CURIOUS

DO WE REALLY KNOW MORE ABOUT SPACE THAN THE DEEP OCEAN?

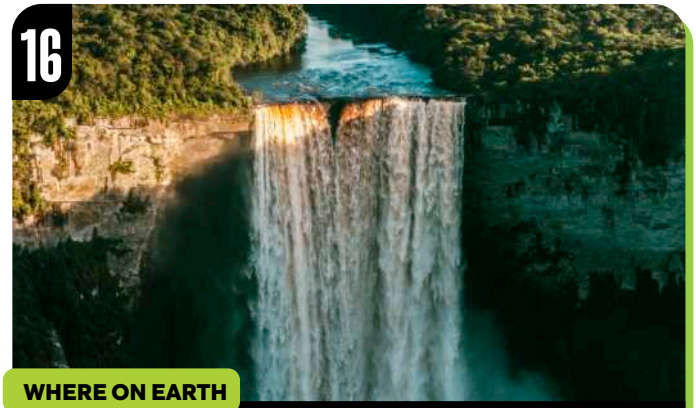
A 37-HOUR OCEAN SWIM

AUGUST 2025

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IFLSCIENCE



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NEWS BITES

World's Most Valuable Meteorite

The world's largest Martian meteorite ever just became the "most valuable" meteorite in the world too, as it sold at auction at Sotheby's New York for a whopping $5.3 million. The space rock was discovered in November 2023 in Niger's remote Agadez region and at 24.5 kilograms (54 pounds) it is officially the largest piece of Mars on Earth.



In fact, NWA 16788, as it is known, is 70 percent larger than the previous record-holder, and of the 400 known Mars meteorites, its mass alone makes up 6.5 percent of all Martian material on Earth. It's unknown yet who bought the pricey space rock or where it will end up, squirreled away in a private vault or in a museum on display to the public, but to ensure at least some scientific access, a reference sample has been saved at the Purple Mountain Observatory in China.



CURIOUS TURNS 3!

Issue 37 marks three years of your favorite digital science magazine and we're celebrating. Not only do you get a monthly magazine (with **36 back issues** for your perusal) packed with deep dives, weird questions answered, exotic geographic highlights, and the latest science news, books, movies, and shows, but you get CURIOUS Live and a podcast to boot. The ***We Have Questions*** **podcast** offers up longer, more in-depth discussions with the experts featured in the magazine column. Catch up with any episodes you missed **here** and subscribe on your favorite podcast platform so you don't miss any again. As part of your membership, you also automatically have access to our **CURIOUS Live events**, where we chat to experts on a range of fascinating topics, and you can even ask questions. Our most recent explored the science of sci-fi and real neurological conditions that are stranger than fiction with neuroscientist and author of *Horror On The Brain*, Dr Adrian Lim. So let's continue to explore the weird world around us and stay CURIOUS!



NASA Is Coming To Netflix

Netflix and NASA are joining forces to stream NASA+ directly to all members across the platform's streaming service. That means you can now tune in to watch live feeds from the International Space Station (ISS), spacewalks, mission controls, and even rocket launches in real-time, from your living room. Not that you couldn't before – NASA+ remains free via NASA.gov, the NASA app, and YouTube – but now you can add it to your watch list on Netflix too, with schedules dropping before event days so you can grab friends and snacks for watch parties. Get ready to visit space this summer from the comfort of your couch.

Image Credit Top Left: gcafotografia/Shutterstock, **Top Right:** Courtesy of Sotheby's, **Bottom Right:** dima_zel/iStock

How To Make Keeping Fit Fun

We know keeping fit and exercise are good for us, but not everyone finds going to the gym fun, and when you don't enjoy something, it can be hard to want to do it. New **research** has discovered that tailoring your exercise to your personality gets the best results. Extraverts tend to enjoy high-intensity workouts with others or team sports, while those scoring high for neuroticism prefer private sessions. Interestingly, halfway through the study, after tailoring the type of exercise to personality traits, all participants showed a reduction in stress. Introverts, this is your get-out-of-a-zumba-class-your-extrovert-mate-is-trying-to-drag-you-to card.

50 Years of Space Co-operation

This summer marks 50 years of the Soyuz-Apollo mission, a landmark event that saw the US and the Soviet Union join forces, quite literally, in space, despite being in the middle of the Cold War. In July 1975, two cosmonauts launched from Baikonur, while three astronauts launched from Cape Canaveral to meet and dock their spacecraft in orbit, marking the first ever international human spaceflight mission. The star travelers shared a meal and exchanged gifts, demonstrating a historic moment of unity against a heated political backdrop that included almost three decades of Cold War and two decades of space race tension. Fifty years later, both US and Russian nationals inhabit the ISS, with Soyuz recently delivering its 92nd payload to the station. With political backdrops in both nations looking pretty dicey right now, let's hope this serves as a reminder that everyone wins with international cooperation.

Lefties Are Not More Creative

Turns out left-handed people are not more creative than right-handed ones. Sorry, Leonardo da Vinci, Lady Gaga, and Mozart. New **research** pored over 100 years of scientific literature that suggested a correlation between handedness and creativity and found the data for so-called "southpaws" didn't stack up. In fact, left-handed people are underrepresented in most creative fields, art and music being the exceptions but still rarer than right-handers, which is perhaps why famous ones are lauded as creative geniuses. It's thought left-handed people make up around 10 percent of the population, but that doesn't mean they are all avant-garde maestros.

WHAT'S UP?



A VERY JUICE-Y FLYBY

Venus, you've got a visitor

Name: Juice's flyby of Venus AKA a gravity assist
Appearance: Shiny spacecraft with solar panels galore whizzing past a planet
Location: Venus

A gravity assist? What's that?
It's a very nifty trick that spacecraft use to reach their destination using less fuel, and involves using the gravitational attraction of a planet in order to change the craft's speed and trajectory. In this case, the spacecraft looking for the assist is the European Space Agency's Jupiter Icy Moons Explorer, or Juice, and Venus is the next planet helping it out on its journey to the gas giant.

Venus is basically like a magician's assistant then.
If you consider its gravitational field to be magical, then yeah, I guess you could put it like that.

When is the flyby due to happen?
This month, and the spacecraft will make its closest approach to the planet on the 31st, reaching just a little over 11,000 kilometers (6,835 miles) from Venus's center. There's a camera onboard too, JANUS, which took some **stunning pictures** during Juice's last gravity assist – so hopefully we'll get some snaps of what it looks like to fly past Venus without having to do it ourselves.

What about Earth? Are we helping out too?
We already have! Juice did a flyby of Earth and the Moon – the first-ever gravity assist of this kind – back in August 2024, and it'll be back for more come September 2026 and January 2029.

When will it get to Jupiter?
Juice is due to arrive at the gas giant in July 2031, so you've got plenty of time to get excited.

What's it going to do once it's there?
Even after its long journey, Juice has got its work cut out for it. It'll spend several months observing three of Jupiter's icy moons, Ganymede, Europa, and Callisto, collecting data on their possible oceans, surfaces, and environments. As for the planet itself, Juice is set to characterize its atmosphere and magnetic environment, as well as its ring system.

Image Credit Top Right: ESA

ARE THERE BODY PARTS YOU CAN LIVE WITHOUT?

Some make it really difficult to let go.

By Rachael Funnell

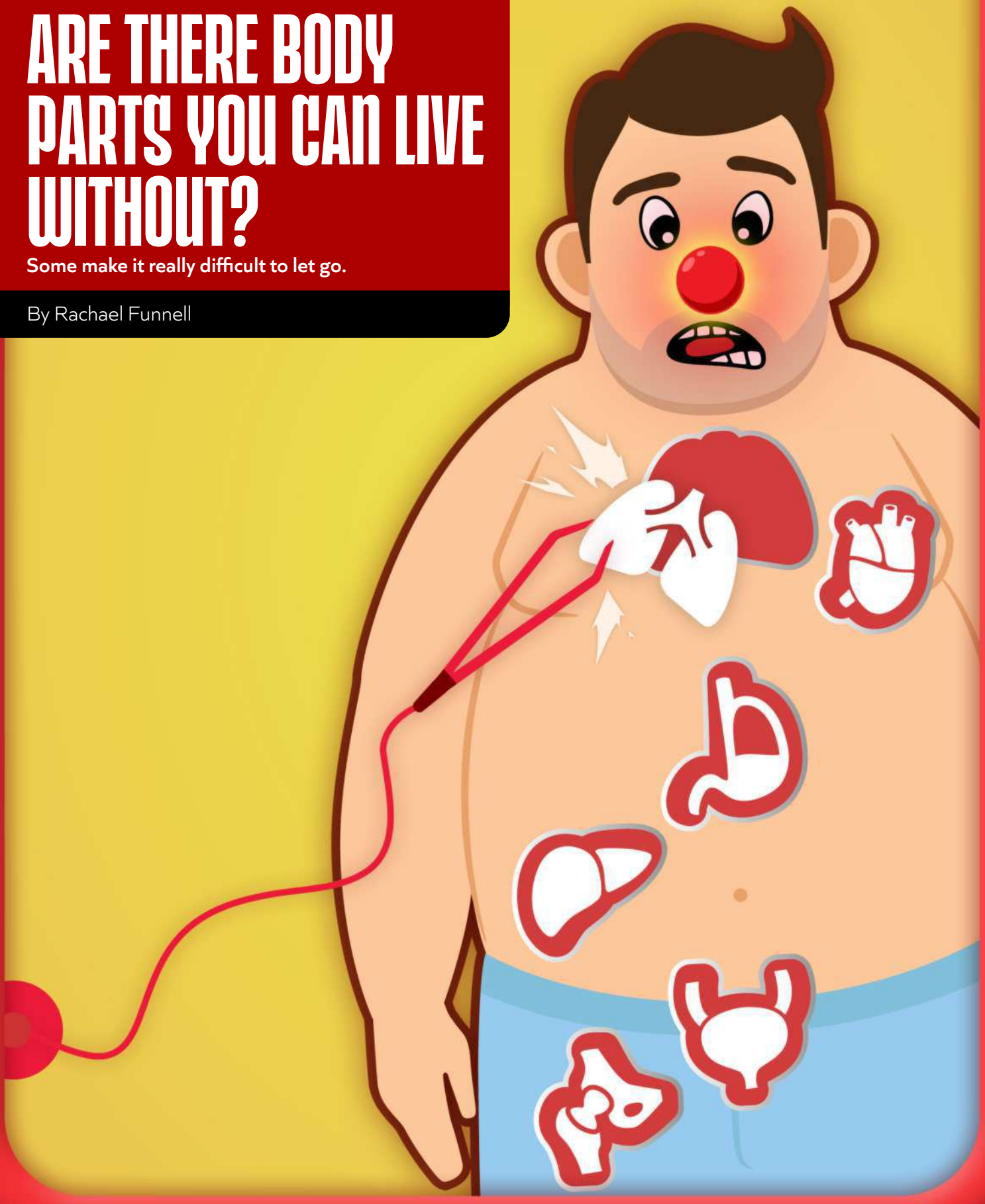


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In the movie *127 Hours Later,* a sound that sends shivers down your spine marks the moment an unlucky hiker finally releases the part of his body that was trapping him in a ravine. It's the true tale of Aaron Ralston, whose arm was stuck under a boulder for five days until he cut it off to free himself.

Remove an arm – or any limb, for that matter – and there's a very good chance you'll bleed to death unless you can find help. With intervention, you can expect to recover within a few months to a year if you manage to steer clear of infection, though phantom limb pain is a common complication (and it **isn't exclusive to limbs**).

Ralston's amputation was done under suboptimal conditions, to say the least, and yet he survived in an incredible demonstration of what the human body can learn to live without. So, how far does that ability stretch? Are there, for example, organs that we can remove without fatal consequences? And how do doctors manage their removal in circumstances where keeping them will do more harm than good?

It's got to go

Inflammation. Disease. Injury. Many scenarios may render a piece of our body more trouble than it's worth. One example you're likely familiar with is the appendix: a pesky little worm of an organ tagged onto the large intestine. It sits on the lower right side of the body, somewhere this writer noticed was getting a bit tender in the summer of '06. A healthy appendix is often hard to spot on ultrasound, so when mine came waving across the screen, coupled with a fever and rebound tenderness, the decision was made. It's got to go.

There was a time we considered the appendix little more than a vestige of human evolution, left over from the days when we needed a bit of extra help to break down tough plant matter. We've since discovered it might not be so useless after all, containing a "**reservoir**" of the healthy gut bacteria that have become so in vogue in recent years. It's possible, then, that during pre-industrial times when getting a severe case of the poops was a lot more common, the appendix could provide a vital infusion of bacteria and fungi to replenish what was lost.

So, am I doomed to a lifetime of inadequate digestion? Not really. Fortunately, we now live in an era of improved sanitation and greater awareness of the myriad ways we can support our gut microbiome, and its removal has even been connected to reduced incidence and severity of irritable bowel diseases like **ulcerative colitis**.

On occasion, the removal of an appendix can be the difference between life and death. There was even a time it was recommended people had theirs removed preventatively before embarking on long stints in Antarctica. Why? Because one person who didn't ended up having to remove their own.

Yes, this was the tortured fate of one of the most famous appendectomy patients of all time: Russian surgeon **Ivanovich Rogozov,** who was simply not willing to delegate when he fell ill during a 1961 expedition. As the only medical professional present, he took the wheel (and a mirror) and removed his own appendix as three – no doubt horrified – non-medically trained assistants looked on.

Suffice to say, the appendix can very much be put in the bracket of things we can live without. See also certain lymph tissues like adenoids and tonsils that are commonly removed in childhood. But what about if we plus things up a little? Like that red-nosed, pot-bellied man we all used to play *Operation* on (what was wrong with him, anyway?) can we just go plucking things out at random?

The non-negotiables

"Most organs can be partially removed without killing the human, but very few can be totally removed," intensivist **Dr Daniel Funnell** told IFLScience. "People can survive with one kidney, half a liver, one lung, even half a brain. But if you remove the entirety of these organ systems, death will happen rapidly."

It probably doesn't take a doctor to muddle out that you can't remove a whole brain, but as for what's needed to support a patient after some-kind-of-organ-ectomy? That definitely does.

Modern medicine has innovated all kinds of machines that can step in to pick up the slack when the compromised body cannot. Lost a kidney? We have dialysis machines that can filter out electrolytes and toxins. For the lungs, there are extra-corporeal membrane oxygenators that effectively bypass circuits that can take blood from the large vessels in the chest, fill it with oxygen, remove carbon dioxide, and pump it back into the vessels again.

Even our hearts can take a break thanks to ventricular assist devices that pump blood around the body, but things can get a little weird here. They pump continuously rather than in rhythmic bursts, sort of like water running through a hose, so people on these machines won't have a pulse despite being alive. It's not a perfect replacement, but it can buy a patient time, acting as a bridge to recovery of the heart from whatever disease was affecting it, or as a back-up until a transplant organ is available.

Leave (get out)

Cancer is bad news for any organ system, but some make removal a lot more complicated than others. Your adrenal glands, for example. A matching set of organs that sit atop your kidneys and typically do a grand job of secreting important hormones like adrenaline, noradrenaline, and dopamine. Throw a phaeochromocytoma into the mix, however, and that production goes haywire.

Patients with these kinds of tumors often report an "impending sense of doom" as this inappropriate release of a hormonal cocktail makes them feel, frankly, awful. It's a tricky one to diagnose, not least because sometimes the tumors are hiding elsewhere in the abdomen, in the heart, or even at the base of the brain. An adrenalectomy can resolve the issue, and it's even possible to have both organs removed in rare cases that call for it. Treatment pre-removal involves a witch's broth of different medications to try

Image Credit Top Right: NASA/JPL-Caltech/ASU, **Bottom Right:** NataliaDeriabina/iStock

and tackle the hormone slurry, and it means giving anaesthetics is fraught with peril.

"The phaeochromocytoma is a highly-strung individual, and its response to certain drugs, inserting an airway for surgery, or the surgeons touching it intraoperatively, will be to unleash hell, which can cause rapid rise in blood pressure and heart rate which needs to be controlled quickly to minimise complications like stroke or damage to the heart," explained Dr Funnell.

"As if that wasn't bad enough, once the tumour is removed, things will often swing the other way as all the hormones causing havoc will be gone, and this often results in a period of low blood pressure which is often difficult to treat, meaning they need to be monitored closely in a high dependency unit. Bastard adrenals."

Bastard adrenals, indeed, and another tricky "ectomy" is that of the thymus.

"Ask someone on the street to point out on your body where they think the thymus gland is and they'll probably reply, 'please sir, you're scaring my children,' but the thymus has a vital role in T-cell maturation," said Dr Funnell. "As we age, the T-cell activity of the thymus reduces hugely and it becomes less important, but this sneaky poltroon of a gland can still create problems in adult life by causing an autoimmune condition known as myasthenia gravis."

"Myasthenia gravis is a condition where the body attacks a specific part of the motor nerves, leading to symmetrical limb weakness that gets worse with exercise, as well as double vision and breathing difficulties. Removal of the thymus in patients with myasthenia gravis can often improve the symptoms significantly."

Other organ systems that can be totally removed without the need for advanced organ support include the thyroid gland, the spleen, and the large bowel, but that's not to say that you won't run into problems without them. For example, the spleen is one of the more readily removable organs, but removal still comes with a number of significant risks.

"It is an organ that has a number of odd little roles, like removing old red blood cells from the circulation, as well as important roles in immune response," explained Dr Funnell. "People who have a splenectomy (due to traumatic splenic rupture, lymphoma, or rare haematological conditions) are at risk of infection from encapsulated organisms that can cause conditions like meningitis, so need additional vaccinations and lifelong prophylactic antibiotics. A feared and rare complication in the post-splenectomy patient is overwhelming post-splenectomy infection (OPSI), a condition characterised by rapid onset severe infection with multi-organ failure and death in approximately 50 percent of cases."

Better together

When it comes to jettisoning the non-essentials, it helps to think of the human body a bit like a ship – built for going the distance, but not without its weak spots. Sometimes, to stay afloat, you have to toss some cargo overboard. Maybe it's the cannons, and that leaves you more vulnerable to attack. Perhaps you lose some crew, without whom things just don't run as smoothly. And all that rum you spilled in the process? Well, that's just going to leave you miserable.

Steering a ship is a breeze compared to the countless tasks constantly needing to take place in order to keep a human body going. It figures, then, that when we lose something – be that an organ, tissue, or limb – even time, patience, therapy, and medication can only help us to recover so far. Still, when the sails split and the pirates are coming, it's nice to know modern medicine's got a few life rafts to fall back on.

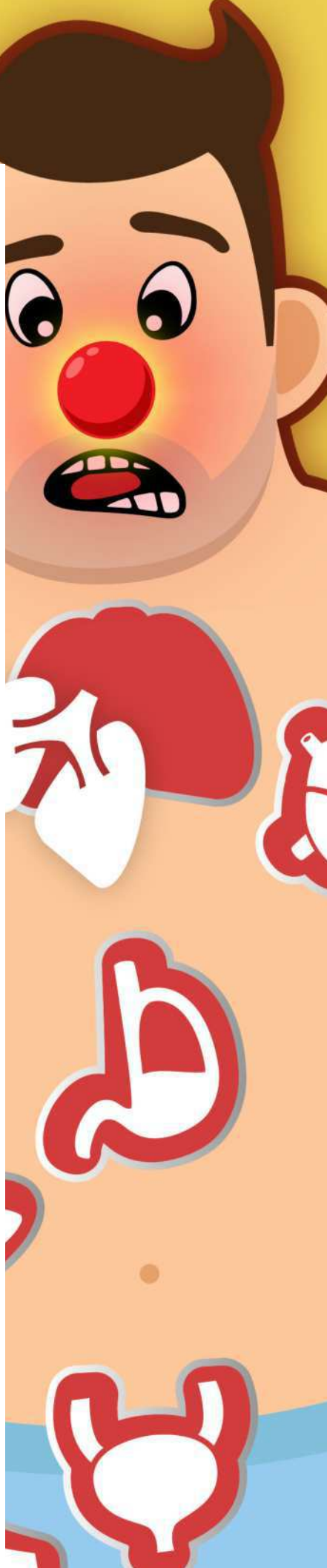


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URCHIN SPINES

Check out this incredible extreme close-up of the purple sea urchin, in the class Echinoidea. Those spikes are movable spines that the urchin uses for defence, as well as a means of transport. Fun fact: their ability to suck and manipulate food towards their mouth is why you see so many pictures of urchins wearing hats. Snapped by Sayaka Ichinoseki in Japan, "Urchin Spines" is a people's choice finalist in the California Academy of Sciences' BigPicture Natural World Photography Competition.

Vote now to choose the winner before July 31, 2025.



Image Credit: Sayaka Ichinoseki/BigPicture Natural World Photography Competition



A 37-HOUR OCEAN SWIM

And why a jellyfish can be as good as a coffee.

By Rachael Funnell

In 2022, a new world record was set in the waters off Grand Cayman in the western Caribbean Sea. I, a once avid collector of the Guinness World Records annual album, was most excited by the prospect, but ask environmentalist Oly Rush about it, and he'd sooner talk to you about plastic.

You see, this wasn't just any swim. This was a 36-hour-and-59-minute test of endurance to raise awareness of one of the greatest plights currently threatening marine species. ***The Grand Swim***, as it would become known in a subsequent documentary about the grueling achievement, details what led Rush and **Project Planet Earth** to embark on such a perilous adventure. We, however, needed more deets on what wildlife you faceplant along the way.

Why do The Grand Swim?

OR: I think really it was combining my passion for swimming and passion for the environment, and I knew that if I did something as crazy

Image Courtesy Of: Oly Rush



as *The Grand Swim*, I could reach a much bigger audience.

It was really a way of getting to the people that we perhaps weren't getting to just by our Instagram. It's a bit of an echo chamber, sometimes, when you're typing these things in about beach cleaning. It's amazing to have such lovely feedback from everyone, but they're already on the beaches. They're already picking stuff up. We want to reach some people that perhaps aren't and hopefully inspire them to. So, this was a great way to take that bigger step and hopefully be able to shine a light on it.

Why Grand Cayman?

OR: I'd been out to Grand Cayman before in the Caribbean, it's a stunning island, but I had seen how bad the plastic pollution was there. I was following an organization, a charity known called Plastic Free Cayman, and I wanted to be able to support them.

I had a friend out there, as well, and we got chatting and I said, "Look, wouldn't it be crazy if I was to attempt to swim around the island." It's the same size, pretty much, as the Isle of Wight, but a much, much bigger challenge, because of the climate. And because of the wildlife as well.

Wildlife?

OR: Everyone gets super excited if you talk about sharks, but there's lots of wildlife in the sea out there that could perhaps be an issue. We did have to be aware that there are bigger fish there. There are some sharks there, which is amazing. We want this, you know. Sharks are so essential for the health of the ocean, but we did have to take that seriously. We had some shark shields, which emit an electronic ping that stopped the sharks if they got too close.

I've seen some amazing wildlife, even just here on the south coast [of England]. I've swum with seals quite often, as well as some big barrel jellyfish. It's quite heart-stopping when you swim into one. Swimming is almost like sensory deprivation, there's no feeling other than the water, and then all of a sudden, you hit something that's solid like a brick wall. That's the barrel jellyfish. When you hit the smaller ones, they sting. It's not so nice, but even that has its benefits. When you're really tired, you just get a little reminder that you're still here. That's the buzz.

The endurance swim version of a coffee, right?

OR: Just that little hit, yeah.

And it was a world record?

OR: It was the world. First person to have swum round in one go. It'd been done in stages before. I think someone swam around and took breaks; they're much more sensible than I am.

I decided to try and do it in one go, which we did. Thirty-six hours and 59 minutes of non-stop swimming. So, that's super cool. It's something that the kids get excited about as well. At school, they're like, I've seen you in the Guinness Book! It engages them, so it's a really cool thing for that.

What do you hope people will take away from the swim?

OR: What I'd like to do is just to try and inspire as many people as we can. They don't have to go and swim around an island, but hopefully, people will start thinking about reducing how much plastic they're using and just trying to tread as lightly as we can. That's all we're asking.

The ocean's precious and we love it. Obviously, it's important to protect the animals, but it's for us humans as well. It's such a special place. It's our playground. So, we just want to inspire people to protect it better.

We have Questions with IFLSCIENCE

Hungry for more CURIOUS questions?
Head to the *We Have Questions* podcast for new episodes monthly.

Image Courtesy Of: Oly Rush

DEEP DIVE

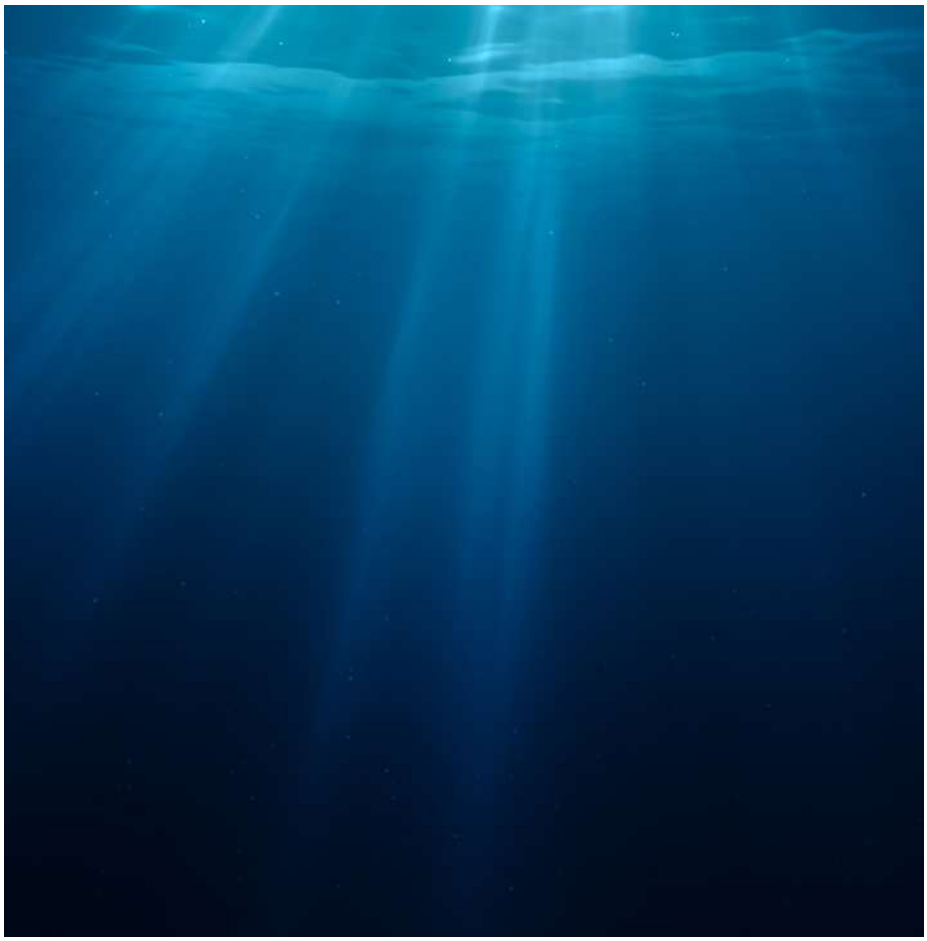
SCIENCE FACT OR FICTION:

DO WE REALLY KNOW MORE ABOUT SPACE THAN THE DEEP OCEAN?

The mysteries of both are ours to discover, but the challenges are surprisingly uneven, as Dr Alfredo Carpineti finds out.



Image Credit: Nanzeeba Ibnat/iStock



The sky and sea are often seen as at odds. Both blue, both a symbol of exploration and adventure that lay just beyond the horizon, both alien worlds. They are spaces of mystery, of danger, where the physical limits of our human form are put to the test, with some places that can only be explored with robots.

Despite the similarities, culturally, we have pitted them against each other. We often hear that we know the surface of the Moon or Mars better than we know our own ocean, with the strong implication that we do not know all that much of what goes on under the waves. While certain celestial bodies have been mapped extensively, and even at higher precision than the bottom of the sea, the reality has crucial complexities that are worth exploring. And we will see that the choices to explore often depend on tech and money, not just our willingness to go there.

The ocean takes an early advantage

Maps of the rocky bodies in the Solar System, such as the Moon, Mercury, Venus, and Mars, are in higher resolution compared to the maps of the global ocean floor – this is a fact. But the incredibly high resolutions of these maps are from recent years – whether we are talking specifically about the data, the analysis, or both. The discussion of whether we know space better is much older, even though space observations have only recently dramatically surpassed ocean mapping.

Ocean mapping under the General Bathymetric Chart of the Oceans (GEBCO) started in 1903, aiming to create a map of submerged structures on the ocean floor. For decades, this map had no need for celestial comparison. We simply didn't know much about the heavens. Consider that sonic and ultrasonic devices were already being used between 1912 and 1931 for the second edition of GEBCO. We didn't even know other galaxies existed for most of the time it was being filled.

It was in 1982 that we could make a more interesting comparison. The **fifth edition** of the world ocean map was released with a scale of 1:10 million. By that point, space mapping had already become much better… at least when it came to the Moon. The US Geological Survey used data from the Apollo missions to create a number of geological maps of the Moon, including a global map at the scale of 1:5 million. This level of detail was beaten in 2024 by the Chinese Academy of Sciences (CAS), which released the highest-resolution geological map of the Moon yet: the Geologic Atlas of the Lunar Globe with a **1:2.5 million scale**.

These global maps can be good, even very good, but it is all relative. The Earth's ocean floor is known in an approximate way at best. Good enough if you want an idea, but if you are interested in the detailed structure, you are out of luck.

"Trying to dive to the bottom of all five of the world's oceans was extremely challenging. No one had ever done it before, ever really attempted it. I thought the major challenge would be helping design, construct, and then piloting the actual submersible that could do it," explorer **Victor Vescovo** told IFLScience in our latest season of ***The Big Questions*** podcast. "What I soon discovered from my scientific team was that we actually didn't know where the bottom of four of the world's five oceans were."

Listen to our chat with Victor Vescovo here!

Image Credit: vchal/iStock

For that unique adventure, Vescovo and his team mapped the ocean around their area of interest. They are involved in GEBCO and the Seabed 2030 initiative, which aims to map all the ocean floors to a resolution of at least 100 meters (328 feet) by 2030. That would take it to the level of resolution of NASA's best map of the Moon, created from the **Lunar Reconnaissance Orbiter** in 2017. Not incredibly far behind.

The main issue is that it is a massive endeavor to map the sea floor. Currently, about three-quarters of it remains unmapped to a sufficient resolution. That's about 300 million square kilometers (116 million square miles) of unmapped seabed surface. Still, progress is happening fast. In 2017, the area mapped to modern standards was just 6 percent. This fraction of mapping is done with sonar – the part that humans have seen, even with remote cameras, is actually much smaller.

Space comes into its own

This is part of the crux. If we can see it, then we can more easily map it – and if we can do that automatically, it is even better. This is why space has such an advantage. Missions around Mars and Mercury have collected hundreds of thousands of photos that can be stitched together to create better and better maps of the planets. Mercury has a **global mosaic** of images at 665 meters per pixel. Mars is known to an even higher resolution, reaching **5 meters per pixel**, creating a 5.7 trillion-pixel image of the planet. BepiColombo, an upcoming mission to Mercury, will map the planet like no other before, reaching comparable resolutions.

But maybe a fairer comparison is Venus. We can't directly see the surface of Venus due to its thick cloud coverage. Radar observations from the MAGELLAN mission between 1990 and 1994, together with advanced computer analysis, delivered a **map** with a resolution of 75 meters per pixel. Future missions to Venus will push that even further.

Space missions can simply go around and around, collecting data. So, the way to make ocean mapping easier would be to automate the process. For example, some satellite observations have been used to map coastal areas. In this way, researchers from the Greenwater Foundation, with the backing of Vescovo, produced **new coastal mapping data** across 14 different countries, totaling 217,560 square kilometers (84,000 square miles). Consistent with the Seabed 2030 goal, the average resolution was 100 meters (328 feet).

This approach to mapping costs $2 per square kilometer ($5.18 per square mile), about 10 times cheaper than what it costs to map the seafloor usually. If this level of affordability could be stretched everywhere, it wouldn't take too much to cover the whole ocean.



Unfortunately, we can't use satellites like that everywhere. Still, automation seems to be crucial, and Vescovo is designing solutions to make the mapping more economically feasible.

Can the deep sea catch up?

Coastal areas can be mapped with satellites. In regions close enough to the coast but where the water is too deep for light to penetrate – between 30 and 500 meters (98 and 1,640 feet) – automated drone boats can sail up and down, mapping as they go along, before going back to harbor. For the deeper oceans, Vescovo has something else in mind.

> "THERE IS A GOOD REASON WHY WE HAVEN'T MAPPED THE SEAFLOOR: IT'S NOT WORTH THAT MUCH DIRECTLY, BUT I THINK IN TERMS OF A COMMON GOOD, IT IS."

"That's where the ship that I'm designing, and hopefully will build in the next two years, will come to the fore. With a crew of just one person, maybe two, it will effectively be a semi-autonomous ship that will go out for two to three weeks at a time and run large tracks with the most powerful mapping sonar you can put on a civilian vessel, the Kongsberg EM124. That is a sonar that can map thousands of square kilometers per day because that's what it's designed to do. And you have the depth to get a large swath of area," Vescovo explained to IFLScience.

Understanding the depths of the oceans can unlock better insights into the processes that govern our planet, but we are not yet a civilization that funds all science for science's sake. Until then, some parts of space might continue to have the advantage in terms of higher resolution.

"There is a good reason why we haven't mapped the seafloor: it's not worth that much directly, but I think in terms of a common good, it is. From helping with navigation for ships so they don't run into sea mounts or shoals that they don't know about, to mapping the tidal areas and the ocean current areas to help with climate modeling, all of those are common goods that are hard to get funded, but if we make it cheap enough, maybe we are able to make it approachable," Vescovo said.

In the coming decade, we will see improvements in both mapping the seafloor and rocky celestial bodies in the inner Solar System. Sure, space will maintain its edge in precision, but a win is a win, and hopefully, ocean mapping won't rest on its laurels after Seabed 2030 is completed.

There is certainly more to know about the ocean. Even if we consider the ocean floor alone, it's shocking how little we have directly observed. **New research** suggests 99.999 percent of the deep ocean (anything under 200 meters (656 feet)) has never been observed by humans. The researchers estimate that there has been visual coverage of between 2,130 and 3,823 square kilometers (822 to 1,476 square miles). The area is only slightly larger than Rhode Island or one-10th of Belgium, out of all the oceans!

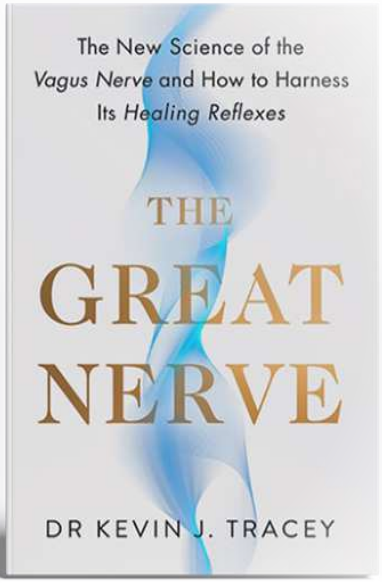
And it's not just about the bottom of the ocean. It's a three-dimensional environment with life and processes across so many depths; the significant efforts to study the seafloor are not the be-all and end-all, but a crucial step to more insights into an "alien" environment we can briefly visit.

The mysteries of the oceans and the peculiarities of rocky celestial bodies are not at all antithetical, as they have been treated in conversation. They are regions that feel limitless (and for the universe, that might be true), but they are limiting to us and our tech. The call to these expanses remains, and humanity will continue to explore, even if it might take a little time.



Image Credit: Nanzeeba Ibnat/iStock

THE GREAT NERVE



People seem to be talking about the **vagus nerve** a lot these days. So much so, in fact, that it can be hard to know what is and isn't true about this alleged wonder nerve. In *The Great Nerve*, Dr Kevin J Tracey, neurosurgeon and leader in the fields of inflammation and vagus nerve stimulation, explores the real science of the vagus nerve, and the emerging technologies that could revolutionize healthcare.

On November 15, 2011, I met the first patient treated with something I had invented. When he was still a young man, an autoimmune disease had sentenced him to disability and premature death. Rendered homebound by debilitating pain in his arms and legs, he could not work or even play with his young children. But in 2011, a neurosurgeon implanted him with a pacemaker-like device under his left collarbone. The surgeon tunneled under the skin to thread a wire up into his neck, connecting the pacemaker to his vagus nerve. The patient's pain, inflammation, and disability disappeared after he received his vagus nerve stimulator.

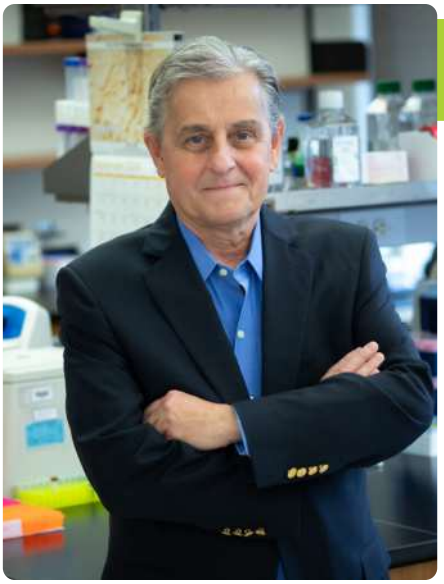
This new field of vagus nerve stimulation therapy to treat inflammation is now poised to revolutionize the way millions of other people are cared for. Its widespread use can help prevent inflammation that contributes to the mortality of 40 million people worldwide every year. Even when it is not fatal, inflammation impairs the health of millions more. Inflammation has replaced infection as the greatest threat to healthful human longevity. I wrote this book to give you the essential information you need about your vagus nerve, including how it regulates inflammation in your body and how you can help it do its job, from everyday healthy habits to the latest medical technology.

Here you will find a new way to think about your immune system. Traditionally, it was studied on its own as an independently functioning system that polices itself and does its own bidding to ward off threats from infection and injury. Scientists and physicians viewed the immune system outside the domain and control of the brain and nervous system, though the latter were understood to coordinate the functions of all your other organ systems. But a discovery in my lab revealed that the brain and immune system are inextricably linked through the vagus nerve. This was the critical insight that enabled my colleagues and me to invent the vagus nerve stimulating device that gave the first patient a second chance at a full life in 2011.

The vagus nerve has been studied for more than 2,000 years, intriguing scientists with its great reach, but it continues to hold many secrets, which hundreds of laboratories around the world are working to unravel. With each passing week, new information emerges, providing evidence that points to new ways of tapping into the vagus nerve's ability to regulate our vital systems and heal us. Our discoveries are guiding us to develop new therapies for inflammation, depression, anxiety, epilepsy, substance use disorders, headaches, cardiovascular and gastrointestinal diseases, Alzheimer's disease, Parkinson's disease, stroke, multiple sclerosis, and other conditions. There are thousands of scientific and medical publications addressing these topics, and my colleagues and I have written many peer-reviewed research papers and review articles ourselves. You'll find a sample of these cited in the endnotes for those who want to dive into detailed discussions of molecular mechanics. The purpose of this book is not to recap all this detail but to introduce you to your vagus nerve and give you enough information to begin tapping into its greatness yourself.

Often described today as a "superhighway" between the brain and the body, the vagus nerve turns out to be much more mysterious and beautiful than traffic. Like the strings, reeds, skins, and soundboards of an orchestra, the 200,000 or so nerve fibers of your vagus vibrate in tune with health. The vibrations are the music, and the song is life.

Image Credit: Penguin Life



Q&A WITH DR KEVIN J TRACEY

AUTHOR OF: *THE GREAT NERVE*

You've likely heard of the vagus nerve. Often referred to in the singular, you might imagine it like a big iron cord connecting point A to point B. In fact, it's a superhighway of 200,000 nerve fibers. It's perhaps unsurprising, then, that they have a lot of potential when it comes to managing the human body when it goes a little haywire, and one person trying to tap that previously untapped potential is Dr Kevin J Tracey in his new book *The Great Nerve*.

Why should everyone get to know their vagus nerve?

Because it carries the signals back and forth between your body and your brain that maintain a balanced function of all your organs, so you don't have to think about it. Signals traveling in the vagus nerve are operating at the level of reflexes. I call them healing reflexes, or healthy reflexes, and what they do is they are activated by changes in the function of your organs, whether it's your heart, or your kidneys, or your intestines. As they work, information about their function is traveling into the brain up the vagus nerve. All reflexes start with input, and so there's input from the body in the vagus nerve going up, and like an undersea fiber optic cable, there are 100,000 fibers on each side of your body.

You have two vagus nerves, like two thumbs and or two kidneys. So, you don't really have *a vagus nerve*. You have 200,000 vagus nerves, and each and every one of these fibers is carrying crucial information that keeps you healthy. It's so important, actually, that if you cut it on both sides, in the neck, it's fatal. You die. It's the only nerve in the body that, if you cut it on both sides, you die. That's why Galen, sort of the world's first scientist, called the vagus nerve "the great nerve", and that name stood for centuries. I think it's a better name, actually.

What do we know about how it can be used in medicine?

We've learned so far that we can treat many patients. Not all, it's not snake oil, but we can treat many patients with rheumatoid arthritis and have significant clinical effects. We can treat many patients with inflammatory bowel disease and have significant clinical effects. We can do this because we can put a device, a computer chip, and a small electrode safely into the neck of people on the left side, and this downregulates, or reduces, the amount of inflammation in the body. It doesn't cause immunosuppression.

So, the obvious next important question is, will it work in multiple sclerosis? Will it work in patients with diabetes caused by excessive inflammation? Will it work in patients with psoriatic arthritis, or lupus, and other autoimmune conditions? These are major important questions that we have reason to believe, either from laboratory experiments or even from early clinical studies, that it might actually be true. So, this is hugely important.

What do you hope people will take away from the book?

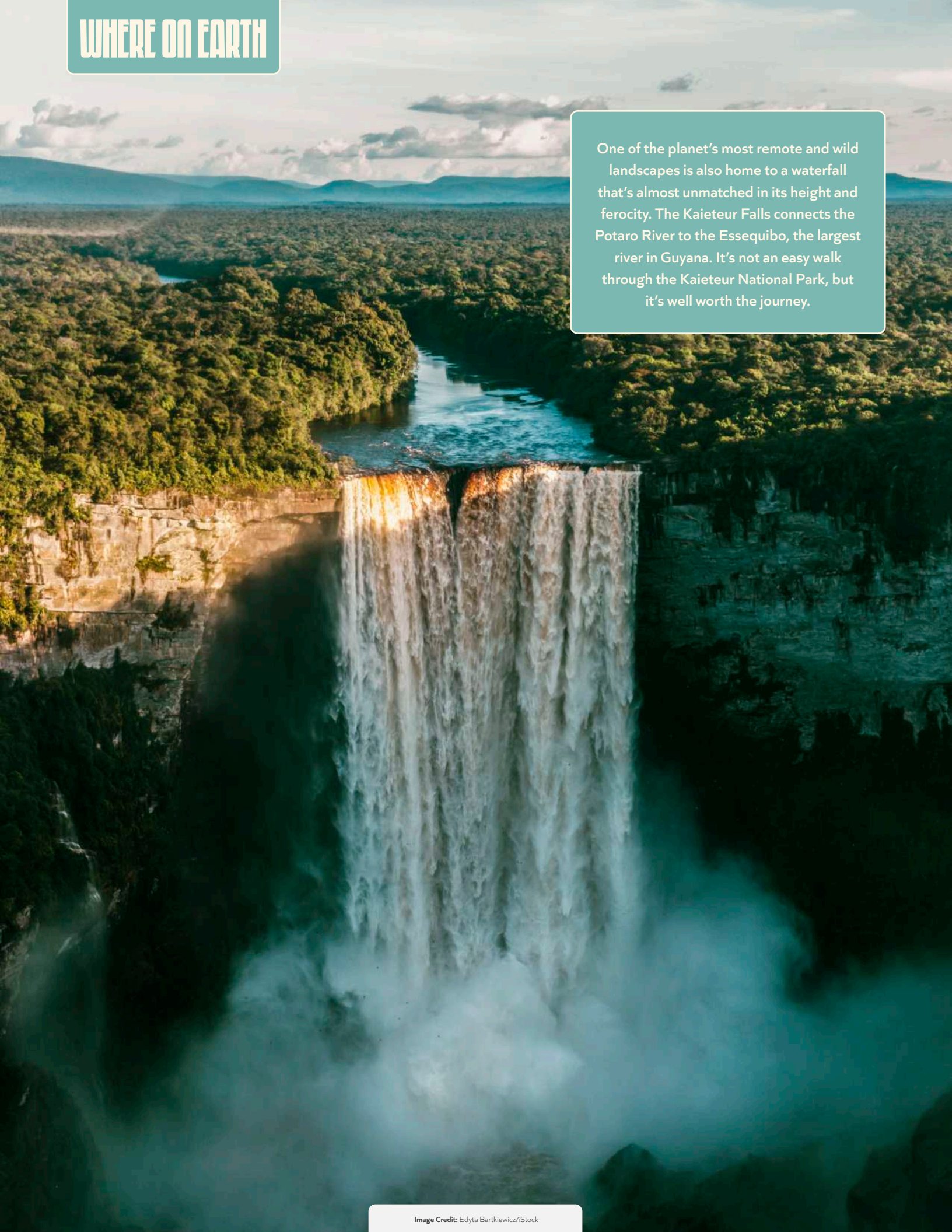
That the vagus nerve's control of inflammation is going to revolutionize how we treat inflammation in the next few years, and that this is going to change things forever for a lot of people. For instance, right now, we treat inflammation, but the trade-off is immunosuppression, and immunosuppression means patients become susceptible to serious infections and cancer. These powerful immunosuppressive drugs are dangerous drugs. Most of them, if not all, have black box warnings, which is the most serious label that a drug can have from the [Food and Drug Administration]. If patients could have relief from a computer chip that's implanted in their neck in a short operation, very safely, that does not cause immunosuppression, does not have a black box warning, doesn't have to be injected every two weeks, doesn't cost $100,000 every year in the United States, year after year, people are going to demand this.

It's a new idea, using electrodes to replace drugs. It's using a computer chip instead of swallowing a pill or injecting a needle. It's the doctor treating the patient through an interface, through a tablet that's talking to the chip. Everything's different. It's going to require people to behave differently, work differently, think differently, and act differently. That's why I wrote the book – to explain it all so the information would be there for the patients and the doctors.

The Great Nerve is published by Penguin Life and is available now.

Image Credit: Northwell Health

WHERE ON EARTH



One of the planet's most remote and wild landscapes is also home to a waterfall that's almost unmatched in its height and ferocity. The Kaieteur Falls connects the Potaro River to the Essequibo, the largest river in Guyana. It's not an easy walk through the Kaieteur National Park, but it's well worth the journey.

Image Credit: Edyta Bartkiewicz/iStock

A WATERFALL FOUR TIMES TALLER THAN NIAGARA



Go out trekking in the right part of Guyana's Kaieteur National Park and you'll find a waterfall so powerful it makes Niagara Falls look like a piddly water fountain. The park itself spans 627 square kilometers (242 square miles) of dense, wild rainforest, but at its heart roars Kaieteur Falls, where the Potaro River barrels off a towering cliff into the vast Essequibo River.

Kaieteur Falls is the highest waterfall in Guyana and ranks among the tallest and most powerful waterfalls on Earth. From where the Potaro tumbles off a sheer sandstone and conglomerate cliff, the water free-falls **226 meters** (741 feet) to the first break, then continues cascading down a series of drops, bringing the water's total journey to 251 meters (822 feet).

The amount of water actually falling from Kaieteur Falls varies dramatically with the seasons, swelling during the wet season and depleting throughout the drier months of the year. However, even in its more modest months of falling water, it's still a beast.

According to the **World Waterfall Database**, Kaieteur maintains an impressive average flow of somewhere around 651 cubic meters (23,000 cubic feet) per second. This combination of high river volume and extreme waterfall height is a rare one, making Kaieteur almost unique for its scale and ferocity.

You might be wondering, then, why it is that it's not as famous as miniature water features like Niagara Falls. The simple answer? It all comes down to its remote location.

"A 700+ foot [213+ meter] tall waterfall can generally be looked at as a fairly major feature in pretty much any country in the world," writes the World Waterfall Database. "When you situate a waterfall of that height on a river of the Potaro's size then it becomes elevated to a classification that very few waterfalls can achieve. Kaieteur Falls is indeed one of the planets most spectacular and most powerful waterfalls, it's really a shame that it isn't more easily accessible."

You *can* visit Kaieteur Falls, but chances are you're going to have to work for it. Small aircraft can take visitors to the Kaieteur Airstrip from Georgetown, but they have to be booked well in advance and require a minimum group size for travel. Otherwise, it's a three-day trip by road and river. A trek, certainly, but one with a finish line that promises to be well worth the effort, and who knows what you might spot along the way.

The Amazon is famous for its wildlife and along the journey, lucky travelers may glimpse giant river otters, paw prints of elusive jaguars, South America's largest butterfly, or the golden rocket frog, a gem of an amphibian found only here. Keep your eyes peeled for a flash of scarlet and you might even witness the lekking performance of the Guianan cock-of-the-rock, one of the region's most extraordinary birds.

Image Credit: Veronika Oliinyk/iStock, modified by IFLScience



LISTEN

THE BIG QUESTIONS

Podcast from IFLScience

The latest episode of *The Big Questions* asks, "How has the Internet changed the way we use language?" Language can evolve surprisingly quickly, and nothing has sped it up quite like the invention of the Internet. How does it affect how we communicate, not just on our devices but offline, IRL? Host Tom Hale discusses this and more with Internet linguist Dr Gretchen McCulloch, where they explore everything from the origins of Internet acronyms to the universal need for ironic punctuation marks. Also, this month we ask, "Will we ever have a universal flu vaccine?" and "What will the fossils of the future look like?". ***– Language is available now, universal flu vaccine is out Aug 14, future fossils is out Aug 28.***

PLAY

ABIOTIC FACTOR

Game from Deep Field Games

Get ready to kill 'em with science in this survival game that plunges you into the center of a condemned research facility. You've got a few problems to contend with: there's the military crusade, and then the minor issue of a paranormal containment failure. You'll have to use your best scientific mind to innovate solutions, or else. ***– Early access available now.***

READ

NATURE AND THE MIND

Book by Dr Marc G Berman

Psychologist Dr Marc Berman, founder of the field of environmental neuroscience, explores how nature enhances attention, brain development, and mental health. Expect practical tools to restore focus, boost resilience, and combat modern distraction. ***– Available August 14.***



WATCH

HURRICANE KATRINA: RACE AGAINST TIME

Documentary series from National Geographic

In 2005, Hurricane Katrina struck New Orleans. This powerful series uses archival footage and firsthand accounts to show how ignored warnings turned a natural disaster into a national tragedy. ***– Available now.***

SMELL

DO HUMANS HAVE PHEROMONES?

Podcast from IFLScience

This month's *We Have Questions* will have you sniffing the air in wonder, as Rachael Funnell dives into the curious science of pheromones with Dr Tristram Wyatt. ***– Available August 25.***

DISCOVER

FREE CREATIONS OF THE HUMAN MIND: THE WORLDS OF ALBERT EINSTEIN

Book by Diana Kormos Buchwald and Michael D Gordin

Many were surprised to see Einstein pop up in *Oppenheimer*, and there's plenty more about this scientist, humanist, and global citizen that gets left out of the conversation. Drawing from deep archival research, the book disentangles the man behind the tongue-out photo, revealing how Einstein's scientific genius intertwined with his political and ethical views during the turbulent events of the 20th century. ***– Available August 28.***

EXPLORE

THE STORY OF CO2 IS THE STORY OF EVERYTHING

Book by Peter Brannen

We often talk about carbon dioxide as a bad thing, but it's been around long before we came into the picture. How has this maligned gas shaped Earth's climate, life, and human history? Brannen reveals CO_2 as both life-giver and potential destroyer, urging us to understand its deep influence, and grasp the stakes of today's climate crisis. ***– Available August 26.***

Image Credit Top Right: M. Nergiz/Shutterstock, modified by IFLScience

DATES TO REMEMBER

AUGUST
NATIONAL IMMUNIZATION AWARENESS MONTH

In the US, National Immunization Awareness Month is an annual observance held in August to highlight the importance of vaccination for people of all ages.



1
WORLD WIDE WEB DAY

9
INTERNATIONAL DAY OF THE WORLD'S INDIGENOUS PEOPLES

Despite their invaluable impact, Indigenous peoples are among the most vulnerable groups on the planet, hence August 9 is designated to raise awareness for their protection.

AUGUST
CURIOUS TURNS 3!

August marks three whole years of your favorite science e-magazine (we can't believe it either). To mark the occasion, why not treat yourself to a look back at some of our iconic **previous issues**?





9
FULL STURGEON MOON



30
FRANKENSTEIN DAY

August 30 would have been Mary Shelley's birthday and is now an annual (unofficial) celebration of her beloved 1818 novel *Frankenstein*; or, *The Modern Prometheus*.

12
PERSEIDS PEAK

The "best meteor shower of the year" will be active until August 24, peaking on Aug 12. Expect to see up to 150 bright, fast space rocks per hour.

2025
AUGUST

Get ready to marvel at vaccines, the internet, and the "best meteor shower of the year" this August. There's also a plethora of podcasts coming your way and, of course, Happy Birthday, CURIOUS!

25
NEW *WE HAVE QUESTIONS* PODCAST EPISODE!

Keep your eyes (and noses) peeled for this month's ***We Have Questions***: Do humans have pheromones?

20
WORLD MOSQUITO DAY

19
WORLD HUMANITARIAN DAY



14 & 28
NEW *THE BIG QUESTIONS* PODCAST EPISODES!

Will we ever have a universal flu vaccine? What will the fossils of the future look like? Join hosts Laura Simmons and Dr Russell Moul as they explore these respective questions in August's instalments of ***The Big Questions***.

Image Credit Top Left: Just_Super/iStock, **Top Middle:** gcafotografia/Shutterstock, **Top Right:** Big_Ryan/iStock, **Middle Right:** Tom Meaker/Shutterstock, modified by IFLScience, **Bottom Middle:** Chayanan/iStock

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 reason why Texas is opening a "fly factory". If you like your science lighter, discover how we aren't the only great apes that love a power nap.





EXPLORE YOUR SIDE ON FACEBOOK

FLY FACTORY

Don't be surprised if you start to hear a faint buzzing sound near the Texas-Mexico border in the next few years. No, it has not become the latest victim of "**The Hum**" – it's where the US is opening a brand-new "fly factory", as many have dubbed it.

Sadly, this isn't a factory run by flies. Sure, they'd probably be quick workers, what with being able to quickly zip about the place, but we're not entirely sure we could trust them to keep their feet clean, or to actually find their way out of a fully open window at the end of their shift.

What we're talking about is a dispersal facility set to begin work later this year, one that will be the temporary home of millions of sterile male New World screwworm (NWS) flies before they're taken up in planes and dropped across Northern Mexico.

Imagine them as soldiers being dropped into a battle zone, because these flies are being sent to fight a serious threat – their wild counterparts. The maggots of NWS flies burrow their way into living animal flesh, doing so in a way that's reminiscent of a screw being driven into wood (hence the name).

Rarely, they can chomp their way into human flesh, but the biggest concern here is their effect on wild animals and livestock. An infestation with NWS maggots can cause serious damage to an animal, and that damage is often deadly. If NWS flies spread uncontrollably, the potential impact could be devastating.

There is, however, proof that this pest can be fought. Sterile dispersal programs previously led to the eradication of NWS flies in the US back in the 1960s; sterile male flies mate with wild females, but no offspring are produced from this union, which gradually decreases the population.

Now, however, they're getting dangerously close to coming back. Though Mexico also got rid of the flies in the 1970s, they returned, and there are now concerns they could make their way northward, having been spotted just 1,127 kilometers (700 miles) from the US border back in May.

It's hoped that the new "fly factory" – which might actually become a kind of factory in the future, with plans to add a breeding facility producing an extra 300 million flies a week – will help to stop that from happening.

We salute you, weird little soldiers.

ORANGUTAN POWER NAPS

As if orangutans weren't already a vibe (healing their **own wounds** with medicinal plants is pretty damn cool), we've now got even more reason to relate to them, after a recent **study** found that, much like us at 3 pm on a workday, our favorite red-headed tree-dwellers also love a cheeky power nap.

Researchers made this discovery during a first-of-its-kind study in the Indonesian rainforest, setting out to uncover more about the sleep patterns of wild adult orangutans. In particular, they wanted to find out how the great apes tackle the challenges of not getting enough sleep at night, and how social and ecological pressures can factor into that – something that has never been studied before.

Using observation data collected from the Suaq Balimbing Monitoring Station in Sumatra between 2007 and 2021, totaling 455 days and 276 nights, the team was able to map out the sleeping patterns of 53 adult orangutans.

They identified multiple factors that appeared to be associated with a shorter night of sleep, one of them being sleeping near other orangutans (again, relatable to those humans who have to sleep next to a chronic snorer).

"Imagine you stay up late hanging out with your friends, or your roommate is snoring so loudly in the morning that you get up early. I think it's a bit like that," explained first author Alison Ashbury in a **statement**. "They're prioritizing being social over sleeping, or their sleep is being disrupted by others nearby, or even both."

Power napping appears to be the solution to this shorter nighttime sleep duration – according to the researchers, sleeping less at night was associated with longer naps the following day, and if the apes could only manage short naps, then they also had those naps more frequently.

It could be these power naps help the orangutans to get through the day and function normally, whilst also accounting for the demands of their relatively solitary, but still social life.

"For people, even a short nap can have significant restorative effects," said co-author Meg Crofoot. "It's possible that these naps are helping orangutans reset physiologically and cognitively after a poor night's sleep, just like they do in humans."

Well, if it's good enough for orangutans, it's good enough for us.