

CURIOS?



"BRAIN FOOD" – IS THERE ANYTHING TO IT?

THE BIGGEST WILD GOOSE IS... POISONOUS?

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CURIOUS Live Is Back!

After our inaugural event last year, IFLScience's virtual "festival of science", CURIOUS Live, is back for a second time. Streaming online so accessible to all, CURIOUS Live takes place on May 31 with a new line-up of fascinating speakers, curious topics, plenty of laughs, and some very weird science.

Hosted by IFLScience's own *The Big Questions* podcast hosts in talks with top experts, prepare to dive into questions such as: Why do we get sick when we're stressed? Are we alone in the universe? And what would happen if a nuclear bomb went off today? **Sign up today** for your ticket to watch on the day or stream after. You just might learn something you won't forget!



Secrets Of The Neanderthals

Netflix's new documentary, *Secrets of the Neanderthals*, premiering globally on May 2, delves into the mysteries surrounding the Neanderthals and what their fossil record tells us about their lives and disappearance.

Voiced by Sir Patrick Stewart, the documentary centers on an archaeological dig at the Shanidar Cave in Kurdistan by Cambridge University, site of the controversial "flower burial" discovery that posited Neanderthals had funerary rites, as well as other discoveries around the world. The more we understand about the Neanderthals, the more we know they were smart, had complex communities, and even art, so why did they disappear?



Search For The Rarest Mammal

Mark your diaries, folks: From May 5 to May 26, the **vaquita survey** will have all eyes on the porpoises as the Sea Shepherd Conservation Society goes in search of the world's rarest mammal. Having been issued an **extinction alert** by the International Whaling Commission (IWC) – the first in 70 years – it's a critical time for one of the planet's cutest and most endangered cetaceans, estimated to have as few as 10 individuals left in the wild. The survey has been running annually as an independent scientific investigation into the surviving population of the vaquita porpoise, *Phocoena sinus*. How many are left? We'll soon find out.

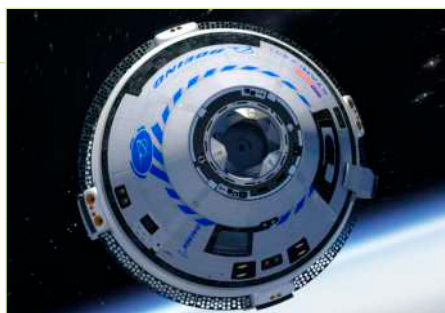


Look For Da Vinci In The Sky

May is the best time to see Earthshine, also known as "da Vinci glow", and it will be best viewed either side of the new Moon on May 8. Instead of just seeing the waxing and waning crescent, you should be able to see the usually dark side of the lunar disk lit by a soft glow. The phenomenon – once thought a mysterious light known as "ashen glow" – occurs when sunlight reflects off Earth's surface and illuminates the unlit part of the New Moon when you can usually only see the bright crescent. Leonardo da Vinci was determined to solve the puzzle of "ashen glow", correctly surmising the bright crescent of the Moon was being lit by the Sun directly while the softer light was being reflected by Earth – pretty impressive considering Copernicus wouldn't publish his Sun-centric theory of the Solar System until 24 years after da Vinci's death.

Birds: Brilliant & Bizarre

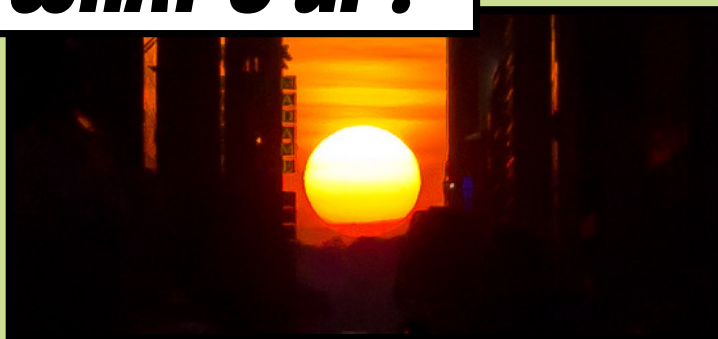
If you missed the wonderful **Titanosaur: Life As The Biggest Dinosaur** exhibition at London's Natural History Museum, have no fear as this spring they are back with a new exhibition looking at the life of today's extant dinosaurs: birds. Discover the weird and wonderful way birds have survived for over 150 million years, evolving from the theropods, a group that included the iconic *T. rex* and velociraptors. Today there are at least 11,000 species of birds, and plenty will be on display, including the Wonderchicken, the earliest known fossil of a modern bird, which survived the mass extinction that took out the dinosaurs 66 million years ago. The **exhibition**, which aims to raise awareness of the dangers facing our feathered friends and how we can take action to protect them, runs from May 24 to January 5, 2025.



Starliner Launch

For the first time, Boeing's Starliner spacecraft will fly into low-Earth orbit with humans onboard on May 6. Running just seven years behind schedule from the initial NASA contract, Starliner will fly on an Atlas V rocket to the ISS, depositing astronauts for an eight-day stay. The beleaguered aeronautical company needs a win, and this test flight will be the decider if NASA formally approves Starliner for regular six-month crew flights to the ISS. If so, Boeing joins SpaceX – which has been delivering crew to the space station since 2020 – as NASA's other commercial contractor, with one difference: Starliner is actually two partially reusable spacecraft. When certified human-rated, NASA will have two rockets available at the same time, something it has never had before.

WHAT'S UP?



Manhattanhenge

I want to be a part of it

Name: The Manhattanhenge Effect/
Manhattan Solstice

Appearance: Instagrammable

Location: Manhattan,
New York City

That sounds like a made-up word...

That's because it is – by Neil deGrasse Tyson, in fact – but the event itself is definitely real.

**So what actually is
Manhattanhenge?**

A bi-annual event when the sunset lines up with the Manhattan street grid, meaning anyone who happens to be on any street heading east and west – at least those with a clear view down towards New Jersey across the Hudson River – is met with an esthetically pleasing sunset. The sunrise aligns twice a year too.

A bit like Stonehenge, then?

You've got it. Tyson coined the term "Manhattanhenge" because the phenomenon reminded him of the prehistoric monument, where the stones are aligned towards the rising Sun on the summer solstice and the setting Sun on the winter solstice.

Was Manhattan also designed like that on purpose?

Though it'd make a great conspiracy

theory, Manhattanhenge is just a coincidence. The island of Manhattan is tilted roughly 30 degrees east of true north and when authorities were making designs for the street grid, it was tilted in the same way to line up with this.

But doesn't the Sun set in the west?

That's actually a generalization; the Sun only sets due west twice a year, on the spring and fall equinoxes. The rest of the time, it sets somewhere north or south of due west on the horizon. Since the street grid is at an angle and not lined up from true north to south, Manhattanhenge happens around late May and mid-July, and not on the equinoxes.

When does it happen this year?

If you want to view just the half Sun on the grid, either May 28 at 8:13 pm ET or July 13 at 8:21 pm ET. For the Manhattanhenge effect in its full glory, either May 29 at 8:12 pm ET or July 12 at 8:20 pm ET.

And where is the best place to see it?

Any east/west street with a view to New Jersey will do, but Tyson **recommends** some of the best views to be on 14th, 23rd, 34th, 42nd, and 57th Street.

WHAT HAPPENS IN A NUCLEAR BLAST?

The nuclear weapons of today are not your weapons of WW2. What would happen if they were detonated now?

By Dr Russell Moul

So many things from the 1970s and '80s have come into vogue again in recent years, from nostalgic television shows like *Stranger Things* to fashion resurgences such as loose-fitting clothes, flared jeans, and corduroy. And while many of these things have returned with charming hints of nostalgia, one other throwback from a bygone era has crept back into (geopolitical) fashion – the risk of nuclear annihilation.

So, what is the current situation concerning nuclear weapons, and what would happen if they were used in a city like Washington DC, London, or Tokyo today?

2024: The board as it is set

Ever since the war in Ukraine began in February 2022, Russia has used its nuclear arsenal as a less-than-subtle threat to deter Western intervention. Putin has signaled on various occasions that, should the US and its allies interfere, Russia would **respond** "immediately, and the consequences will be such as you have never seen in your entire history."

Russia's nuclear posturing has raised the risk of nuclear weapons use to the highest it has been in decades. Admittedly, at the time of writing, the country has eased back on nuclear threats in its narrative, but, as the Center for Strategic and International Studies (CSIS) recently explained in a **report**, "the risks of nuclear use will likely rise if Russia faces significant battlefield setbacks in the future or the conflict expands in new or unexpected ways."

At the same time, North Korea has continued to build up both its nuclear capabilities and its aggressive rhetoric towards South Korea and its allies. Over the last few years, the country has intensified its weapons tests, which have included the use of a new solid-fuelled intercontinental ballistic missile (ICBM), which not only threatens South Korea but also the US and its allies in Asia. This

led the US and South Korea to strengthen and expand their military cooperation last year, provoking Kim Jong Un, North Korea's leader, to declare that he had the legal right to **"annihilate"** his southern neighbor if needed.

Fallout fatigue

While the situation on the world stage is reminiscent of the tensions of the Cold War, there has been a general change in attitudes towards the meaning of nuclear weapons. According to recent research, the fear posed by these weapons of mass destruction has **faded** from the public mind, despite the success of films like **Oppenheimer** and *Godzilla Minus One* in 2023.

DECADES OF POPULAR CULTURE REPRESENTATIONS HAVE CREATED AN IMAGE OF INEVITABLE DESTRUCTION WHICH HAS GIVEN WAY TO A KIND OF COLLECTIVE "OH WELL" ATTITUDE.

Part of the issue here is that the public view of these weapons has grown fatalistic and apathetic. Decades of popular culture representations have created an image of inevitable destruction which has given way to a kind of collective "oh well" attitude.

However, knowing more about how these things work may help inspire a new generation of public engagement, especially at a time when the established systems designed to prevent nuclear war are being placed under greater stress.

As **Annie Jacobsen**, author of **Nuclear War: A Scenario**, recently explained to IFLScience at **CURIOUS Live**, "It's the lack of information that to my eye, is always the most dangerous situation. Because when you learn about just how radically dangerous many of these nuclear systems are, and when you couple that with the idea that it's just a big system of systems, and all systems fail, you have to ask

yourself, maybe it's wise for me to know about this."

Modern nuclear weapons

If a modern nuclear weapon state decides to attack an enemy target, it is extremely unlikely that it will only use one weapon. This is simply because, as devastating as they are, one weapon is not enough to cripple another nuclear-weapon state. Even in a limited-scale conflict, whereby states rely on **tactical nuclear weapons** (short-range weapons), multiple bombs would be launched against an enemy to optimize the damage.

As of the start of 2024, there are around 12,100 nuclear weapons in existence. These weapons are owned by nine countries: the US, Russia, Britain, France, China, India, Pakistan, Israel, and North Korea. According to the **Federation of American Scientists**, 88 percent of the world's total nuclear weapons stockpiles are owned by Russia and the US.

Of the total number of weapons in the world, around 9,583 are in military stockpiles for use on missiles, aircraft, submarines, and ships. Around 3,880 of these are deployed with "operational forces" (attached to missiles and bombers in bases), while around 2,000 of the weapons owned by the US, Russia, Britain, and France are currently set to high alert – ready to use at short notice.

The US and Russia are currently the only states that feel the need to hold thousands of weapons. All the other nuclear weapon states are content to limit themselves to a few hundred weapons to satisfy their national security. However, many of these states are modernizing and increasing their stockpiles. More importantly, a few hundred weapons are still more than enough to cause terrible destruction if used.

To put it into perspective, modern nuclear weapons are significantly more powerful than the nuclear bombs dropped on Hiroshima and Nagasaki in August 1945. These weapons had an equivalent of about 15 kilotons and 20 kilotons of

dynamite, respectively. If included in a modern arsenal, these weapons would be considered “low-yield” despite the fact they managed to claim between **129,000 and 226,000** lives when detonated in 1945.

Today, most nuclear weapons, especially within the US and Russian stockpiles, are **thermonuclear** weapons, which dwarf these earlier examples. A thermonuclear weapon can have an explosive yield of at least 100 kilotons of dynamite, and some are known to be far higher still.

What comes after the bang?

So, if we went with a 100-kiloton weapon as a baseline and detonated it in a city like Washington DC, what would happen? Well, the explosion alone could kill around **175,700** people and cause some 189,400 injuries.

The effects of such an explosion would be felt within a 5.46-kilometer (3.4-mile) radius of the point of detonation, with the worst affected areas being within a 1.01-km (0.6-mile) radius of this point. Here, even heavily built-up concrete buildings would be severely damaged and probably demolished entirely. Anyone within this radius would most certainly be killed. Even those within a 2.12-km (1.3-mile) radius of the initial explosion, what is referred to as the “moderate blast” zone, would likely be killed or severely injured, while residential buildings would collapse. Fires caused by the blast would also be a significant concern within this area.

But at the heart of the explosion sits the most devastating testament to a nuclear weapon’s power. A 100-kiloton weapon could create a 0.56-km (0.3-mile) radius fireball that would only exist for about 1.6 seconds but would vaporize anything it touches (especially if the weapon detonated close to the ground). The heat created by this ball of nuclear flame could be over 100 million °C (180 million °F).

This temperature is “unfathomable”, Jacobsen added. There are “some things that are impossible to imagine and that temperature is one of them.”

The threat posed by nuclear weapons is terrifying and we should be terrified, but these daunting details should not freeze us into accepting their inevitable use.

“[T]he entire fireball, everything within it is utterly [...] obliterated; it doesn’t exist anymore. All cellular life gone,” she explained. “And there are situations with the radiation that emits from it, the X-ray light that will blind people 1,020-1,030 miles [1,640-1,660 km] away, that are looking in the direction of the [explosion]”.

In addition to this, the winds generated by the blast would also be shocking. “A hurricane is [...] about 80 miles per hour [129 km/h],” Jacobsen explained. “You’re talking about several 100-mile-an-hour winds mowing down everything 10 miles [16 km] out.”

And then there is the **radiation**, a much longer-lasting threat. Anyone within a 1.82-km (1.1-mile) radius of the initial explosion would be exposed to high degrees of ionizing radiation which would likely be fatal, killing many people within a month of the exposure. Unfortunately, around 15 percent of those who survive would eventually develop cancer, while people within a 3.9-km (2.4-mile) radius of the blast would suffer severe third-degree burns from the thermal radiation.

The blast would also create nuclear fallout, ionized material that is sent into the stratosphere and distributed across long distances. The amount of fallout created by a nuclear blast depends on where the weapon is detonated – whether it explodes on the ground or in the air. This hazardous material can be carried great distances on the wind, causing further dangers to health but also significant environmental damage.

The threat posed by nuclear weapons is terrifying and we should be terrified, but these daunting details should not freeze us into accepting their inevitable use. Instead, they should awaken us to the political situation right now and encourage us to make informed decisions as citizens. After all, we all have flesh in this game. ●





Image Credit: ArendTrent/Shutterstock.com

MURDEROUS PLANTS

Salamanders are on the menu for the Northern pitcher plant, *Sarracenia purpurea*. As carnivorous plants, these pitchers have evolved to compensate for the lousy soil they grow in by seeking nutrients from another source – and they're bad news for small creatures, even vertebrates. Taking a passive approach to carnivory, the plants wait for unsuspecting prey to slip into their bells, where a host of digestive enzymes reduce them to pulp. Ye be warned, spotted salamanders.

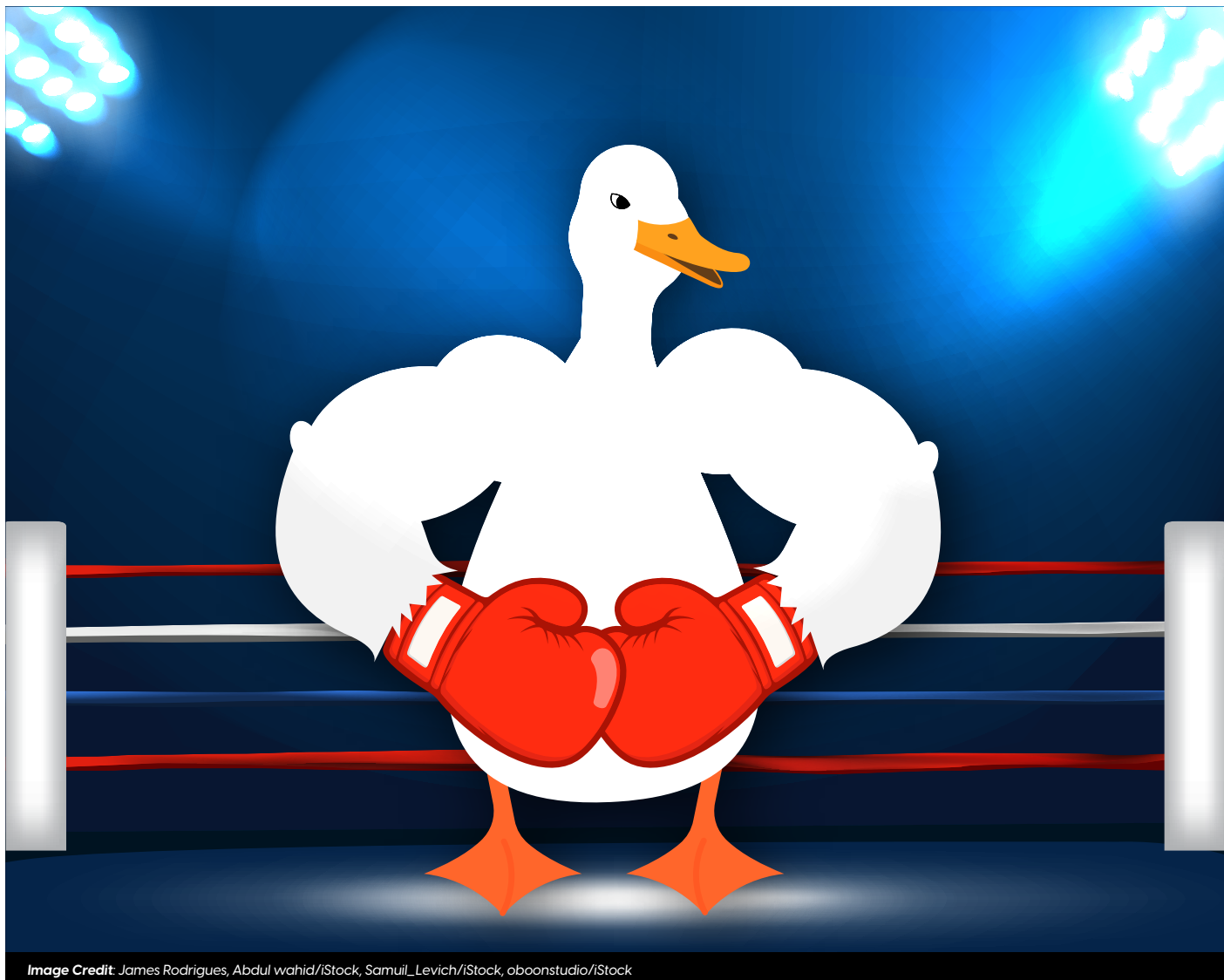


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THE BIGGEST WILD GOOSE IS... POISONOUS?

REVELATIONS OF A COMEDY-NATURE PODCAST.

By Rachael Funnell

Geese are famously aggressive animals whose sassy attitude appears to be crucial to their social rank. Large in size with peculiar **goose "teeth"**, they can be scary, and yet despite this, **45 percent of Britons** reckon they could take on a goose. It's a curious question that got two naturalists wondering: isn't it time someone did a podcast on how many animals you could take in a fight?

That's just one segment of **How Many Geese**, a nature podcast headed up by Jack Baddams and Roddy Shaw that aims to bring comedy and science together. We caught up with the duo to find out how an expedition to Madagascar led them to podcasting, what sort of animals they're fighting (theoretically), and what on Earth is up with the world's biggest wild goose being poisonous.

How did How Many Geese come about?

JB: Roddy and I were working on a science expedition that's led by a company called Operation Wallacea, and we were based in this really remote part of Madagascar for two months. You've got to entertain yourself when you're there for two months in the middle of

the dry forest and there's no electricity, there's no internet.

RS: That's the thing that led to the podcast, because after the first week of "What's your name? Where are you from?" you get to week two and suddenly the conversations, you're having to dig a bit deeper. By about week three, you're looking at things and going "How many of that do you reckon you could take in a fight?"

There's a very clean image of natural history, it's very hushed whispers, but we found that people – scientists – they talk about it in the way they would talk about anything else. So, we came back, and it wasn't until a couple of years later that we decided to hit record.

And what about this "poisonous goose"?

RS: We got sent in about this goose, which has become quite obviously a bit of a totem animal for us. It's in the name, *How Many Geese*. And the spur-winged goose is the largest, or one of the largest, waterfowl in Africa. It's quite a hardcore bird in that it has a little spur coming out of its wings, and it turned out to have poisonous flesh due to the beetles it was eating. It eats these things called blister beetles and that was leading to it becoming a poisonous goose.

When you're a show with "goose" in the title and someone sends you in, "Did you know that the biggest goose also has spines and is poisonous?" You certainly sit up straight and pay attention.

What's it like being a bird-ringer?

JB: I have been a bird-ringer since I was 16. So, that is somebody who has a license to capture and tag wild birds with metal rings so that we can learn all sorts of stuff but in general, where they go, how long they live, etc. And I post videos and pictures on social media. It's all done for the British Trust for Ornithology (BTO), who are the people who oversee it all in the UK and Ireland and hand out the licenses. You have to go through a two-to-three-year training process before you're given a license, and then you collect data on behalf of the BTO, but anyone can get involved.

Any occupational hazards?

RS: He has all these stories of amazing birds; the owl, the parrot, and the swan, but his one true nemesis is the blue tit.

JB: Yeah, blue tits have got to have the best PR team because everybody loves them. They're so cute. They're so adorable. They're the poster bird for the Big Garden Bird Watch, but they are these little devils. As soon as you catch them, they find on the cold winter morning the softest part of your cuticle and they're hammering their beak in there and twisting it and pulling at your skin. They're just ferocious little things.

What's the goal of the podcast?

JB: The ultimate goal is just talking about nature in a really accessible way. We're all having these discussions anyway, people our age are all talking about nature like this to their friends. But TV especially is still stuck in either very hushed whispers or then you have kids TV, where it is a bit more animated, but there's nothing really in the middle. At the heart, it's just taking nature and dragging it down to our level.

RS: And just to add to that, in terms of goals and targets and where we see it going. If there is anyone out there who wants to put up a seven-figure sponsorship deal to televise a fight with a goose at The O2 or Wembley, get in touch. Let's talk.

Will you ever answer, how many geese?

RS: No. We can't! You can fight tigers, you can fight aye-ayes, you can fight Arabian sand boas and leopard geckos, tasseled wobbegongs, or Portuguese man o' war, leatherback turtles, but anyone out there who reckons they can take on a goose in a fight is insane. •



Want to hear more? We Have Questions is launching as a podcast in June 2024. Find out where you can catch the full conversation in future issues of CURIOUS.

Image Credit: James Rodrigues, Abdulwahid/Stock, Samuil Levich/Stock, oboonstudio/Stock



SCIENCE FACT OR FICTION:

"BRAIN FOOD" – IS THERE ANYTHING TO IT?

How does the food we eat impact the brain, and can we use our diet to give it a boost? Laura Simmons investigates.

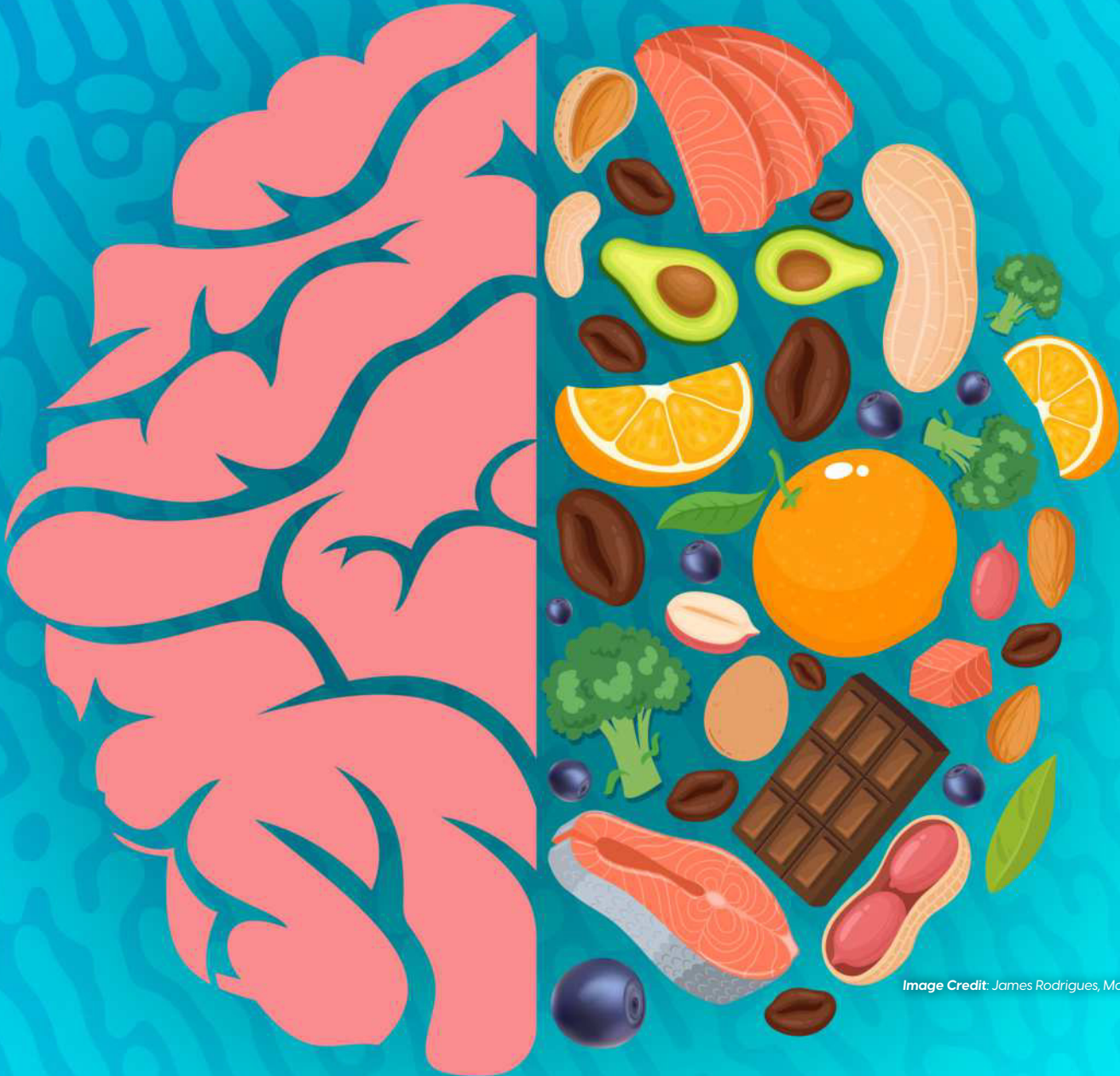


Image Credit: James Rodrigues, Modified from iStock



"You should eat that, it's brain food!" You probably heard that at least once as a kid. But when the grownups were begging us to **eat our greens**, were they right to bring our brains into it? Now that we're older and (hopefully) wiser, we wanted to find out if there was anything to this notion of "brain food".

What nutrients does the brain need?

Brain health is one part of overall physical health, and getting a good balance of nutrients is essential to maintain that. But some vitamins are even more critical than others.

"IT'S IMPORTANT TO APPROACH THE IDEA OF 'BOOSTING' WITH CAUTION, AS COGNITIVE FUNCTION IS COMPLEX AND INFLUENCED BY MANY FACTORS."

One is vitamin B1, or thiamine, essential to keep brain cells **alive and kicking**. A deficiency can lead to a condition called Wernicke encephalopathy, which in **80-90 percent** of cases progresses to

the irreversible Korsakoff syndrome. The symptoms include confusion, movement disorders, and eye issues.

Low thiamine has also been linked to **Alzheimer's disease**. Fortunately, it's in quite a lot of foods – pork, peas, and beans are all good sources, and it's often added to fortified breakfast cereals.

A vitamin B12, or folate, deficiency often shows up as **neurological symptoms** like problems with balance and muscle weakness. Folate-rich foods include leafy greens, nuts, oranges, and eggs. Folic acid, a subtype of folate, is also added to fortified cereals because of its important role in early fetal development.

Brain function can also be affected by vitamin E deficiency. Coordination and balance can be impaired, and in more severe cases it can cause cognitive dysfunction and dementia. In developed countries, deficiencies are normally down to an **underlying disease** rather than diet, but it's still good to be aware.

As National Spokesperson for the Academy of Nutrition and Dietetics **Dr John "Wesley" McWhorter**, told IFLScience:

"Certain populations, including the elderly, individuals with strong dietary restrictions, and those with malabsorption issues, may be at risk for nutrient deficiencies that can impact brain health."

Can you use food to "boost" the brain?

"While the concept of 'brain-boosting' foods can be appealing, the evidence suggests that rather than specific foods providing a boost to cognitive functions, a balanced diet rich in a variety of nutrients supports overall brain health," said Dr McWhorter. "It's important to approach the idea of 'boosting' with caution, as cognitive function is complex and influenced by many factors such as sleep, stress reduction, physical activity, and overall nutrition."

Having said that, he continued, "Foods rich in omega-3 fatty acids, such as oily fish, and those high in antioxidants, like berries (and other fruits and vegetables), have been associated with better brain health."

IF YOU WANT TO USE THIS AS A REASON TO INCLUDE SOME SQUARES OF DARK CHOCOLATE IN YOUR DAILY DIET, YOU'LL FIND NO JUDGMENT FROM US.

Interest in **omega-3 fatty acids** really reached its peak at the tail end of the 20th century. Studies mainly touted their benefits to cardiovascular health, but some investigations focused on their potential as brain boosters.

Much of this stems from the observation that diets rich in fish, such as the **Mediterranean diet** and its cooler **Atlantic** cousin, are associated with better cognitive health as people age. But rather than heading to the pharmacy, you might want to detour to the fishmongers: as the experts at **Harvard Medical School** explain, there's no evidence from studies that omega-3 supplements have the same brain benefits as getting it straight from the seafood source.

This is a familiar story in the world of **dietary supplements**. Lots of products on the market make impressive-sounding claims, but when you dig down into the hard data it can be lacking.

"Regarding supplements, while they can play a role in addressing specific deficiencies, they should not replace a well-rounded diet," Dr McWhorter told IFLScience. "Omega-3 supplements, B vitamins, and vitamin D are commonly associated with brain health. As always, I recommend consulting with your dietitian and doctor before starting any supplement regimen, especially since individual needs can vary greatly."

So, it's more about filling in any gaps, rather than jacking up your vitamin levels to way beyond the recommended limits (which can be a **very bad idea**).

Food for thought

Omega-3-tastic oily fish is not the only

"brain food" out there. Dark chocolate often comes up in this conversation, thanks to its flavanol compounds. A **2022 study** found that a flavanol supplement could help support cognition in older adults. But if you want to use this as a reason to include some squares of dark chocolate in your daily diet, you'll find no judgment from us.

Other examples include eggs, which are rich in those all-important B vitamins as well as **choline**, the precursor to vital neurotransmitter acetylcholine; and sources of **antioxidants**, such as **red grapes** and **green tea** — this, Dr McWhorter tells us, is a particularly promising area of research right now.

But with all of these, we're thinking quite long-term. These foods might well help support better brain health throughout your life, but what about if you need a quicker pick-me-up?

You might not have even thought about it that way, but there's a "brain booster"

that many of us consume every single day: **caffeine**.

Whether your preferred vehicle is **espresso**, tea, or an energy drink, lots of us routinely use caffeine to start our days off right or ward off the post-lunch slump. That's because caffeine is a stimulant, which is thought to affect the brain through three main mechanisms.

First, it binds to receptors that usually latch on to a molecule called adenosine, preventing it from doing its normal job as a depressant. Caffeine may also affect the movement of calcium ions in the central nervous system. Thirdly, it stops a molecule called cyclic AMP being broken down, which in turn causes a spike in dopamine, epinephrine, and norepinephrine. The net effect of all this is an increase in alertness, and alterations in mood, memory, and cognitive function.

But even for a substance as widely used

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- How mental and physical health intersect
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- Are we alone in the universe

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as caffeine, the science remains unsettled, as detailed in a **2021 review** by Fiani et al. “Recent studies continue to show mixed results regarding the effects of caffeine on mood, attention, processing speed, and memory,” they wrote, going on to call for studies with larger sample sizes.

Still, caffeine is probably the closest thing we have to a “brain-boosting food”. Even if that increased alertness comes at the expense of getting better acquainted with the **smallest room in the house**.

Introducing the gut-brain axis

It's not just about specific nutrients within our food and drink. Increasingly, scientists have become fascinated with the two-way communication between the brain and the community of bacteria that live inside the digestive system.

“There is a growing body of evidence suggesting that a healthy gut microbiota is linked to positive brain health outcomes,” Dr McWhorter explained. For example, some research shows a direct link between the gut microbiome and diseases like **Alzheimer's and Parkinson's**.

It works the other way too. **Promising research** shows that some people with irritable bowel syndrome can experience transformative effects from cognitive behavioral therapy, addressing the psychology behind their physical symptoms.

Given the importance of the axis, it makes sense that foods that feed the gut microbiome are some of the biggest buzzwords in health right now. This is driven by a concern that factors such as overuse of antibiotics and an abundance of **processed foods** in our diets are causing what's been described as “**an internal climate crisis**”

Dr McWhorter has some recommendations for dietary adjustments that can help. “Foods rich in fiber, such as fruits, vegetables, whole grains, legumes, nuts and seeds, support a healthy gut microbiome, as

do fermented foods like yogurt and kimchi.”

Fiber-rich foods are not easily digested, meaning they hang around in the gut for longer to be fermented by the bacteria in there, encouraging them to thrive.

Fermented foods have been consumed across diverse human cultures for centuries, and can be a great addition to a balanced diet.

While the sample size was quite small, one study published in **2022** found that people who'd been following a high-fiber diet with two or three servings of fermented foods per day felt less stressed and slept better. Even more recently, a **twin study** suggested that supplementing prebiotic fiber might be a simple way to help preserve brain function as we age.

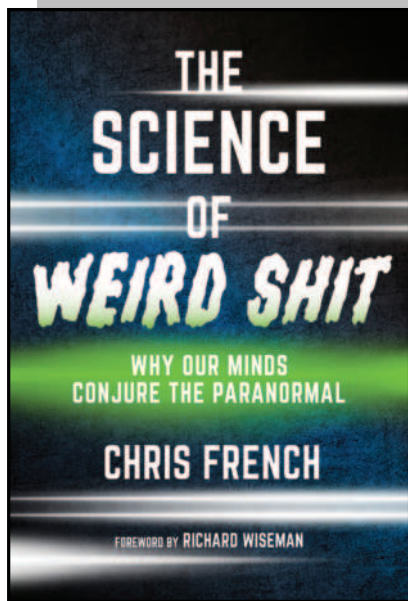
And again, it works both ways. Using **Tibetan Buddhist monks** as a case study, scientists have found some evidence that their practice of regular, deep meditation could be upping their numbers of friendly gut bacteria.

As before, Dr McWhorter's advice would be to start with the food we eat before considering supplements: “Probiotics and prebiotics can also be beneficial, but I would stress that across the board a fiber-rich whole foods diet will be best to support brain and overall health.”

Interest in the gut-brain axis is going nowhere. The next frontier is likely to be **personalized nutrition**, where technology will be able to tell us which foods we need for optimal brain and general health. Despite flashy ads on social media and more people using tech like **continuous glucose monitors**, some experts think the data **isn't yet there** to justify widespread adoption of these methods.

But that data is coming. Probably from scientists fueling their brains with gallons of coffee. •





(AT LEAST) TWO TYPES OF SKEPTICISM

In this excerpt from *The Science of Weird Shit: Why Our Minds Conjure the Paranormal*, Chris French asks when it comes to paranormal beliefs, who is fooling who?

In most situations, humans prefer simplicity over complexity. We all have a natural tendency to perceive and think about the world around us in simple binary terms such as good versus bad, right versus wrong, us versus them. This is understandable. It makes decision-making much easier if we can immediately see the correct course of action in any given situation. The only snag is that the world around us is in reality complex and nuanced. As Algernon Moncrieff, a character in Oscar Wilde's play *The Importance of Being Earnest* famously said, "The truth is rarely pure and never simple."

Looking back now at some of the views I held about the paranormal when I first discovered the joys of skepticism, I am very much aware that I was a victim of such black-and-white thinking. For example, I would pretty much have agreed with all of the following statements.

- Most (if not all) people who claim to be psychic (as well as astrologers, tarot

card readers, practitioners of alternative medicine, and so on) are deliberate frauds, knowingly deceiving their clients for monetary gain, or else suffering from some sort of psychopathology.

- Most (if not all) people who claim to have personally experienced the paranormal are either stupid, lying, or suffering from some sort of psychopathology.
- Most (if not all) experimental parapsychologists are either incompetent when it comes to experimental design and statistical analysis or knowingly fraudulent.

I would not endorse any of those views now. Having said that, there is certainly a grain of truth in each. The history of psychical research is indeed littered with examples of frauds claiming to possess paranormal abilities, and there are many notable examples on the modern scene (although one must be careful when it comes to naming names, as being on the receiving end of a libel case can be very expensive even if one ultimately wins the case).

Every year, many con artists stand trial for defrauding their victims, having based their deception on a claim that the victim was cursed – and that the fraudster could lift the curse in return, of course, for a substantial sum of money. But my personal opinion is that the vast majority of those who claim psychic powers

genuinely believe that they possess them. They are fooling themselves as much as, if not more than, they are fooling others.

When it comes to those reporting paranormal experiences, the evidence is pretty clear that those making the claims are typically not stupid, lying, or mad. True, some studies investigating the correlation between intelligence quotient (IQ) and paranormal belief have reported small but significant negative correlations, but some find no such correlation. Equally, there is little doubt that sometimes people do knowingly lie about having had a paranormal experience. But we now know enough about anomalistic psychology to be certain that many ostensibly paranormal experiences can be caused by a range of psychological factors that lead the claimant to sincerely believe that they have had a genuinely paranormal encounter. Finally, studies do indeed consistently show significant correlations between paranormal belief and reports of paranormal experiences, on the one hand, and a range of measures of psychopathological tendencies, on the other. But such correlations are small and account for only a fraction of the variance associated with levels of paranormal belief. Besides, given the high levels of paranormal belief within society, it would seem somewhat perverse to insist that paranormal belief is necessarily an indication of psychopathology. •

AUTHOR
Q&A

PROFESSOR CHRIS FRENCH

PSYCHOLOGIST AND AUTHOR OF *THE SCIENCE OF WEIRD SHIT*

Professor Chris French talks to us about the weird shit that goes down in the field of anomalistic psychology, and how we can use science and skepticism to search for non-supernatural explanations for people's experiences of "paranormal activity".

What is anomalistic psychology?

The primary aim of anomalistic psychology is to put forward and, where possible, test non-paranormal explanations for ostensibly paranormal phenomena. These explanations are often psychological in nature relying on such well-established phenomena as the unreliability of eyewitness testimony, false memories, hallucinations, and a range of cognitive biases. In practice, anomalistic psychologists also devote some time to directly testing paranormal claims.

Why did you want to write this book?

I actually wrote my initial proposal for this book back in 2010 but found that my day job as a professor in the Department of Psychology at Goldsmiths, University of London, did not leave me with enough spare time to take the project forward. I retired in 2020 and finally had enough time to work on the book. I had always wanted to write a popular science book on anomalistic psychology as I knew from my experience as a lecturer, public speaker, and media consultant that people, whether believers in the paranormal or skeptics, generally find these weird topics as fascinating as I do. Given the increased presence of misinformation and disinformation in recent years, the need for books that encourage critical thinking has never been greater.

What drew you to study such experiences?

Throughout my childhood and teenage years, I was fascinated by accounts of aliens and ghosts – and particularly terrified of the latter! I was a believer in many paranormal phenomena until well into early adulthood. My eyes were opened to alternative, more skeptical, explanations by a single book:

Parapsychology: Science or Magic? by Canadian psychologist James Alcock.

My interest in skepticism began as a hobby but I did give a couple of lectures on the topic as part of Goldsmiths' BSc (Hons) Psychology programme when I took up a position there in 1985. They seemed to go down well with the students and 10 years later I put on an entire 20-hour (optional) module on anomalistic psychology, which again proved to be very popular with students. I was also beginning to do one or two small-scale studies in this area although it has to be said that my research in this area was only tolerated, not encouraged, by my Head of Department at the time! Eventually, however, I realised that it was the weird stuff that I found the most interesting and I abandoned my research in other more conventional areas of research altogether.

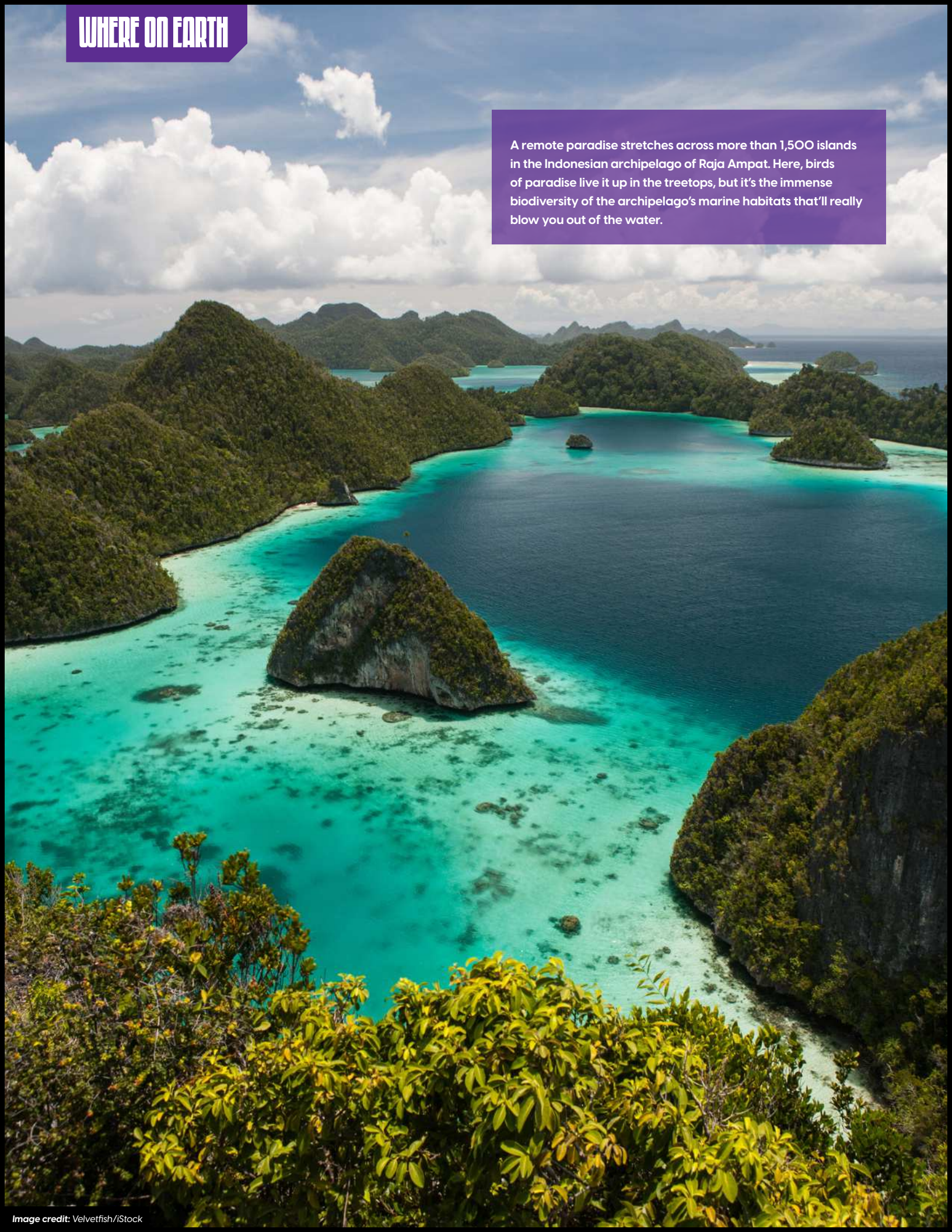
What do you mean by skepticism?

For me, proper skepticism is all about the application of critical thinking. It is not about telling people what to think but more about instructing people in how to think in terms of helping people to evaluate different forms of evidence. Even a full understanding of the biases that affect our cognition will not totally eliminate them but it will certainly minimise their effects and help us to avoid drawing faulty conclusions (such as believing that an experience we had could only be explained in paranormal terms when, in fact, there may be more plausible non-paranormal explanations). So I'd advise anyone wanting to approach the topics covered within parapsychology and anomalistic psychology to arm themselves with critical thinking skills. Such skills, they will find, can also be usefully applied in many other areas of life besides just "the weird stuff"! •

The Science of Weird Shit: Why Our Minds Conjure the Paranormal is published by The MIT Press and is available now.

WHERE ON EARTH

A remote paradise stretches across more than 1,500 islands in the Indonesian archipelago of Raja Ampat. Here, birds of paradise live it up in the treetops, but it's the immense biodiversity of the archipelago's marine habitats that'll really blow you out of the water.



RAJA AMPAT: “THE LAST PARADISE ON EARTH”

The Raja Ampat archipelago in Indonesia is considered one of the most biodiverse marine habitats on Earth, home to thousands of fish, mollusks, and coral species. Its remote location means the wildlife here can thrive without the impact of intensive human activity, which is why it's known as “the last paradise on Earth”.

Sitting within the western Pacific Ocean’s “coral triangle”, the region’s reefs are among the **healthiest in the world**, acting as a vital habitat for diverse marine life. The unique conditions at Raja Ampat mean many species found here can’t be found anywhere else on Earth – and hoo boy, do they have some characters in the mix.

Raja Ampat’s walking shark caused a stir back in 2020 when it was recorded using its pectoral and pelvic fins to potter along the seafloor. Named the **leopard epaulette shark** (*Hemiscyllium freycineti*), it was declared a new species and joined eight other known species of walking sharks.

The leopard epaulette isn’t the only peculiar shark in the area, as Raja Ampat is one of the few places the tasseled wobbegong shark calls home. Looking a bit like someone stamped on a potato, these peculiar sharks are flat and – as the name suggests – pretty frilly at the edges, making them hard to spot but a remarkable sighting.

Raja Ampat is also home to the highest proportion of melanism among the black manta rays *Mobula birostris* – also known as the giant oceanic manta ray – and *Mobula alfredi* – the reef manta ray. Melanism describes a kind of hyperpigmentation that gives animals a uniform and dark coloration. A **goth manta**, if you please.

Not only do the massive mantas here come in a spooky hue, but they’re incredibly social. Scientists studied more than 500 social groups of reef manta rays over five years in Indonesia’s Raja Ampat Marine Park, to **analyze social networks** and see how manta rays interact with one another. It revealed that the reef-dwelling cartilaginous fish form social relationships and choose social partners, but do they have “friends”? Check out the **cover story** from our April issue for more on animal friendships.

The biodiversity of Raja Ampat doesn’t end in the water, either. A hunt for a **long-lost species of orchid** not only rediscovered the blue beauty *Dendrobium azureum*, but also stumbled upon a new-to-science species that was bright red: *Dendrobium lancilabium*.

So, if you like your sharks flat and frilly, and your orchids rare and colorful, Raja Ampat really is paradise on Earth. ●



How to get there

Reaching Raja Ampat is a journey, but it begins at Jakarta or Makassar airports, from which you'll need to get to Sorong for the ferry.

ATTEND



CURIOUS Live

Virtual event from IFLScience

What happens if a nuclear bomb goes off? Are we alone in the universe? Is our mental and physical health connected? And have insects taken over the world? Find out at CURIOUS Live, IFLScience's virtual event, returning in 2024 with its first event on May 31. Our hosts Dr Alfredo Carpineti, Rachael Funnell, and Eleanor Higgs will put their burning questions to the experts on some pretty curious topics. Can't make it? You can catch up any time on demand. Click [here](#) for more information on securing your spot.

Airing on **May 31**, then available on demand.

READ



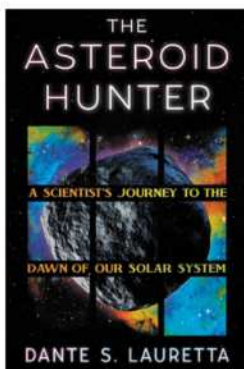
The Asteroid Hunter

Book by Dante Lauretta

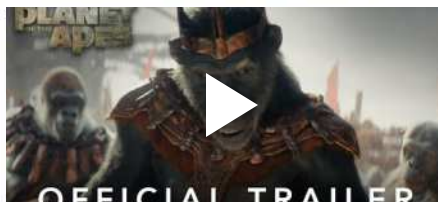
A colossal celestial entity was discovered on September 11, 1999: the cosmic titan Benu. It belongs to a rare breed of asteroids, and is a behemoth itself, about the height of the Empire State Building. It could hold the key to understanding the essence of life, but it could also collide with Earth on **September**

24, 2182. Get a behind-the-scenes account of NASA's take on the asteroid from Dr Dante Lauretta, Principal Investigator on the mission that sampled the beastly Benu.

Available **now**.



WATCH



Kingdom Of The Planet Of The Apes

Movie from 20th Century Studios

Long after the "apes together strong" crew raised funds for GameStop (read: **gorilla conservation**), we rejoin the apes in the wake of Caesar's reign 300 years in the future. Humans have been sufficiently squashed, forced into the shadows, and (non-human) apes now rule the planet, living in sweet harmony – but not for long. A new tyrannical ape leader called Proximus Caesar is on the rise, and what happens next will change the fate of humans and other apes alike. Expect more apes on horseback, electric weapons, and – ahem – a fair bit of monkeying around.

In cinemas **May 24**.

SCIENCE IN MEDIA



EXPLORE



Pathless Forest

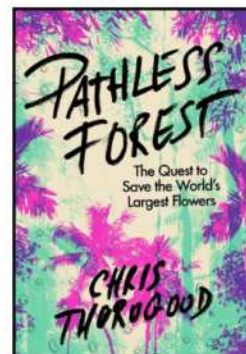
Book by Dr Chris Thorogood

If you follow Dr Chris Thorogood on socials, you'll have seen in brilliant technicolor the kinds of adventures his obsession with plant life has taken him on.

Pathless Forest: The Quest to Save the World's Largest Flowers tells the story of his journey to study and protect *Rafflesia*, a biological enigma that steals foods from vines as a leafless parasite.

Finding the world's largest flower proves to be a treacherous undertaking filled with leeches, but with the aid of Indigenous tribes, Thorogood reaches his corpse-smelling prize.

Available **now**.



PLAY



Endless Ocean Luminous

Game from Nintendo

Need to chill? You could do worse than to dive into *Endless Ocean Luminous*, now on Nintendo Switch. Explore the unexplored region of the Veiled Sea where you can discover over 500 species of marine life – some long-extinct, some perhaps a little mythical – and even meet other explorers as you swim around in search of sea life with other online gamers. Open world meets open ocean? BRB, fetching our flippers.



Available **May 2**.



DATES TO REMEMBER

As we march into May, don't miss the opportunity to quench your thirst for knowledge at Pint of Science and celebrate the beauty of nature as the Nature Photographer of the Year contest deadline looms. There are also fiery space rocks whizzing past Earth to behold, endangered species to protect, and the whole cosmos to marvel at.

MAY

Eta Aquarids

5 Good news meteor fans: the Eta Aquarids will be putting on a show throughout May. The shower is active between April 15 and May 27 but will peak between midnight and dawn on May 5, when you can expect to see a maximum of 50 meteors per hour, according to the **American Meteor Society**. It will be best seen from the Southern Hemisphere, but will still appear low in the sky for those at northerly latitudes. With little interference from the waning crescent Moon, it's set to be quite a spectacle.



13-15 Pint of Science

Pint of Science – the international science festival that brings cutting-edge research directly to you – is back for another year! From May 13 to 15 you can learn about everything from astronomy to climate change all from the comfort of your local pub/bar/cafe/space. Thousands of scientists across hundreds of cities are set to be involved – find an event near you **here**.



18 International Astronomy Day

International Astronomy Day is celebrated twice a year, in spring and fall, giving us the biannual chance to explore and appreciate the wonders of the universe. Fancy marking the occasion and broadening your understanding of the field of **Astronomy**? All over the world, astronomical societies, planetariums, museums, and observatories will be hosting public viewing sessions, presentations, workshops, and other activities on May 18.



17 Endangered Species Day

May 17 is Endangered Species Day, dedicated to celebrating, learning about, and taking action to protect threatened and endangered species across the globe. More than 157,100 species are currently on the IUCN Red List, including the vaquita – the **world's rarest mammal**. Its prospects look bleak, but there are new efforts to bring it back from the brink, and awareness raised during Endangered Species Day events will hopefully help with its, and many other at-risk animals', conservation.



26 Nature Photographer of the Year

Calling all budding nature photographers: you have until May 26 to get your submissions in for **Nature Photographer of the Year**. Professionals and non-professionals of all ages, from all over the world, are invited, and you could win up to €3,000 – so what are you waiting for?



ARE YOU DRAWN TO THE DARKER OR LIGHTER SIDE OF SCIENCE?

Choose how you end each issue. For those who prefer the darker side, Holly Large explores the baby beetles that use poop for protection. If you like your science lighter, discover how the UK's biggest football stadium is making its pitch more sustainable.

POOP PARASOLS

Move over, vibranium: for tortoise beetle larvae, poop and a bit of old exoskeleton are the ideal materials to make a shield.

When they're all grown up, tortoise beetles come in a variety of snazzy colors and patterns. But in a bid to protect themselves as babies, the larvae carry around a delightfully boring brown fecal shield.

THE REASON THEY'RE ABLE TO CREATE A SHIELD IN THE FIRST PLACE IS BECAUSE THEY HAVE A LONG, HIGHLY MOBILE ANUS. YES, YOU READ THAT CORRECTLY.

Lugging about a bunch of crap sounds bizarre enough already, but the more you read about the larvae's little poop umbrellas, the more bonkers it gets. The reason they're able to create a shield in the first place is because they have a long, highly mobile anus. Yes, you read that correctly.

This moveable butt dumps blobs of poop onto a structure known as the anal fork, which acts as a support for the shield. The anal fork can also be moved about, although how easily this can be done can depend on how big the shield gets.

Researchers think the primary purpose of the poop shield is protection from predators – larvae have been observed moving the shield to point towards them – although there might be more to this than the shield simply providing a DIY hiding spot.

It could, for example, be mistaken for the droppings of a larger animal. It's also been hypothesized that it could give off a smell that's unpleasant to those who might otherwise snack on it, which, given it's made out of literal shit, is not an entirely unbelievable theory.

The shield might also have a role in protecting the larvae from the elements; it could shield them from the Sun, like a less-than-fashionable parasol, but also act as an umbrella, having been seen to be resistant to water.

Regardless of exactly how it shields the larvae, their protective poop makes for a great example of "waste not, want not".

ECO-FRIENDLY FOOTBALL

In what's thought to be a world-first for football, Wembley Stadium has made its pitch 100 percent recyclable.

Though it would be hard to spot the difference watching a match from the seats or on the television, many professional football pitches nowadays aren't just made of grass. They also contain plastic, and Wembley's pitch is no different.

Known as hybrid pitches, their purpose is to make the pitch more durable to both the natural elements and to uses other than football. Wembley is also a concert venue, for example, and thousands of Harry Styles fans doing the famous "boot scoot" could easily ruin a regular lawn.

Whilst some added plastic might help to maintain pitches that see a lot of boots on the ground, hybrid pitches aren't necessarily the most sustainable, with many eventually ending up in landfill sites.

In an effort to make Wembley greener, a team from the stadium worked with recycling company Circular 11 to develop a new process in which the plastic from the pitch is extracted and repurposed – though it wasn't easy.

"Extracting the plastic from a hybrid pitch is notoriously difficult, due to its compound and structure. When we first mooted the idea of recycling it, we were told it couldn't be done. However, we were determined to find a sustainable answer to the problem," explained Karl Standley, Wembley's grounds manager, in a **statement**.

"It's been a long journey, testing and re-testing, but we have finally come up with a solution we are happy with."

So what can the extracted plastic be turned into? The team has started off with benches, the first of which, according to Wembley, contains the remnants of a pitch that saw star players like Bukayo Saka and Mary Earps play on it.

It's hoped that just one pitch could be turned into around 50 benches, though there are plans to expand its potential uses in ways that could be fed from the national stadium all the way back to – coincidentally enough – grassroots football.



**The Darker Side
of Science**



**THE LIGHTER SIDE
OF SCIENCE**