

St Benedict's SCIENCE NEWS Monthly

Welcome to the March 2023 issue

SCIENCE NEWS *Monthly* is produced by the Science Department,
St Benedict's Catholic Secondary School, Bury St Edmunds, Suffolk, UK.

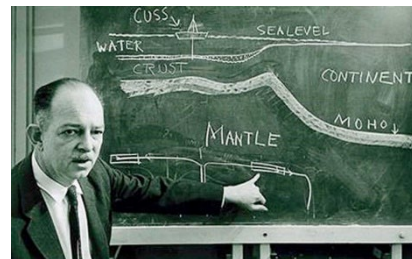
EARTH SCIENCE – Turkey suffers devastating earthquake – but why?

In the early morning of February 6, a devastating magnitude 7.8 earthquake struck southern Turkey, near the border with Syria. Numerous aftershocks followed, the strongest nearly rivaling the power of the main quake, at magnitude 7.5. This was the strongest earthquake in the region since 1939. But why is this particular region so prone to such devastating events? The answer lies in the theory of **PLATE TECTONICS**.



The theory has its origin in 1912 when a German scientist, **Alfred Wegener**, advanced the idea that whole continents move over time – **Continental Drift**. Although he accumulated strong evidence, based on the similarity of rock formations and fossils over widely separated continents, he was ridiculed. This was compounded by the fact that Wegener could not explain how the continents could drift. Wegener died during an expedition to Greenland in 1930 but his reputation was redeemed in the 1960s when his idea of Continental Drift was explained by the new theory of Plate Tectonics.

New data began to support the idea of continental drift. Maps of the ocean floor showed a massive undersea mountain range that almost circled the entire Earth. An American geologist named Harry Hess proposed that these ridges were the result of molten rock rising from the mantle. As it came to the surface, the rock cooled, making new crust and spreading the seafloor away from the ridge in a conveyor-belt motion. Millions of years later, the crust would disappear into ocean trenches at places called subduction zones and cycle back into Earth. Magnetic data from the ocean floor and the relatively young age of oceanic crust supported Hess's hypothesis of **seafloor spreading**. By the 1970s the Earth's crust had been surveyed and could be seen to be divided into numerous sections, or "plates", that moved and interacted, often in violent ways.



Most of Turkey sits on a small tectonic plate (the Anatolian microplate) that is sandwiched between two slowly colliding behemoths: the vast Eurasian Plate to the north and the Arabian Plate to the south. As those two plates push together, Turkey is being squeezed out sideways, like a watermelon seed snapped between two fingers, says seismologist Susan Hough of the U.S. Geological Survey. The entire country is hemmed in by strike-slip, or sideways-sliding, fault zones: the North Anatolian Fault that runs roughly parallel to the Black Sea,



and the East Anatolian Fault, near the border with Syria. As a result, Turkey is highly seismically active.

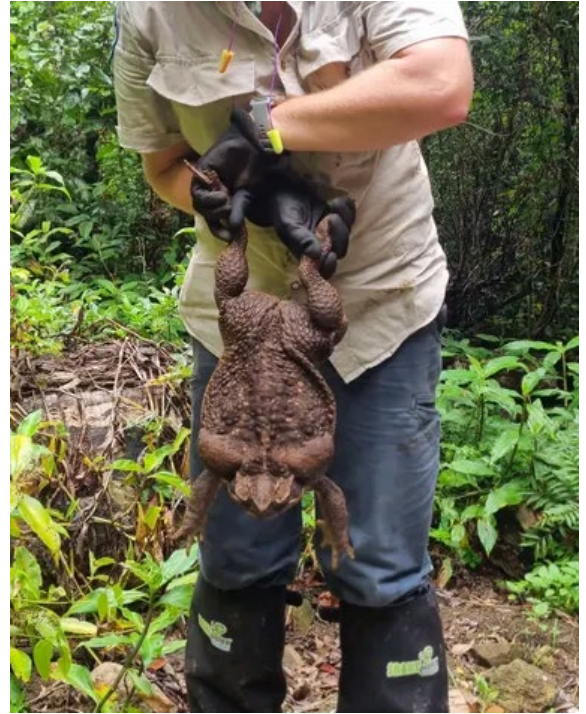
Although distant from the nearest plate boundary, the Mid-Atlantic Ridge, **earthquakes in the UK** occur as crustal stresses within the tectonic plates are relieved by movement occurring on pre-existing fault planes. Each year, between 200 and 300 earthquakes are detected and located in the UK. The largest known British earthquake occurred near the Dogger Bank in 1931, with a magnitude of 6.1. Fortunately, it was 60 miles offshore but was still powerful enough to cause minor damage to buildings on the east coast of England. The most damaging UK earthquake was in the Colchester area in 1884. Some 1200 buildings needed repairs, chimneys collapsed and walls were cracked.

Dr R DAVIES LIVED AND WORKED IN AUSTRALIA FOR A WHILE, BUT NEVER SAW ANYTHING LIKE THIS!

NATURE – The largest toad in the world?

Cane toads (*Rhinella marina*), which can normally grow to around 15cm (5.9in) in size, are one of Australia's most notorious invasive species and are considered a threat to native wildlife. They have colonised a wide variety of habitats across north-eastern Australia after they were introduced into Queensland in 1935 to control the cane beetle. The brown, warty toads can be fatally poisonous to wildlife and have caused local extinctions of some of their predators. They also compete with native species for shelter and resources.

The Guinness World Record for the largest toad in history was 2.65kg (5.8lbs), found in 1991. This record has now been broken by a giant cane toad, dubbed "Toadzilla", that was found by rangers in Queensland's Conway national park and is believed to be the largest of her species ever found. Ranger Kylee Gray was walking in the national park and had stopped to let a snake slither across the track when she saw the enormous toad. The rangers who found "Toadzilla" took it back to their base and weighed it. She tipped the scales at 2.7kg (6lbs), which could be a new record. "A cane toad that size will eat anything it can fit into its mouth, and that includes insects, reptiles and small mammals," Gray said.

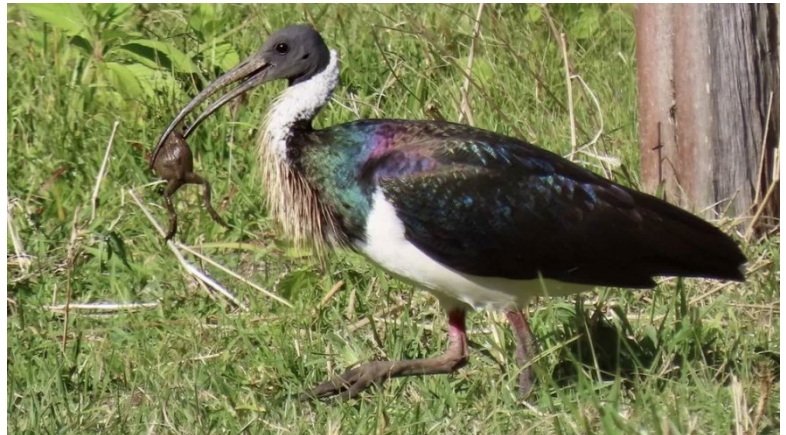


<https://www.theguardian.com/environment/2023/jan/20/we-dubbed-it-toadzilla-giant-cane-toad-believed-to-be-the-largest-of-its-species-found-in-australia>

MORE NEWS FROM OZ SPOTTED BY Dr DAVIES

NATURE – More on cane toads: How 'bin chickens' learnt to wash poisonous cane toads

There are few Australian animals more reviled than the white ibis (*Threskiornis molucca*). It has earned the moniker "bin chicken" for its propensity to scavenge food from anywhere it can - messily raiding garbage and often stealing food right out of people's hands. But the native bird may have figured out how to overhaul its bad reputation. It has developed an "ingenious" method of eating one of the only animals Australians hate more - the cane toad, a toxic and pervasive pest.



First introduced to Australia in the 1930s, cane toads have no natural predators in the country and have wrought havoc on native animal populations. The toad's skin contains venom which it releases when threatened, causing most animals that come into contact with it to die quickly of a heart attack. Hence Emily Vincent's surprise when members of the community started sending her pictures and videos of ibis "playing" with the amphibians.

Ms Vincent, who runs the invasive species programmes at environment charity Watergum, says the behaviour has been reported up and down Australia's east coast. "Ibis were flipping the toads about, throwing them in the air, and people just wondered what on earth they were doing," she told the BBC. "After this they would always either wipe the toads in the wet grass, or they would go down to a water source nearby, and they would rinse the toads out."

She believes it is evidence of a "stress, wash and repeat" method that the birds have developed to rid the toads of their toxins before swallowing them whole. It isn't the first time birds have been spotted eating cane toads and they seem to be less susceptible to the toad's poison than other animals, like snakes, mammals or crocodiles. But they can still die from too much of it and it will have a foul taste. The ibis appear to have worked out how to stress the toads in such a way that they release all their poison, meaning that the ibis can then "wash" the toads to get rid of the poisonous liquid on their skins, before swallowing them.

Ms Vincent says that it is a promising sign that native animals are learning to adapt to the toads, which are now estimated to number over 2 billion!

<https://www.bbc.co.uk/news/world-australia-63699884>

ARCHAEOLOGY - Archaeologists discover a new papyrus of Egyptian *Book of the Dead*

Archaeologists have confirmed that a papyrus scroll discovered at the Saqqara necropolis site near Cairo last year does indeed contain texts from the Egyptian *Book of the Dead*—the first time a complete papyrus has been found in a century, according to Mostafa Waziri, secretary-general of the Supreme Council of Antiquities in Egypt. The scroll has been dubbed the "Waziri papyrus" and is currently being translated into Arabic.



The 52-foot (16m) papyrus scroll contains spells from the *Book of the Dead*.

Its discovery will undoubtedly enhance modern understandings of the ancient Egyptian belief in magic. Currently, the lengthy papyrus is being restored at the Egyptian Museum Laboratory in Cairo, and it's hoped the epic document will eventually go on display at the all-new Grand Egyptian Museum.

Fans of the 1999 film *The Mummy* know that the Egyptian *Book of the Dead* plays a key role in bringing the cursed high priest Imhotep back to terrorize the living. The reality is naturally quite different: notably, there is not one magical copy of the *Book of the Dead*, as depicted in the film; there were many versions over the centuries, all unique, with the choice of spells often tailored to the specific needs of deceased royals and (later) high-ranking members of Egyptian society.

These "books" were actually collections of funerary texts and spells to help the deceased on their journey through the underworld (*Duat*)—not to bring people back from the dead—and they are not holy texts like the Bible or Quran. They were originally painted onto objects or written on the walls of burial chambers. Over time, illustrations were added and spells were also inscribed on the interior of coffins or the linen shrouds used to wrap the deceased.

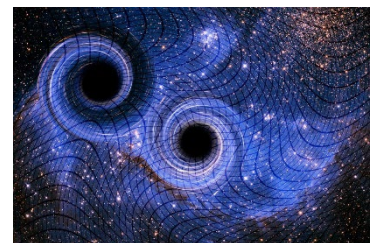


One of the most famous spells is the "Weighing of the Heart" (designated 125 by scholars), dating to around 1475 BCE, by which time copies of the *Book of the Dead* were commonly written on papyrus. Anubis would lead the deceased before Osiris, where they would swear they had not committed any of 42 listed "sins," and their heart was weighed on a pair of scales against a feather to determine if they were worthy of a place in the afterlife. Of the 192 spells currently known—no one manuscript contains them all—there are several protective spells to guard against the damage or loss of the heart, and in one case (30b) imploring the heart not to "betray" its owner during the weighing ritual by "telling lies in the presence of the god."

<https://arstechnica.com/science/2023/01/archaeologists-discovered-a-new-papyrus-of-egyptian-book-of-the-dead/>

PHYSICS - Ripples in the fabric of the Universe may reveal start of time

Gravitational waves are 'ripples' in space-time caused by some of the most violent and energetic processes in the Universe. Albert Einstein predicted the existence of **gravitational waves** in 1916 in his general theory of relativity. Einstein's mathematics showed that massive accelerating objects (such as neutron stars or black holes orbiting each other) would disrupt space-time in such a way that 'waves' of undulating space-time would propagate in all directions away from the source. Though Einstein predicted the existence of gravitational waves in 1916, the first proof of their existence didn't arrive until 1974, 20 years after his death.



Scientists have advanced in discovering how to use gravitational waves to peer back to the beginning of everything we know. The researchers say they can better understand the state of the cosmos shortly after the Big Bang by learning how these ripples in the fabric of the universe flow through planets and the gas between the galaxies. "We can't see the early universe directly, but maybe we can see it indirectly if we look at how gravitational waves from that time have affected matter and radiation that we can observe today," says Deepen Garg, lead author of a paper reporting the results in the *Journal of Cosmology and Astroparticle Physics*.

Since 2015 gravitational waves have been observed by a network of super-sensitive detectors known as LIGO (Laser Interferometer Gravitational Wave Observatory) in the US. Garg created formulae that could theoretically lead gravitational waves to reveal hidden properties about celestial bodies, like stars that are many light years away. As the waves flow through matter, they create light whose characteristics depend on the matter's density. A physicist could analyse that light and discover properties about a star millions of light years away. This technique could also lead to discoveries about the smashing together of neutron stars and black holes, ultra-dense remnants of star deaths. They could even potentially reveal information about what was happening during the Big Bang and the early moments of our universe.

<https://phys.org/news/2023-01-ripples-fabric-universe-reveal.html>

TECHNOLOGY - Turning problem sea algae into a replacement for plastic

Excessive outbreaks of seaweed are clogging up waters from the Caribbean to the Baltic. Now the algae is being harvested alongside farmed crops to create ingredients for cosmetics and food products.



Toxic algae blooms are becoming an almost constant problem in the Baltic Sea. The outbreaks occur when tiny cyanobacteria, also called blue-green algae, suddenly multiply rapidly, stretching out on top of the water for potentially kilometres. Also called eutrophication, it is a form of marine suffocation, and it is a significant environmental concern in the Baltic Sea. It can occur in 97% of the total area of the sea, according to official figures. The blooms impact on other marine life, by causing oxygen deficiency, reducing water quality, and blocking out light.

The problem is caused by too many nutrients entering the water, typically nitrogen and phosphorus from artificial fertilisers. These are carried into the sea by the rivers of the surrounding countries - Denmark, Estonia, Finland, Germany, Latvia, Lithuania, Poland, Russia and Sweden. While the use of such fertilisers has reduced in recent years, the Baltic Marine Environment Protection Commission, the intergovernmental organisation that aims to improve water quality in the sea, says that the effect of these measures has not yet been detected.

Some six years ago Ms Granström, a Finnish biochemist, determined to tackle the problem herself. She'd harvest the microalgae and use it to make ingredients for a host of products. In addition to cosmetics and human food, the microalgae extracts can be used in detergents, animal feed, packaging, and even as a replacement for plastic. This comes as there is a growing trend for seaweed to be harvested for such purposes, as a replacement to oil-based ingredients such as plastics.

Ms Granström says she worked on the project as *"a hobby for a long time"*, before in 2019 setting up a company called Origin by Ocean (ObO). She is the chief executive. The business, which has attracted both commercial investment and European Union funds, is now continuing with a pilot production scheme ahead of aiming to be fully operational by 2025-26. ObO collects the microalgae off the coast of Finland, where it is sucked on to boats and then separated from the water. It uses a patented biorefinery technology it calls *"Nauvu"* to separate the algae into numerous useable materials. These are then sold to food, cosmetics, textiles, packing and agricultural companies.



<https://www.bbc.co.uk/news/business-64317261>

EARTH SCIENCE - Earth's inner core may be reversing its rotation

Earth's inner core may have temporarily stopped rotating relative to the mantle and surface, researchers report in the journal *Nature Geoscience*. Now, the direction of the inner core's rotation may be reversing — part of what could be a roughly 70-year-long cycle that may influence the length of Earth's days and its magnetic field — though some researchers are sceptical.

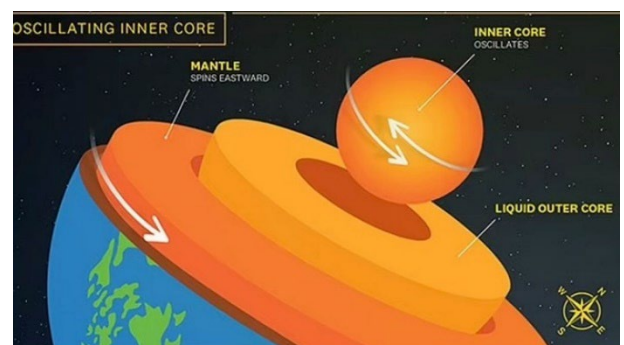
The structure of the Earth comprises of the crust, mantle, outer core and inner core. The crust is the outer, solid rocky layer and is relatively thin – ranging between 5 and 70km in thickness. The mantle is a semi-solid layer at high temperature – it is the Earth's thickest layer extending down nearly 3000km. The outer core is a liquid layer of iron and nickel and is about 2400km thick. Finally, the inner core is thought to be a solid mass of mainly iron, but with some nickel, and is about 1200km in radius.

Studies have suggested that this solid inner core may rotate within the liquid outer core, compelled by the outer core's magnetic torque. Researchers have also argued the mantle's immense gravitational pull may apply an erratic brake on the inner core's rotation, causing it to oscillate. The researchers inferred that the inner core rotates at a different speed than the mantle and crust, causing the time differences. The planet spins roughly 360 degrees in a day. Based on their calculations, the researchers estimated that the inner core, on average, rotates about 1 degree per year faster than the rest of Earth.

The latest research infers that the inner core may oscillate with a roughly 70-year periodicity — switching directions every 35 years or so. Because the inner core is gravitationally linked to the mantle and magnetically linked to the outer core, the researchers say these oscillations could explain known 60- to 70-year variations in the length of Earth's days and the behaviour of the planet's magnetic field.

But this latest research needs much follow up work to confirm its findings.

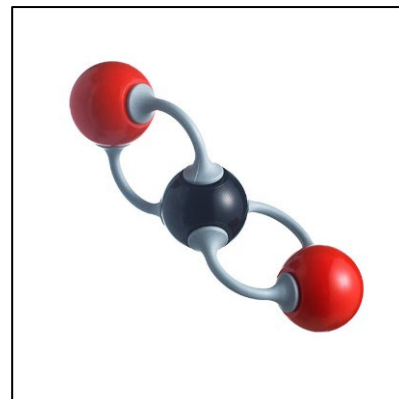
<https://www.sciencenews.org/article/earth-inner-core-reverse-rotation>



CHEMISTRY – Something about carbon dioxide

The gas carbon dioxide (CO₂) gets a bad press, but the truth is that we cannot do without it! It's actually what makes our planet habitable — but there is the downside of “*having too much of a good thing.*”

Carbon dioxide is a simple molecule that makes life on Earth possible. CO₂ is called a trace gas because it makes up less than 1 percent of the atmosphere. Even that small amount, however, plays a big role in shaping Earth's climate. Without it warming Earth's atmosphere, our planet would be too cold for most organisms to survive. But lately, this beneficial triplet of atoms has taken a lot of heat for making the atmosphere a bit too toasty. If you could zoom in to see a single molecule of CO₂, it would look like a straight line with a carbon atom in the centre and oxygen atoms at either end. One reason it forms this straight-line shape is its two double covalent bonds. This means that the carbon shares two pairs of electrons — four electrons in all — with each of the oxygen atoms. Although the bonds are very strong, they have a flexibility that means that the molecule can “wobble” — this movement is what makes it able to absorb the Sun's heat so well.



Carbon dioxide has also played an important role in the evolution of life on Earth – in particular, the part it plays in **photosynthesis** (the process used by plants and other organisms to convert light energy into chemical energy, by the synthesis of carbohydrate). There is good geological evidence that life arose between 3.5 and 3.8 billion years ago in the form of *cyanobacteria*. Their early form of photosynthesis is thought not to have produced oxygen and Earth's atmosphere remained almost entirely devoid of oxygen until an event, beginning around 2.4 billion years ago, that has become known as the **Great Oxygenation Event (GEO)**. The photosynthesising bacteria evolved to use water in their biochemical process which resulted in the production of oxygen as a by-product of the reaction. Over time the oxygen accumulated in the atmosphere, which was an important event as oxygen would lead to the development of cellular respiration as a mechanism for releasing energy within living cells and, ultimately, the evolution of animal life.

<https://www.snexplores.org/article/explainer-carbon-dioxide-source-chemistry-greenhouse-gas-climate>

ANOTHER PIECE OF NEWS SPOTTED BY Dr R DAVIES

ANTHROPOLOGY - Humans and wild apes share common sign language

Humans share elements of a common sign language with other apes, understanding many gestures that wild chimps and bonobos use to communicate. That is the conclusion of a video-based study in which volunteers translated ape gestures. It was carried out by researchers at St Andrews University (UK) and is published in the journal *PLOS Biology*. It suggests that the last common ancestor we shared with chimps used similar gestures, and that these may have been a “starting point” for our own language.

Lead researcher, Dr Kirsty Graham from St Andrews University, explained that this gesture-based way of communicating is shared by other species of great apes, including gorillas and orangutans. “*Human infants use some of these same gestures, too,*” she told BBC News. “*So we already had a suspicion that this was a shared gesturing ability that might have been present in our last shared ancestor. We're quite confident now that our ancestors would have started off gesturing, and that this was co-opted into our language.*”

This team of researchers has spent many years observing wild chimpanzees. They previously discovered that the great apes use a whole “lexicon” of more than 80 gestures, each conveying a message to another member of their group. Messages like “groom me” are communicated with a long scratching motion; a mouth stroke means “give me that food” and tearing strips from a leaf with teeth is a chimpanzee gesture of flirtation.

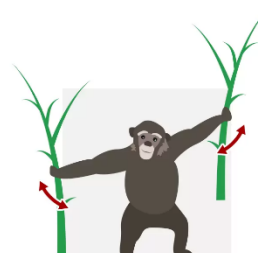
Scientists used video playback experiments, because the approach has traditionally been used to test language comprehension in non-human primates. In this study, they turned the approach on its head to assess humans' abilities to understand the gestures of their closest living ape relatives. Volunteers watched videos of the chimps and bonobos gesturing, then selected from a multiple choice list of translations. The participants performed significantly better than expected by chance, correctly interpreting the meaning of chimpanzee and bonobo gestures over 50% of the time. The gestures people can innately understand may form part of what Dr Graham described as “*an evolutionarily ancient, shared gesture vocabulary across all great ape species including us.*”

<https://www.bbc.co.uk/news/science-environment-64387401>

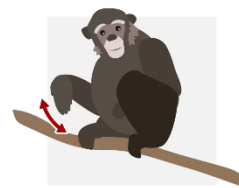
How apes use gestures



“Groom me”
Scratching their chest



“Let's mate”
Shaking a tree



“Come here”
Beckoning with fingers pointing down

Source: Towards a great ape dictionary, Graham & Hobaiter (2023)

BBC

STRANGE SCIENCE - What is hippopotomonstrosesquippedaliophobia?

At 36 letters it is not quite the longest word in the dictionary, but what does it mean? The clue comes in the last six letters that spell an identifiable word that most people are familiar with – **phobia** (an anxiety disorder defined by a persistent and excessive fear of an object or situation).

Believe it or not, **HIPPOPOTOMONSTROSESQUIPPEDALIOPHOBIA** is the **FEAR OF LONG WORDS!**

Sesqui is Latin for one and a half, and the phrase “*sesquipedalia verba*” was used as long ago as the first century BCE by the Roman poet Horace, to criticise writers who used words “a foot and a half long”. Converting this into a fear of long words should really only require us to add -phobia at the end, but the longer version appears to have been coined by the American poet Aimee Nezhukumatathil in 2000, who presumably added the extra syllables for literary effect. Like aibohphobia (fear of palindromes) this is an amusing wordplay, not a genuine medical condition.



The longest word in the English language dictionary is actually:

PNEUMONULTRAMICROSCOPICSILICOVOLCANOCONIOSIS (45 letters)

The funny thing about *pneumonoultramicroscopicsilicovolcanoconiosis* is that it's not even a real word! It's an invented term that was coined by Everett M. Smith, the president of the National Puzzlers' League. Everett came up with this word as a sarcastic term for long medical terms and a synonym for silicosis - a lung disease caused by inhaling sand and ash dust. *Pneumonoultramicroscopicsilicovolcanoconiosis* is just a string of Latin terms that together describe an inflammatory lung disease caused by long-term inhalation of silica dust. While the word is made up, the disease is real, and it's known under the names pneumoconiosis, silicosis, or black lung.

<https://www.sciencefocus.com/science/what-is-hippopotomonstrosesquippedaliophobia/>

SPOTTED BY Mrs H DUNN – A NOVEL WAY TO HEAT YOUR HOME

HOME SCIENCE - Farewell radiators? Testing out electric infrared wallpaper

Look carefully and you will notice there is something slightly different about Kris Bilski's house in Hull. It has no radiators. Yet even on a -2C winter's day, it's nice and warm inside. This is because Kris is an early adopter of electric infrared wallpaper.

Thin, metallic sheets are hidden behind the plaster of his walls, which are connected to the mains electricity of his house. These sheets emit heat by infrared waves. Radiators in a central heating system heat rooms by what is known as convection heating, warming up the air in rooms, which then circulates. This infrared technique warms up solid objects in the room directly, including us humans. It also means you can easily choose to heat only one room at a time, using an app. Why also heat the bedroom, for example, when you are going to be watching Happy Valley in the sitting room for the next few hours?



Around 23 million homes are currently connected to the gas grid in the UK. But the government wants all homes in the UK to have phased out gas-fired boilers by 2035. Homes currently account for about 17% of the UK's greenhouse gas emissions, and this fossil fuel-based way of heating our homes is responsible for much of it. As well as not requiring gas, electric wallpaper is also thought to produce better air quality in properties. It doesn't dry out the air so much and generates less mould, for instance around windows. Poor air quality has been linked to health problems in some social housing properties.

So is this potentially a greener and cheaper way to heat our homes? Dr Tina Fawcett of the University of Oxford's Environmental Change Institute is not so sure. “*It could certainly be greener, especially as we use more renewables [like solar and wind power] to generate electricity,*” she says. Currently gas is used to generate a significant proportion of our electricity supply. “*But I think the running costs could be quite high, as electricity costs three to four times as much as gas.*”

<https://www.bbc.co.uk/news/business-64402524>

WORD(S) OF THE MONTH:

FUSION (noun, “FYEW-zhun”)

Fusion occurs when pairs of atomic nuclei slam into each other and meld, or fuse, together. This process leads to new atoms of a different element and releases lots of energy. Fusion is the physical reaction that powers the sun and other stars. Fusing atoms requires squeezing them together under immense heat and pressure. Inside stars, these conditions fuse hydrogen atoms into helium atoms. The mass of each newborn helium atom is less than the total mass of the hydrogen atoms that formed it. The remaining mass transforms into energy, making stars shine.

SPOTTED BY Mr J RICHMOND – AN UNEXPECTED RING AROUND A DWARF PLANET

ASTRONOMY - Ring discovered around dwarf planet Quaoar confounds theories

Observations using a powerful astronomical telescope on the island of La Palma have shown a ring system around a dwarf planet in the outer solar system called Quaoar – but, according to all our current thinking, the ring should be impossible!

The only planets in the solar system to have rings are the four “giant” planets, Jupiter, Saturn, Uranus and Neptune – with Saturn’s rings being the most prominent. It was thought that smaller planets, and certainly dwarf planets, would not have the ability to maintain a ring system. The observations were led by Prof Vik Dhillon, of the University of Sheffield’s department of physics and astronomy. He says: “*The*

ring came as a real surprise and doubly surprising was where it was, well outside the theoretical maximum for where a ring can survive according to classical theory. These are the most unusual rings we’ve seen.”

The dwarf planet, which is about half the size of Pluto and orbits beyond Neptune, is too distant and the ring too narrow to be seen directly. The detection was made during a so-called occultation event, when a planet passes directly in front of a star, meaning its sharp silhouette can be briefly observed by Earth-based telescopes. The observations, by the HiPERCAM telescope, showed a sharp dip in starlight as Quaoar passed in front of the star. Intriguingly, two smaller dips, before and after, were also observed, which the astronomers realised indicated the presence of a ring system.

The ring is located at a distance of more than seven planetary radii, twice as far out as what was previously thought to be the maximum radius, known as the Roche limit. Inside the Roche limit, the planet exerts strong gravitational tidal forces that prevent debris in the ring amalgamating into a moon. Outside of that limit, the debris will amalgamate under its own gravity to form a moon. The latest observations confound these theories and the team are exploring various possibilities for how the distant ring could remain stable. One idea is that the debris is “less sticky”, meaning that fragments in the ring are more likely to bounce off each other during collisions.

<https://www.theguardian.com/science/2023/feb/08/ring-discovered-around-dwarf-planet-quaoar-confounds-theories>

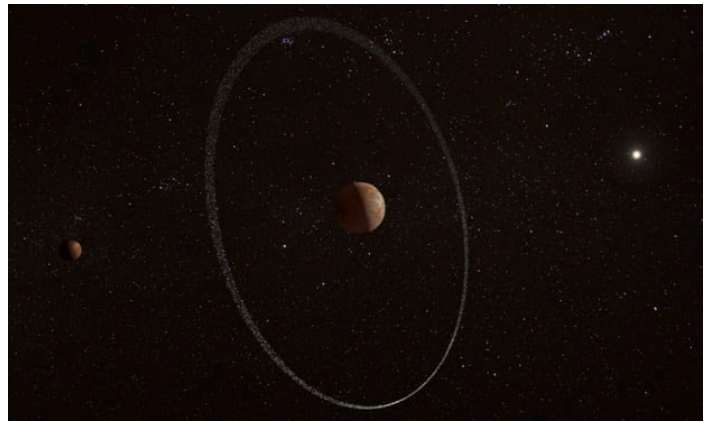
21st CENTURY TECHNOLOGY - The tiny diamond sphere that could unlock clean power

At 1:03am on Monday 5 December, scientists at the National Ignition Facility in California aimed their 192 beam laser at a cylinder containing a tiny diamond fuel capsule. That powerful burst of laser light created immense temperatures and pressures and sparked a fusion reaction - the reaction which powers the sun. Fusion reactions have been started before, including in the UK, but they have always required more energy than they produced – but this latest test was different. The energy that came out of the reaction was more than the laser power used to trigger it. Scientists have been trying for decades to meet that threshold and the hope is, one day, to build power stations that employ a fusion reaction to generate abundant, carbon-free electricity. That’s still some way off. In the meantime, much work needs to be done in developing the technology.

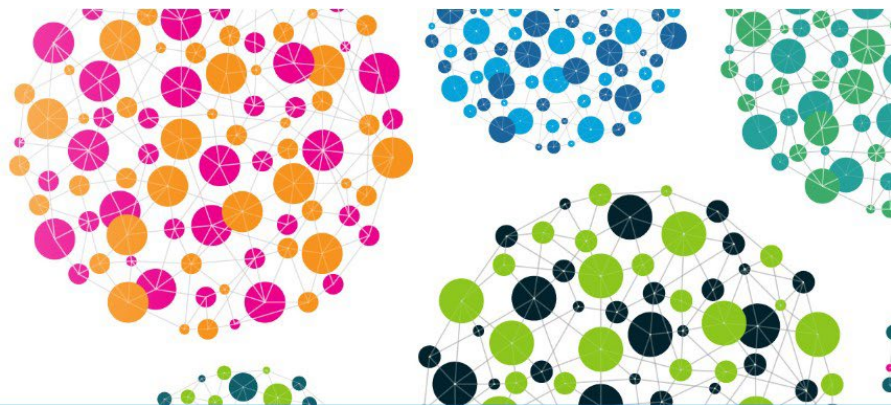
The latest success was achieved thanks to a peppercorn-sized **synthetic diamond capsule**, which holds the fuel. The properties of that spherical capsule are crucial to creating a successful fusion experiment. The sphere has to be perfectly smooth and contaminant-free - any anomalies could ruin the reaction. Those precisely engineered spheres are not made in California though. They are the result of years of work by Diamond Materials, a company based in Freiburg, Germany. The 25-strong team at Diamond Materials manufactures synthetic diamond through a process called chemical vapour deposition.

It takes around two months to create each batch of 20-40 capsules, which are made by painstakingly layering tiny diamond crystals around a silicon carbide core and polishing repeatedly. During the development process they discovered that even the most meticulous polishing was not enough as at the microscopic level the surface was still pitted and uneven. Working with teams at LLNL, they eventually discovered they could glaze a polished capsule with a fresh layer of diamond crystals to achieve the clean mirror-like finish they needed.

<https://www.bbc.co.uk/news/business-64553796>



10-19 March
**British
Science
Week
2023**



British Science Week is a ten-day celebration of science, technology, engineering and maths. This year's theme - connections!

THIS YEAR'S THEME: CONNECTIONS!

Nearly all innovations in science, technology, engineering and maths are built on connections between people; two (or more) heads are better than one, after all! But as well as exploring the importance and joy in connections between individual scientists, research groups and institutions, you could discover the different ways connections appear across all areas of science. Evolution, for example, shows us the ways that animals, including humans, as well as plants and bacteria are all connected in a family tree stretching back millennia.

'Connections' as a theme offers a huge range of topics to delve into as part of British Science Week 2023.

The connection between human actions and climate change could be a fantastic topic to explore in our poster competition. Or how about how atoms connect to form chemical bonds which make up everything around us. What is water if not a connection between hydrogen and oxygen?



Tuesday 14 – Thursday 17 March

Science Farm LIVE from the NFU

After the success of Science Farm LIVE 2022, we are inviting you to join us again to celebrate British Science Week with three new, free and curriculum-aligned Live Lessons from [NFU Education](#), 14-17 March.

This year's lessons will take your learners on an adventure from the very bottom of the sea, all the way to outer space to explore three puzzling questions linked to the theme of 'connections':

How are tractors connected to space?
How are pigs connected to jumbo jets?
And how are sheep connected to seaweed?

Sign up at [Science Farm Live 2023!](#) | [livestream.co.uk](#)

BBC Teach – 'Forces' Live Lesson

BBC Teach is taking over the Science Museum in London for an 'out of this world' forces Live Lesson for British Science Week, Monday 13 March at 11:00am!

Using their knowledge of gravity friction and air resistance, KS2 pupils will be challenged to bring our very own Live Lessons astronaut – Frankie – back from the moon.

Along the way, we'll be hearing from real-life astronauts including Dr Helen Sharman, the first British astronaut in space, and American astronaut Bob Hines who's recently returned from a NASA space mission.

This 30 minute curriculum-linked programme is presented by CBBC's Rhys Stephenson and Maddie Moate and was devised in partnership with the Science Museum.

[Save this link and tune in](#)



Monday 13 March

Question Time, British Science Week edition

The British Science Association (BSA) are hosting their own Question Time panel event, which will explore what science can do to better involve and include young people.

Chaired by the BSA's President (2022/23) Dr Anne-Marie Imafidon, you can watch live or on demand on [YouTube](#).

[Find out more](#)



Thursday 9 March

The human body is another topic that offers a plethora of opportunities to think about connections. Why not use how our organs are connected and work together as a brilliant topic for a school assembly, or create a poster which explores the human skeleton?

We can find examples of connections within all subjects and all around us, making it an excellent starting point for a celebration of science!

British Science Week 2023 is supported by **UK Research & Innovation** (UKRI), which is the agency that brings together the seven Research Councils, Innovate UK and Research England. Funding from UKRI enables the BSA to deliver the core British Science Week activity; large

grassroots campaign that aims to reach a diverse range of audiences, including those from disadvantaged communities and people who would not usually engage in science.

Above are just three of the online/live activities that can be enjoyed – there are many more during the week. Find out all the details at <https://www.britishscienceweek.org/whats-on/>