

CURIOS?



IS PHOTOGRAPHIC MEMORY
A REAL THING?

WHY DON'T ANIMALS HAVE
TO BRUSH THEIR TEETH?

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Editors

Katy Evans
Rachael Funnell

Art & Design

James Rodrigues

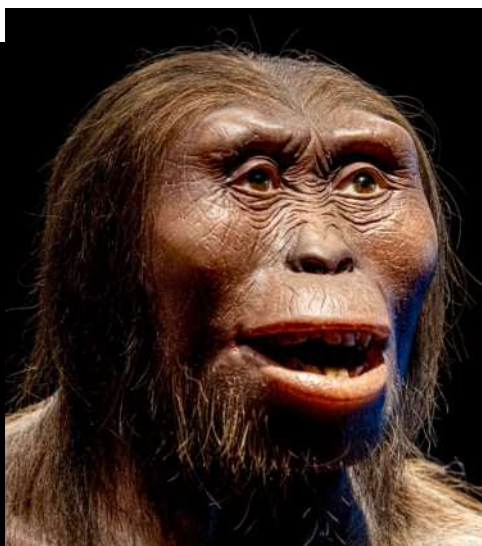
Deputy Editor

Maddy Chapman

Contributing writers

Rachael Funnell
Laura Simmons
Holly Large

NEWS BITES

Lucy Turns 50

This month marks the 50th anniversary of the extraordinary discovery of "Lucy", the first proof that our ancestors walked upright as early as **3.2 million years ago**. Lucy is one of the most famous fossils of all time, and changed what we knew about humans' origins and evolution – and **how we became human**. The small female skeleton was discovered in Ethiopia in 1974. At almost 40 percent complete, she was by far the most complete known early hominin at the time. Eventually named *Australopithecus afarensis*, Lucy demonstrated that our ancient relatives walked upright long before the evolution of bigger brains. Dink'inesh ("you are marvelous"), as she is called in Amharic, showed that ape-like ancestors didn't evolve into human-like creatures in one go, but rather different parts of the skeleton changed at different times, supporting the theory human evolution was a gradual process involving the appearance and survival of transitional forms over long periods.



Rocket Ready To Launch

Hot on the heels of SpaceX's successful Starship fifth flight test, where it made history by catching the reusable booster stage mid-air in **giant mechanical arms** as it returned to its launchpad for the first time, we should be getting another massive rocket launch this month if all goes smoothly. Blue Origin's New Glenn – named for John Glenn, the first American to orbit Earth – is scheduled for inaugural launch this month, adding to the roster of reusable heavy-lift booster rockets built to send crewed and uncrewed payloads into Earth's orbit and beyond. At 98 meters (322 feet) and a capacity for taking 50 tons of cargo, it's Blue Origin's first orbital rocket. The launch will also be a demonstration mission for the National Security Space Launch program run by the US Space Force.



Comets, Like Buses, Appear All At Once

It's fitting that this month, which marks the 10th anniversary of Philae landing on 67P/Churyumov-Gerasimenko – the first time humans landed a spacecraft on a comet – we've got a choice of comets to look up at the sky and enjoy. Not only can you view the much-hyped Comet C/2023 A3 (Tsuchinshan-ATLAS) with the naked eye right now after it survived its closest encounter with the Sun, but the recently discovered sungrazer **C/2024 S1 (ATLAS)** could become brighter than Venus and even be visible in the daytime about now, while 333P/LINEAR should become visible through binoculars late November.

World's Largest Artificial Reef

A historic ocean liner could soon be the world's largest artificial reef, located in the Gulf of Mexico, where it would mimic a natural reef, creating a new habitat for marine creatures as well as providing diving opportunities. The SS *United States* is the largest passenger ship ever built in the US – 30 meters (98 feet) longer than the *Titanic* – and broke the record for fastest transatlantic crossing on its maiden voyage in 1952. An icon deserves a legacy, and that's what a county in Florida is hoping for after inking a tentative deal. It could be starting a new life – and enhancing others' – on the ocean floor in just 1.5 years, watch this space.



Nights-In November

The nights are drawing in, which means the good telly starts now – and November is full of treats. If you haven't caught up with the mind-blowing journey through our corner of the cosmos in the BBC/PBS show *Solar Systems*, fronted by Prof Brian Cox, current episodes are airing and the whole thing is available on BBC iPlayer. You can catch our interview with Brian about it [here](#). Also from the BBC, a culmination of four years of filming sees its first wildlife show focusing on Earth's largest continent: Asia. Fronted by David Attenborough, the seven-part series travels from the Gobi Desert to Siberia, exploring mountains, jungles, seas, and their fascinating inhabitants. Not to be outdone on the presenter front, Netflix's new five-part series *Our Oceans* is narrated by none other than Mr President himself, Barack Obama, taking viewers on a 120,000-kilometer (74,500-mile) journey across five oceans, as seen from below. Dive in from Nov 20.



Caught In A Loop

Vermeer's *Girl with a Pearl Earring* is one of the most instantly recognizable paintings in the world. Now, thanks to science, we may know why it resonates so much. According to **new research**, it holds the viewer captive with a neurological phenomenon called "sustained attentional loop": the viewers' eye is drawn first to the girl's eyes, then down to her mouth, then right to the pearl, and back up to her eyes, in a loop. This appears to make it harder for people to look away, capturing their attention for longer, and may be unique to the painting. This phenomenon was 10 times stronger when viewing the real 17th-century painting, which is housed in the Mauritshuis museum in The Hague, Netherlands. If you're ever there, pop by and try it!

WHAT'S UP?



Mini Moon

Earth's got a (temporary) new friend

Name: 2024 PT5

Appearance: Smol/just a lil guy/ actually a 10-meter (33-foot) hunk of space rock

Location: Earth's orbit

A mini moon sounds adorable – but what is it?

That depends on if you find asteroids cute or not, because that's exactly what 2024 PT5 is: an asteroid from the Arjuna belt that's ended up as a satellite in Earth's orbit.

Why is it here?

Arjuna asteroids are near-Earth objects and follow a pretty similar orbit to Earth. This means that if they end up close enough and travel relatively slowly whilst doing so – as has happened with 2024 PT5 – they get temporarily captured by Earth's gravitational pull.

How often does this happen?

It's thought to be fairly common, but 2024 PT5 is only the fifth mini moon to have been detected, though that could be because they're... well... mini.

How big is it compared to the Moon?

Not to be all "my horse is bigger than your horse" about it, but 2024 PT5 doesn't really have a patch on Earth's permanent pal. The mean diameter of the Moon is 3,476 kilometers (2,160 miles), making it a whopping 347,600 times wider than its asteroid buddy.

If it's that small, will we still be able to see it?

If you happen to have a professional telescope, then yes. With the naked eye? Unfortunately not – it's just too small and dim.

Is it here to stay?

Nope. It's due to leave Earth's orbit on November 25, having first arrived in September.

Will it ever come back?

We can bring you some good news on that front – 2024 PT5 will be back in 2055. That should give you plenty of time to save up for a professional telescope/ persuade a family member to buy you one/become an astronomer in time for the next visit.

WILL WE ALL BE EATING INSECTS IN THE FUTURE?

The benefits of insect-based foods are stacking up, legs 'n' all.

By Rachael Funnell



Eating insects, known as entomophagy, is an ancient practice that dates back to early humans and remains a popular protein source in over 80 percent of the world's countries. Elsewhere, the idea of eating crickets is met with, well, crickets. In many Western countries, your average diner will likely turn up their nose at crispy creepy crawlies (and yet pop down a plate of shrimp and they're in heaven).

A recent **joke online** captured this paradoxical attitude towards eating insects best: we're all chomping at the bit to eat wet arthropods, but when it comes to the dry ones? No thanks. However, in the age of sustainability and doing your bit for the planet, could entomophagy be the way forward? Will we all be eating insects in the future?

The problem with cows

That cattle farming has a negative influence on the environment is no great secret. It degrades habitats by stripping them of their plant diversity, it increases the risk of zoonotic disease (just look at the **spread of bird flu among dairy cows**), and these grass-eating **gas machines** produce so many emissions that we're trying everything from feeding them seaweed and **toilet training** to try and get it down.

WE KNOW FROM MICROFOSSILS IN THE DENTAL PLAQUE OF ANCIENT HUMANS AND PREHISTORIC HUMAN POO THAT INSECTS PLAYED A PART IN OUR CULINARY PAST.

So, where do we go next if we want to satisfy a meat craving without such a substantial environmental footprint? The vegan diet has seen a massive surge in popularity in recent years, with even

meat-eating folks curious to try what's on the market (that doesn't involve taking this little piggy).

Lab-grown meat alternatives have taken all kinds of forms to fulfill the niche, from **beef-rice hybrids** to peculiar **pink jelly**, and even a lab-grown take on **pet food**. However, a 2023 pre-print study that hasn't yet undergone peer review concluded that creating meat from cultured animal cells could potentially have a worse environmental **impact** than the real stuff.

A tricky situation for the environmentally conscious meat fan, then, but is the solution scuttling right in front of our noses?

"WHEN I REALIZED HOW MUCH OF AN IMPACT OUR CURRENT FOOD SYSTEMS HAVE ON THE ENVIRONMENT, I SAW INSECTS AS A REAL SOLUTION TO SOME OF THOSE CHALLENGES."

Insects as food

Many insects can be a good source of nutrition, boasting protein, omega-3s, vitamin B12, calcium, iron, and potassium, as well as being lower in components such as fats. They're small, requiring less land to be farmed, and can be fed on foodstuffs that humans don't want, like apple cores and vegetable peelings – sparing us from the greenhouse emissions that would've been generated if they were left to rot naturally.

There's also a rich variety on offer.

"Edible insects are classified into eight main orders belonging to Blattodea (cockroaches and termites), Coleoptera (beetles), Diptera (flies), Hemiptera (cicadas, stink bugs), Hymenoptera (bees, wasps, ants), Lepidoptera (butterflies, moths), Odonata (dragonflies), and Orthoptera (crickets, grasshoppers, locusts)," explained professor of food science Andrea Liceaga in a **2022 paper**.

"Several traditional cooking (e.g., boiling, roasting, sun-drying) and processing technologies (e.g., pasteurization, enzymatic proteolysis, high-pressure processing) have shown that it is feasible to prepare safe and nutritious insects and/or foods with insects."

We know from microfossils in the dental plaque of ancient humans and prehistoric human poo that insects played a part in our culinary past. Evidence of early humans eating insects has been uncovered in Spain, the United States, Mexico, and Peru, and we find written accounts of their consumption from the likes of Aristotle and Pliny the Elder.

Their place at the table has endured to the modern era, with orthopterans among the most consumed insects across the globe. According to a **2021 review**, over 60 cricket species are on the menu in 49 countries worldwide, and it sounds like they're really onto something.

"Based on our findings, crickets have a promising nutritional profile in terms of energy, protein, lipids and important fatty acids, mineral elements vitamins, carbohydrate and medicinal elements and may become part of many food products in future," the authors write. "As an enterprise, cricket farming, can mitigate food insecurity, act as a source of income when sold and a source of employment."

Liceaga notes that one limitation of entomophagy is the potential presence of allergens, but with sufficient evaluation, this can be addressed as more people in the West jump on the entomophagy bandwagon. So, what's stopping us?

Leading by leggy example

According to **Dr Duncan Sivell**, Senior Curator in Charge, Diptera and Siphonaptera, at the Natural History Museum, London, around 2 billion people around the world eat insects as part of their regular diet. To suggest that eating insects is some kind of novel 21st-century solution to the climate crisis would be foolish, then, but extending the appeal of entomophagy in some of the more reticent corners of the globe – especially in places where consumption of meat is particularly high –

could be a step towards a more sustainable global food market.



One of the companies trying to do this in the UK is **Yum Bug**, headed up by co-founders Leo Taylor and Aaron Thomas. They've been spreading the good word on bugs since 2018, developing from a garage-based insect recipe kit operation to a bricks-and-mortar restaurant in London serving small plates designed to showcase **insects' culinary potential**.

"THE TASTE OF CRICKETS IS OFTEN COMPARED TO A NUTTY, EARTHY FLAVOR WITH A SLIGHTLY UMAMI UNDERTONE, WHICH MAKES THEM A GREAT ADDITION TO A VARIETY OF DISHES."

"Growing up in Southeast Asia, I ate insects regularly, and it was just part of the food culture," Taylor told IFLScience. "When I realized how much of an impact our current food systems have on the environment, I saw insects as a real solution to some of those challenges. Aaron, as an entomologist, was already passionate about insects, so when we teamed up, it felt like the perfect way to bring both of our experiences together."

So, how does it work? And what does it taste like?

Making the mince

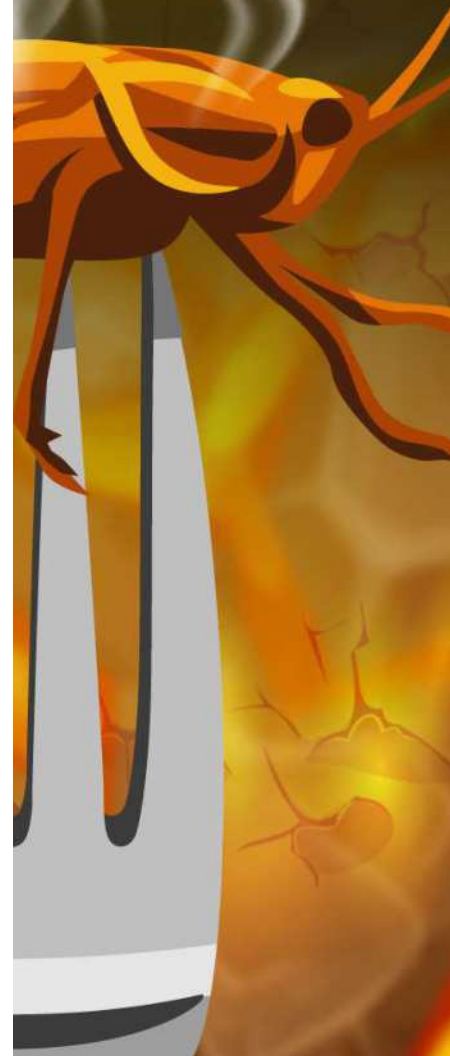
"The journey from farm to plate starts with crickets being sustainably raised on insect farms," Taylor explained. "These farms are incredibly efficient compared to traditional livestock farming. Crickets require minimal space, water, and feed, and produce far fewer greenhouse gases. Once harvested, the crickets are cleaned, processed, and often roasted or ground into cricket mince or powder, depending on the product we're making."

"The taste of crickets is often compared to a nutty, earthy flavor with a slightly umami undertone, which makes them a great addition to a variety of dishes," said Taylor. "The texture of crickets can vary depending on how they're prepared – whole roasted crickets are crunchy, while cricket mince or powder blends easily into foods, giving them a meaty, slightly dense texture that's perfect for things like burgers and sausages."

The previously overlooked edible insect market is gaining momentum in **Singapore**, too, where 20 species were recently approved for sale as food. As mindsets shift in favor of insects as food, it could be that the children really are the future.

Research into the attitudes of French children showed that while they often expressed initial revulsion towards the idea of eating insects, they got used to it quite quickly. For kids, interest may increase if entomophagy is associated with familiar flavors or menu items – so a cricket-meat sausage may go down better than a whole crispy cricket – and if they adopt it as a dietary choice, they could drive a dietary shift that lasts for generations.

So, it seems we're left with just one question: anyone for crickets? ●



WHAT ON EARTH



Image Credit: © Alistair Luckman, Beaker Street Science Photography Prize

WELCOME TO DREAMLAND

"The 'once in a lifetime' event that took place over the skies of Australia on the 11th May 2024. A solar storm comprised of protons and electrons moving past the Earth incredibly fast. Trapped in the Earth's magnetic field, they move to the magnetic poles. Forcing these atomic particles into the atmosphere, they strike atoms and molecules within. These particles enter a state of excitement and expel the energy by emitting light, creating spectacles like the fantastic light show we saw," said Beaker Street Science Photography Prize finalist Alistair Luckman.



Image credit: Peter Kertesz / Monika Mazurkiewicz

WHY DON'T ANIMALS HAVE TO BRUSH THEIR TEETH?

AND WHY DECAY ISN'T REALLY ABOUT BRUSHING.

By Rachael Funnell

Wake up? Brush your teeth. Going to bed? Brush your teeth. The dental routine of being a human can be a bit monotonous, but it's an important step towards maintaining a happy mouth. It can be slightly baffling, then, to spot a photo of a bonobo with a seemingly perfect grin. How are wild animals getting away with it as we dutifully march off to our next dental hygienist appointment? Why don't animals have to brush their teeth?

It's a question that led us to the office of **Peter Kertesz**, who, as well as seeing human patients, was Dental Consultant to ZSL London Zoo for over 30 years and has worked with 80 other wildlife establishments around the world. A quick glance at his **website** shows Kertesz tending to the teeth of everything from elephants to tigers and dolphins with the help of dental nurse Monika Mazurkiewicz.

We sat down with Kertesz to find out more about what it's really like doing dentistry on non-human species, and why their days aren't bookended by scrubbing their mouth bones.

How did you become a dental consultant for animals?

PK: Going back many, many years, I got a phone call and he said, "I don't know you, and you don't know me, but I've got a problem with a little cat. Could you help me?" So, I went along. I did what I had to do. I cobbled together a few bits and pieces, instruments and some equipment, and did the job. And I said, "This is really hard work. Never again."

"WE'VE SEEN AARDVARKS, WHICH ARE VERY DIFFICULT TO OPERATE ON, BIG CATS, ELEPHANTS, SEA MAMMALS, SEA LIONS, SEALS, WALRUSES, DOLPHINS, GORILLAS, CHIMPANZEES, SLOTHS, PYGMY HIPPOS, RHINOS, BEARS..."

And just look at you now.

PK: Yeah. What happened then was that our cat broke a tooth, and I said to the vet, "What are you going to do about it?" And he said, "Nothing. You're going to do it." After that I thought, well, if I'm going to carry on doing this, I better be better equipped than anybody else in the world. And we are.

What kind of animal patients have you seen?

PK: You name one, and I've seen it. Monika has been working with me for 15 and a half years, so she has seen a huge variety of animals as well. We've seen aardvarks, which are very difficult to operate on, big cats, elephants, sea mammals, sea lions, seals, walruses, dolphins, gorillas, chimpanzees, sloths, pygmy hippos, rhinos, bears...

Do their dentistry needs cross over with humans'?

PK: Trauma is very, very common. Decay is not that common. It's fairly rare because their diets are relatively natural, certainly in Europe. They don't have refined carbohydrates. They usually have a self-cleansing diet. In North America, it's a bit different. They get a lot of processed food, but trauma is the biggest problem.

Also, you have to remember that in the protective environment of zoos and safari parks, the animals live longer than they would in the wild. They get very good food. They get very good health care. They've got no natural predators, so you're seeing a geriatric population as well. So, you get geriatric changes.

Why don't animals have to brush their teeth?

PK: We have to first of all understand that brushing doesn't stop decay. Diet will, and don't forget, we are on an unnatural diet that's very often heavy on refined carbohydrates, and that is going to cause the decay. If you're going to stop the decay, you're going to have to change the diet.

You do see decay [in some animals]. I think the worst case of decay I saw was in a rock hyrax. They were on a most wonderful, healthy fruit diet, but is it natural for them? Probably not. Do they get fruit in the middle of the desert? No. And they had the most horrendous decay. There was a massive infection from the destruction of the teeth, and they had massive systemic problems in all of the major organs, and that's what killed them – because there's a repercussion, don't forget. The mouth is the gateway to the body, and the damaged or diseased unhealthy mouth can have major repercussions to the major organs.

You have to understand the habitat they're from and what is right for them. They have to be on a diet that is as close to natural as possible because of their dentition. So, it's complicated, and you have to look at the animal's individual needs. ●



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Questions podcast, episodes
released monthly, wherever you
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SCIENCE FACT OR FICTION:

IS PHOTOGRAPHIC MEMORY A REAL THING?

Lots of people have claimed to have it, but does the science add up? Laura Simmons investigates.





Wouldn't it be great to look at a page of text, or a map, and immediately remember every detail? Many famous people – from **Leonardo da Vinci** to former US President Bill Clinton – have claimed to have some level of photographic memory. But is true photographic memory actually a real thing? Or are some people just better at those **memorization techniques** they tried to teach you in grade school?

What do we mean by “photographic memory”?

We spoke to Professor **Jon Simons**, a cognitive neuroscientist at the University of Cambridge, to try and get to the bottom of it. When we say “photographic memory”, what we usually mean, according to Simons, is “being able to perfectly recall an image, scene, or text as if it were a photograph,” – but when we asked if it was real, the answer was clear.

Simons told us photographic memory “is not supported by scientific evidence.”

Instead, neuroscientists might talk about

“**eidetic**” memory – fans of *The Big Bang Theory* will remember that one of the show's main characters, Sheldon Cooper, often claims to have this ability.

“Eidetic memory is the ability to vividly recall images, sounds, or objects in great detail, almost as if they're still present,” Simons told us. “This type of memory is sometimes found in children but is relatively rare in adults.” If you're reading this, Sheldon, sorry to disappoint.

Even in kids, it's uncommon. An oft-quoted statistic suggests 2-10 percent of kids aged 6-12 might have the ability, which appears to stem from research conducted in the 1960s.

In a **1979 paper**, psychologist Ralph Norman Haber detailed the results of a decade-long project he had undertaken to investigate eidetic memory, finding that the concept was “virtually nonexistent” in adults. Haber includes transcripts of conversations with some of the kids involved in the research, providing a fascinating insight into what having an eidetic memory might be like.

In one example, a 10-year-old boy was briefly shown an illustration of Alice – of **Wonderland** fame – chatting to the **Cheshire Cat** as it sits in a tree. When the image was taken away, the subject (S) was asked to continue looking at the blank easel, moving their eyes if needed, and to tell the experimenter (E) what they could see, as in the following excerpt:

E: Do you see something there?

S: I see the tree, grey tree with three limbs, I see the cat with stripes around its tail.

E: Can you count those stripes?

S: Yes, (pause) there's about sixteen.

This is just a brief snapshot – but consider whether you could remember an image you'd only seen for 30 seconds to this level of detail.

“PORTRAVALS OF PHOTOGRAPHIC MEMORY IN POPULAR MEDIA ARE OFTEN EXAGGERATED AND CAN SOMETIMES BE MISLEADING.”

Although most kids who appear to show this ability do eventually lose it with age, a **case report** published in 2023 raised the possibility of eidetic memory in a 27-year-old woman with epilepsy. After having various types of seizures starting at age 6, the woman was undergoing some testing prior to surgery when her impressive ability at memorizing pairs of words became apparent. The authors hypothesized that in this rare case, the woman's seizures – which originated in the part of the brain responsible for language – could have actually enhanced her memory.

As to why a small number of children may have eidetic memory when it's seemingly out of reach for most adults, there have been a few theories. Some have suggested that it's to do with developmental changes in the brain, or that younger children rely more on their visual memory before their verbal skills progress to the point that they can think more abstractly.

Haber wasn't convinced by this though, writing that there was "no evidence to support any version of a developmental hypothesis" In his conclusions, he primarily called for more research to unpick the nature of eidetic memory, but to this day it remains **poorly understood.**

"IT IS POSSIBLE TO TRAIN YOUR VISUAL MEMORY, ENHANCING ABILITY TO RECALL VISUAL INFORMATION MORE VIVIDLY AND ACCURATELY THROUGH DELIBERATE PRACTICE AND THE USE OF SPECIFIC TECHNIQUES."

What about all those famous people with supposedly "photographic" memories?

If there's no evidence photographic memory exists, why are so many convinced they have it? Are all the examples in film and TV just straight-up fiction?

"Portrayals of photographic memory in popular media are often exaggerated and can sometimes be misleading," Simons confirmed. "In movies, TV shows, and books, characters with photographic memory are depicted as being able to recall vast amounts of information with perfect accuracy, such as reading a page once and remembering every word forever. In reality, no scientific evidence supports this level of perfect, detailed recall in humans."

Thankfully, the professor did have some good news. While true photographic memory may be a fantasy, with a bit of work it's possible to improve your

visual memory to a level that begins to approach it.

"It is possible to train your visual memory, enhancing ability to recall visual information more vividly and accurately through deliberate practice and the use of specific techniques," Simons told IFLScience. "An example [is] mnemonic strategies such as the Method of Loci (or Memory Palace) technique, which involves imagining placing information you want to remember along a familiar route or location, like rooms in a house."

"Studies have shown that training in this technique for a few weeks can enhance visual memory significantly."

Seems Sherlock Holmes was really onto something after all.

Why do some people have such good memories?

They may not have a photographic memory,



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but you might know someone who just seems to have a knack for recalling information. It could even be you – if you're a trivia champ or can learn directions better than a sat nav, you might have wondered why your memory seems to work so well.

"Some adults have something called Highly Superior Autobiographical Memory, which allows them to remember **personal experiences** and events with great detail. However, this does not equate to true photographic memory because it doesn't involve perfect recall of visual details like images or texts but rather an exceptional level of recall of life events," Simons explained.

He added that while some people have excellent memory for certain types of information, such as numbers, this may be because these individuals have gotten very good at using memorization techniques.

"While true photographic memory, as depicted in media, has not been scientifically proven to exist, understanding the neurological basis of exceptional memory abilities can provide insight into why some individuals can recall information with remarkable detail," he continued.

"For example, a region in the middle of the brain known as the hippocampus is crucial for forming and retrieving memories, especially spatial and episodic memories. People with exceptional memory may have highly active or structurally distinct hippocampi, allowing them to form stronger and more detailed memories."

The classic example of this is taxi drivers in London. If you've never visited the UK's capital, you should know that in many areas, the streets are basically a maze (grid pattern, who's she?). That's what you get when you start with ancient Roman foundations and just keep building. But drivers of the iconic black cabs need to be able to navigate through this mess confidently, and to do so they must pass a test called **The Knowledge**. It typically takes three to four years – you can often spot people zipping around on mopeds, memorizing a section of the map.

At the end of all that, as well as being able to start their career as cab drivers, studies have

shown that successful candidates have literally **restructured their brains**: "London taxi drivers [...] have been found to have a larger posterior hippocampus compared to the average person," said Simons.

There's more to memory

For most of us with average recall capabilities, that mythical photographic memory sounds pretty sweet. Think how handy it would have been to go into an exam with the pages of the textbook ready-memorized, diagrams and all. But according to all the scientific evidence we have right now, photographic memory is just that – a myth.

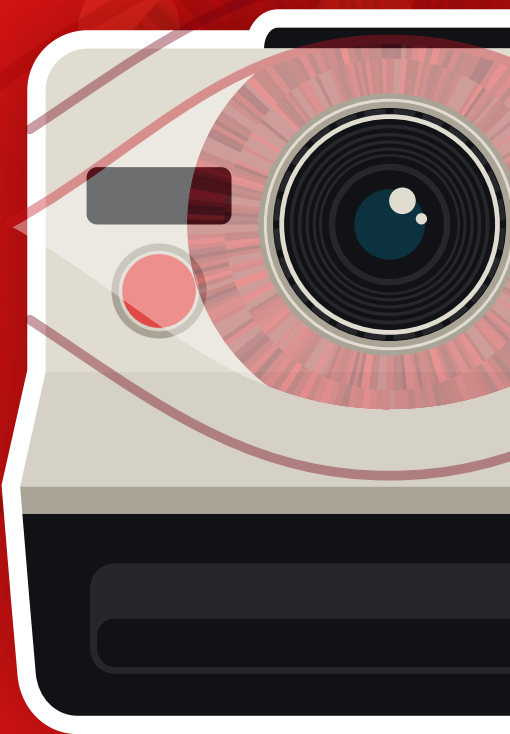
***THOUGH THE BIG BANG THEORY DIDN'T
QUITE NAIL IT, BENEDICT CUMBERBATCH'S
21ST-CENTURY SHERLOCK GOT PRETTY
CLOSE – AND WITH A LITTLE WORK,
YOU PROBABLY COULD TOO.***

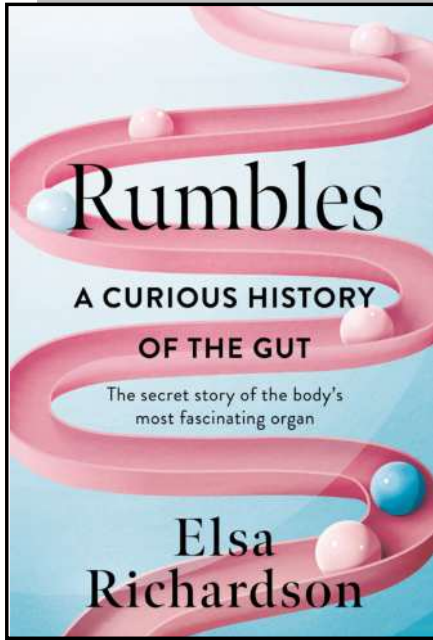
Nevertheless, the study of memory remains arguably one of the most fascinating areas of neuroscience. Photographic memory may not be real, but there's still so much to discover.

"We're currently running a research study to learn more about the cognitive and brain basis of exceptional memory abilities, to understand whether people who are 'super memorisers' use particular strategies to achieve their remarkable feats of memory, and whether their brains show differences in how they are structured or how they function," Simons told IFLScience.

Lots of other exciting studies are **pushing the boundaries** of how we think about memory and **how it works** in the brain, with important implications for tackling major health issues like **Alzheimer's disease**.

So: photographic memory? Not a thing. Eidetic memory? A thing, but only in a tiny number of people, mainly kids. But just... really good memory? Though *The Big Bang Theory* didn't quite nail it, Benedict Cumberbatch's 21st-century Sherlock got pretty close – and with a little work, you probably could too. ●





WHO YOU CALLING BORBORYGMUS?

In this excerpt from *Rumbles: A Curious History Of The Gut*, author Dr Elsa Richardson explores the far-reaching influence of the very outspoken organ.

Writing in 1794, Erasmus Darwin – physician, abolitionist, and eventually grandfather to the founder of evolutionary theory – recounted the case history of a rather unfortunate patient. A girl of 16 who, along with all the other awkward afflictions that puberty brings, was plagued by a remarkably vocal gut. Her bowels, Darwin recorded, “almost incessantly made a gurgling noise so loud as to be heard at a considerable distance, and to attract the notice of those who were near her”. The noise, which “never ceased a minute”, caused understandable distress to the sensitive patient, drawing public attention to the body’s innermost workings in a way that must have been especially excruciating for a teenage girl.

Most of us, even if we have not had to seek medical treatment, will have heard the same resonant tumult from within. Of the 78 organs of the body, the stomach is certainly among the noisiest. While the kidneys filter

waste without a peep, the lungs quietly puff away, and even the steady beat of the heart can only really be heard by pressing an ear up close to the chest, the belly is notoriously outspoken. It growls, gurgles, and grumbles. Its clamorous sounds are often a source of embarrassment, drain-like modulations that bubble up from the deep without warning, bringing with them news of digestion and defecation. Its rumbles disturb the hushed silence of libraries and echo through the civilised quiet of museums, interrupt important interviews, and make unwelcome interventions into promising first dates. There is something almost obnoxious in the way the organ barges its way into our social world, drawing attention to the fleshy fact of the body and its most shame-inducing functions. Even the medical term for gastric noises – borborygmus – has an unappealing bilious ring to it.

To quieten his patient’s obstreperous belly, Darwin devised a specially tailored course of treatment: she was to swallow “10 corns of black pepper” after dinner, take a daily dose of crude mercury and allow a “small pipe” to be occasionally inserted into her rectum to “facilitate the escape of air”. This dispiriting prescription would seem to imply that they were dealing with a purely physical problem, but in his notes, Darwin pointed to another possibility: an excessively noisy gut, especially in a young woman, was often a symptom

of “fear”. Long fascinated by the complex relationship between mind and body, Darwin wagered that his patient’s unsettled mental state might produce gastric distress, trapping her in a dreadful cycle in which negative feelings upset the stomach, whose vocal protests then provoked even greater anxiety.

According to this diagnosis, the gut was a uniquely sensitive organ capable of registering the slightest modulations of mood, but it also seems to have possessed a kind of social agency. In the case history recorded by Darwin, the talkative bowel was a problem not just because it caused physical discomfort, but also because its loud protestations exposed the murky inner workings of the viscera to the outside world.

Eating involves crossing the same border in the opposite direction, taking something from the outside into the deep interior of the body. This simple act has significant consequences because, as the historian Michael Schoenfeldt has observed, the incessant demands of appetite “require the individual to confront on a daily basis the thin yet necessarily permeable line separating self and other”.

The everyday nature of tasting, chewing, and swallowing obscures how momentous these small acts are not only in terms of sustaining life but also, as will become apparent, in shaping our identity. ●

AUTHOR
Q&A

DR ELSA RICHARDSON

AUTHOR OF *RUMBLES: A CURIOUS HISTORY OF THE GUT*

There's been a lot of research into how our gut microbiome may be running the show as of late, so what better time to dive into a fascinating tour of our digestive system with Dr Elsa Richardson's new book, *Rumbles: A Curious History of the Gut*? We wanted to know what inspired the deep dive.

Why did you write *Rumbles*?

I was in the middle of a different research project, looking at popular wellbeing cultures in the Edwardian period and I kept being struck by how gut-obsessed the era was! Whether they were adopting special diets to improve its health, popping purgatives to speed it up, or worrying that its aches were

a sign of emotional upset, our early 20th century forebears were convinced that good digestion meant good health. I couldn't help but see parallels with how we view the gut today and it made me want to dive deeper into its history.

Do you think people misunderstand their gut in the modern era?

I am not sure that people misunderstand it necessarily, but there is perhaps too much emphasis placed on what biomedicine can tell us about the gut. If we consider scatological humour, or the way that digestion is used as a metaphor for learning, or even the idea that authentic feelings might begin in the stomach, it's clear that the gut also has a rich social, cultural, and imaginative life.

Do you have a favorite fact you picked up during your research?

The history of the gut is full of weird facts, but I think the weirdest might be that – up until at least the 16th century – it was thought

to be particularly vulnerable to demonic possession. Demons were, apparently, drawn to excrement and the bowels were where dark forces could make their home in the body.

What is something everyone should know about the gut?

The gut-brain axis, which is frequently characterised as a discovery of modern science, has a very long history that can be traced back to antiquity. The pioneering philosopher and acclaimed anatomist Galen, for example, held that the stomach possessed a kind of intelligence that was separate from the mind and evident in the fact that it was able to register its own emptiness!

Are there any questions we have yet to answer about the gut?

There is still so much we don't know about the gut's prophetic potential. Some recent research out of Harvard Medical School has suggested that microbes in the gut could be used to predict not only whether you might develop conditions like IBS or diabetes in the future, while a Finnish study of thousands of stool samples has gone further to suggest that the make-up of your microbiota could exercise some influence on mortality.

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

Part of what history reveals is that we have long understood not only that there is a connection between the belly and the brain, but also that the gut and its processes play an outsized role in how we shape and understand our identities. I hope that readers come away from the book recognising the gut's significance, but also with an appreciation of how weird and wonderful its history is. ●

***Rumbles: A Curious History of the Gut* is published by Pegasus Books and is available now.**

Fire meets ice on the tallest active volcano in Antarctica. Not content with that title, though, the world's southernmost active volcano boasts many talents. From having a permanent lava lake that stays red-hot in winter, to spewing out thousands of dollars' worth of gold daily, there's more to Mount Erebus than meets the eye.

A VOLCANO THAT SPEWS GOLD DUST

There are dozens of volcanoes in Antarctica, but one of the most ferocious volcanoes on the continent is Mount Erebus. It's the tallest active volcano in Antarctica – with a summit height of 3,794 meters (12,448 feet) – and the southernmost active volcano on Earth.

Named by Captain James Clark Ross for his ship *HMS Erebus* (before its doomed final expedition), it is said Mount Erebus was erupting when Ross first set eyes upon it in 1841. It boasts a permanent lava lake that may be miles deep and has been bubbling since at least 1972. It stays red-hot even in winter, making it one of just five known lava lakes to do so across the planet.

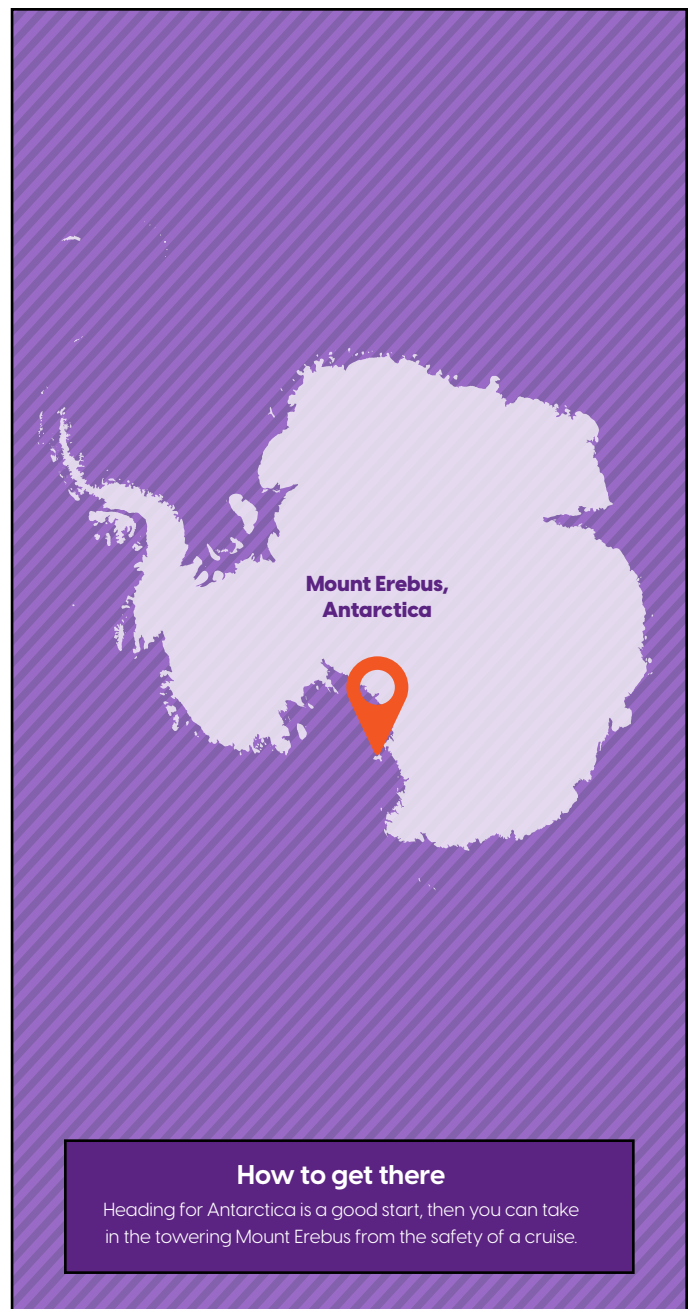
Mount Erebus also stands out for a curious discovery made by scientists studying its gusts of gas. The plumes are loaded with tiny crystals of metallic gold, no larger than 20 micrometers. Over the course of a single day, it's estimated that the volcano **spews out around 80 grams (2.8 ounces) of gold** – that's worth around \$6,000.

The gold dust travels far and wide. Antarctic researchers have detected traces of the gold in ambient air up to 1,000 kilometers (621 miles) from the volcano. The volcano regularly pumps out plumes of gas and steam. In past bouts of volcanic activity, it has been known to eject boulders of partially molten rock known as “volcanic bombs”.

In spite of all the steamy volcanic action, Mount Erebus is also covered in ice caves. The winding networks were whittled away by gases escaping from the volcano, making them fumarolic ice caves. The extreme conditions within the caves make them a hotspot for studying extremophiles, and Erebus's caves have been found to be home to 61 **species of fungi**.

Their discovery in 2013 was believed to be the first report of a fungal community setting up camp in a dark oligotrophic volcanic ecosystem in Antarctica. The fungi are associated with skin surfaces of animals, needing a high lipid content to grow, which the researchers said indicated they are likely evidence of **human contamination**.

The caves have been visited by scientists and field parties as far back as the Heroic Age of Antarctic Exploration back in the 20th century. Warren Cave is among the most visited, near an established field camp called Lower Erebus Hut, and sits around **300 meters** (984 feet) from the volcano's rim. •



How to get there

Heading for Antarctica is a good start, then you can take in the towering Mount Erebus from the safety of a cruise.

EXPLORE



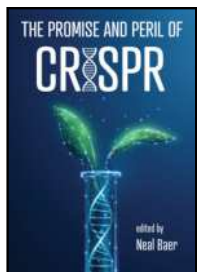
NATURE

Series from PBS

Explore the survival strategies of animals all around the globe, from the most remote and harsh parts of the planet to our own backyards, in the new season of the Emmy- and Peabody Award-winning series *NATURE*. Kicking off with *Silverback*, you can follow filmmaker Vianet Djenguet as he documents a grueling but vital mission to habituate a notoriously protective 227-kilo (500-pound) silverback – the largest in the Congo.

Weekly from now on **PBS**.

READ



The Promise and Peril Of CRISPR

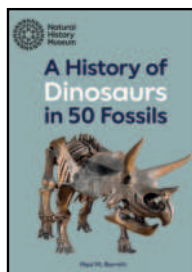
Book edited by
Dr Neal Baer

Gene-editing technology could lead to the cure for **thousands of genetic diseases**, but

it isn't without risk. From designing biological weapons to editing human embryos, there are many moral, ethical, and policy challenges posed by this technology. Dr Neal Baer brings together a collection of essays from bioethicists, philosophers, and geneticists to explore how the uses of CRISPR today could affect life in the future.

Available **now**.

DISCOVER



A History Of Dinosaurs In 50 Fossils

Book by Prof
Paul Barrett

It's been 200 years since the first dinosaur was named, so what better time to take a

trip down memory lane with this tour through the 150-million-year world of dinosaurs?

Looking at 50 fossils, Barrett pieces together the history of some of the most fascinating, fearsome, and successful animals to have ever walked the planet. You can catch a sneak peek and author interview in our

September issue.

Available **now**.

LISTEN



We Have Questions

Podcast from IFLScience

The podcast inspired by our very own *CURIOS* We Have Questions feature is finally out on the airwaves, giving a behind-the-scenes look at some of the remarkable conversations with amazing experts we've had. With monthly episodes, on November 18, we explore how the biggest wild goose is poisonous with Jack Baddams and Roddy Shaw from the comedy-nature podcast, **How Many Geese**. Can't wait? Check out our previous episodes including "what's it like working in a human tissue bank?".

Available on **all good podcast platforms**.

WATCH



Joy

Film from Netflix

The remarkable true story behind the ground-breaking birth of Louise Joy Brown in 1978, the world's first "test-tube baby". Joy is told through the perspective of Jean Purdy, a young nurse and embryologist, who joined forces with scientist Robert Edwards and surgeon Patrick Steptoe to unlock the puzzle of infertility by pioneering in vitro fertilization (IVF). The film tracks the 10-year journey that would eventually help millions of people to have children.

Available **November 22**.

SCIENCE IN MEDIA





DATES TO REMEMBER

There are loads of awesome dates to remember, remember this November. It's the perfect opportunity to rethink your recycling, learn about antimicrobial resistance, and support Pride in STEM, all while watching some fiery space rocks light up the night sky and searching for Fibonacci sequences in nature.

NOVEMBER



15 **America Recycles Day**
November 15 is America Recycles Day (ARD) – the only nationally recognized day dedicated to promoting and celebrating recycling in the United States. As human activities continue to put the planet at risk, ARD asks US citizens to be more mindful of their consumption and aims to educate them on where and how to properly recycle. This year marks 30 years since the first ARD – to find out how you can get involved, check out the Keep America Beautiful [website](#).



18 **International Day of LGBTQIA+ People in STEM**
The **International Day of LGBTQIA+ People in STEM** – celebrated annually on November 18 – honors the work of LGBTQIA+ people in science, technology, engineering, and math (STEM) while drawing attention to the barriers they face. Almost 30 percent of LGBT+ people have at some point considered leaving their jobs because of hostility or discrimination. However, organizations such as Pride in STEM are committed to combatting this and are working to make the field a more inclusive place for all.



18 **Leonids**
This month's celestial spectacle is brought to you courtesy of the Leonids meteor shower. The Leonids are one of the most prolific annual meteor showers, so you can expect to see fast, bright meteors shooting across the night sky between November 6-30, peaking on the 18th. They can be seen with the naked eye so you won't need any fancy equipment, just allow your eyes to adjust to the dark and enjoy the show.



18-24 **World Antimicrobial Resistance Awareness Week**
Antimicrobial resistance (AMR) is **forecast** to increase by 70 percent by 2050, potentially resulting in over 39 million deaths if more is not done to combat the problem. As bacteria, viruses, fungi, and parasites become increasingly resistant to current medications, World AMR Awareness Week seeks to improve awareness and encourage best practices to help reduce the further emergence and spread of AMR.



23 **Fibonacci Day**
A **Fibonacci** sequence is a series of numbers where each number is the sum of the two numbers before it – 1,1,2,3, for example. Write that as a date (11/23) and you get November 23 – Fibonacci Day, which honors one of the most influential mathematicians of the Middle Ages, Leonardo Bonacci.



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 why one ant species' queens cannibalize their young. If you like your science lighter, discover more about how soundboards might actually be a reliable way of communicating with your dog.

CANNIBAL QUEENS

"Reduce, reuse, recycle" – they might be words to live by, but there's one species of ant that appears to have taken them to the extreme. How? By throwing in a cheeky spot of **filial cannibalism**, better known as eating their offspring.

Scientists from the University of Oxford **determined** that founding queens of the black garden ant (*Lasius niger*) exhibit this behavior by presenting them with larvae that had a fungal infection. The infection was only in the early stages at this point, and could not yet spread, but would eventually become lethal if left.

The researchers found that the queens gobbled up 92 percent of the infected larvae – and ate every last morsel. None became infected from doing so.

"Once the queens find a sick larva in the brood pile they get to work immediately and spend [...] several hours chewing them up until they're all consumed," explained lead researcher Dr Chris Pull in a **statement**.

While it might seem like an option taken rather hastily, the consequences of not acting quickly can be dire;

the researchers found that when presenting queens with larvae that had reached the infectious stage, they did not attempt to eat them, but 80 percent of those queens became infected and wound up dead, even in cases where they'd sprayed the larvae with antimicrobial venom.

THOUGH IT MIGHT SEEM A BIT GRUESOME TO US, IT AVOIDS WASTE – BUT IT ALSO APPEARS TO DO MORE THAN JUST SATISFY APPETITES.

The benefit of hoovering up sick larvae extends beyond avoiding death, however. For one, though it might seem a bit gruesome to us, it avoids waste – but it also appears to do more than just satisfy appetites. The cannibal queens ended up laying 55 percent more eggs than their non-cannibalizing control counterparts.

As co-author Flynn Bizzell explained: "The queens who produce the most workers have the best chances of survival, so being able to eat and recycle infected larvae back into brood production means valuable resources are not wasted."

Grim? Perhaps. Effective? Most definitely.

CANINE CONVERSATIONS

Spend enough time watching animal videos on the internet and no doubt you'll have come across at least one featuring a dog and a soundboard, appearing to have finally solved the problem of human-canine communication – but is that really what's going on?

A team of cognitive scientists sought to find out using two experiments carried out in the homes of pet dogs, which were the same in every way, except that one was conducted by the researchers and involved 30 dogs, while the other was conducted by owners and involved a different group of 29 dogs.

Besides those differences, the experiments were designed to test the ability of the dogs to both recognize and respond "appropriately" to three different categories of words on a soundboard: food-related, play-related, and outside-related. They also tested whether or not who was presenting the word to the dogs, and how it was presented, made a difference in recognition and response.

The results appear to show that dogs really do grasp what's being said on a soundboard – and when their owners speak too.

"We find that dogs produced contextually appropriate behaviours for both play-related and outside-related words regardless of the identity of the person producing them and the mode in which they were produced," the researchers wrote in the **study** describing the findings.

SOUNDBOARD VIDEOS OFTEN SHOW THE DOGS USING THE BUTTONS THEMSELVES – AND USING MORE THAN ONE WORD. ARE THEY TALKING BACK TO US?

"This study addresses public skepticism about whether dogs truly understand what the buttons mean," said study lead Federico Rossano in a **statement**. "Our findings are important because they show that words matter to dogs, and that they respond to the words themselves, not just to associated cues."

So, what's next? After all, soundboard videos often show the dogs using the buttons themselves – and using more than one word. Are they talking back to us?

"We're just scratching the surface in this study," said Rossano. "Future studies [will] explore how dogs actively use these buttons, including the meaning and systematicity behind sequences of button presses."



The Darker Side of Science



THE LIGHTER SIDE OF SCIENCE