

CURIOUS



DO HUMANS HAVE
PHEROMONES?

CAN YOU REALLY "READ"
BODY LANGUAGE?

IFSCIENCE.COM | FEBRUARY 2025

IFSCIENCE



16



WHERE ON EARTH

GAZE INTO THE CAULDRON OF DEATH

The spectacle has to be seen to be believed, and a crazy few have even dared to climb it.

10



DEEP DIVE

CAN YOU REALLY "READ" BODY LANGUAGE?

Is there any real science behind the idea?
Dr Katie Spalding investigates.

4



OUR COVER STORY

THE SCIENCE OF FEVER DREAMS

Benjamin Taub takes a peek inside the world of extremely weird fever dreams.

February 2025

CONTENTS

News Bites | page 2

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

What On Earth | page 7

Fantastic Foxfire

We Have Questions | page 8

Do Humans Have Pheromones?

Book Bites | page 14

"Iron Of God" Meteorite

Meet The Author | page 15

Joshua Howgego on *The Meteorite Hunters*

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?

IFLSCIENCE

Cover illustration: Modified from iStock/Jayesh, iStock/ayagiz, iStock/castrosogarcia, iStock/Halyna Lakatosh, vi73777/iStock

Editors

Katy Evans
Rachael Funnell

Art & Design

James Rodrigues

Deputy Editor

Maddy Chapman

Contributing writers

Benjamin Taub
Dr Katie Spalding
Holly Large
Dr Alfredo Carpineti

NEWS BITES



Quantum Leap

A century ago, a handful of pioneering physicists turned long-held notions of nature on their heads and a new branch of physics, which would come to be known as “quantum mechanics”, was born. The word “quantum” refers to how matter absorbs or releases energy, and this new theory fundamentally changed our perspective on reality, an impact akin to Darwin’s theory of natural selection for biology. To mark this revolution, 2025 is the UN’s International Year of Quantum Science and Technology, so this year you can look forward to a whole host of exciting events, explainers, videos, and interviews with experts – IFLScience is off to CERN this month, so watch this space! – discussing the origins, current state (yes, that’s a pun), and what’s next for quantum mechanics. In anticipation, check out our *The Big Questions* podcast episode on **How Does A Quantum Computer Work And How Will They Change The World?**



Rare 7 Planet Parade

It’s not that unusual to get a **multi-planet parade** in the night sky, but it is much rarer to get all seven, which is basically a full house seeing as you’re standing on the eighth. Planetary alignments are not a celestial event, but they provide a nice perspective from our view on Earth, when the other planets appear close enough in their orbits to roughly line up in our field of view, despite being millions of kilometers apart. On February 28, if skies are clear, pop outside and observe Saturn, Mercury, Mars, Jupiter, and Venus with the naked eye; grab a telescope for Uranus and Neptune.



Visit Apex While You can

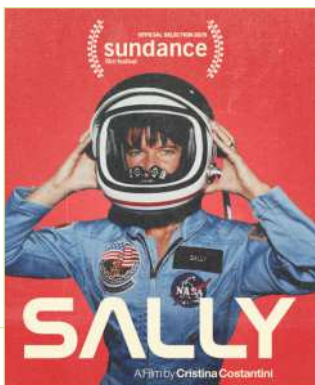
In July last year, the world was stunned by the record-breaking sale of “Apex” the Stegosaurus, thought to be the largest and most complete specimen known – it has 254 of approximately 320 bones – for a whopping \$44.6 million at auction. Sold to American hedge fund manager Kenneth Griffin, it’s the most expensive fossil ever and inevitably sparked debate on the private sale of scientifically important specimens. Luckily, billionaire Griffin has loaned the specimen to the American Museum of Natural History in New York for the next four years, making it available to both the public to view and the museum’s palaeontologists to study. If you’re in New York, don’t miss it.

STEM Valentine

Need inspiration for the nerd in your life this Valentine’s? Here are a few ideas that will tickle the STEM bone. If you want an out-of-this-world gift, then plan a night of star gazing, as all of February will see the seven-planet parade. You just need clear skies and maybe binoculars to catch the ice giants. For something more terrestrial, zoos around the world are back with the all-purpose “**name a roach**” program – whether that’s because, like cockroaches, your love will last forever, or, like your ex, one deserves to be fed to a meerkat, you decide. From The Bronx Zoo in New York to Dartmoor Zoo in the UK, just look up your closest or send your love internationally.

25 Years Of Living On The ISS

2025 marks a quarter of a century of humans living continuously in space. The first crew to step foot on the International Space Station (ISS) did so on November 2, 2000, marking the beginning of the continuous habitation of humans in Earth orbit ever since. Multiple records have regularly been broken since then: in February 2024, cosmonaut Oleg Kononenko set a new record for the **longest time in space**, while September 2024 saw a **new record** for number of people in space at once, with 19 briefly in Earth orbit, including taikonauts on the Chinese Tiangong space station and the civilian Polaris Dawn crew. With the plan to de-orbit the ISS in 2030 to make way for the proposed Lunar Gateway – a step towards potential **settlements on the Moon** and getting humans closer to Mars – and the rise in private space missions, these numbers will fluctuate. Still, it's unlikely that there won't be a continuous off-world population for the foreseeable future, so here's to the next milestone.



SALLY

A new documentary about the pioneering life and love of the first American woman and the first known LGBTQ+ person to go to space is set to premiere at the Sundance Film Festival this month. **SALLY** tells the story of **Sally Ride**, who in 1983 became the third woman ever to go into space, and her 27-year relationship with Tam O'Shaughnessy, which was hidden from the public until after Ride died in 2012. Narrated by O'Shaughnessy and directed by Cristina Costantini for National Geographic, the film has already won the prize for most outstanding depiction of science and technology in a feature-length film shown at Sundance. Catch it when it becomes available on Disney+.

WHAT'S UP?



Back To The Moon

Will the US land on the lunar surface once more?

Name: IM-2

Appearance: A box with six legs and some fancy foil

Location: The lunar south pole (hopefully)

Who's going back to the Moon?

Intuitive Machines – or more specifically, one of the private space exploration company's lunar landers. It'll be the second of three missions due to be carried out by the company for NASA that aim to land payloads on the Moon. Dubbed IM-2, it should already have launched by the time you're reading this.

Remind me – what happened with the first mission?

IM-1 ended up making history in more than one way. When the Nova-C lunar lander – named *Odysseus*, or "Odie" – plunked down in the Moon's south polar region on **February 22, 2024**, it became the first time since 1972 that the US had landed on the lunar surface, and the first time ever that a private company had done so.

It wasn't an easy landing; there were problems with the lander's ranging lasers, it landed on its

side, and communication was lost for a few hours. Nevertheless, NASA was able to receive some data from its science payloads. However, it powered down on February 29 as the lunar night settled in – and never came back to life.

What's different about this mission?

First, following the problems with IM-1, the lunar lander has been updated, meaning it hopefully won't experience the same issues. It's also carrying different payloads, the main one being the Polar Resources Ice Mining Experiment-1 (PRIME-1). This experiment will be the first time a drill and mass spectrometer are used on the Moon to explore resources and search for water ice.

When is IM-2 due to land?

If everything has gone to plan with the launch and its journey to the Moon, then IM-2 is expected to touch down on the lunar south pole this month. You might be able to watch as it does so; the landing of IM-1 was livestreamed, and it's likely IM-2's landing will be too.

OUR COVER STORY

THE SCIENCE OF FEVER DREAMS

When we're sick, our dreams can get
extra weird – what's that all about?

By Benjamin Taub

Image Credit: Modified from iStock/Jayesh, iStock/ayagiz, iStock/castrosogarcia, iStock/Halyna Lakatos, vi73777/iStock

Dreams are utterly bonkers at the best of times, yet when we're feeling a little off-color we can get a glimpse of how deep the rabbit hole really goes. Research has shown that fever dreams tend to be more vivid, more emotionally intense, and considerably weirder than regular visits to the dreamscape – so how do we even begin to make sense of the madness?

Boggling the mind

Scientific interest in feverish delusions began well before the modern age and has kept psychologists and neuroscientists busy for more than a century. Back in 1892, the esteemed Scottish doctor and father of modern pathology, Joseph Coats, contributed an article to the **Glasgow Medical Journal** in which he recounted an "attack of typhus fever" that he had suffered 26 years previously. As his temperature soared, Coats succumbed to "days of delirium", during which he experienced visions of his sister's death that were so lifelike that he remained convinced that she had really died, even the next day.

FEVER DREAMS WERE ON AVERAGE 58 PERCENT MORE BIZARRE THAN CONTROL DREAMS, AND THIS SENSE OF WACKINESS WAS MOST COMMONLY ACCOUNTED FOR BY 'SPATIAL DISTORTIONS'.

What's particularly striking about all this is that Coats' fantasies occurred while he was fully awake. Given the absurdity of this conscious malfunction, one can hardly imagine the deceptions the feverish mind is capable of while dreaming.

One scientist who has imagined just that is **Professor Michael Schredl**, Head of Research at the Sleep Laboratory at the German Central Institute of Mental Health at Heidelberg University. "In fever, the brain is not functioning properly, which means that if you are sleeping, then of course, the content [of dreams] is more bizarre," he tells IFLScience. Having conducted the two largest existing scientific surveys of fever dreams, Schredl discovered that extreme eccentricity is the single biggest attribute separating these ailing apparitions from regular dreams.

IF ONLY WE COULD GET A BUNCH OF SLEEPING SICK PEOPLE INTO AN MRI SCANNER, WE MIGHT JUST GET TO THE BOTTOM OF THE ENIGMA.

In the first of these studies, he and his colleagues found that fever dreams were on average 58 percent **more bizarre** than control dreams, and that this sense of wackiness was most commonly accounted for by "spatial distortions". Specific examples of this proportional preposterousness included moving walls, gigantic insects, and "creatures with over-sized arms and legs".

Seeking to find some sort of explanation for this increase in absurdity, the study authors state that "as waking cognitive processes are affected also by fever, we speculate that the bizarreness and distortions of fever dreams is a result of a brain that doesn't work properly at high temperatures." This assertion is backed up by several studies that have indicated that high body temperature – or hyperthermia – significantly interferes with brain connectivity patterns and impairs basic cognition.

For instance, it has been **shown** that having a core temperature of 38.8°C (101.8°F)

compared to that of 37.2°C (98.96°F) can impair memory. Being exposed to temperatures of 50°C (122°F) for approximately 1 hour messes with signaling in the temporal, frontal, and occipital lobes. This, in turn, could have a negative impact on cognitive functions such as attention, memory, and information processing.

To date, however, no one has ever tracked the neural activity of feverish participants while dreaming, so it's impossible to say for sure how the febrile brain produces these maddening visions. Acknowledging that such a study would be extremely difficult to conduct, Schredl says that, if only we could get a bunch of sleeping sick people into an MRI scanner, we might just get to the bottom of the enigma.

"That would be really great," he says. "What would be especially interesting would be to see the **default mode network** – which is for daydreaming and mind wandering, and also possibly for dreaming – and whether this has changed [during a fever dream]."

Turning up the heat

Given the deleterious and potentially even dangerous effects of hyperthermia, it seems slightly odd that our bodies would have evolved to overheat as part of their immune response to infectious pathogens. As it happens, scientists still don't entirely understand the purpose of fevers, although the most widely accepted theory is that raising the internal temperature inhibits the spread and viability of invading microbes. There's also some **evidence** to suggest that lymphocytes and other components of the immune system actually work better at slightly higher temperatures.

Despite the gaps in our comprehension, one thing we do know is that fever is an incredibly ancient, shared feature among life forms across the planet, with the typical hyperthermic response to infection having first evolved around 600 million years ago. When a trait has been around for that long and inherited by so many different species, you can be pretty sure it does more good than harm and carries a significant survival advantage.

Funnily enough, temperature also pops up as a common theme in fever dreams. In the second of Schredl's studies, **heat-related topics** featured in 10 percent of fever dreams compared to just 2.22 percent of control dreams. To give an idea of how the subject manifests in the infected slumberer's mind, one study participant described a nightmare in which "the air is so hot that breathing hurts [...]. I see a red glow in the corner of my eyes and I turn around to see an enormous lava ball coming down the mountain heading toward the city and me."

"I am running faster and faster, the air grows hotter and hotter, the lava ball is changing directions in pursuing me and does not affect the houses," continues the account. "It seems the lava ball has the task of getting me."

It's thus very tempting to conclude that the experience of having a high temperature triggers these heat-related dreams, although Schredl and his colleagues are keen to stress that there are currently no studies testing whether real-world heat stimuli are superimposed into sleepers' dreams in the same way that sounds and other environmental elements are. "We don't know whether they actually had a hot body and this stimulus was directly incorporated into the dream, or whether they simply dreamed about having a hot body," says Schredl.

The continuity hypothesis

It goes without saying that dreams are still **something of a mystery** to us, but most scientists do at least subscribe to the so-called continuity hypothesis, which states that dreams tend to reflect our waking-life experiences, emotions, and thoughts – albeit sometimes in strange and abstract ways. "For instance, if you have stress, then your dreams are more stressful, even if you don't dream about the actual stressor," explains Schredl.

"And if you are very ill, I think most people

don't expect to experience positive emotions, but more the negative emotions. That's why fever dreams are also more negatively toned, because it's a stressful situation," he adds. Sure enough, almost 95 percent of fever dreams reported by Schredl's initial study participants were accompanied by negative emotions. A high proportion even included the dreamer being threatened by everything from dogs, stones, and insects to terrorists and "big spheres".

Sticking with the continuity hypothesis, it suddenly becomes less surprising to learn that themes related to health and illness tend to occur more frequently in fever dreams than regular dreams. Fever-tinged visions also typically include fewer characters and interactions than your typical dream, which may reflect the experience of social isolation that most people impose on themselves when ill.

What's less clear, however, is whether the continuity hypothesis can account for the fact that fever dreams tend to be so much more emotionally intense than everyday dreams. Even more intriguingly, Schredl's research revealed that around 40 percent of fever dreams are **lucid dreams**, in which the dreamer is fully aware that they are dreaming.

Unable to explain the remarkable lucidity of these diseased hallucinations, the study authors cautiously hold their tongues, allowing themselves only to remark that "this supports the notion that fever has an effect on the cognitive processes during sleep."

In some ways, then, our understanding of fever dreams hasn't progressed all that much since Dr Coats described them as "imperfection[s] in the completeness of sleep." Fortunately for him (and his sister), these unsettling apparitions can't do us any harm, no matter how real they might seem. ●

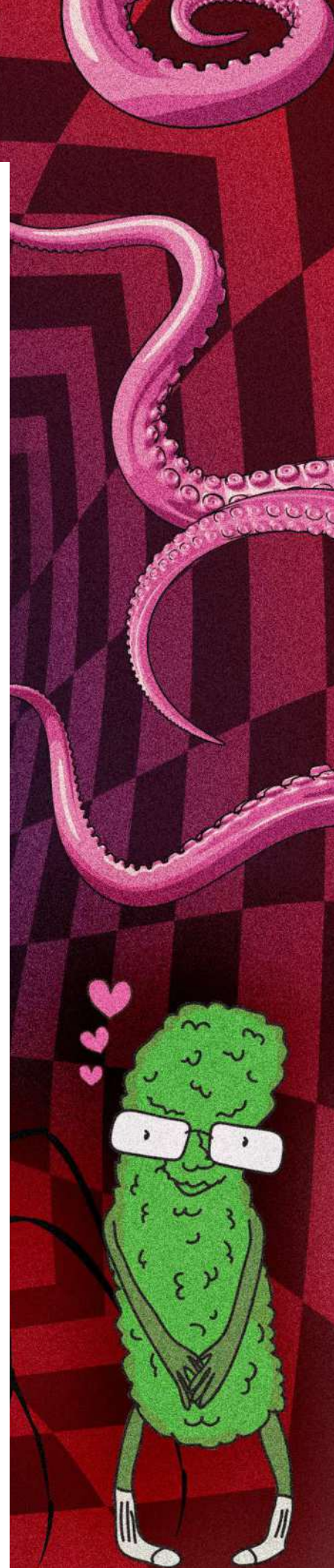




Image Credit: Ylem - Own work, Public Domain, via Wikimedia Commons

FANTASTIC FOXFIRE

This neon rave of a mushroom is the saprophytic fungus *Panellus stipticus* exhibiting bioluminescence in a light display known as foxfire. There are over 125 species of fungi known to glow like this, and it comes down to a small, light-emitting compound known as luciferin. Luciferin is present in a wide range of bioluminescent plants, fungi, and animals, and it produces light when it's oxidized by the enzyme luciferase. Another fungus known as ringless honey fungus glows like this, and scientists recently found a way to incorporate its radiant superpower into **glowing wood**.



Image credit: Elizabeth Ziegelbein / Shutterstock.com

DO HUMANS HAVE PHEROMONES?

AND WHY THE NIPPLE MIGHT BE OUR BEST BET.

By Rachael Funnell

Q&A

Humans smell, there's no denying it, but are some of those smells sending out chemical signals we aren't consciously aware of? Are we, like ants, giving off **pheromones**? We spoke to **Dr Tristram Wyatt**, Senior Research Fellow in the Department of Biology at the University of Oxford, who recently spoke at the **IFRA UK Fragrance Forum 2024**, to find out.

What are pheromones?

TW: Pheromones are smells. They're chemical signals between members of the same species, and they affect physiology and behaviour. So, it's sending a message between individuals. The word was invented in 1959 when the first pheromone was chemically identified, and it means transferred excitement.

How did we discover them?

TW: The first pheromone to be identified was that of the female silk moth, and her chemical signal causes the male silk moth to flap his wings excitedly and try to find her. That's what the scientist, the chemist [Adolf] Butenandt, used to track down the pheromone in his colourless solutions. He used traditional chemistry to try to locate the molecule, synthesize the molecule, and, having identified it, he then – crucially – went back to the male moths and asked them, had he got it right? Their excited wing fluttering told him that he had identified the molecule correctly.

That was really the beginning of modern pheromone research. Butenandt needed half a million female moths to get enough

pheromone, because each moth produced a tiny, tiny quantity. It was lucky that it was a domesticated animal, the same silk moths we get our silk from, so he could get the female in large numbers.

Now, with gas chromatography, mass spectroscopy, and good chemistry, that same process can be done with one moth, instead of half a million. That is, if you know the kind of molecule you were looking for.

The other thing we have realised since then is that he didn't know it, but he was incredibly lucky. Had he chosen almost any other moth, he would have had a much more difficult problem, because the silk moth has a single molecule as its pheromone. Whether that's because of domestication, I don't know, but most other moths gain their species specificity – so, each moth species has its own pheromone blend – and the way they make them unique is by combining different molecules together in a particular combination or ratio.

The number of molecules can be anything up to six or so different pheromone molecules, often variations on a theme, but that would have meant that Butenandt would have taken years, even more years than he did take (which was a good decade), to identify the pheromone. It's much more complicated when you're trying to track down a combination of molecules.

Which animals have pheromones?

TW: It was very quickly realised that ants and other social insects are the supreme users of pheromones, whether we're talking about ant trails or alarm pheromones in bees.

There was quite a debate about pheromones in mammals because there was an initial idea that mammals were too complicated to use these simple chemical messages, but gradually people have come around to the idea. There is a spectacular pheromone very nicely identified in rabbits, which is produced by the mother and the baby rabbits. The pups use this pheromone to find a nipple when they're looking to suckle. So, that's a very important part of their life.

Why might we think humans have pheromones?

TW: Well, humans are mammals. Mammals are smelly, and so are we, and pheromones have been found not just in rabbits, but also in mice. We know less about what's happening in cats and dogs, but they certainly have pheromones.

It's highly likely that humans have pheromones, and there is another clue, which is that our smells – the smells we give off as we grow up and go through puberty – change. As children, we don't smell very much, but as adults, we start to get these glands developing, particularly in our armpits and groins along with the hair that grows there.

If we were looking at any other mammal, we'd think these were probably something to do with reproduction, something to do with sex. So, although no pheromones have been identified so far in humans, I would be very surprised if we didn't discover that humans do have pheromones, just like other mammals.

Why has it been so tricky to prove?

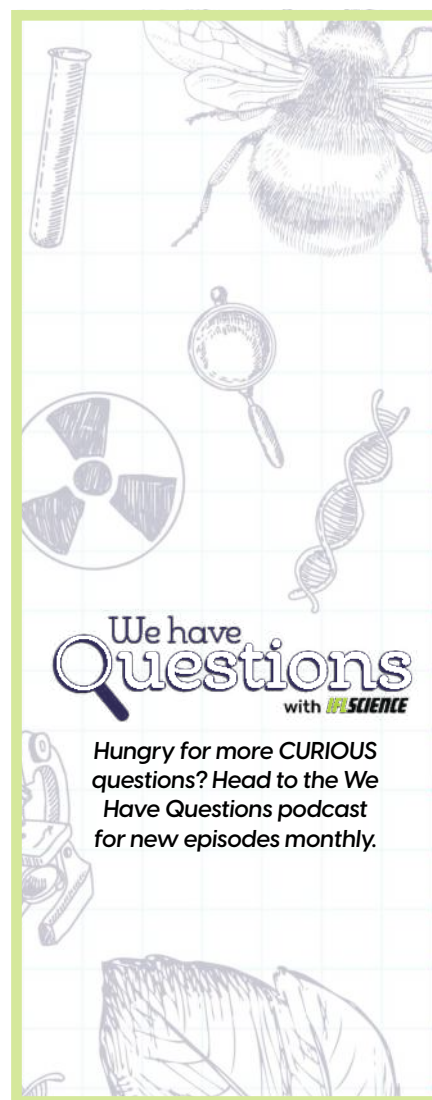
TW: To identify a pheromone, you have to go through the steps that Butenandt did for the silk moth pheromone. You have to have a behaviour, you have to collect the molecules, you have to identify them, synthesize them, and then you have to close the loop by going back to the original study. In the case of Butenandt, it was his male silk moths and their wing fluttering that showed the molecule worked. That's the gold standard for identifying a pheromone. It needs large numbers of subjects. It needs rigor, and that has never been done for human pheromones.

How could we get there?

TW: I think what could happen is that we start from scratch. We start with human behaviours, and then begin doing more robust experiments. Eventually, we'll need to go to the chemists, but actually, there's a lot we need to do to show that smells really are important in those human behaviours. And it might not just be [about] sex, as I mentioned in the rabbits, pheromones are used for other things apart from sex.

Smell is very important to newborn babies. They may not open their eyes for a little while. So, smell is very important. This group in France have found, and this is only a preliminary study, but they've found that babies will turn to the secretion from little glands around the nipple of lactating mothers, mothers who are producing milk. They'll also turn to a glass rod that has the secretion deposited on it, no matter who the woman is.

So, it's not just responding to the smell of their mother. It's actually responding to something that seems to be produced by any lactating woman. That's very exciting, because one of the things about pheromones is they're not about recognizing a particular individual. They are, as it were, universal signals across the species. •



SCIENCE FACT OR FICTION:

CAN YOU REALLY “READ” BODY LANGUAGE?

Does the idea hold up – or is it
doing more harm than good? Dr
Katie Spalding investigates.



"The small area here between the eyes [is] called the glabella. It's one of the first areas that reveals information to us."

"If there's any head tilt [...] the person is more relaxed. The minute the head tilt goes away, there's usually some issue."

"When something's troubling us we tend to stiffen our fingers, interlace them and, almost like a teepee, we move our hands back and forth very slowly."

Type "body language" into YouTube, and you'll find yourself bombarded with results like these. Ex-FBI agents and "**Human Lie Detectors**" abound with such advice – tips that, they heavily imply, will allow you to all but read the minds of strangers in the street.

It's an idea with a long history. Ask an ancient Hindu what marks a liar, and you might be told that shivering is a dead giveaway; a scholar in medieval Europe, on the other hand, may have pointed to your pulse as evidence of deceit.

Today, of course, we rely on more scientific methods to sniff out a fraud. After all, the

FBI, the US Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF), the US Transport Security Administration (TSA), and countless police departments – not to mention various communication consultants and tabloid editors – wouldn't be using these body language techniques if there wasn't some evidence to support it, right?

"IT APPEALS TO THE MIND TO BELIEVE THAT IT WOULD BE POSSIBLE TO KNOW WHAT A PERSON IS THINKING BUT NOT SAYING. THAT WOULD BE A SUPERPOWER!"

The eyes have it?

It's a classic crime procedural plotline: the perp sits in the interrogation room, denying any connection to the crime – only for the police department's expert body language reader to walk in and tear the suspect apart. His eyes are looking up and to the right – he's lying; his arms are crossed – he's defensive; he's itching his nose on the

left side – he's ruminating on the fragility of life now that he knows what it's like to kill. Within minutes, he's in tears and confessing to everything.

Or how about the myriad influencers on TikTok or Instagram with videos showing how some Hollywood starlet or royal duchess is secretly conspiring against her beau. How can you tell? It's in the position of her hands; the angle of her body; the slope of her smile.

It's all "very entertaining," says **Vincent Denault**, Assistant Professor at the University of Montreal's School of Criminology and Regular Researcher at the International Center for Comparative Criminology.

"It appeals to the mind to believe that it would be possible to know what a person is thinking but not saying," he tells IFLScience. "That would be a superpower!"

Consider this received wisdom, for example: a liar, we are told, will frequently look up and to the right as they deliver their story. It's an idea that "has received widespread acceptance among the public," notes a **2012 paper** investigating the claim; it's "frequently taught in NLP [neuro-linguistic programming] training courses, and [is] ubiquitous on the internet."

It would be a neat trick if it were true. But it isn't. The study "revealed no relationship between lying and eye movements, and [...] telling people about the claims made by NLP practitioners did not improve their lie detection skills," **reported** first author of the study Richard Wiseman.

They even put the theory to the test in real-life situations – to the same result. "We analyzed films of liars and truth tellers from high profile press conferences in which people were appealing for missing relatives or claimed to have been the victim of a crime," Wiseman explained. "Once again, the alleged tell-tale pattern of eye movements failed to emerge."

It's the same story with other supposed body language tells. The TSA **purports** to

use techniques “based on scientifically validated behaviors” to pinpoint “high-risk individuals” – but a **2013 government analysis** of their results found that they get it wrong more than 99 percent of the time.

“THERE’S NO SUCH THING AS A LANGUAGE OF THE BODY.”

“It’s completely bogus,” Jeff Kukucka, an assistant professor of psychology and law at Towson University who studies forensic confirmation bias, interrogations, and false confessions, told **The Intercept** back in 2020. “And what’s maybe more alarming about it [...] is that this isn’t new. We’ve

known for quite a while that this stuff doesn’t work, but it’s still being peddled as if it does.”

One in the eye

Time and time again, when put to the test, the claims from supposed “body language experts” come up short. And there’s a good reason for that: “There’s no such thing as a language of the body,” Denault tells IFLScience. “There is no dictionary for interpreting behavior as suggested on traditional and social media.”

It’s not that “body language” doesn’t exist, Denault clarifies – indeed, “non-verbal behavior is fundamental to our daily lives,” he says, “to our identity and the way we perceive and interact with others.” It’s the reason we prefer to see our friends in person rather than over Zoom, he explains, and why important meetings tend to be face-to-face. It’s a big part of why autism is considered a disability:

without the insights from body language and facial expressions that allistic people take for granted, life is simply much harder to navigate.

But claims of some universal physical lexicon that anybody can learn to decode are “misleading,” Denault says.

“Of course, certain facial and body movements are more recognizable than others, and from one culture to another,” he tells IFLScience. “But most of the time, their interpretation in a face-to-face interaction can change due to a variety of factors.”

“What’s more, if we consider different theories, they can have different meanings,” he points out. “For example, a smile may be considered to reflect a person’s joy, but according to other scientists, it is more a sign of a desire to create a bond.”



THE FUTURE OF
IFLSCIENCE

Guilty on the face of it

Now, it's at this point that you might ask the question: so what? So what if some people think that they can spot a liar from the frequency of their blinks, or a psychopath from the way their jaw tenses?

It's a reasonable question – with an unfortunately straightforward answer. As we've already seen, law enforcement agencies across the US (and other countries) support and use these techniques; behave the wrong way, in the wrong place, and you may fall foul of authorities such as the TSA or FBI – both of whom have at some point endorsed the idea of being able to “see” liars or potential criminals through body language alone.

“In the US, for example, one interview technique suggests to police officers that movement in the chair, and looking away should arouse suspicion,” Denault wrote in an article for **The Conversation** this year. “But such beliefs have no value and can actually reinforce the perception of guilt in individuals who, in reality, have done nothing wrong.”

In extreme circumstances, it could even be a jury of your peers, or a judge, who decides you're acting too “suspiciously” to be innocent: “Witnesses who tell the truth risk not being believed, and witnesses who lie risk being believed,” Denault tells IFLScience.

“This should not be overlooked,” he warns. “The outcome of many trials is determined by the credibility of witnesses. If judges observe and judge the non-verbal behavior of witnesses on the basis of unsubstantiated and discredited claims about non-verbal behavior, this can negatively influence the outcome of trials.”

It's a problem with extremely bleak real-world consequences. The belief that we can accurately “read” body language has **resulted** in child victims of alleged abuse being dismissed as non-credible in court: “she fidgeted, played with her glasses, swung around in her chair, smiled,” reads one **2008 court judgment** concerning a 13-year-old child testifying about an

alleged offense that happened when she was 11; “Her evidence was peppered with answers like, ‘I don't know,’ ‘I guess,’ and ‘I don't remember.’”

“UNSUBSTANTIATED AND DISCREDITED CLAIMS ABOUT NON-VERBAL BEHAVIOR CAN HAVE DISASTROUS CONSEQUENCES WHEN USED BY PEOPLE IN POSITIONS OF POWER.”

The defendant – her accused abuser – was found not guilty on both counts he was charged with.

Eye want to believe

So why do we fall for it? More to the point, why do the *authorities* fall for it? It's not like the data isn't available, after all – shouldn't law enforcement and legal experts want to base their judgments on the most accurate information possible?

For Denault, the causes are manifold. There's the motivation of having a “problem to solve”, he says, but a lack of understanding of science – and **pseudoscience** – through which to tackle it. Couple this with good old repetition bias – the fact that repeated information feels more “true” than information we're not exposed to as much – and it's no surprise that the myth of “reading body language” has taken hold so tenaciously.

“I think it is important to underline that, in my opinion, people who promote misconceptions about non-verbal behavior are probably acting in good faith,” Denault tells IFLScience. “They are probably sure that what they are promoting is correct, and that it will help others.”

“However, good faith is not synonymous with good practice,” he adds. “And unsubstantiated and discredited claims about non-verbal behavior can have disastrous consequences when used by people in positions of power.” ●





"IRON OF GOD" METEORITE

In this excerpt from *The Meteorite Hunters*, science journalist Joshua Howgego takes us back to the early 20th century when a French army captain supposedly stumbled upon a huge hunk of space rock in Mauritania... Or did he?

This tale begins more than a century ago in Mauritania, another North African nation to the west of where Buhl was hunting. In 1916, it was a French colony, and a French army captain named Gaston Ripert was stationed in the town of Chinguetti. Remote and ancient, Chinguetti has a rich history of Muslim scholarship. The town served as a gathering place for the Islamic pilgrimage to Mecca, and at its peak in the 18th century it had 12 mosques and five libraries. By Ripert's time, it was still beautiful and atmospheric, but diminished, with dunes nibbling at its edges. One day, the captain overheard a conversation between some camel drivers about what they called the "Fer de Dieu" (or "Iron of God").

It was enough to furrow the brow and, curious, Ripert asked the head man of the town, Idi Ahmed Ould Sein, about the gossip. Ahmed at first denied any knowledge of it and only at length did he consent to take him to visit

this mysterious object, and then only on the condition of secrecy. Ripert was forbidden to carry any means of measuring the geography of their destination – no compass, no map. The pair set out at dusk and travelled overnight by camel. At dawn, they arrived at what appeared to be a huge hill, with one edge polished by the aeolian sand to a metallic, mirror-like finish.

In later communications, Ripert described this thing as an enormous, isolated metallic mass, partly covered by dunes. It was gigantic: 40 metres [131 feet] high and 100 metres [328 feet] long. The captain scrambled to the top of the hill, where he found a 4.5-kilogram [10-pound] lump of iron, which was much later confirmed to be a meteorite. He also encountered some exposed "metallic needles" at the summit and tried to splinter a piece off one of them by hitting it with the meteorite – but he found it was oddly ductile, bending but not breaking. His guide was anxious to be off, so the pair soon retreated to Chinguetti.

Ripert gave his story and his souvenir rock to a colonial administrator called Henry Hubert, who passed them on to Alfred Lacroix, a mineralogist at the French Museum of Natural History. It was Lacroix who rubber-stamped the rock as a genuine meteorite and introduced the idea that the 40-metre-high iron mass could be one too. In 1924, he read a paper on the subject to the French Academy of Sciences, which described Ripert's nocturnal journey and fabulous sighting. Lacroix ended his paper by saying: "if, in effect, the dimensions given by M. Ripert are exact, and there is no reason to

doubt them, the metallic block constitutes by far the most enormous of known meteorites." The largest meteorite we know of today is about 3 metres [10 feet] across – a tadpole compared to the legendary Fer de Dieu.

Is "legendary" the operative word here though? It would be easy to dismiss it all as a tall tale, but there are reasons not to. For one, there is the meteorite Ripert brought back, a lump of silvery metal the size of an outstretched hand, inset with gleaming crystals. How did Ripert get hold of this, if not from a bona fide strewn field?

Maybe he purchased the meteorite surreptitiously and concocted the whole story. But if so, what was his motive? Based on everything I have read about him, Ripert would have gained little by inventing this absurdist yarn. Then there is the most telling argument, which concerns those "needles" that Ripert described. It would be a strangely precise detail to invent, but according to a paper on Chinguetti by the historian of meteoritics Ursula Marvin, there is an explanation for them. You can sometimes find weathered iron meteorites in which areas of nickel-rich iron (a mineral called taenite) are left standing after the neighbouring regions of less hardy, nickel-poor minerals have been worn. These taenite spikes, Marvin conveys, tend to be ductile just as Ripert described – and this fact was not known at the time of Ripert's alleged discovery. If he cooked up this detail, that would be a coincidence almost as big as his putative meteorite. ●

AUTHOR
Q&A

JOSHUA HOWGEGO

AUTHOR OF *THE METEORITE HUNTERS*

Meteorites are like time capsules for the Solar System – and, as such, are incredibly valuable to scientists. We caught up with science journalist Joshua Howgego, author of *The Meteorite Hunters*, to find out how intrepid – and sometimes unexpected – explorers are tracking the space rocks down.

Why did you want to write this book?

Usually, when we want to know about space, we look at it with a telescope. But years ago, I met scientists who study meteorites as an alternative way of discovering the history of the Solar System. Something about using these enigmatic stones to answer grand questions about how the planets formed appealed to me. Also, I've been editing magazine features for years and I think a lot about how to tell interesting stories about science. I thought I could see a way to weave together the excitement of hunting these extraterrestrial treasures with the stories of scientific discovery in a satisfying narrative that hadn't been done before.

What was a surprising fact about meteorites and meteorite hunting that you discovered?

When I first learned about it, I found it so delightful that the best place in the world to hunt meteorites is Antarctica. Meteorites have fallen on the ice there over the eons and then the glaciers carry and concentrate them in areas near the base of mountains, like a conveyor belt. This was discovered decades ago, but teams still go out every year and Hoover up the frozen meteorites.

You interviewed some incredible people for the book, did you have a favorite chat or interaction?

Yes, meeting so many interesting people was one of the best parts of working on the book. They were all wonderful, but my favourite was Jon Larsen – he's such a nice bloke and such an extraordinary character. His first love was jazz guitar, and he became Norway's most famous jazz musician. But then a tiny speck of dust fell on his breakfast table one morning and he wanted to know where it came from. That set him on a decade-long quest to develop a method for finding micrometeorites – that is, tiny meteorites, often a fraction of a millimetre wide – in urban areas. All the experts said it could not be done, but Jon proved them wrong. I went hunting with Jon on the rooftops of Oslo and it was unforgettable.

Which is the coolest meteorite you encountered in the book?

I desperately wanted to find my own micrometeorite on the roof of my house using Jon Larsen's methods. That would have been so great, and I tried hard – I climbed up and collected a disgusting bucket of muck from the gutters – but in the end, I had neither the skill nor the patience.

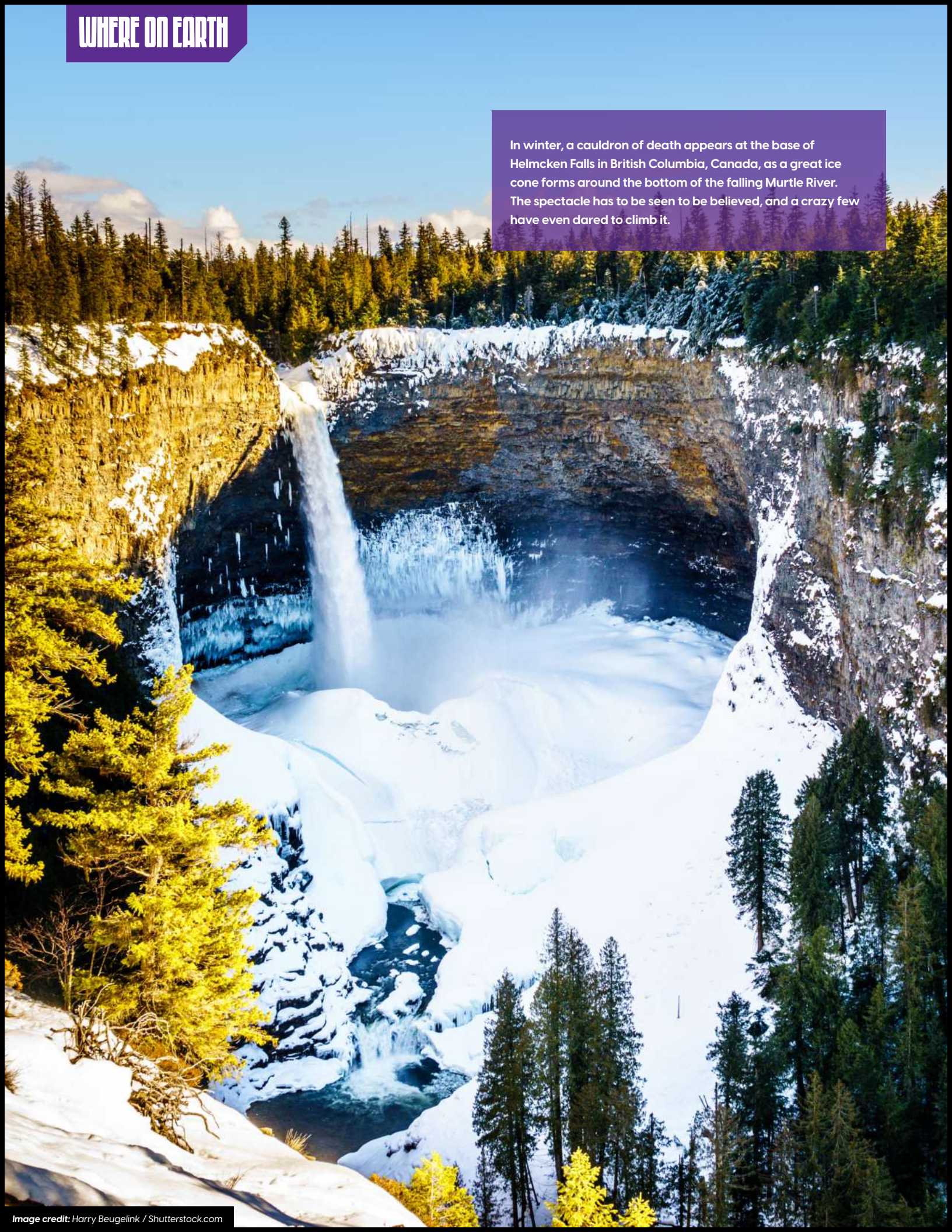
In terms of larger specimens, the sheer beauty of the Ilmälac meteorite is hard to beat. It's a hodge-podge of silvery metal and yellowish, transparent minerals; I describe it in the book as looking like an alien stained-glass window. There are so many others I like too, but – whisper it – many others look rather bland. You have to know their stories to truly appreciate them, and I hope my book helps initiate more people into that club.

You talk about the lack of regulations surrounding meteorites throughout the book. How do you hope governments will act in the future?

There is sometimes a tension between those who see meteorites primarily as treasure to be cashed in and those who care more about their scientific value. I don't think the non-scientist collectors are bad, and without them we would have found far fewer specimens. At the moment, legislation is different from country to country, some good, some deeply unhelpful, so I would like to see better laws and regulations balance the competing interests. One idea that comes up in the book is a win-win-win model, where the finder, the scientists, and owner of the land where the stone fell all get a share in the spoils. The tragedy I'd like to avoid is this cosmic heritage being stripped from countries, especially poor places, by rich meteorite hunters flying in from overseas. ●

The Meteorite Hunters is published by Oneworld Publications and is available February 6.

In winter, a cauldron of death appears at the base of Helmcken Falls in British Columbia, Canada, as a great ice cone forms around the bottom of the falling Murtle River. The spectacle has to be seen to be believed, and a crazy few have even dared to climb it.



GAZE INTO THE CAULDRON OF DEATH

Standing at the top of Helmcken Falls in summer, you find yourself staring down at a churning pool of water as the Murtle River plummets 141 meters (463 feet). Visit that same spot in winter and you'll find yourself staring into "the cauldron of death". At least, that's what climber Will Gadd and his crew nicknamed the cavernous bowl of ice that was waiting below when he completed his first ascent of a route known as Overhead Hazard.

The cauldron Gadd spoke of is an impressive ice cone that forms at the base of the falls and grows into a giant bowl-like structure. The wall behind develops spikes as enormous icicles form from the freezing temperatures and falling water. In fact, it gets so cold that the falls can create their own snow.

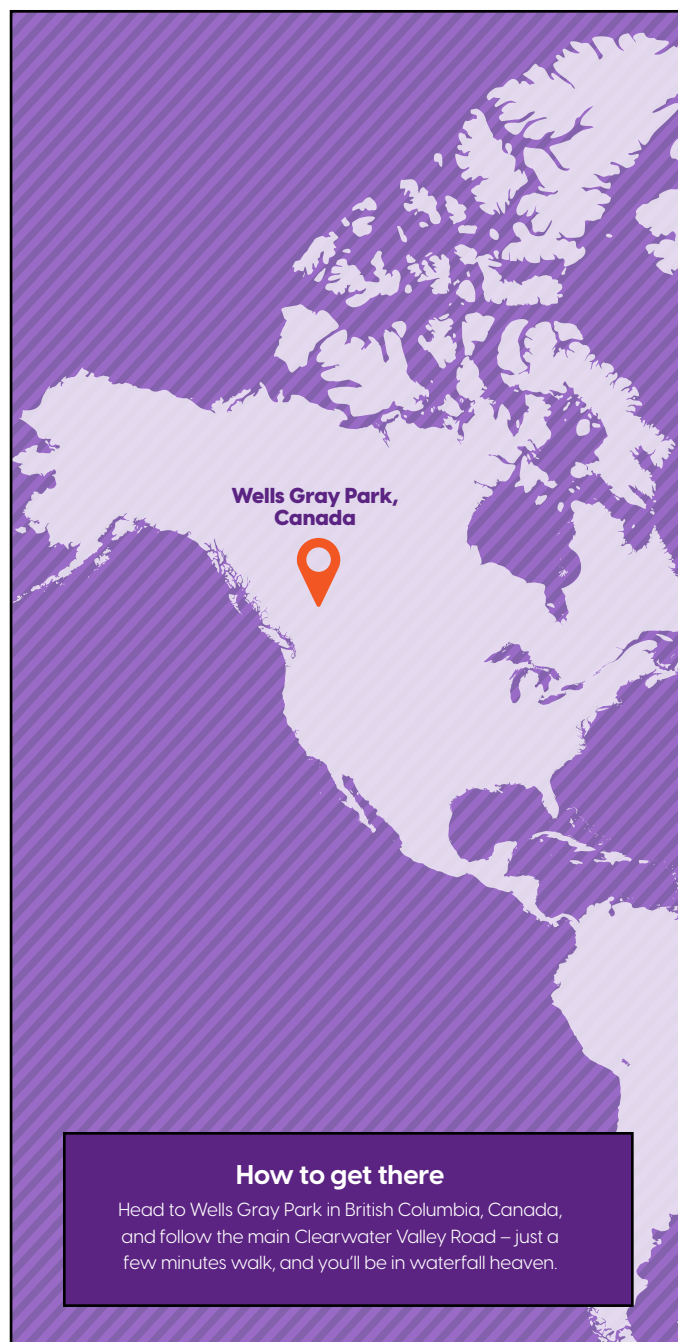
It's a treacherous route, not only because that cauldron of death is lurking below waiting to swallow your tools or – worse – you, but also because giant spears dangle overhead that could very easily crush you.

"This route is called Overhead Hazard, named for all the giant icicles hanging over your head as you walk around the base," Gadd told **National Geographic**. "It's a constant 'head bob' to look up and make sure there isn't an icicle above you. They break off regularly, and weigh as much as a bus or something – they'd smush you pretty effectively."

It perhaps goes without saying, then, that this is not the recommended way to enjoy the winter majesty of Helmcken Falls. Fortunately, for those who don't fancy staring down a bus-for-an-icicle, there's a trail for that.

Wells Gray is known as "Canada's Waterfall Park" thanks to the action of ancient volcanoes and glaciers that carved out the powerful bodies of water that now tumble across the landscape. The sheer variety means there's a waterfall for every hiking preference, from those that can be found minutes from the main road up to Helmcken Falls, the fourth-highest waterfall in Canada. There is a wheelchair-accessible viewing platform that can be reached from the parking lot, or you can follow Helmcken from source to falls along the South Rim Trail.

Beyond housing a charismatic cast of waterfalls, Wells Gray is also a biodiversity hotspot with a host of creatures big and small to spot throughout the year. Read up on your bear safety as the **park site** says there's a good chance of encountering black and grizzly bears between spring and fall. The park's moose, on the other hand, are active year-round. ●



How to get there

Head to Wells Gray Park in British Columbia, Canada, and follow the main Clearwater Valley Road – just a few minutes walk, and you'll be in waterfall heaven.

READ



Bill Gates



My Beginnings

Source Code

Source Code Book by Bill Gates

As one of the biggest names in The Information Age, co-founder of Microsoft Bill Gates has a fair few stories to tell. From his card-playing childhood in Seattle

through to his early love of computing and software as a teen, he describes the pivotal moments in his early life that led him to the realization that "by applying my brain, I could solve even the world's most complex mysteries". In *Source Code*, Gates lays down his own origin story, and the path that led him to co-found one of the world's most influential companies, featuring what's thought to be the **most viewed image in the world**.

Available **February 4**.

LISTEN

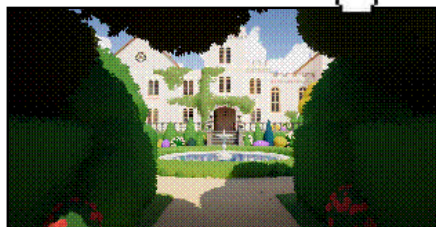


Why Do Humans Play Games? We Have Questions podcast from IFLScience

Stick two humans in an enclosed space with nothing to do, and before long, someone is likely to suggest a game of I Spy. Kids are so hot for smartphone games that it inspired a **meme**, and while certain generations might like to tell you this compulsion is a new thing – the fact is, humans have been playing games for thousands of years. It's believed that gaming actually predates language, begging the question: why do humans play games? We spoke to **Kelly Clancy**, a neuroscientist and author of *Playing With Reality: How Games Shape Our World*, to find out.

Available **February 17**.

PLAY

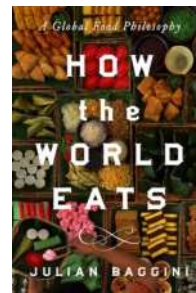


Botany Manor Game from Balloon Studios

Step into the shoes of Arabella Greene, a retired botanist who – as luck would have it – now inhabits Botany Manor, a stately home in 19th-century England. Your task? To grow rare plant specimens from seed to bloom, with a little help from the clues and contraptions hidden around the manor. Wander the expansive house and gardens, conducting botanical research so you can figure out the ideal habitats for a wide variety of plant life and finish your book, "Forgotten Flora". Each plant you grow will reveal its unique qualities in this charming first-person puzzle game that frankly we wish was our real life.

Available **now**.

DISCOVER



How The World Eats Book by Julian Baggini

How we eat has been transforming the way we live since *Homo sapiens* first evolved, and

since the early days of hunter-gathering, how we source our food has also evolved. Much of the world's food forms part of an incredibly complex food web of production, distribution, consumption, and disposal, each of which presents unique challenges we are now trying to overcome. From food waste to emissions, we've got a lot on our hands, which is why Baggini urges that it's never been more urgent to gain a better understanding of how we feed ourselves.

Available **February 4**.

WATCH



The Gorge Movie on Apple TV+

Two elite snipers are hired for a cryptic mission to guard either side of a mysterious and highly classified gorge, to protect the secret that lies within, without knowing what that is. With that set-up, it can't be good and it's unlikely whatever is down there is staying put either. Their mission? To keep the world's most deadly secret from escaping, and well, secret. How they are meant to do this when they've been told not to interact is anyone's guess. We particularly enjoy Apple TV+'s chosen release date too.

Available **February 14**.

SCIENCE IN MEDIA





DATES TO REMEMBER

Love is in the air, and (if you've got any sense) these dates will be in your diary. This Feb sees the return of the Great Backyard Bird Count as avid ornithophiles watch, count, and celebrate all things avian. There's also World Cancer Day, International Day of Women and Girls in Science, and Groundhog Day, and Groundhog Day, and Groundhog Day...

FEBRUARY



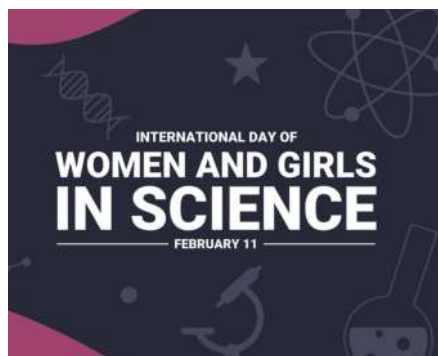
2 Groundhog Day

That's right folks, it's time to find out what a bunch of rodents have to say about spring. The outlandish tradition posits that when a groundhog emerges from its burrow at the end of hibernation, its shadow will help determine the turn of season. If it sees its shadow and scurries back inside, winter will continue; if it doesn't, spring is upon us. The marmot meteorologists are **not the most scientific**, but they sure are cute.



4 World Cancer Day

Cancer touches millions of lives, and so World Cancer Day on Feb 4 aims to raise awareness for and take action against this devastating group of diseases. In 2025, the "United by Unique" campaign centers on person-first care, striving to look beyond the disease and see the person before the patient.

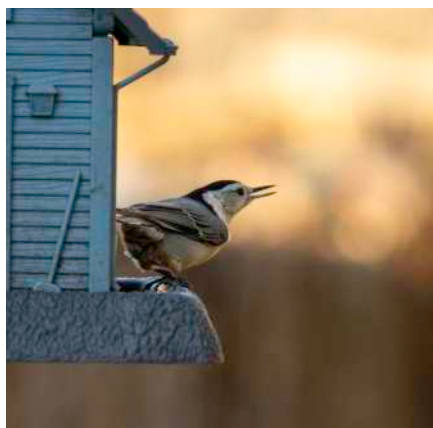
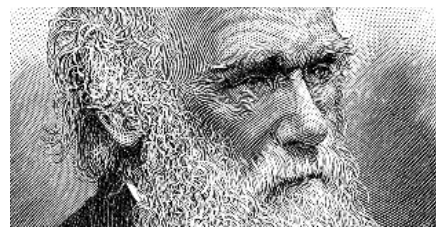


11 International Day of Women and Girls in Science

The 10th International Day of Women and Girls in Science will be celebrated on Feb 11, to honor the contributions of women and girls to Science, Technology, Engineering, and Mathematics (STEM). Despite the critical role that they play, there is still a gaping gender gap in STEM, which observances such as this hope to close fast.

12 Darwin Day

On February 12, 1809, the infamous British naturalist and father of evolutionary theory, Charles Darwin, was born. We now celebrate his birthday as Darwin Day, highlighting his contributions to science, alongside the discipline in general.



14-17 Great Backyard Bird Count

Great news for bird fanatics: the Great Backyard Bird Count is back for 2025! The community science project invites you to spend as little as 15 minutes out in nature, identifying – and, of course, counting – any feathered friends you see. By submitting your findings you'll help scientists better understand and protect avian species around the globe. Will you join the world in connecting to birds? Find out how **here**.



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

Choose how you end each issue. For those who prefer the darker side, Holly Large explores the time the CIA tried to train a cat as a superspy. If you like your science lighter, discover why feeling sorry for a lonely banana might actually be a good thing.

SPY CAT

As soon as we found out the following information, we just knew we had to share it: back in 1964, the CIA began a program to turn cats into spies.

Sadly, this didn't involve training a feline to play poker in the hopes of pulling off a *Catsino Royale*. Instead, the program sought to take advantage of cats' stealthy abilities to eavesdrop on conversations between foreign agents taking place out in the open.

How? By turning them into walking, meowing microphones.

In a microsurgical procedure, the cat selected to become the first "Acoustikitty", as it was later dubbed, had a tiny microphone implanted in one of its ears, a transmitter placed under some skin, and an antenna in its fur.

During the Cold War, this could have been a fairly inconspicuous way of gaining information. Even if the cat was noticed, you'd likely be hard-pressed to spot any of the wiring underneath all that floor.

There was just one problem – Acoustikitty wasn't a fan of following orders. In news

that will come as no surprise to anyone who's ever met a cat, the fluffy little fiend spent field tests roaming about in whatever direction it pleased.

THE PROGRAM SEEMS TO HAVE WORKED UNDER THE ASSUMPTION THAT THOSE BEING SPIED UPON WEREN'T CAT PEOPLE.

Not to mention, the program seems to have worked under the assumption that those being spied upon weren't cat people. Sure, those agents might have been professionals and carried on their intelligence-filled conversation if they spotted a cat, or they might have started going "here, kitty kitty" instead. We know what we'd do.

At some point in 1967, the program was canceled without Acoustikitty ever having gone on a full-fledged field operation. After it ended, a rumor began circulating that the cat was actually killed during a field test, though the CIA would later debunk this as a joke made by a former official.

Regardless, we hope Acoustikitty got a meowntini for their efforts – shaken, not purred.

ONE LESS LONELY BANANA

Have you ever found yourself in the fruit aisle of the grocery store feeling sorry for the single bananas separated from the rest of the bunch? That might sound like a sense of empathy taken a bit too far, but according to science, it might actually be the key to reducing food waste.

Anthropomorphizing – that is, applying human attributes to non-human entities – food has previously been shown to give consumers a more positive view of "imperfect" food items, like wonky veg.

"HERE ARE SINGLE BANANAS THAT WANT TO BE BOUGHT AS WELL". IF YOU NEED INSPIRATION FOR YOUR TINDER BIO, THERE YOU HAVE IT.

Researchers from the University of Bath, Goethe University Frankfurt, and RWTH Aachen University wanted to determine if the same could be applied to "single" food items, such as torn-off bananas, which often end up going to

waste. They also wanted to see whether it made a difference to how many bananas were bought when they were given a "happy" or "sad" emotion.

Conducting their field **study** with a large German food retailer, the team placed one of three different signs above baskets of single bananas: a drawing of a banana with a sad face and the words "We are sad singles and want to be bought as well"; the same drawing with a smile and "We are happy singles and want to be bought as well"; and a control sign with no drawing and "Here are single bananas that want to be bought as well". If you need inspiration for your Tinder bio, there you have it.

After recording how many of the single bananas were purchased per hour, it appeared that a little guilt trip – albeit a very forgivable one – was the way to go. While both happy and sad banana signage led to more sales per hour than the neutral, the team found that the sad banana was by far the most effective at triggering a compassionate response and subsequently, a sale.

"The plight of the single bananas is really relatable," said study co-author Dr Lisa Eckmann in a **statement**, "and the findings have very practical applications for boosting sales and reducing food waste from our supermarkets"



The Darker Side of Science



THE LIGHTER SIDE OF SCIENCE