

CURIOS?



CAN TRANSPLANTS CHANGE
YOUR PERSONALITY?

IS ROBOTIC SURGERY
THE FUTURE?

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CAN WE REALLY
TRUST OUR
MEMORIES?

16

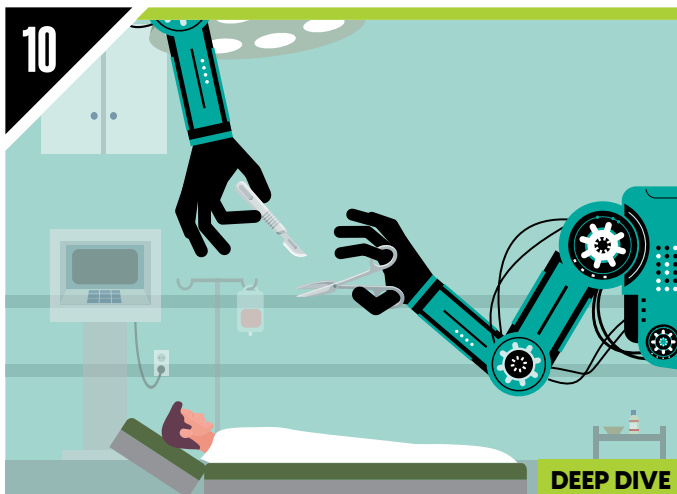


WHERE ON EARTH

THE "FLOATING" MOUNTAINS OF ZHANGJIAJIE

Curious pillars of rock meet fluffy white clouds at this geological phenomenon that inspired a blockbuster movie.

10



DEEP DIVE

IS ROBOTIC SURGERY THE FUTURE?

The technology isn't new, but where is it headed?
Laura Simmons investigates.

4



OUR COVER STORY

CAN WE REALLY TRUST OUR MEMORIES?

Dr Katie Spalding asks: Are our brains lying to us?

March 2025

CONTENTS

News Bites | page 2

What's new, what's weird, what's happening?

What On Earth | page 7

Mushroom Skirts

We Have Questions | page 8

Can Transplants Change Your Personality?

Book Bites | page 14

Losing Your "Mind's Eye"

Meet The Author | page 15

Adam Zeman on *The Shape Of Things Unseen*

Science In Media | page 18

What to watch, read, and listen to this month

Dates To Remember | page 19

What to look out for this month

Dark Vs. Light | page 20

How will you end the issue?

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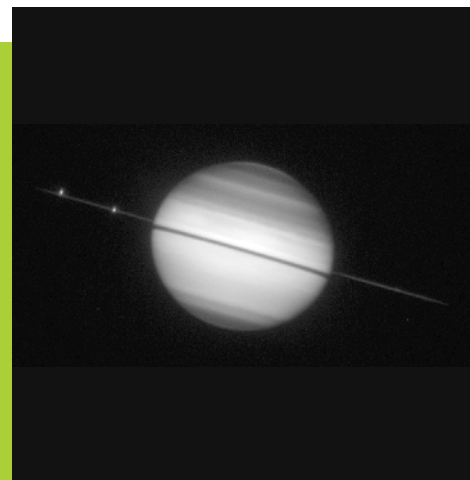
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NEWS BITES



Celebrate Women And Our Place In The Universe

March is Women's History Month in the US, with International Women's Day on March 8. 2025 is also the 100th anniversary of Edwin Hubble proving that the universe extended beyond our galaxy, the Milky Way. He couldn't have done that without astronomer Henrietta Swan Leavitt, so we're combining all three notable dates to share this video with you. Leavitt's work on Cepheid variables – stars that brighten and dim periodically – demonstrated how calculating their luminosity could be used to measure vast distances in space. This gave astronomers the first "standard candle" with which to measure the distance of other galaxies, which in 1925, using Leavitt's Law, Hubble did. He proved that a tiny speck of light in the Andromeda Nebula had to be a Cepheid variable, revealing Andromeda to be so large and far away as to be another galaxy, providing the first compelling evidence that the universe had galaxies – plural. Sadly, Leavitt's nomination for the Nobel Prize in physics was halted due to her death in 1921, but as legacies go, helping us grasp the vastness of the universe and our place in it can't really be beaten.



Saturn's Rings Disappear

From March, Saturn's rings will briefly "disappear" for a few months due to the planet's alignment with Earth. As Saturn completes its 29-year orbit, it leans at an angle of 26.7 degrees from us. However, when Earth passes through Saturn's "ring plane" – which happens around every 15 years – its rings will appear edge-on. From that angle, and because they are so thin, they reflect very little light, so they will practically vanish. Over the next few months, they'll gradually come back until disappearing again in November 2025. This will allow scientists some unique observations of the gas giant; moons Titan, Enceladus, and Mimas were all discovered during ring plane crossings.



X Marks The Spot

Watch an X appear on the Moon thanks to the clair-obscure effect, where light and shadow create the illusion of a shape. On March 6 at around 11 pm UTC, the sunlight hitting the rims of the Blanchinus, La Caille, and Purbach craters will create an X – known as the Lunar X – on the Moon's surface. The Lunar X is only visible for a few short hours during the first quarter of a Moon, when the light hits the craters at a specific angle near the lunar terminator – the line that separates the light and dark sides of the Moon.

The Overview

If you've been thinking there's just not enough epic space-themed prog music around, then luckily for you, multi-Grammy-nominated musician Steven Wilson is releasing his latest album, *The Overview*, on March 14. Inspired by the "overview effect" – a phenomenon experienced by those who have witnessed Earth from space; a powerful sensation of awe causing a cognitive shift in their mental perspective – the album, according to Wilson, explores the theme of perspective. If this floats your boat, Wilson will be touring Europe from May to June 2025. Find out more [here](#).



Earth Hour

Earth Hour this year is on March 22, from 8:30 pm to 9:30 pm your local time. Since its beginning, Earth Hour has been known for its lights-off initiative, where people around the globe turn their lights off for one hour in symbolic support for the planet and raising awareness for the environmental issues affecting it. This year, the World Wildlife Fund is aiming for the "Biggest Hour for Earth", encouraging people to give an hour doing anything positive for our planet. Whether it be stargazing, litter-picking, building a birdbox, or contacting your government representative, share it to inspire others with #MyHourForEarth.



The Americas

A new nature documentary series, *The Americas*, narrated by Tom Hanks, is out now in the US and soon to follow in the UK. The 10-part series is an epic exploration of the wonders – and fragilities – of the supercontinent's natural world. It took five years to make, with 180 expeditions to film the spectacular landscape and secrets of its inhabitants. This is the only landmass on Earth to stretch to both poles, with a landscape that takes in tropical rainforests, snow-capped mountains, lakes, swamps, the deep sea, deserts, and more, capturing plenty of world firsts along the way: new species, new behaviors, and some of nature's strangest stories. With vulnerable ecosystems under threat across the Americas, hopefully, this will galvanize people to protect these precious treasures and won't end up a reminder of what once was.

WHAT'S UP?



Blood Moon

Sorry October, March is now the spookiest month

Name: Total Lunar Eclipse/
Blood Moon

Appearance: The usual circle of
cheese, but more Red Leicester-y

Location: The night sky (the
Moon)/the Americas (you)

What's a total lunar eclipse?

It's an astronomical event where the Sun, Earth, and a full Moon are aligned so that the entire Moon is cast in the Earth's shadow.

When and where is the next one?

You're in luck – well, if you live in the Americas. While anywhere where the Moon is above the horizon at the time will get a look, it's there that the next total lunar eclipse will be best visible on March 14, with totality beginning at approximately 7:26 am UTC and ending at around 8:31 am UTC.

What's the best way to watch the one happening this month?

The good news is that, unlike last year's total solar eclipse, you don't need any special glasses – there's no risk of a lunar eclipse damaging your eyes. The

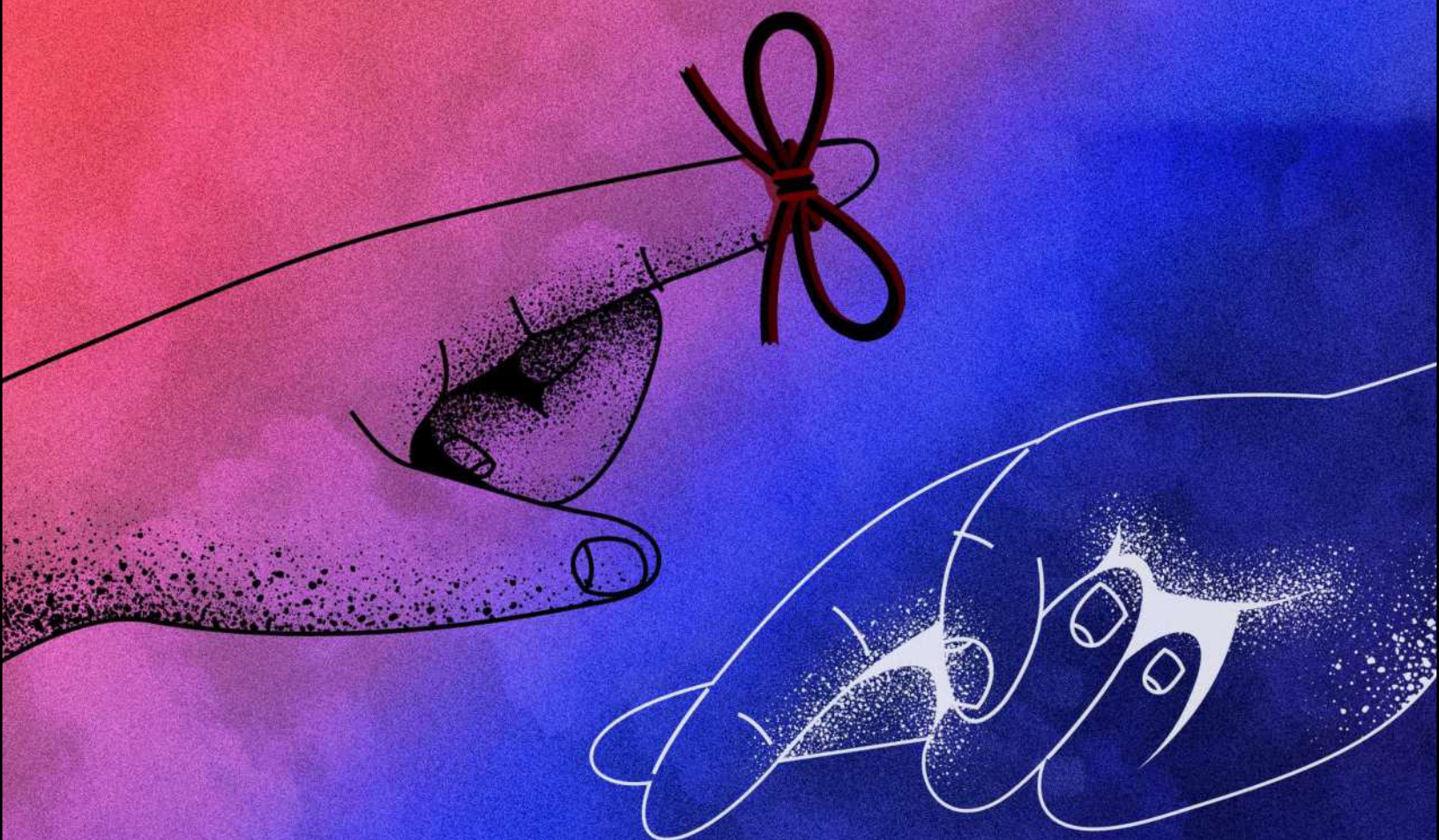
bad news is that you might not actually be able to keep your eyes open given the time that it's happening.

But, with a hefty dose of caffeine and determination, you might just be able to head outside to somewhere with a clear view of the sky and as little light pollution as possible. The eclipse will be visible to the naked eye, but a pair of binoculars will do the trick if you want to get a closer look, or even a telescope if you want to get the most detailed possible pictures for the 'gram.

Why do some people call it a "blood moon"?

Why not? It's arguably a lot more badass than the actual astronomical term, even if it's not exactly scientifically accurate. But seriously, it's because the light that has passed through the Earth's atmosphere and illuminated the Moon can turn it a dark coppery red as the eclipse is happening – and well, humans have a flair for the dramatic when it comes to describing colors. Just look at paint names.

OUR COVER STORY



CAN WE REALLY TRUST OUR MEMORIES?

Are our brains lying to us – and so what if they are?

By Dr Katie Spalding

Image Credit: Modified from iStock/Gokcemim, iStock/VectorFun, iStock/Vitaly_Art, iStock/STILLFX

Helen Wilson, of Beatrice, Nebraska, was a model grandmother. She played bingo; she volunteered at the local Methodist church. And in 1985, she was brutally attacked in her own home, suffocated, and killed.

Six people were eventually arrested for the murder, and all sentenced to lengthy prison time. It wasn't a complex trial, in the end: all but one of the accused openly confessed to the murder, with three providing strikingly detailed descriptions of what went on.

There was just one problem: **all six of the accused were innocent.** They had nothing to do with it. And a full 20 years after they were sentenced, DNA evidence proved it.

So why did they confess? And why, even some 40 years later, do they still feel guilty about a murder they didn't commit?

The invention of memory

Since time immemorial, humans have liked to compare our memories to whatever the most cutting-edge technology of the day has been. For Plato and Aristotle, memory was "a block of wax" that events and information leave impressions in; for early psychologist Tom Hatherley Pear, writing in the 1920s, "the function of memory [can] be compared with that of the gramophone."

Today, we often think of it as a sort of internal video recording – like a constantly-updating CCTV reel we store in our heads at all times. But that's a fundamental misunderstanding of how memories are created and stored, explained Elizabeth Loftus, a distinguished professor at the University of California Irvine and longtime researcher on human memory, in 2019.

"Once you have an experience and you record it in memory, it doesn't just stick there in some pristine form [...] waiting to be played back like a recording device," Loftus told the American Psychological Association's **Speaking of Psychology** podcast. "But rather,

new information, new ideas, new thoughts, suggestive information, misinformation can enter people's conscious awareness and cause a contamination, a distortion, an alteration in memory."

"THE FUNCTION OF MEMORY IS NOT TYPICALLY TO REFLECT TRUTH, BUT TO ENHANCE RELATIONSHIPS."

Far from being a static representation of true events as we experienced them, our memories are constantly updating – changing based not only on others' input, but our own retellings. Who we're talking to; when and where we're recalling the event; even how we feel that day – all of it can influence which details we remember, and how we integrate them into the wider story.

"We tune our memories to our audience," explains **Deryn Strange**, a professor in John Jay College of Criminal Justice's Department of Psychology. We "emphasize different bits to different people and the more we do that the more the underlying memory changes too."

"The function of memory is not typically to reflect truth," Strange tells IFLScience, "but to enhance relationships."

Remembering what never happened

A memory getting warped and frayed over the years is one thing – but surely, most of us know the difference between fact and fiction, especially when we experienced it directly.

In fact – well, you'd be surprised.

"When someone tells me they are sure they remember exactly the way something happened, I just laugh," said Donna Bridge, then a postdoctoral fellow at Northwestern University Feinberg School of Medicine, in 2012.

"Your memory of an event can grow less precise even to the point of being totally false with each retrieval," she explained. And, in her

research, "every single person has shown this effect. It's really huge."

Much of the time, these false memories are fairly harmless. Consider, for example, the so-called "Mandela effect", where large groups of people misremember some fact or event in the same way. It's a phenomenon named for a prime example of itself: popularized by self-described "paranormal researcher" Fiona Broome in 2009, the first famous example was of people convinced they'd heard news of anti-apartheid activist Nelson Mandela's death in prison some time in the 1980s (in reality, the man was eventually freed and went on to become President of South Africa in 1994).

"That's a real social phenomenon," Strange tells IFLScience. "Hearing the same thing over and over again makes it feel true, you imagine it and it starts to seem real and true enough."

"YOU HAVE TO BE A VERY STRONG-WILLED, CONFIDENT PERSON TO CONTINUE TO SAY SOMETHING WAS RED WHEN EVERYONE AROUND YOU IS CONFIDENTLY STATING IT WAS GREEN."

Implanting a lie

We're already a little closer, then, to seeing how somebody could be convinced they "remember" a murder they didn't commit. It comes, as so much does, back to our hyper-social nature: "You have to be a very strong-willed, confident person to continue to say something was red when everyone around you is confidently stating it was green," Strange points out.

That said, there's "a lot we don't know" about how false memories work, she tells IFLScience. **Studies** have linked their creation to certain personality types and circumstances – "essentially, the more vulnerable a person is, the more susceptible they are to suggestion and thus false memories," Strange explains – as well

as our brains' tendency to forget details quickly and broad strokes slowly.

But "the mechanism [...] that best explains these memory errors is called a source monitoring error," Strange says. "Put simply, we don't store memories with tags or labels specifying where the knowledge of each individual piece of that memory came from. As a result, information from a particular event is combined with information we learn later, and we cannot tell the difference.

"Since we tend to rely on heuristics – such as how familiar an event feels or how easily it comes to mind, factors that can easily be manipulated via repeated imagining or discussion – to determine whether an event really occurred, we frequently make mistakes," she tells IFLScience. "It's really just the price we pay for an otherwise efficient system."

In other words, we're kind of predisposed to create these fictions for ourselves. And if you know what you're doing – or, perhaps, if you really don't – you can end up creating them for someone else, too.

"I wouldn't say it's easy to create a whole memory," Strange says. But, she adds, "it is much easier than people think."

Do you trust yourself?

So, should we all be doubting every memory we have? Do we even know our own life stories, at this point?

The answer is... complicated. "Entirely false memories are not common," Strange tells IFLScience, "but nor are entirely true memories." Rather, she explains, "our memories adapt with us and most exist in the zone in-between, a little true a little false."

"Research suggests that in a group of 100 people, 33 would develop a false memory," she explains. "So it's not the majority – but a third is still significant!"

The thing is, while a skewing of a detail here and there seems to be entirely normal, inventing a memory whole-cloth is something very different.

"To create a whole memory takes effort," Strange says. "Trying to remember; knitting different details together, imagining how it would have looked and felt. It happens, but it needs some effort to flesh out the memory and have it match the level of detail we have for other memories from the same time period."

"Just thinking about it repeatedly can be enough effort," she adds – and when it comes to the judicial system, at least, that can be a big problem. Investigations into the "Beatrice Six", as they became known, found that most of the accused were vulnerable people, whom the police and a trusted psychologist had fed grisly details of the crime before directing them to ruminate and imagine how it happened. As a result, all "believed to varying degrees that they had blood on their hands," Nebraska psychiatrist Eli Chesen, who evaluated the defendants after their release, told **The New Yorker** in 2017. "Their new beliefs superseded their previous life experiences, like paper covering a rock."

The upside?

What this all adds up to is, to use the scientific term, a bona fide mindfuck. But it's not all bad news: some researchers have found that false memories can be used to change bad habits for good ones – "you can plant a false memory that you got sick eating a particular food," Loftus said, "and you don't want to eat as much of that food. We've planted false memories that you got sick drinking a vodka drink and you're not as interested in the vodka drink."

But like the "Luke, I am your father," that never was, perhaps the biggest advantage to false memories is smaller. Perhaps it's simply the permission they give us to forgive our past selves.

"In reality, I would not want to have all my memories be entirely accurate," Strange told IFLScience. "I like being able to adjust the way I see things based on experience."

"If I couldn't do that I'd still be crippled by the stupid things I said and did as a teenager!" ●





Image Credit: Pradit.Ph/Shutterstock.com

MUSHROOM SKIRTS

Congratulations! You have just been curtsied to by a mushroom. This “veiled lady” is the long-net stinkhorn, *Phallus indusiatus*. Also known as bamboo mushrooms, they’re certainly head-turners, first described by French botanist Étienne Pierre Ventenat in 1798. Mushrooms are the fruiting body of a fungus, while their **mycelium networks spread underground** – but bamboo mushrooms are particularly eye-catching for their characteristic lacy skirts. They hang from the bell-shaped caps, just skirting the forest floor, and have had a lasting influence on fashion – just ask the attendees at Colorado’s **Telluride Mushroom Festival**.

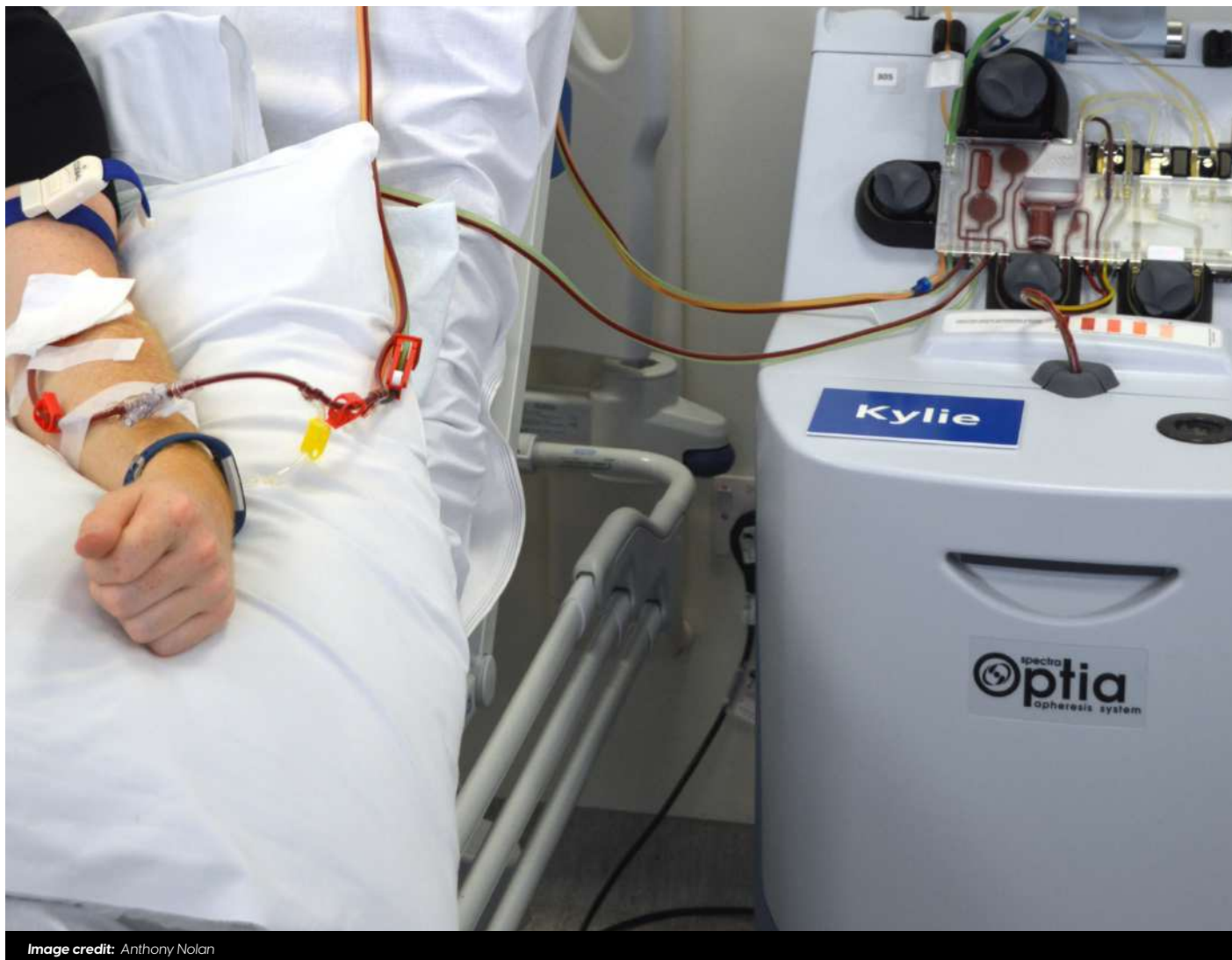


Image credit: Anthony Nolan

CAN TRANSPLANTS CHANGE YOUR PERSONALITY?

*FROM LOVING GHERKINS TO SWITCHING FROM WHITE TO RED WINE,
BONE MARROW TRANSPLANTS HAVE SEEMINGLY ALTERED PEOPLE IN
STRANGE AND MYSTERIOUS WAYS.*

By Rachael Funnell

There's a strange phenomenon reported among some recipients of organ transplants whereby people report altered memories, tastes, and personality changes. A particularly **curious example** included a woman who, having never much liked chicken nuggets, found herself compelled to eat them after receiving an organ from a man who had nuggets on his person when he died.

Similarly perplexing changes in taste have also been reported among the recipients of **bone marrow transplants**, something the UK-based stem cell charity **Anthony Nolan** knows a thing or two about. We spoke to their senior medical officer **Dr Tania Dexter** to find out more about what these transplants entail and how they may have changed people, including a remarkable tale of someone who went from hating gherkins to loving them after a bone marrow transplant.

What is a bone marrow transplant?

TD: A bone marrow transplant, or a stem cell transplant, is essentially trying to replace the blood- and immune-system-creating organ of the body with someone else's. So, stem cells

are like the baby blood cells. They grow in the bone marrow, and they can grow into all of the cells that you need within your blood and within your immune system.

If you have a problem with the bone marrow, either a cancer or an immune-related problem, then it may be that you need to have the immune system of somebody else. For that, we collect the stem cells from one person and they get infused into another.

How are they done?

TD: I think people still think you need to have an operation to donate your stem cells, but that's not the case. It's a much simpler procedure than that most of the time, as we can take the stem cells from your blood.

Do recipients experience any changes after transplant?

TD: Allergy changes are very commonly reported, and we can explain it quite easily because the entire immune system has changed, and it's the immune system that's overactive in allergies. Some people report that allergies they had before have completely resolved, but also many people report new allergies. This is why we always make sure we tell the transplant centre about the allergies of the donor, so that they're aware that these things may develop.

"WE HAVE ONE PATIENT WHO MENTIONED THAT THEY'VE DEVELOPED A LIKING OF COUNTRY MUSIC SINCE THEIR TRANSPLANT."

What interests me is that all of those patients, even if they develop quite severe allergies, will say it's actually quite [a] small price to pay for the treatment of the disease that they initially had.

Do recipients experience any personality changes?

TD: We recently reached out on social media to some of our patients about this, and I was quite interested in a number of stories.

One patient said that she suddenly started to order red wine instead of white wine in the pub, and her sister, who was her donor, was also a red wine drinker and not a white wine drinker. There was also someone who also reported that they used to hate spicy food, and now they really like spicy food.

We have one patient who mentioned that they've developed a liking of country music since their transplant. We don't know about the donor in that case, because obviously unrelated donors can't always meet, so it can be more difficult to find those things.

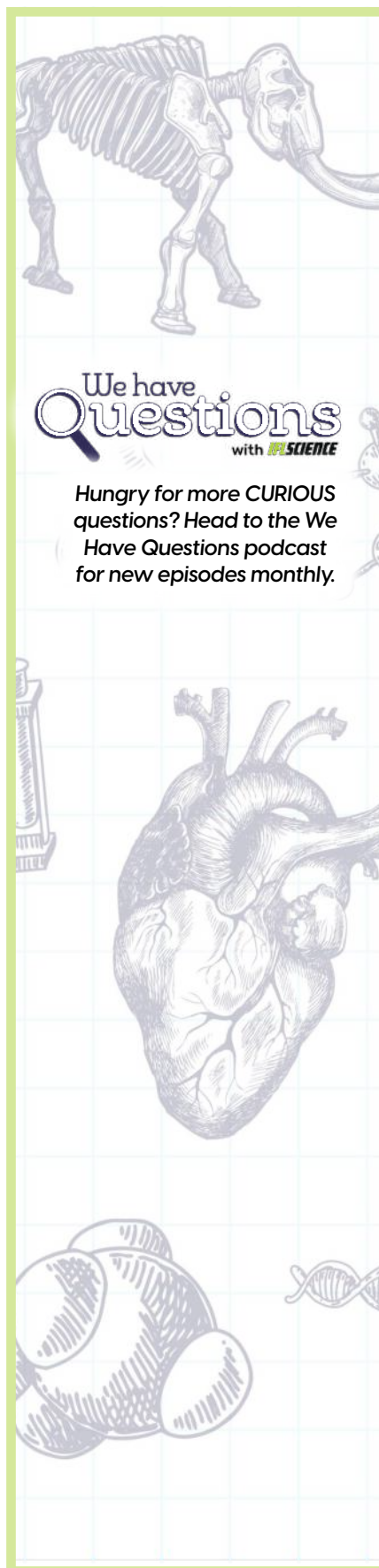
Another patient mentioned that he now has a bit of a liking for gherkins, which is something that his brother [who was his donor] was a fan of before. There's a lot of these kinds of anecdotal stories that people will tell, and they're more difficult to explain as a result of the change in immune system.

Why do these changes in tastes happen?

TD: Perhaps there is such a significant impact on the lining of the mouth and of the gut caused by inflammation that food tastes change. That's certainly easy to explain. It's slightly harder to explain why those changes in taste reflect those of the donor, but the immune system is a complicated thing.

How can someone join the register to donate?

TD: There's a **short form** to fill out, just to make sure you don't have any health conditions that could be negatively impacted by a donation. We'll send you a little swab, which is just like a cheek swab that you send back to us, and then that's it. You're on the register, and then it's a waiting game, really, to see if you'll be a match for anybody that needs a transplant in the future. ●

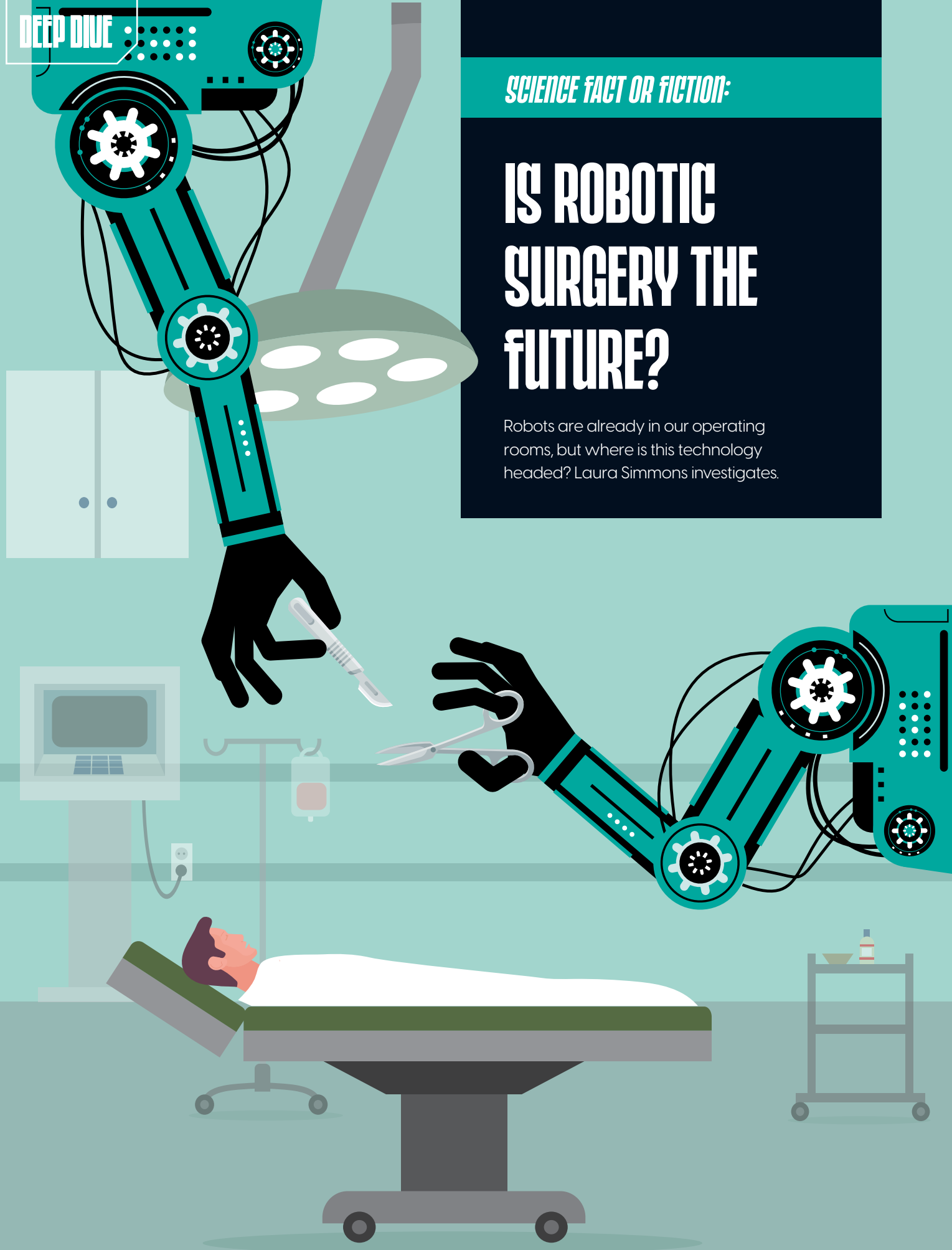


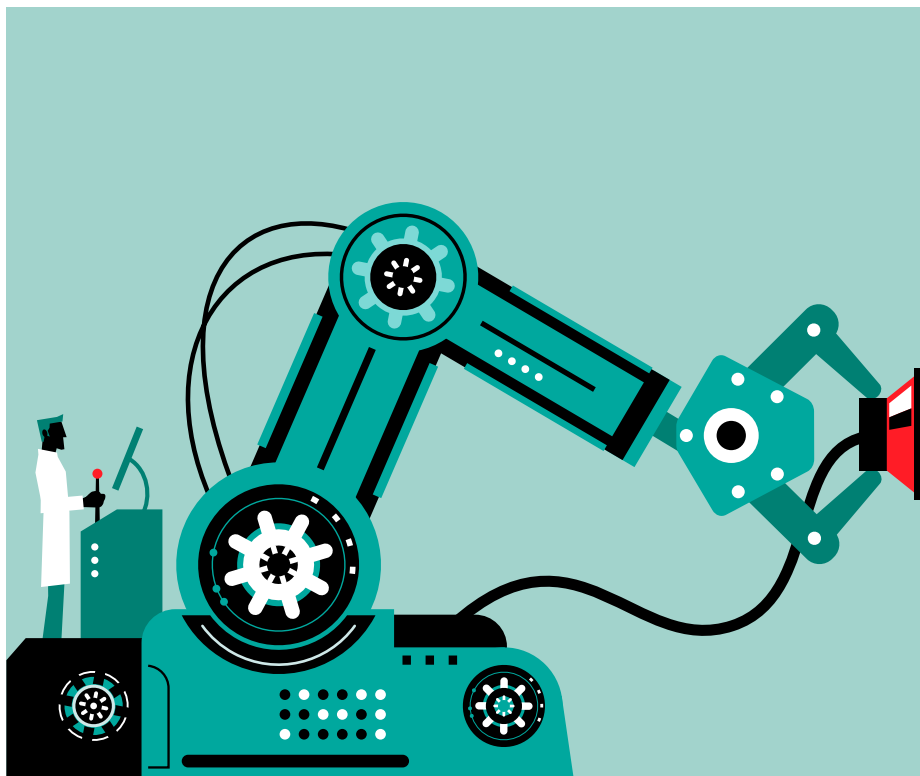
DEEP DIVE

SCIENCE FACT OR FICTION:

IS ROBOTIC SURGERY THE FUTURE?

Robots are already in our operating rooms, but where is this technology headed? Laura Simmons investigates.





Why bring robots into the OR?

Speaking at a recent **news conference**, Professor Russell Taylor of Johns Hopkins University – who was involved in the 1992 ROBODOC™ study and has been at the forefront of robotic surgery development – explained that the key has been leveraging the complementary capabilities of the human surgeon and the robot. Put simply, we can do things robots can't, and they can do things that we can't.

Robotic systems like the widely adopted **da Vinci** capture all the benefits of laparoscopic surgery, but a robot could also be protected against conditions that would be risky for a human surgeon, such as high levels of ionizing radiation. Robotic instruments can perform high-precision movements within a space where a human hand just wouldn't fit. Camera technology, too, has come on leaps and bounds, so surgeons are getting a clearer view than ever before.

Where the machines fall short is in their ability to use judgment and to improvise, things humans are great at. Sometimes when you open a patient up, you **find things** you weren't expecting!

Robot-assisted surgery is therefore a partnership between human and machine. We can be guilty of oversimplifying things and forgetting this important context – while today's robots might be very impressive at taking over parts of an operation, it still takes a whole lot of human input to pull off surgery successfully.

How robots are changing surgery

Let's consider suturing, a skill most surgeons use on a daily basis. A **2022 study** compared a cutting-edge robot to expert human surgeons in the context of intestinal surgery. The robot placed sutures at a more consistent distance and closer to the 3-millimeter target than the humans did.

A quick search of the literature finds no shortage of studies claiming to show positive outcomes for patients undergoing robot-assisted procedures.

A paper published in **January 2025** found

We might not yet have friendly house robots to do our chores (still waiting for that flying car too), but one place you are increasingly likely to find a robot is inside an operating room (OR). Recent figures from the **Royal College of Surgeons of England** show that over 1.8 million surgical procedures in 2022 had robotic assistance, and that number is rising all the time. There are lots of advantages to be gained by bringing the machines into the OR, but is robotic surgery really the future?

How we got here

There was a time when pretty much all surgical procedures were "open". Surgeons would make large incisions so they could get their hands, and eyes, directly on the organs.

Over time, laparoscopies arrived. Otherwise known as keyhole surgery, these procedures use small incisions to insert a camera and other instruments. Smaller incisions mean less risk of infection and quicker healing.

Robot-assisted operations are the next stage in this evolution, but it might surprise you to learn that the first such procedures took place over 30 years ago. In a **1992 study**, researchers from Integrated Systems, Inc.

described how their ROBODOC™ system could be used in hip replacement operations, having successfully trialed it in dogs and humans.

***WHERE THE MACHINES FALL SHORT IS
IN THEIR ABILITY TO USE JUDGMENT
AND IMPROVISE. SOMETIMES WHEN
YOU OPEN A PATIENT UP, YOU FIND
THINGS YOU WEREN'T EXPECTING!***

Since then, robotic assistance in surgery has become increasingly normalized. Certain procedures lend themselves particularly well – in the UK today, **almost 90 percent** of prostatectomies (surgery to remove the prostate) use robots.

Most health systems now use a mixture of open, laparoscopic, and robot-assisted procedures, depending on individual surgeons' expertise and experience and the practical considerations of each operation.

improved outcomes in 500 cases of **gender-affirming** vaginoplasty operations carried out with robot assistance, compared to an earlier version of this procedure.

IN 2024, WE SAW THE FIRST-EVER OPERATION OF A SURGICAL ROBOT ON THE ISS WITH THE CONTROLLER STANDING ON THE SURFACE OF THE EARTH.

A **2024 review** concluded that robotic assistance holds promise for surgery to remove tumors of the **thymus gland**, although the authors did note that open surgery would still be useful in certain cases.

Another **recent study** looked at robotic vs. open living donor hepatectomy – removing

part of the liver of a living person so that it can be used for a **transplant**. It's early days, but it concluded that robot-assisted versions of this operation can be performed safely, even in centers with no prior experience with the procedure as long as there's detailed planning.

Surgery in space?

Another key advantage of robot-assisted surgery is in broadening access to different procedures via telesurgery.

Many surgical robots work via what's called "hand-over-hand" control; a human surgeon operates controls, and surgical instruments mimic their movements. However, some are also remote-operated, and recently, people have been pushing the boundaries of exactly how "remote" that can be.

In 2024, we saw the first-ever operation of a surgical robot on the **International Space Station** with the controller standing

on the surface of the Earth, far below. That same year, a pig in Hong Kong underwent an endoscopy while the person controlling the instrument was **over 9,000 kilometers** (nearly 6,000 miles) away in Switzerland.

Sounds great – are there any downsides?

If the very thought of a robot operating on you makes you uneasy, that's fair.

"At the moment, we might feel like this technology is not mature yet," **Dr Mathias Unberath**, John C. Malone Associate Professor in the Department of Computer Science at Johns Hopkins University, told IFLScience. "And the reason why that is, is because it's true, right?"

Unberath's **Advanced Robotics and Computationally Augmented Environments (ARCADE) Lab** "pioneer human-centered solutions" that leverage cutting-edge technology to improve access to healthcare.



THE FUTURE OF
IFLSCIENCE

He told us about the difficulties in training robots to help out with more complex surgeries, especially soft tissue procedures.

But in the cases where robots are being used effectively, what we're seeing according to Unberath is patients embracing the technology, not shying away from it: "This is just a transformation that we're already seeing."

What the future holds

So far, we've focused on the idea of training robots to gradually take over from human surgeons and perform parts of a procedure – or maybe, one day, the whole operation.

This is easy to describe but very tricky to achieve, as Unberath explained: "There's a surgery that is already done in a specific way, and your research question is, 'How can I equip the robotic system with the capability, [meaning] perception, reasoning, and execution, [...] to replicate what a human is already doing?' Then I face a lot of challenges."

First, you need to understand every single action the robot needs to take. Then, you need to come up with a way of communicating this to the robot. All of this has to include considerations like where unhealthy tissue actually is, and the location of important blood vessels that you really don't want to nick.

"That's what makes this so so humongously difficult, because how do you write this down? How do you write that in code?" Unberath explained.

"Can I watch a human to learn what I'm supposed to be doing? If the answer is yes, things become, not trivial, but they're considerably easier."

But what about totally new robots, with innovative designs that don't resemble human hands? How could you begin to imagine the things these robots could do – and start to write the algorithms for them – before the prototypes even exist? Sounds impossible, right?

"The CyberKnife is a system that is not humanlike," Unberath pointed out. CyberKnife uses a robotic arm to deliver radiation therapy in an extremely targeted way, opening up the option of **radiotherapy** to patients with many types of tumors in different locations while minimizing damage to healthy tissue. It's already being used around the world.

"That's a robotic technology that performs fully autonomously, and we wouldn't be able to do it non-autonomously at all."

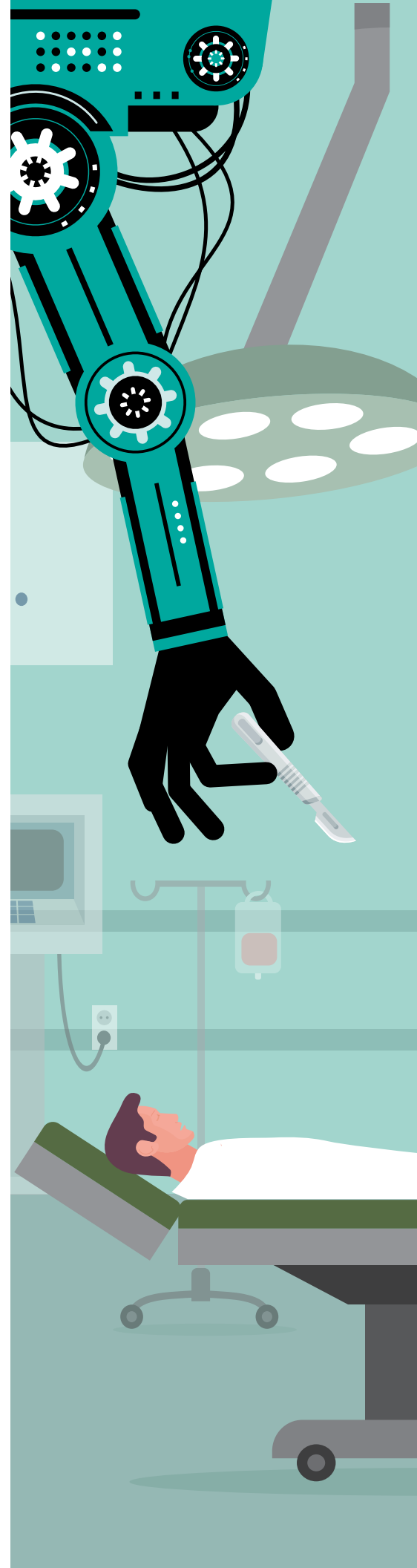
In other words, the robot is not copying or improving on something a human could do – it's doing something new. That raises a whole new set of questions to explore. "How do you create a control strategy for a robot that doesn't exist?" Unberath said.

This is one area that Unberath's team is actively exploring right now. He also told us about their focus on human factors – how humans and machines can interact successfully, and how we might work synergistically.

As robots become more and more integrated into the surgical ecosystem, Unberath asks, "How do we prepare people for the next roles that they might be taking on?" Might some clinical roles become obsolete when the robots take over? It's something many in other fields have been concerned about (possibly **prematurely**) given the explosion in large language models like ChatGPT.

"I think we have to think about this sooner rather than later," Unberath said, "not because we can perfectly foresee what will happen, but because we can create scenarios, and we can create ideas along various possible options."

Above all else, when we're talking about a new medical advance, the patient must come first. Not everyone is **completely convinced** by robot-assisted surgery and still more debate the best path forward. We don't know what the robots of the future will even look like, nor the levels of automation they'll be able to achieve. But the overarching mission behind all this innovation will always be to give more people access to quality medical care. ●





LOSING YOUR “MIND’S EYE”

In *The Shape Of Things Unseen: A New Science Of Imagination*, author Adam Zeman explains how a curious case of a lost “mind’s eye” led to the discovery that thousands are born without it.

If we are all imaginative, we imagine in very different ways. In April 2003 I met, for the first time, someone who had lost his mind’s eye, the ability to visualize. Jim Campbell – “MX” in our first paper on the topic – was a delightful, highly articulate surveyor in his mid-sixties who had relished his visual imaginings – of friends and family, favourite places, and past holidays. Previously, when he opened a novel, he had entered a richly visual world. If he lost his keys he would try to call to mind an image of their last location. But abruptly, after a cardiac procedure, he found himself bereft of imagery. Just like a patient described by Jean-Martin Charcot a century before, Jim had “absolutely lost this power of mental vision”. He was a grounded family man – the loss had not shaken him too gravely, but it troubled him sufficiently to send him off to consult his family doctor. Although his everyday

vision was perfectly normal, he told me expressively, “I miss being able to see!”

We studied his case in detail. The loss of his mind’s eye was highly selective. His IQ was undiminished. His memory, even his visual memory, was fully preserved. He performed well on tests that are meant to assess visual imagery, like the question “is the green of grass darker or lighter than the green of a pine tree?”, explaining that he “just knew” the answer, and had no need to consult any image – a good thing, as there was none to consult!

**THEIR EPIPHANY WAS TYPICALLY
NOT A REALISATION THAT THEY
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THAT OTHERS HAD WHAT SEEMED
TO THEM A SUPERPOWER.**

Persuaded that Jim was reporting a genuine change in his experience that we were finding difficult to measure, we resorted to brain imaging. When he looked at famous faces the expected areas in his visual cortex became active – but when he tried to visualise them in their absence, he largely failed to activate the regions towards the back of the brain that most of us bring into play when using our mind’s eye. We had found

a “neural correlate” for his oddly altered experience.

The scientific report of his case was picked up by the American science writer Carl Zimmer in an article in *Discover* magazine. Then came a surprise. Over the next few years, I and my colleagues received a steady trickle of emails from people who had read Carl Zimmer’s article. They felt a sense of affinity with Jim, but with one vital difference: these folk had never been able to visualise. Some discovered this in classes at school that involved visualisation, others when reminiscing with friends. Some “diagnosed” themselves for the first time after reading Zimmer’s article. Their epiphany was typically not a realisation that they lacked something – they didn’t feel deficient – but that others had what seemed to them a superpower.

This phenomenon – the lifelong lack of a mind’s eye – was in need of a name. Aristotle had used the word “phantasia” to refer to the mind’s eye. We added an “a” to denote its absence. The term “aphantasia” was born over tea in a Bloomsbury café. We later coined the term “hyperphantasia” to describe the experience of those at the opposite extreme of the imagery vividness spectrum – with imagery so vivid it rivals “real seeing”. Words are powerful things. These inventions filled a gap – people had wanted ways to refer to these odd features of their experience. Over the next few years, our 21 contacts turned into 16,000. ●

AUTHOR
Q&A

ADAM ZEMAN

AUTHOR OF *THE SHAPE OF THINGS UNSEEN*

Imagination shapes our lives in more ways than we realize, from reminiscing to planning and understanding others' minds. In *The Shape of Things Unseen: A New Science of Imagination*, neurologist Adam Zeman explores how imagination defines humanity, drawing on neuroscience, human evolution, and child development.

How do humans use imagination?

Imagination enables us to detach ourselves from the here and now, to recollect the past and anticipate the future, to enter the virtual worlds created by artists and the extraordinary worlds revealed by scientists, to daydream and to dream – so we use it much of the time. Studies show, that, on average, we daydream more than 1/3 of the time! Arguably, imagination is also involved in our moment-to-moment experience of the world and of ourselves – certainly, this depends on the incessant, teeming activity of our brains and on a huge, invisible, stock of hard-won knowledge and expectations: all our experience is a creative act.

Can imagination affect us physically, like triggering goosebumps?

A remarkable brain imaging study by Anne Blood and Robert Zatorre examined, precisely, goosebumps! They asked musicians to identify passages of music that reliably gave them shivers down the spine – these are quite reliable for a given individual but differ between individuals. They compared brain activity while listening to shiver-provoking and neutral passages, showing that shivery music is associated with strong activation of a network of deep brain areas linked to rewarding activities generally, from chocolate to sex. Locating the source of such an evanescent – even if intense – experience in the brain was a tour de force.

What is “hyperphantasia”?

People with hyperphantasia report visual imagery that is “as vivid as real seeing”. They tend to have vivid imagery in other sense modalities also. Some describe a more or less constant awareness of imagistic experience, alongside their experience of the real world. Hyperphantasia nudges people in a creative direction, for example toward making art, (though it is worth noting that aphantasia, lack of imagery, by no means precludes creative work). People with hyperphantasia tend to have a rich memory of past personal events, but the strength of their imagery can cause difficulty in distinguishing real from imagined events. Establishing whether hyperphantasia predisposes to some problems linked to vivid

imagery, like PTSD, requires further research, which is now underway.

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

An enlivened appreciation of the miracle of human experience generally and of the key importance of imagination to “cultural creatures” like us. I hope that readers will enjoy exploring the book's four guiding ideas – that imagination is a cardinal hallmark, perhaps the distinguishing feature, of human thought; that our tendency to lose ourselves “in our heads” becomes less puzzling when we realise that all our experience originates in our heads; that imagination broadly involves running off-line the brain systems that we deploy in perception; that over the past 3 million years or so we have evolved the extraordinary ability to share what we imagine. My readers will, I hope, discover that science can now provide some really satisfying answers to the basic question – why do we imagine?

What questions about imagination would you like to answer in the future?

Two kinds of questions – first, focused, scientific, ones about aphantasia and hyperphantasia. For example, what are their subtypes? Do these imagery extremes have a partially genetic basis and, if so, what are the genes involved? What are their implications for mental health? How does brain activity differ between people with aphantasia and hyperphantasia?

Second, a much broader question – can a richer understanding of the role of imagination in our lives help us to deal with some of the world's big problems? Appreciating the role of imagination in creating human cultures has sharpened my respect for traditions: they are great imaginative achievements that make us what we are. But, on the other hand, it's a matter of chance which set of human traditions we inherit. These reflections should make us proud of our own and appreciative of other cultures – and suspicious of fundamentalism of every kind. ●

***The Shape of Things Unseen* is published by Bloomsbury and is available now.**

Luscious green islands meet fluffy white clouds in Zhangjiajie National Forest Park, where curious pillars of rock soar high into the sky. Having formed hundreds of millions of years ago, they now support two record-breaking structures and even inspired a blockbuster movie.

THE “FLOATING” MOUNTAINS OF ZHANGJIAJIE

In China's Hunan Province, a geological wonderland can be found inside the Zhangjiajie National Forest Park. Sitting within the Wulingyuan Scenic Area, a **UNESCO World Heritage Site**, it's famous for its towering quartz sandstone pillars. They reach high enough into the sky that clouds often seep in between the pillars, a sight so beautiful it inspired James Cameron.

Yes, that James Cameron. Director of *Avatar* and *checks notes* occasional world-record holder for solo deep-sea diving, James Cameron (some folks just can't be pigeonholed). The alien world of Pandora featured in the movie is home to the Hallelujah Mountains, enormous floating blobs of rock that drift among the clouds and collide mid-air.

Zhangjiajie's columns might not float, but they do stretch dizzyingly high into the sky. Many of the over 3,000 quartz sandstone pillars reach over 200 meters (650 feet) tall, creating a pointy landscape upon which green foliage meets fluffy white clouds.

Reaching such dizzying heights has taken millions of years – 400 million, to be precise, taking us back to the Devonian period when the region was submerged in a shallow sea. The marine environment provided the perfect conditions for sandstone and quartz to accumulate and compress, creating solid rock that later was lifted above sea level due to tectonic activity. This rock was then eroded by heavy rains, creating the unique columnar formations that still stand today.

You'll need to crane your neck to see the top of them but you don't have to break your back to get on their level thanks to the Bailong Elevator, known as the “hundred dragons sky lift”. It holds the **Guinness World Record** for being the world's tallest outdoor elevator and can lift 46 people 326 meters (1,070 feet) in less than 2 minutes.

If giant elevators aren't your thing, then how about a massive glass bridge? The Zhangjiajie Glass Bridge opened in 2016 and connects two mountains **430 meters** (1,410 feet) apart at a height of 300 meters (980 feet).

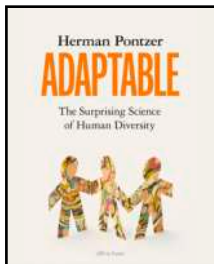
If you prefer to make like James Cameron's alter ego and take a dip, you'll find one of China's most famous aquatic residents scrabbling through the streams of Zhangjiajie National Forest Park: the Chinese giant salamander. Hailed as the world's largest amphibian, we received the puzzling news in 2024 that it could represent up to **nine different species**. Identity crises aside, who could resist those **beady little eyes?** •



How to get there

It's just a 40-minute drive from Zhangjiajie Hehua International Airport to the Wulingyuan Scenic Area where you'll find Zhangjiajie National Forest Park.

READ



Adaptable
Book by Herman Pontzer
Adaptable by Herman Pontzer dives into the science of human diversity, exploring how our bodies and cultures evolved

over 100,000 years to fine-tune us to our local environments. Drawing on his research as an evolutionary anthropologist, Pontzer documents the connections between lifestyle, landscape, local adaptations, and health, with some remarkable examples including Andean groups' increased lung capacity and Sama divers' larger spleens. In highlighting how genetic variation and cultural contexts shape health and resilience, we can better tackle the biggest questions of our day, such as the health impact of social inequality.

Available **March 25**.

ESCAPE

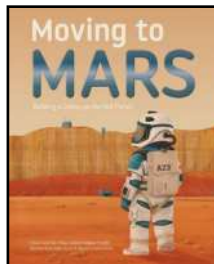


Atomfall
Game from Rebellion Developments

This survival-action game was inspired by true events, set five years after the Windscale nuclear disaster in Northern England. In this universe, a quarantine zone was set up across the British countryside, a zone that you must navigate – but it won't be easy. You'll encounter mysticism, cults, and rogue government agencies as you try to gather information and find out what really happened at Windscale. You'll have to fight for answers at times, but armed with a metal detector, you can search for hidden treasures that might make your journey a little bit easier.

Available **March 27**.

LEARN



Moving To Mars
Book from Button Books
We talk a lot about upping sticks and moving to the Red Planet, but could we really build cities

on Mars? (Side note: we actually spoke to a **space lawyer** about this). Based on cutting-edge scientific research, astrophysicist Guillem Anglada-Escudé, aerospace engineer Miquel Sureda Anfrés, and science author Sheddad Kaid-Salah Ferrón envision how future generations could call Mars home, with illustrations from Eduard Altarriba. The perfect read for any young folks with dreams of space exploration from the team behind the award-winning *My First Book of Science* series.

Available **March 11**.

CURATE

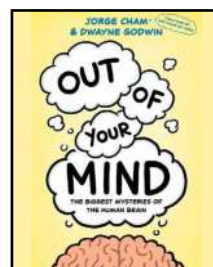


Two Point Museum
Game from SEGA

Ever dreamed of working at a museum? Now you can, in this new game from SEGA that puts you in charge of creating and curating your museum. Design layouts, curate exhibits, and send teams on expeditions to uncover rare artifacts. The collections explore subjects you typically find in museums, as well as a few unexpected extras including "Ghostology". You'll also have to keep thieves, vandals, and mischievous children at bay, but that's just a day in the life of a museum curator.

Available **March 4**.

DISCOVER



Out Of Your Mind
Book by Jorge Cham and Dwayne Godwin

Did you know that, by volume, your brain is the equivalent of a

liter bottle of soda? Or how about the fact that it's 75 percent water, having been described by those who have handled the tissue as like silken tofu? Strange to think a blob of something so soft could contain the unfathomably complex neural network that makes up who we are (well, until you introduce **donor organ memories**), and yet it's true. Find out everything we do and don't know about the human brain in this new book from cartoonist Jorge Cham and neuroscientist Dwayne Godwin.

Available **now**.

SCIENCE IN MEDIA





DATES TO REMEMBER

March has rolled around again, and that can only mean one thing: Spring is nigh. As well as the equinox, this month will see opportunities to celebrate women in STEM and the weird and wonderful creatures we share our planet with, while learning all about the brain and (potentially) winning prizes for your astrophotography. What's not to love?

MARCH



3 World Wildlife Day

Wild animals and plants are a fundamental part of life on Earth – and they need protection. To continue to enjoy the benefits and beauty of nature, we need to safeguard vulnerable species from extinction. World Wildlife Day offers the perfect opportunity to celebrate our planet's varied fauna and flora and raise awareness for their conservation. This year will focus on how we can work together to finance wildlife conservation more effectively and sustainably, to help build a resilient future for people, the planet, and all the creatures we share it with.



3 Astronomy Photographer of the Year deadline

Astronomy Photographer of the Year showcases the best that astrophotography has to offer, from spectacular skies and gorgeous galaxies to out-of-this-world objects, and it's back for its 17th year. Have you taken a stunning celestial snap and fancy your chances at winning a cash prize? Get your entries in ASAP as the competition closes on March 3 at 12 pm UTC. Find out all you need to know [here](#).



8 International Women's Day

International Women's Day (IWD) strives to propel us toward a gender-equal world – one that is diverse, equitable, inclusive, and free of bias, stereotypes, and discrimination. Women are still vastly outnumbered in the fields of Science, Technology, Engineering, and Mathematics (STEM), but with each observance like IWD, we hopefully get a step closer to rectifying that.

10-16 Brain Awareness Week

Our brains are incredibly complex and understanding how they work can be tricky, but it's crucial that we try. Brain Awareness Week is a global campaign to draw attention to the progress and benefits of **brain research**, including the latest developments in the diagnosis, treatment, and prevention of disorders of the brain such as Alzheimer's, Parkinson's, stroke, schizophrenia, and depression.



20 Spring Equinox

For those in the Northern Hemisphere, March 20 is the spring (or vernal) equinox. At 9:01 am UTC, the Sun will cross the celestial equator, heralding the arrival of a new season – spring if you're in the north, or fall in the south.



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 some of the most disgusting animal antics out there. If you like your science lighter, discover how songbird migration might not be as lonely as we thought after all.

ANIMALS ARE GROSS

It's easy for the grimmer side of the animal world to remain hidden – after all, nature documentaries usually have far more scenes of epic migrations and cute cubs than they do of creatures licking their own buttholes. The reality, however, is that animals can be super gross, at least by human standards.

WE'D ARGUE IT'S ACTUALLY MORE METAL THAN GROSS DEPENDING ON HOW YOU FEEL ABOUT BLOOD.

Caught your dog eating poop in the backyard? Yeah, he's not the only one. Known as coprophagia, the idea of sitting down to a dinner of dung is pretty nausea-inducing to us, but **over 150 vertebrate species** are reported to use it as a way of getting nutrients. In others, it is thought to provide a nice boost to their gut microbiome. Perhaps one animal's crap is another animal's treasure after all, but we think we'll stick to a salad.

Speaking of poop, it turns out that "defensive defecation" is also a thing. Sperm whales have been spotted using this technique to ward off orca attacks, releasing a poonami so vicious it easily puts any human baby's to shame. Grim, no doubt – but effective.

On the gorier side of defense tactics, when its life is under threat, the blood vessels in a short-horned lizard's eye ducts rupture, sending blood spurting up to nearly a meter (3 feet) away. Understandably, this can throw off a potential predator, though we'd argue it's actually more metal than gross depending on how you feel about blood.

Everyone's favorite model organism *Caenorhabditis elegans* is also no stranger to disgusting liquids – but in this case, it's used to feed their young. This so-called "worm milk" is produced by the worms destroying their own organs, mixing it up with a tasty side of unfertilized eggs. Researchers think this serves a similar purpose to mammalian milk, though this particular mixture gets secreted out of *C. elegans'* vulva because, y'know, worms don't have boobs.

Hopefully, none of this has put you off your next meal, but we won't apologize if it has. Just be glad you weren't fed worm milk or poop as a child.

CHATTY SONGBIRDS

Sometimes there's nothing worse than being stuck on a long journey with no one to talk to, but it appears that's not a problem for migratory songbirds. According to a study published in **Current Biology**, it doesn't matter if none of their own are around – they can have a natter with other songbird species too.

The researchers behind the study captured over 18,300 hours of audio from songbirds flying at night. Using machine learning, they were able to pinpoint the flight calls of 25 songbird species. When they followed that up by measuring how often those calls happened close in time to each other, the findings suggested that different species may be "talking" to each other.

"We can't be sure what they're saying, but birds might broadcast calls during flight to signal their species, age, and sex. And we can certainly speculate that these flight calls could relate to navigation or finding suitable stopover habitat," said lead study author Benjamin Van Doren in a **statement**.

The team also identified the factors that might play a role in two different species communicating with one another, finding that having a similar wing length and calls made it more likely.

Though it's only an educated guess at the moment – more research needs to be done on a bigger group of birds – the study authors suggest that the results could help us understand why some unrelated species have similar calls.

"It is possible that species' calls have converged over time because of this social link," explained Van Doren, "or that species that happen to give similar calls are simply more likely to gravitate towards each other."

They also think the findings could be used to inform songbirds' futures, too.

"This study really calls into question the long-held idea that songbirds migrate alone, solely following their own instincts," said Van Doren. "Learning more about the consequences of these social connections – not only for migration, but also for other aspects of their biology – will be important to inform and manage the risks they face in a changing world."



The Darker Side of Science



THE LIGHTER SIDE OF SCIENCE