statement.

These findings have implications for how and where the *T. rex* might have lived. A warm-blooded *T. rex* would have been an energetic, active animal, chasing or scavenging food to fuel its fast metabolism rather than basking in the sun to gain energy, wrote the authors.

It also means that during the Cretaceous period, one of the warmest periods in Earth's history, about 11°-25° F (6°-14° C) warmer than today, *T. rex* would have been able to survive in most of the North American continent, from what is now Mexico up to chilly climates where cold-blooded reptiles wouldn't have survived. This helps explain why a tyrannosaur fossil has been found in the Kikak-Tegoseak Quarry in Alaska, although there is no trace of other reptiles like lizards, turtles or crocodiles from that period in the region.

The ability for *T. rex* to inhabit cooler, high latitudes also aligns with recent evidence that tyrannosaurs crossed the Bering Land Bridge between Asia and North America, write the authors.

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Image Of The Day 2

Peculiar land bridge separates a pair of colourful lakes in Patagonia — Earth from space

A 2020 astronaut photo shows the unusual point where two contrastingly coloured Patagonian lakes meet. The duo was originally a single body of water but was split by a narrow land bridge.



From above, Lake Pueyrredón (left) and Lakes Posadas (right) look drastically different. However, they were once part of the same body water before a narrow land bridge tore them apart. (Image credit: NASA/ISS program)

This eye-catching astronaut photo shows the point where an ancient Patagonian lake has been split by a peculiar land bridge, creating two contrastingly coloured bodies of water.

Lake Pueyrredón (on the left in the photo) is the Argentine half of a roughly 40-mile-long (65 kilometres) glacial lake, which stretches across the country's border with Chile in Patagonia — a region in South America that is well known for its diverse range of geographic features, including

mountains, fjords, deserts and rainforests. The Chilean half of the lake is known as Lake Cochrane (not shown in this image). Both halves hold crystal-clear water that is up to 1,600 feet (500 meters) deep, giving Pueyrredón a deep blue hue when viewed from above.

Thousands of years ago, a thick sediment barrier formed across the southern section of Lake Pueyrredón, creating a new body of water known as Lake Posadas. This smaller body, which is roughly 5 miles (8 km) long, has a lighter, teal colour due to its shallow water and a large influx of sediment from a nearby river, according to NASA's Earth Observatory.

Other rivers from nearby hills have previously dumped large quantities of sediment along the western shore of Lake Pueyrredón (bottom of the photo), creating a trio of fan-shaped landforms, known as deltas, that increase in size from north to south (left to right in the photo).

QUICK FACTS

Where is it? Lake Pueyrredón and Lake Posadas, Argentina [-47.41961002, -71.87622200]

What's in the photo? The point where two different-colored lakes meet

Who took the photo? An unnamed astronaut on board the International Space Station

When was it taken? Sept. 15, 2020

Wind-driven currents and waves have pushed some of this sediment from the outer edges of the two smaller deltas, creating long, thin strips of land, known as sandspits, pointing down-current.

The strip of land separating Pueyrredón and Posadas looks similar to the sandspits. However, it is most likely a moraine — a barrier of sediment and larger rocks that formed along the edge of a hefty iceberg or long-lost glacier, according to the Earth Observatory.

Reference:

https://www.livescience.com/planet-earth/peculiar-land-bridge-separates-a-pair-of-colorful-lakes-in-patagonia-earth-from-space?utm_term=8DEBC9E5-6C7F-4337-AFFF-D9A51CC6C2C0&lrh=840a98cbe34ba22d824f6df096d90a0be8fe4763876a779b0361304855882d8f&utm_campaign=368B3745-DDE0-4A69-A2E8-62503D85375D&utm_medium=email&utm_content=6827ED80-2538-47EF-A60F-09FC451D5A2C&utm_source=SmartBrief

News

Earth's crust is 'unzipping' beneath Italy — and that could explain most of the earthquakes in the region

The peeling away of Earth's crust beneath Italy may explain a lot of the seismic activity in the mountains that run along the spine of the country.

Stephanie Pappas, LiveScience ***23 September 2026***

The crust under Italy is "unzipping" and falling away into the mantle, new research finds.

This process is the driver of much of the seismic activity in the Apennine Mountains, the long chain of peaks that runs like a spine down the Italian peninsula. This area provides a unique look into the swan song of subduction, or the movement of a slab of oceanic crust under a neighbouring chunk of continental crust, said study lead author Stefano Tavani, a geoscientist at the University of Florence.

"We are experiencing the very, very late-stage to the subduction, and the tectonics is driven by a different engine, which is this unzipping," Tavani told **Live Science**.

The Mediterranean region, between Africa and Eurasia, is a patchwork quilt of tectonic microplates and mountain ranges, making the geology of the region extremely intricate. The big-picture geology is driven by the fact that the African plate, to the south, has been pushing northward, squeezing the

crust and driving the sinking of an ancient ocean, the Tethys, into the mantle beneath the Apennine Mountains. This process has been ongoing for about 50 million years.

Along the Apennines, this process created a push-and-pull of forces. As the African plate subducted under the Eurasian plate, the boundary of the subduction zone was making its own march toward the African plate, causing the crust on the Eurasian side to stretch and thin, creating two large basins: an older one in the Mediterranean Sea west of Corsica and Sardinia, and a younger one, the Tyrrhenian Sea segment of the Mediterranean east of Corsica and Sardinia, which formed roughly 10 million years ago. Until now, the driver behind the extension creating these basins and the compressional forces building the Apennines has not been entirely clear, Tavani said.

To better understand this unusual tectonic movement, Tavani and his colleagues integrated earthquake records and ground movements from GPS and satellite measurements with the tectonic models of the plate movements and found that under the Apennines, the lower crust is peeling away and dropping into the mantle — a process called **delamination**. It is this delamination, and not the subduction of one plate under another, that causes most of the seismic activity in the Appennines, the researchers reported in their study published this month in the journal **Communications Earth & Environment**. In a few more million years, Tavani said, the lower crust will finish dropping away and the two plates will weld together.



Seismic activity in the Apennine Mountains is tied to the crust unzipping beneath Italy. (Image credit: Paolo Corsetti via Getty Images)



A complex mix of tectonic forces has built the Apennines and led to the formation of the two basins in the Mediterranean that lie east and west of the islands of Corsica and Sardinia. (Image credit: 1xpert via Getty Images with labels added)

There are other places around the world where similar processes are happening, such as in the Hellenic trench south of Greece, Tavani said. The findings "could be applied to other several systems," he said, "because in the end, it is a kind of very late-stage plate tectonics."

Article Sources:

Tavani, S., Petracchini, L., Billi, A., Carminati, E., Molli, G., Palano, M., Scognamiglio, L., Morgan, J. P., & Vannucchi, P. (2026). Lower-crustal unzipping drives active orogenic deformation. **Communications Earth & Environment**. https://doi.org/10.1038/s43247-026-04021-w

Reference:

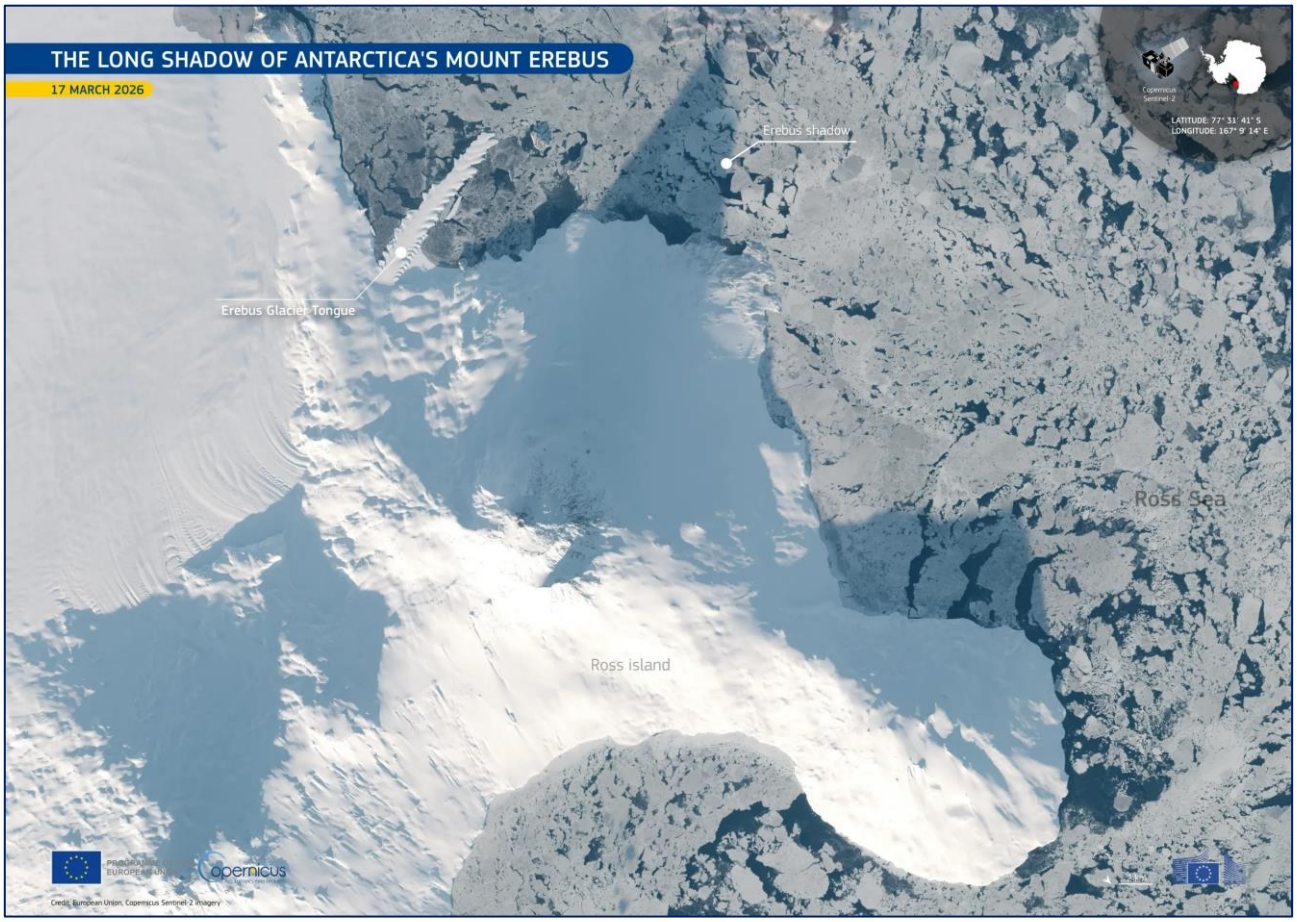
https://www.livescience.com/planet-earth/earths-crust-is-unzipping-beneath-italy-and-that-could-explain-most-of-the-earthquakes-in-the-region?utm_term=8DEBC9E5-6C7F-4337-AFFF-D9A51CC6C2C0&lrh=840a98cbe34ba22d824f6df096d90a0be8fe4763876a779b0361304855882d8f&utm_campaign=368B3745-DDE0-4A69-A2E8-62503D85375D&utm_medium=email&utm_content=CD836D71-96DB-45CE-BAB8-95CECB9B8142&utm_source=SmartBrief

Image of the Day 3

Mount Erebus casts a 35-kilometre-long shadow over Antarctic sea ice

11 October 2026

Location: Antarctica



Credit: European Union, Copernicus Sentinel-2 imagery

Mount Erebus, the southernmost active volcano on Earth, rises above Ross Island, Antarctica, reaching an elevation of approximately 3,800 metres. When the Sun sits low above the horizon at this high southern latitude, the mountain can cast long shadows across the surrounding landscape and sea ice, highlighting its height.

This natural-colour image, acquired by one of the Copernicus Sentinel-2 satellites on 17 March 2026, shows the snow-covered slopes of Mount Erebus and the nearby Erebus Glacier Tongue, a floating extension of glacial ice which stretches from the coast of Ross Island into the sea. The volcano's shadow extends north-eastwards for approximately 35 kilometres across the fragmented sea ice.

Data from Copernicus Sentinel-2 satellites support the monitoring of Antarctica's remote polar environment, providing valuable information on glaciers, sea ice, and volcanic landscapes.

Reference:

https://eu-space.europa.eu/components/earth-observation-copernicus/image-of-the-day/mount-erebus-casts-35-kilometre-long-shadow-over-antarctic-sea-ice

Podcast



Radio 4,·08 Oct 2026,·56 mins

Megalosaurus: the first dinosaur to ever be scientifically named

The first dinosaur to ever be scientifically named, almost 20 years before we even had the word 'dinosaur'. In 1824, the geologist and priest William Buckland (1784-1856) stood before the Geological Society of London and announced something that would kickstart two centuries of dinosaur science. He'd been studying large, fossilised bones which didn't resemble those of any living animal - and, as he told his rapt audience at that meeting, he had a new name for this mysterious and unusual creature: ***Megalosaurus***.

Misha Glenny and his guests discuss why the 19th century was such profound period of theological and scientific change, and how our understanding of mid Jurassic dinosaurs has changed since. This **In Our Time** episode examines the story of a dinosaur that led to palaeontology as we know it today. The discussion explores the influential roles of William and Mary Buckland, how we learn about animals from over 160 million years ago, and why you'd never have seen a *Megalosaurus* and a *Tyrannosaurus Rex* together.

With **Emily Rayfield** (Professor of Palaeobiology at the University of Bristol), **Emma Nicholls** (Vertebrate Palaeontologist and Collections Manager at Oxford University Museum of Natural History) & **Steve Brusatte** (Professor of Palaeontology and Evolution at the University of Edinburgh)

Reference:

https://www.bbc.co.uk/sounds/play/m0032fqb

News

Island fossil identified as new dinosaur species

BBC Science ***14 October 2026***

A new species of dinosaur - a long-clawed predator the size of a large tiger - has been identified from a fossil found on the Isle of Wight more than 100 years ago.

The dinosaur, named *Invictibellatrix amberina*, is described in a new paper in the journal **Royal Society Open Science** and belongs to a group of agile, two-legged carnivores called megaraptorans.

Megaraptorans were closely related to tyrannosaurs including *Tyrannosaurus rex* but had slender heads and attacked prey with their large arms and giant curved claws instead of their jaws.



Invictibellatrix amberina is thought to have lived in the Early Cretaceous period about 120 million years ago. (Image source: Sergey Krasovskiy and Pedro Salas)



The researchers undertook a CT scan of the fossil. (Image source: Trustees of the Natural History Museum)

Invictibellatrix, meaning "unconquered female warrior", is one of the smallest and earliest of the group to be found, living in the Early Cretaceous period about 120 million years ago.

Researchers believe *Invictibellatrix* would have been three to four metres long and just over a metre and a half in height - about as tall as a human. It would likely have had feathers, and its claws might have been about 10cm to 20cm long.

It would have eaten small dinosaurs, lizards and mammals – occupying a similar role in the food chain to the hyena today.

Megaraptors are regarded as the most mysterious of the large, meat-eating dinosaurs, as few megaraptor fossils have been found. Until now no megaraptorans had been found in Europe.

Lead author Dr Cassius Morrison (UCL Earth Sciences) said: "It is a real mystery that this fossil was overlooked for so long, sitting in a drawer for nearly 100 years. Lots of bones are found on the Isle of Wight – who knows what else is waiting to be discovered."

The researchers undertook a CT scan of the fossil, creating a 3D model of this part of the skull. They compared the fossil with skulls and brain cases from tyrannosaurs, spinosaurs, raptors and other two-legged meat-eating dinosaurs.

The research team also used mathematical modelling to investigate how the spread of megaraptors around the world might have changed over time, based on fossils discovered so far, dinosaurs' evolutionary trees, geography and climate.

It was one of more than 1,000 specimens discovered by Tooley that were acquired by the Natural History Museum after his death.

Professor Paul Barrett, the study's senior author from the Natural History Museum, said: "Despite over 200 years of collecting, the Isle of Wight continues to surprise us with new dinosaur species. Work like this shows the exceptional value of working with historical museum collections where there are still many discoveries to be made."

The study did not explain why megaraptors likely died out in the north, but this may have been a result of shifts in climate or environment, or the presence of competing predators such as other tyrannosaurs.

Reference:

https://www.bbc.co.uk/news/articles/cmvgx70v9vrjo?xtor=AL-71-%5Bpartner%5D-%5BBBC+England%5D-%5Bheadline%5D-%5Bnews%5D-%5Bbizdev%5D-%5Bisapi%5D&at_link_type=web_link&at_campaign_type=owned&at_campaign=Social_Flow&at_medium=social&at_bbc_team=editorial&at_link_origin=BBC_Hampshire&at_link_id=C562B708-C79E-11F1-B1BF-BC907422B514&at_format=link&at_ptr_name=facebook_page&fbclid=IwY2xjawU9h4RleHRuA2FlbQIxMABwZG9mBWJyaWQRMEdEMzB2YUxNclpwME1ZcTFzcnRjBmFwcF9pZBAyMjIwMzkxNzg4MjAwODkyAAEeQbexlyhiRd-mrIfhgK-Jw2LwJfHRhrDU9kIceUXIsIpHyzhI8ClpIahWBqo_aem_VlesqxmiRkoywtE2V-kJ4A

Bit: the smallest unit of data a computer can process (a single 0 or 1).					
Byte: the fundamental unit of digital information in computing				**=**	**8 bits**
Kilobyte (KB)	**=**	**1,024 bytes**	**Megabyte (MB)**	**=**	**1,024 KB**
Gigabyte (GB)	**=**	**1,024 MB**	**Terabyte (TB)**	**=**	**1,024 GB**

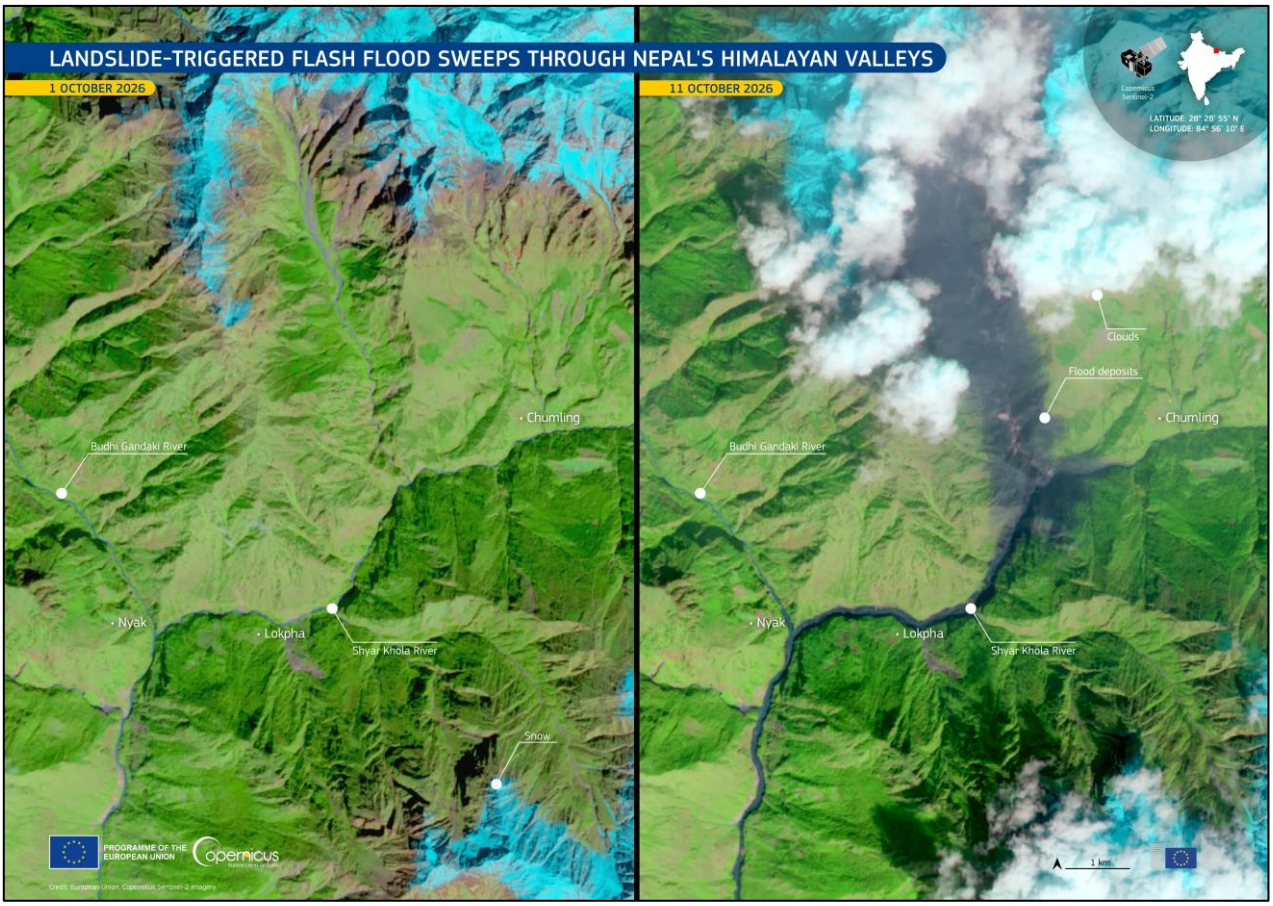
Image of the Day 4

Landslide-triggered flash flood sweeps through Nepal's Himalayan valleys

14 October 2026

Location: Nepal
Credit: European Union, Copernicus Sentinel-2 imagery

On 11 October 2026, a flash flood swept down the Budhi Gandaki River in Nepal's Gorkha District, about 100 km northwest of Kathmandu. The flood came less than two months after a similar event struck the Rasuwa District on 26 August 2026. This new event affected bridges, homes, and trekking routes in the Manaslu region. Local officials reported that more than 100 foreign trekkers were stranded.



This comparison of images acquired by Copernicus Sentinel-2 satellites shows the area before and after the event. In the image from 1 October 2026, the valleys of the Budhi Gandaki and its tributary, the Shyar Khola, appear undisturbed. In the image from 11 October 2026, dark sediment deposits are visible along a side valley leading down to the Shyar Khola, and the river channels downstream appear darker and wider.

The Copernicus Sentinel-2 satellites support the monitoring of river valleys and landslide-prone terrain, helping authorities to identify affected areas and plan disaster response.

Reference:

https://eu-space.europa.eu/components/earth-observation-copernicus/image-of-the-day/landslide-triggered-flash-flood-sweeps-through-nepals-himalayan-valleys

Further Reading



THE CONVERSATION

Updating Darwin: biologists are returning to an older theory to explain anomalies in evolution

Pim Edelaar, Visiting Professor, Division of Biodiversity and Evolution, Lund University; Universidad Pablo de Olavide 28 July 2026

Evolution is a fact of life. So much so that even the theory of evolution is evolving. Lately, a centuries-old, discredited idea has been making a strong comeback. It helps us explain scientific observations that according to standard evolutionary theory should be impossible.

I'm referring to **Lamarckism**, named after theoretical proposals from French biologist Jean-Baptiste Lamarck in 1809. Lamarckism stands for the hypothesis that parents of a given organism may acquire or improve certain characteristics during their lifetimes in response to the demands of their environment. And they then somehow transmit those characteristics to their offspring, making those better able to cope with the same demands too.

Lamarck sought to explain why organisms and their environments fit so well together, and how organisms change over time, as observed in the fossil record. Of course, an alternative explanation was provided by Charles Darwin (and others) half a century later. Darwin's ideas were built around natural selection, which says that some individuals within a species are born with differences that lead them to perform better and therefore reproduce more than others.

Darwin argued that if these differences can be passed from parent to offspring, the next generation will contain relatively more of these higher performing individuals. In other words, the next generation will have a greater fit with their environment.

Over time, Lamarck's idea was discredited. A key moment was an experiment performed by Germany's August Weismann in 1904. He surgically removed the tails of adult rats before allowing them to reproduce, expecting to see this change inherited by their offspring. But it never happened, despite him removing the tails of many generations of rats. Lamarckism as understood then would have predicted that the offspring should have been born with no tails, so for many years biology textbooks presented his theory as a firmly refuted hypothesis.

https://theconversation.com/updating-darwin-biologists-are-returning-to-an-older-theory-to-explain-anomalies-in-evolution-276549?utm_medium=email&utm_campaign=Historys%20most%20dangerous%20clothes%20-%203892039656&utm_content=Historys%20most%20dangerous%20clothes%20-%203892039656+CID_03f1e313d21fdac7af970c705ba6b7de&utm_source=campaign_monitor_uk&utm_term=Updating%20Darwin%20biologists%20are%20returning%20to%20an%20older%20theory%20to%20explain%20anomalies%20in%20evolution

Chicxulub's lingering dust may have turned falling debris into a global firestorm

American Geophysical Union 28 July 2026

Sixty-six million years ago, the six-mile-wide (10-kilometer-wide) Chicxulub asteroid crash-landed in Mexico's Yucatán Peninsula and changed life on Earth forever. The reign of the dinosaurs ended, and only creatures that could shelter in burrows or shallow waters survived into the age of mammals that followed.

Friction between the atmosphere and debris falling back to Earth from the impact caused an intense heat pulse in the immediate aftermath. A new study has found that a thick, global

blanket of dust likely insulated the atmosphere, trapping and radiating enough heat down to the surface to ignite worldwide wildfires and burn even the thickest-skinned animals to a crisp.



(Credit: Pixabay/CC0 Public Domain)

"We're in the realm where we might be essentially killing off everything within that first hour or two," said Brandon Johnson, a planetary scientist at Purdue University and lead author of the study. This result reinvigorates the decades-long debate about whether it was the asteroid impact or another aftereffect that killed the dinosaurs.

The study appears in ***Journal of Geophysical Research: Biogeosciences.***

https://phys.org/news/2026-07-chicxulub-lingering-falling-debris-global.html?utm_source=nwletter&utm_medium=email&utm_campaign=daily-nwletter

Tiny fossils crack a Cretaceous cold case: Ocean acidification triggered one of the ocean's most severe extinctions

Northwestern University ***30 July 2026***

A 113-million-year-old marine murder mystery may finally be solved. Using chemical clues locked inside microscopic fossils, Northwestern University scientists found evidence that ocean acidification drove one of the largest extinction events in the history of planktic foraminifera — tiny shell-building organisms that help regulate Earth's carbon cycle.

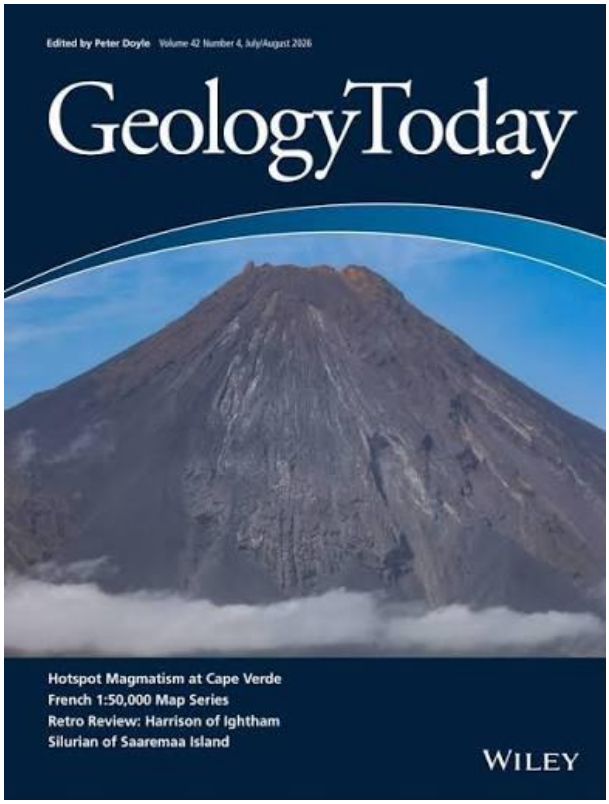
The scientists attribute the acidification to the eruption of the Kerguelen Plateau, a massive volcanic province in the southern Indian Ocean. During the Early Cretaceous, the volcanic province spewed vast quantities of carbon dioxide (CO_2) into the atmosphere. As the oceans absorbed that CO_2, seawater became more acidic, making it more difficult for marine organisms to build and maintain their shells.

The study is published in the journal ***Science***. The new study marks the fifth Northwestern-led investigation to link widespread volcanic eruptions to ocean acidification and extinction, strengthening evidence for a recurring pattern that played out across more than 60 million years.

https://phys.org/news/2026-07-tiny-fossils-cretaceous-cold-case.html?utm_source=nwletter&utm_medium=email&utm_campaign=daily-nwletter

Geology Today

May/June 2026



https://onlinelibrary.wiley.com/toc/13652451/2026/42/4?campaign=woletoc

Were there tiny dinosaurs? New study explores one of evolution's biggest mysteries

American Museum of Natural History
5 August 2026



A model of Microraptor being put on display at the American Museum of Natural History. Microraptor was one of the smallest known dinosaurs, weighing about one pound—roughly the size of a large rabbit. (Credit: Alvaro Keding / AMNH)

Dinosaurs are famous for being big, from the towering *Tyrannosaurus rex* to the colossal *Apatosaurus*. But a new study published today in the journal ***Evolution*** by scientists at the American Museum of Natural History and Princeton University suggests that one of the greatest mysteries of dinosaur evolution isn't how some species became giants—it's why even the smallest dinosaurs never became truly tiny.

https://phys.org/news/2026-08-tiny-dinosaurs-explores-evolution-biggest.html?utm_source=nwletter&utm_medium=email&utm_campaign=daily-nwletter

Industry boosts efficiency to deliver millions more barrels from existing fields

NSTA ***06 Aug 2026***

North Sea operators produced 21,000 extra barrels of oil equivalent (boe) every day in 2025 by running their facilities more efficiently and reducing the number of unplanned shutdowns, a new report shows.

Production efficiency, which indicates how well companies are performing by comparing actual production with maximum potential output, increased by one percentage point to 76% last year.

The improvement equated to the production of 21,000 additional boe per day last year, more than 7.5 million boe in total, according to the annual production efficiency report from the North Sea Transition Authority (NSTA). This represents an impressive turnaround following a decrease of 2 percentage points between 2023 and 2024.

Average daily production was approximately 1.1 million boe per day in 2025, while full-year output totalled 401 million boe.

For the first time since 2021, operators reduced production losses caused by issues with facilities, wells and systems used to transport oil and gas to onshore terminals in 2025.

Operators planned maintenance and executed shutdowns more effectively and have been engaging with the NSTA to identify shut-in wells they could bring back online.

NSTA Operations Director Tom Wheeler said: “The rise in production efficiency in 2025 shows that even mature basins such as the North Sea can reward those with high operating standards with additional barrels.

“The NSTA will continue to help operators make the most of their fields by sharing best practice and learning lessons through its stewardship reviews, data tools, and the work of industry task forces.”

https://www.nstauthority.co.uk/news-publications/industry-boosts-efficiency-to-deliver-millions-more-barrels-from-existing-fields/

One of UK’s best fossil collections sold overseas in ‘loss to the nation’

Nicola Davis, Guardian Science correspondent ***8 Aug 2026***

One of the most important collections of UK Jurassic fossils ever compiled has been sold to a museum in Abu Dhabi, the Guardian can reveal, in what British experts have described as a loss for the nation.

The collection, which was amassed by a private fossil collector, consisted of 318 specimens, including ichthyosaurs, fish and crustaceans among other creatures, some of which could be new species.

The fossils were initially offered for purchase to the Natural History Museum (NHM) in London and to Amgueddfa Cymru (Museum Wales) for what was described by one source as an "eight-figure sum".

Neither institution bought the collection, with both citing a lack of funding. An email seen by the Guardian suggested the NHM had "no money at all" for acquisitions.



Composite: Guardian Design/Getty Images.

https://www.theguardian.com/science/ng-interactive/2026/aug/09/one-of-uks-best-fossil-collections-sold-overseas-in-loss-to-the-nation

Britain's Jurassic gold rush: the fossil hunters chasing fortunes on Dorset's beaches

Social media and soaring prices are fuelling a fossil-hunting boom, with rare discoveries worth thousands of pounds

Nicola Davis, Guardian Science correspondent ***8 Aug 2026***

Bent double at the waist, Martin Curtis combs a stretch of a Dorset beach with the concentration of a man searching for a lost cufflink or wedding ring.

The search is meticulous – and with good reason. What he hopes to find could be far more valuable than an errant piece of jewellery. Curtis is searching instead for the telltale spiral of an ammonite, the star-shaped rod of a crinoid or rocks of a particular shape and colour that suggests there is something very special inside. He is hunting fossils.

Along Charmouth beach and elsewhere on the Jurassic Coast, families with children, seasoned collectors and lone day-trippers peer intently at the ground in search of traces of creatures that lived 190m years ago. While some are here for fun, a growing number are here for business.

That growing professional interest reflects the rising popularity and value of Jurassic fossils, creating a thriving marketplace that has made some collectors social media celebrities and others very wealthy.

https://www.theguardian.com/science/2026/aug/09/britain-jurassic-fossil-hunters-dorset-beaches

1-billion-year-old Mars meteorite found in Algeria is like nothing we've seen from the Red Planet

Elizabeth Howell, Space.com

11 August 2026

"The characteristics of this meteorite were entirely surprising."

A newly found Mars meteorite is revealing the secrets of a previously hidden time period of Red Planet geological history.

The 1.27-billion-year-old space rock, called Northwest Africa (NWA) 13441, was discovered in Algeria in 2019 — but its age was not confirmed until recently. Now scientists say the meteorite helps answer questions about a huge gap in the Martian geologic record: a span of time between 600 million years ago and 2.4 billion years ago.

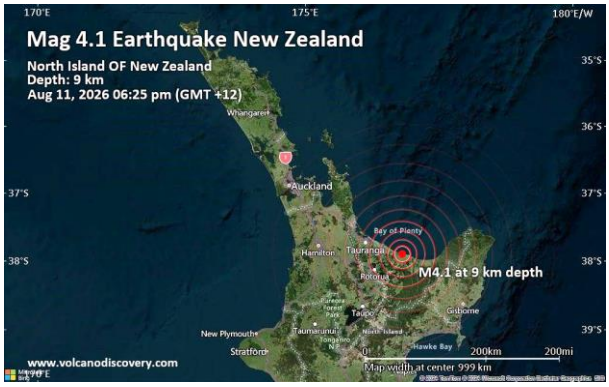
This vast timespan has no known examples of meteorites containing igneous (solid magma) shergottites, which are the most abundant type of Martian meteorites, chunks of the Red Planet that were blasted away by impacts, ejected into space and eventually fell to Earth. The only meteorites known from this time range, roughly 1.3 billion to 1.4 billion years ago, are rarer types known as chassignites and nahklites. As such, the newly analysed meteorite is opening new insights already about this time period.

https://www.space.com/astronomy/mars/1-billion-year-old-mars-meteorite-found-in-algeria-is-like-nothing-weve-seen-from-the-red-planet?utm_term=8DEBC9E5-6C7F-4337-AFFF-D9A51CC6C2C0&lrh=840a98cbe34ba22d824f6df096d90a0be8fe47638763a779b0361304855882d8f&utm_campaign=58E4DE65-C57F-4CD3-9A5A-609994E2C5A9&utm_medium=email&utm_content=46F582B4-1BF8-4FD5-8152-55D24C9CAF62&utm_source=SmartBrief

Moderate 4.1 quake hits near Whakatane, Whakatane District, Bay of Plenty, New Zealand

EarthquakeMonitor, Volcano Discovery
11 August 2026

Just 11 minutes ago, a 4.1-magnitude earthquake struck near Whakatane, Whakatane District, Bay of Plenty, New Zealand. The tremor was recorded early evening on Tuesday, August 11th, 2026, at 6:25 pm local time, at a very shallow depth of 8.80 km below the surface.



The event was filed by the European-Mediterranean Seismological Centre (EMSC), the first seismological agency to report it.

https://www.volcanodiscovery.com/earthquake/news/323460/Moderate-41-quake-hits-near-Whakatane-Whakatane-District-Bay-of-Plenty-New-Zealand.html

Mammal ancestors may have given live birth 90 million years earlier than we thought, rewriting evolutionary timelines

A distinctive growth ring in fossilized bones is revealing how an ancestral species in the mammalian family reproduced.

Chris Simms, LiveScience 13 August 2026

A dog-sized carnivore and mammal ancestor that lived around 236 million years ago seems to have given birth to live young, a new study suggests. This means the tactic of keeping young developing inside the mother — known as viviparity — may have emerged in the mammalian lineage 90 million to 95 million years earlier than scientists previously thought, researchers noted in the study.

"This is the first time that we have evidence on how these mammalian ancestors reproduced," said first author Leandro Gaetano, a palaeontologist at Argentina's National Scientific and Technical Research Council. His team reported the findings Aug. 13 in the journal ***Frontiers in Mammal Science.***

https://www.livescience.com/animals/land-mammals/mammal-ancestors-may-have-given-live-birth-90-million-years-earlier-than-we-thought-rewriting-evolutionary-timelines?utm_term=8DEBC9E5-6C7F-4337-AFFF-D9A51CC6C2C0&lrh=840a98cbe34ba22d824f6df096d90a0be8fe47638763876a779b0361304855882d8f&utm_campaign=368B3745-DDE0-4A69-A2E8-62503D85375D&utm_medium=email&utm_content=BFC782FE-87B6-4209-B053-4BE5ACE7812F&utm_source=SmartBrief

Layered rock in India shows potential signs of microbial life dating to 3.5 billion years ago

Krystal Kasal, Phys.org ***18 August 2026***

A team of researchers reports that they may have found rock containing some of the earliest forms of microbial life on Earth. Their study, published in the ***Proceedings of the National Academy of Sciences***, describes the biosignatures found in this 3.5-billion-year-old, carbon-rich, layered rock, called chert.



Outcrop photo showing dark carbonaceous bands in chert. (Credit: Trisrota Chaudhuri)

https://phys.org/news/2026-08-layered-india-potential-microbial-life.html?utm_source=nwletter&utm_medium=email&utm_campaign=daily-nwletter

Hikers watch as molten lava spews from Mount Etna – video

Source: Reuters ***13 August 2026***



Mount Etna has continued to erupt in Sicily, sending molten lava, rocks and ash down its slopes as hikers watch nearby. The Italian volcano is Europe's most active

https://www.theguardian.com/world/video/2026/aug/13/hikers-lava-mount-etna-video

Geology Bites.

22 August 2026

Sara Pruss on the first reef builders

The video edition of Sara Pruss on the first reef builders (archaeocyaths) is now up on the **Geology Bites YouTube** channel.

The video version includes quite a bit of material that goes beyond the episode web page — beautiful pictures of the first reef builder fossils as well as timelines and summary screens.

Archaeocyaths were sponges that built the first animal reefs in the Early Cambrian, and their spread seems to have fostered a rise in animal diversity. But they didn't last — they were gone by the Middle Cambrian, and animal diversity fell away with them — and it wasn't until the Middle Triassic, some 240 million years ago, that corals took on the job. Reef builders keep appearing, vanishing, and being replaced by

something quite different. Why reefs are such a persistent feature of the record, despite everything the environment throws at them, is the question Sara is working on now.

https://www.youtube.com/@geology_bites_video

27 August 2026

Brian Wernicke on Lithospheric Extension and the Basin and Range Province

Between the Colorado Plateau and the Sierra Nevada, dozens of mountain ranges march north in near-parallel array. This landscape was produced not by squeezing but by stretching, in a crust that has been pulled out to about twice its original width. As explained in the podcast, extension usually leaves little trace, because thinned lithosphere subsides and the basins fill with sediment. The Basin and Range is where it can still be seen.

Brian Wernicke is an Emeritus Professor in the Division of Geological and Planetary Sciences at Caltech.

https://www.geologybites.com/brian-wernicke

Ancient shark 'graveyard' uncovered in Egyptian desert

Fossilized teeth from at least seven shark species have been discovered in the Egyptian desert, hinting at its complex, watery past.

Pandora Dewan, LiveScience

27 August 2026

Scientists have uncovered an ancient shark "graveyard" in the middle of the Egyptian desert.

Fossilized teeth from seven shark species dating back millions of years were discovered in the Abu-Tartur Plateau — located in Egypt's Western Desert — between 2020 and 2022, offering new insight into the desert's watery past. The researchers detailed their discovery in a study published Aug. 18 in the journal **Cretaceous Research.**



An assemblage of the collected shark teeth and the site where the teeth were found, the Abu-Tartur Plateau in Egypt's Western Desert (Image credit: Tarek Yassin)

"This study provides evidence that the area now occupied by the plateau was once a sea with flourished marine life, with environmental conditions suitable for its development and prosperity, including favourable temperatures, sunlight, and appropriate oxygen levels," study first author Tarek Yassin, a palaeontologist at Cairo University in Egypt, told **Live Science** in an email.

https://www.livescience.com/animals/sharks/an-exciting-surprise-ancient-shark-graveyard-uncovered-in-egyptian-desert?utm_term=8DEBC9E5-6C7F-4337-AFFF-D9A51CC6C2C0&lrh=840a98cbe34ba22d824f6df096d90a0be8fe4763876a779b0361304855882d8f&utm_campaign=368B3745-DDE0-4A69-A2E8-62503D85375D&utm_medium=email&utm_content=6B417321-9C75-4D96-8F07-6F5A5E547471&utm_source=SmartBrief

Tiny fossils reveal big insights about ant ancestors

Narsimha Pujari, Canadian Light Source

3 September 2026

Two tiny ant fossils recovered in southern Saskatchewan are helping scientists better understand the evolutionary history of modern ants. Ant fossils dating from 72–56 million years ago are rare. What happened to insects such as ants during this period that saw a mass extinction wipe out all non-bird dinosaurs? How did that event reshape their world?

https://phys.org/news/2026-09-tiny-fossils-reveal-big-insights.html?utm_source=nwletter&utm_medium=email&utm_campaign=daily-nwletter

Salt may have helped turn Earth into a frozen world 700 million years ago

Hannah Bird, Phys.org 3 September 2026

Earth may have been pushed deeper into a global deep freeze by something surprisingly ordinary: salt. Around 700 million years ago, Earth entered periods of extreme glaciation known as **Snowball Earth**, when ice is thought to have spread across much or potentially all of the planet's surface. Scientists have long known that expanding ice could have helped drive this transition: As bright ice replaces darker ocean water, more sunlight is reflected back into space, causing the planet to cool further and allowing even more ice to form.

Now, Aksel Samuelsberg, from University of Tromsø — The Arctic University of Norway, and colleagues have identified another possible feedback that could have amplified this cooling: salt crystals accumulating on the surface of sea ice. Their modelling suggests that these crystals could have made the frozen surface even more reflective, helping temperatures fall rapidly during the early stages of a Snowball Earth event.

Publication details

Aksel Samuelsberg *et al*, Amplified cooling of Snowball Earth from a salt-albedo feedback, **Climate of the Past (2026).**
DOI: 10.5194/cp-22-1499-2026

https://cp.copernicus.org/articles/22/1499/2026/

https://phys.org/news/2026-08-salt-earth-frozen-world-million.html?utm_source=nwletter&utm_medium=email&utm_campaign=daily-nwletter

Six unusual structures identified at Earth's core-mantle boundary with the help of deep learning

Krystal Kasal, Phys.org 6 September 2026

Since scientists can't drill 2,900 km (1,800 miles) to the boundary between Earth's core and deep mantle, they must use information relayed by seismic waves recorded during earthquakes to study this region. In a new study published in the journal **JGR Solid Earth**, a group of scientists used deep learning to study a large set of a specific type of seismic wave. The analysis revealed six continuous bands of irregularities at the core-mantle boundary (CMB) that had previously appeared only as sparse patches.

Yurui Guan et al, Global Distribution of PKP Precursors Derived From Three Decades of Seismic Data With Deep Learning, **Journal of Geophysical Research: Solid Earth (2026).**
DOI: 10.1029/2025jb033195

https://phys.org/news/2026-09-unusual-earth-core-mantle-boundary.html?utm_source=nwletter&utm_medium=email&utm_campaign=daily-nwletter

THE CONVERSATION

How the 'first bird' leapt into the sky and soared above the dinosaurs

Neil J. Gostling, Associate Professor in Evolution and Palaeobiology, University of Southampton 7 September 2026

Archaeopteryx is an icon of evolution and is often called the first bird. Scientists have long debated just how it took off from the ground, but a recent study published by my colleagues and I has brought new insights to the mystery.

Our study compared Archaeopteryx with the anatomy of modern birds, and our findings

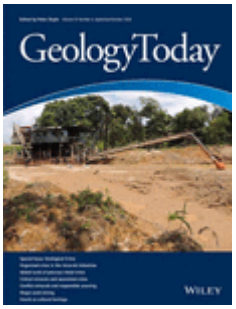
suggest it generated the force needed to take off by taking several jumps forwards.

Archaeopteryx, a fossil uncovered from the Jurassic rocks of Germany, dates back 150 million years. It was covered in feathers, and it had wings. But it retained a number of distinctly dinosaur features such as a long bony tail, claws on separate fingers and teeth in a beakless jaw.

Charles Darwin predicted, in the first edition of **On the Origin of Species** published in 1859, that fossils would later be found linking major groups of animals. A year after publication a feather, and within two years, an entire skeleton of Archaeopteryx had been discovered, showing clear links between birds and the dinosaurs. Archaeopteryx is one of those transitional forms that links one group to another.

https://theconversation.com/how-the-first-bird-leapt-into-the-sky-and-soared-above-the-dinosaurs-289927?utm_campaign=the-daily-39447&utm_content=the-daily-39447_uk%7C2%7C39447%7C72e09371&utm_medium=email&utm_source=braze&utm_term=How+the+%E2%80%98first+bird%E2%80%99+leapt+into+the+sky+and+soared+above+the+dinosaurs

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https://onlinelibrary.wiley.com/toc/13652451/2026/42/5

New analysis reconstructs the dawn of dinosaurs and other reptiles

Ingrid Fadelli, Phys.org 11 September 2026

About 252 million years ago, at the end of the Permian Period, a large proportion of species on Earth rapidly became extinct. After this mass extinction, many groups of organisms began to recover, while reptiles known as *archosauromorphs* — the group that includes dinosaurs and crocodiles — proliferated.

The proliferation of these reptiles gradually transformed life on land, laying the foundations for the ecosystems that characterized the Mesozoic Era (i.e., the interval between 252 and 66 million years ago). The diversification of *archosauromorphs* is an example of an evolutionary radiation, a relatively rapid increase in the number and variety of species descending from a common ancestor, often following a major extinction.

Many palaeontologists and biologists have tried to understand this evolutionary radiation, typically using evolutionary family trees (phylogenies) that map the inferred relationships among different *archosauromorph* species. They have often found — as in other major radiations — an "early burst" pattern, in which many new species are generated early on, and the rate of origination then slows. However, exactly what processes drive such early-burst patterns remains unclear.

An international team of researchers based at the University of Liège (Belgium), the Argentine Museum of Natural Sciences "Bernardino Rivadavia" and University of Buenos Aires (Argentina), the University of Fribourg and ETH Zurich (Switzerland), the University of Gothenburg (Sweden), and the University of Birmingham (U.K.) recently analysed data extracted from fossil records to reconstruct changes in *archosauromorph* speciation and extinction rates.

Their findings, presented in a paper published in the **Proceedings of the Royal Society B**, suggest that *archosauromorph* evolution underwent an early burst of speciation, followed by declining speciation and increasing extinction rates.

https://phys.org/news/2026-09-analysis-reconstructs-dawn-dinosaurs-reptiles.html?utm_source=nwletter&utm_medium=email&utm_campaign=daily-nwletter

A 66.5-million-year-old trackway captures adult T. rex at walking pace

Denver Museum of Nature & Science ***9 September 2026***

Scientists from the Denver Museum of Nature & Science and Liverpool John Moores University in England have discovered the first adult *T. rex* trackway, providing insights into how this emblematic predator moved. The findings are published in the **Journal of Vertebrate Paleontology**.

https://phys.org/news/2026-09-million-year-trackway-captures-adult.html?utm_source=nwletter&utm_medium=email&utm_campaign=weekly-nwletter

A fossil feather preserved inside dinosaur poop could help explain why birds survived the mass extinction

Field Museum ***10 September 2026***

About 66 million years ago, a dinosaur—maybe a *T. rex* or a *Nanotyrannus* — ate a bird. The record of that meal, in the form of fossilized poop, has survived to today, preserving the best example of a feather ever found from the age of dinosaurs. By studying this feather, scientists reported in a new study in the journal **Current Biology**, researchers have found clues that help explain why birds are the only group of dinosaurs that survived the mass extinction 66 million years ago.

"It's such a beautiful, well-preserved feather, from such an unexpected source, and it's exciting that it could help us answer this huge question in palaeontology," says Jingmai O'Connor, the lead author of the new paper and associate curator of fossil reptiles at the Field Museum in Chicago.

Birds are a specialized kind of dinosaur, and they've been around for a long time. The earliest known bird is *Archaeopteryx*, from 150 million years ago, and birds continued to evolve and coexist alongside their fellow dinosaurs for nearly 100 million years. In the aftermath of Earth's collision with an asteroid 66 million years ago, nearly all the dinosaurs, including nearly all the birds, went extinct. But one group of birds, *Neornithes*, survived, and every living bird today is one of their descendants.



The fossil feather preserved in dinosaur poop. (Credit: O'Connor et al)

One of the biggest mysteries in palaeontology is why this one small group of birds survived

when all the other birds and all the other dinosaurs died out. O'Connor has spent years studying fossil birds to try to answer this question. But this is the first time she's studied feathers that were preserved inside fossilized droppings, or coprolites.

https://phys.org/news/2026-09-fossil-feather-dinosaur-poop-birds.html?utm_source=nwletter&utm_medium=email&utm_campaign=weekly-nwletter

THE CONVERSATION

End of humanity? Blow-by-blow account of what would happen if the Yellowstone supervolcano erupted now

Ilan Kelman & Matthew Blackett
21 September 2026

Around 631,000 years ago — a geological blink of an eye — catastrophe unfolded in what is now north-western Wyoming, US. During what is thought to have been a series of immense volcanic eruptions, life within hundreds of kilometres of the blasts was shattered. Ash was dispersed across much of North America and the effects were felt worldwide. This was a super-eruption of the massive volcanic system located in what is now the Yellowstone National Park.

Despite the scale, no known human witnessed the cataclysm. As far as we know, early humans had not yet reached the continent. Across oceans, perhaps early humans did wonder at the hazier skies and unusually vivid sunsets. Volcanic particles circulating in the sky cooled their climate and likely affected their weather patterns and lives. Whether they noted these changes – or connected them to any distant event – is unknowable.

Today, humanity would certainly notice. We already know that a super-eruption on this scale would be a threat civilisation as we know it. So, what exactly would we experience if Yellowstone erupted? We are experts in disasters and volcanoes and what follows is a thought experiment into what might happen in the worst-case scenario. We've based our hypothesis on research and by examining how countries have dealt with disasters in recent years.

https://theconversation.com/end-of-humanity-blow-by-blow-account-of-what-would-happen-if-the-yellowstone-supervolcano-erupted-now-288649

https://phys.org/news/2026-09-humanity-blowbyblow-account-yellowstone-supervolcano.html?utm_source=nwletter&utm_medium=email&utm_campaign=weekly-nwletter

Bizarre new dinosaur with giant claws discovered in China

Paul Arnold, Phys.org 23 September 2026

It walked on two legs and may have looked like a feathered bear with giant claws. Meet *Kayrasaurus changliensis* - well, it's almost complete skeleton, to be precise.

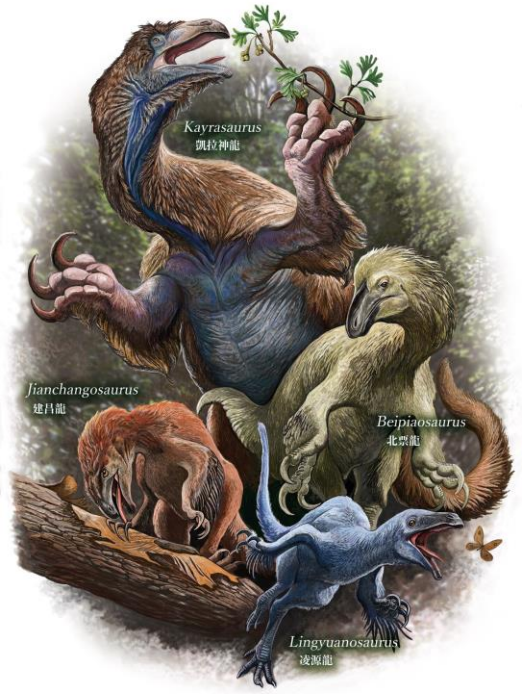
Palaeontologists have described a new species and genus of *therizinosaur* found in the Yixian Formation of western Liaoning, China, that lived during the Early Cretaceous.

Therizinosaurs were a group of primarily plant-eating theropod dinosaurs with long necks, pot bellies and large claws that may have been used for feeding.

This new dinosaur measured more than 3.6 meters (11.8 feet) long and is estimated to have weighed between 117 kilograms (258 pounds) and 274 kilograms (604 pounds). It is thought to be the largest therizinosaurian specimen discovered in the Jehol Biota (an Early Cretaceous ecosystem in northeastern China), at least 1.6 times larger than *Beipiaosaurus inexpectus*, the previous record holder.

But several features distinguish it from other early therizinosaurs, as researchers Chun-Chi Liao, William J. Freimuth, Lindsay E. Zanno and Xing Xu detail in a study published in the ***Journal of Systematic Paleontology.***

DOI: 10.1080/14772019.2026.2710287



Life reconstruction of Jehol therizinosaurians, illustrating variation in body size, skeletal proportions and inferred ecological strategies among taxa. Illustration by Kōhei Futaka. (Credit: Journal of Systematic Palaeontology (2026)).

https://phys.org/news/2026-09-bizarre-dinosaur-giant-claws-china.html

Jackdaw would have 'meaningful impact' on gas prices

New analysis by Kathryn Porter dismisses "myth" UK gas production does not offer cheaper bills.

Erikka Askeland, EnergyVoice
28 September 2026

North Sea gas is the cheapest source of it available to Britain, which lowers the cost of gas and therefore also of electricity in the UK, a new report has argued.

Kathryn Porter, founder of independent energy consultancy Watt-Logic, has issued a new report tackling why there's a "myth" around arguments that North Sea gas – particularly from the Jackdaw oil and gas field – is a globally traded commodity so cannot reduce household energy bills.

The report comes as pressure mounts on UK prime minister Andy Burnham to make a decision on the North Sea field, the second largest hydrocarbon field in the UK continental shelf which is awaiting a government decision on whether or not it goes ahead.

Porter argued that commodities pricing and the UK's marginal pricing model was little understood by policy makers and that claims UK North Sea production was in "terminal decline and no longer worth bothering with" was "both dishonest and stupid".

She said: "Once this marginal pricing mechanism is understood, the case for maximising domestic production becomes obvious.

"North Sea gas is not only cheaper than imported LNG, it is also cleaner, so preferring it is a no-brainer for anyone not completely brain-washed by Just Stop Oil zealots.

"UKCS gas is also more secure than imported gas – it is directly connected to the National Transmission System ("NTS"), and, unlike an LNG cargo, it cannot just sail away when a buyer elsewhere in the world offers more money."

She added: "The Jackdaw field is large enough to fully displace price-setting LNG for between two and four months of the year, which would have a meaningful impact on summer gas prices."

https://www.energyvoice.com/oilandgas/north-sea/604386/jackdaw-would-have-meaningful-impact-on-gas-prices/?utm_campaign=402430177-Energy%20Voice%20%7C%20Daily%20Newsletter&utm_medium=email&_hsenc=p2ANqtz-_vKSFAdwXWdatJueIcrpWLxpglecq96eQymbH7j-xkfPNWGVOJnOxauRmcdSo3LoNT6atAuNA8PRKTEIPuokmpY5556Q&_hsmi=135376940&utm_content=135376940&utm_source=hs_automation

How the moon and sun may trigger slow earthquakes on Earth

Paul Arnold, Phys.org 29 September 2026

While not quite a fatal attraction, the gravitational pull of the moon and sun creates tiny stresses on Earth that can trigger events known as **slow earthquakes**. These are movements along fault lines (fault slips) that release their energy gradually over much longer periods than ordinary quakes. Although they have been observed, exactly how these celestial bodies trigger them has been a relatively tough nut to crack.

So, a team of geoscientists led by Yishuo Zhou at PSL University in Paris created computer models of these fault lines to find out what is going on.

The results revealed a fascinating pattern, as the research team details in their paper published in the **Journal of Geophysical Research: Solid Earth**. Timing, force and friction were all key.

https://phys.org/news/2026-09-moon-sun-trigger-earthquakes-earth.html?utm_source=nwletter&utm_medium=email&utm_campaign=daily-nwletter

Geology Bites.

2 October 2026

Torgeir Andersen on Ultrahigh-Pressure Metamorphism

In the early 1980s, coesite, a dense form of quartz that forms only under pressures found about 100 km down, was discovered almost simultaneously in rocks of the Western Alps and western Norway. It meant that continental crust, buoyant material that should resist being pushed into the mantle, had been dragged to those depths and then returned to the surface.

In the podcast, Torgeir Andersen explains how the Norwegian rocks got down, how they came back, and why a few isolated diamond-bearing pods may record local overpressure rather than even greater depth.

Andersen is Professor Emeritus of Geology at the University of Oslo.

https://www.geologybites.com/torgeir-andersen

15 October 2026

Tony Watts on the Mechanics of Tectonic Plates

In the early 1970s, as a postdoc at the Lamont-Doherty Earth Observatory, Tony Watts set out to test whether the tectonic plates are as strong as plate tectonics assumed. Borrowing the equations engineers use for a beam bending under a load, he measured how the lithosphere flexes where it plunges into ocean trenches and beneath the weight of seamounts, and from that estimated its strength. The same approach has since been used to study sedimentary basins, ice sheets and even volcanoes on Mars.

Watts is Emeritus Professor of Marine Geology and Geophysics at the University of Oxford.

https://www.geologybites.com/tony-watts-on-the-mechanics-of-tectonic-plates

Why has a Lancashire village had 25 earthquakes in a year?

Judy Hobson, BBC North West environment and transport correspondent
13 October 2026

Silverdale is at the centre of a geological mystery.

Over the course of the past 12 months, **25 earthquakes have been recorded in the Lancashire village**, the largest of which - in December - had a 3.2 magnitude and was powerful enough to be felt by people living up to 12 miles (20km) away.

The most recent earthquake happened on 21 September.

So, what is going on?

Seismologists at the British Geological Survey (BGS) in Edinburgh are keeping a close eye on Silverdale and its surrounding area.

Dr. Brian Baptie - who leads the BGS's earthquake seismology team - explained: "We do get earthquakes in the UK."

"We get around 200-300 every year - and about 20-30 of them are felt by people - so it's actually quite normal."

He said western parts of England, north-west Wales and the west of Scotland "are all, what we might call, **earthquake hot spots**".

Baptie explained earthquakes "usually happen in clusters - so when there is one earthquake, we usually get lots of others".

While Silverdale residents may be reassured by this, some fears remain.

https://www.bbc.co.uk/news/articles/crn4e8end5zpo

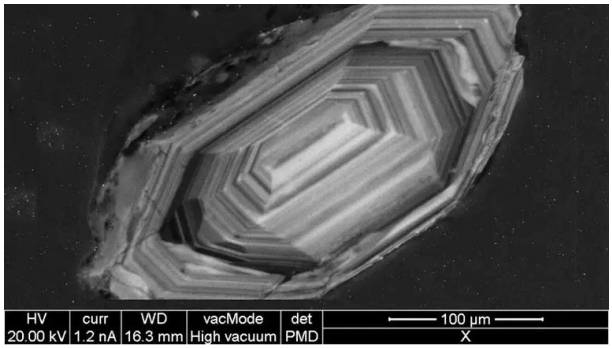
One of America's biggest meteor craters is 100 million years younger than we thought — and coincided with a global extinction event



There are no visible signs of the Ames crater today. This circle represents the rough outline of the submerged structure.
(Image credit: EarthExplorer/USGS/Landsat with annotations Harry Baker)

Analysis of tiny zircon crystals buried within the 10-mile-wide Ames crater in northwest Oklahoma suggests that the submerged structure dates back to 370 million years ago, during the Frasnian-Famennian mass extinction event.

Harry Baker, LiveScience 14 October 2026



Zircon crystal (Image credit: Emmanuel Roquette via Wikimedia)

https://www.livescience.com/planet-earth/geology/one-of-americas-biggest-meteor-craters-is-100-million-years-younger-than-we-thought-and-coincided-with-a-global-extinction-event?utm_term=8DEBC9E5-6C7F-4337-AFFF-D9A51CC6C2C0&lrh=840a98cbe34ba22d824f6df096d90a0be8fe4763876a779b0361304855882d8f&utm_campaign=368B3745-DDE0-4A69-A2E8-62503D85375D&utm_medium=email&utm_content=0864E2C4-7307-4F43-9C02-756F2B7EC15E&utm_source=SmartBrief

Flightless Jurassic bird was like a carnivorous pheasant with killer claws

An early bird with many dinosaur-like features discovered in China seems to have been a fast-running, land-based carnivore with killer claws.

Chris Simms, LiveScience 14 Oct 2026

Palaeontologists in China have discovered a small Jurassic bird that was likely a land-based predator — like a carnivorous pheasant with killer claws. It had some features of birds and others of dinosaurs, suggesting that the earliest birds had a greater diversity of lifestyles than previously recognized.



Illustration of the flightless Jurassic bird Yuezhuornis yangyuanensis, which had features of both birds and dinosaurs. (Image credit: Mr. Chung-Tat Cheung)

Jurassic birds first emerged 150 million to 148 million years ago, and fossils of them are rare, so experts are just starting to understand how early birds diversified and evolved the ability to fly.

The researchers discovered the newly identified *Yuezhuornis yangyuanensis* in 2024, in the fossil assemblage known as the Upper Jurassic Zhenghe Fauna in southeastern China. It lived 150 million to 148 million years ago, roughly when birds started to appear in the fossil record. The team published their findings Wednesday (Oct. 14) in the journal **Nature**.

https://www.livescience.com/animals/extinct-species/flightless-jurassic-bird-was-like-a-carnivorous-pheasant-with-killer-claws?utm_term=8DEBC9E5-6C7F-4337-AFFF-D9A51CC6C2C0&lrh=840a98cbe34ba22d824f6df096d90a0be8fe4763876a779b0361304855882d8f&utm_campaign=368B3745-DDE0-4A69-A2E8-62503D85375D&utm_medium=email&utm_content=0864E2C4-7307-4F43-9C02-756F2B7EC15E&utm_source=SmartBrief

UK approves Jackdaw gasfield in North Sea

Decision was widely expected after lobbying by Shell but will dismay environmental campaigners

Peter Walker, Kiran Stacey and Aletha Adu, BBC 21 Oct 2026

The UK government has approved the controversial Jackdaw gasfield in the North Sea, a widely expected move that will nonetheless dismay environmental campaigners and a number of Labour MPs.

While Labour's 2024 election manifesto committed to a ban on new drilling licences in the North Sea, the companies behind Jackdaw and the Rosebank oilfield project, which is being decided on separately, have sought environmental approval for existing licences.

The companies resubmitted their applications for environmental approval earlier this year. The decision on Jackdaw had been expected last month but was delayed, seemingly to take it beyond the Holborn and St Pancras byelection on 8 October, where Labour was defending a seat against a Green challenge and ultimately won.



The Jackdaw field will start supplying gas to homes and businesses from the end of the month, the government said after approving the scheme.

https://www.theguardian.com/environment/2026/oct/21/jackdaw-gasfield-in-north-sea-approved

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  Lunar Science by Prof. Katherine Joy
  The Secret Ingredient for a Habitable Planet by Dr. Lucía Pérez-Díaz
- Activities for children

ROCKWATCH
The UK's Nationwide Geology Club for Children

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Burlington House is a short walk from Green Park station and on the same site as the Royal Academy.

www.geologistsassociation.org.uk

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Images © Phil James (ammonite), Ryan Hill (background)

https://geologistsassociation.org.uk/festival/#leaflet