

CURIOS?

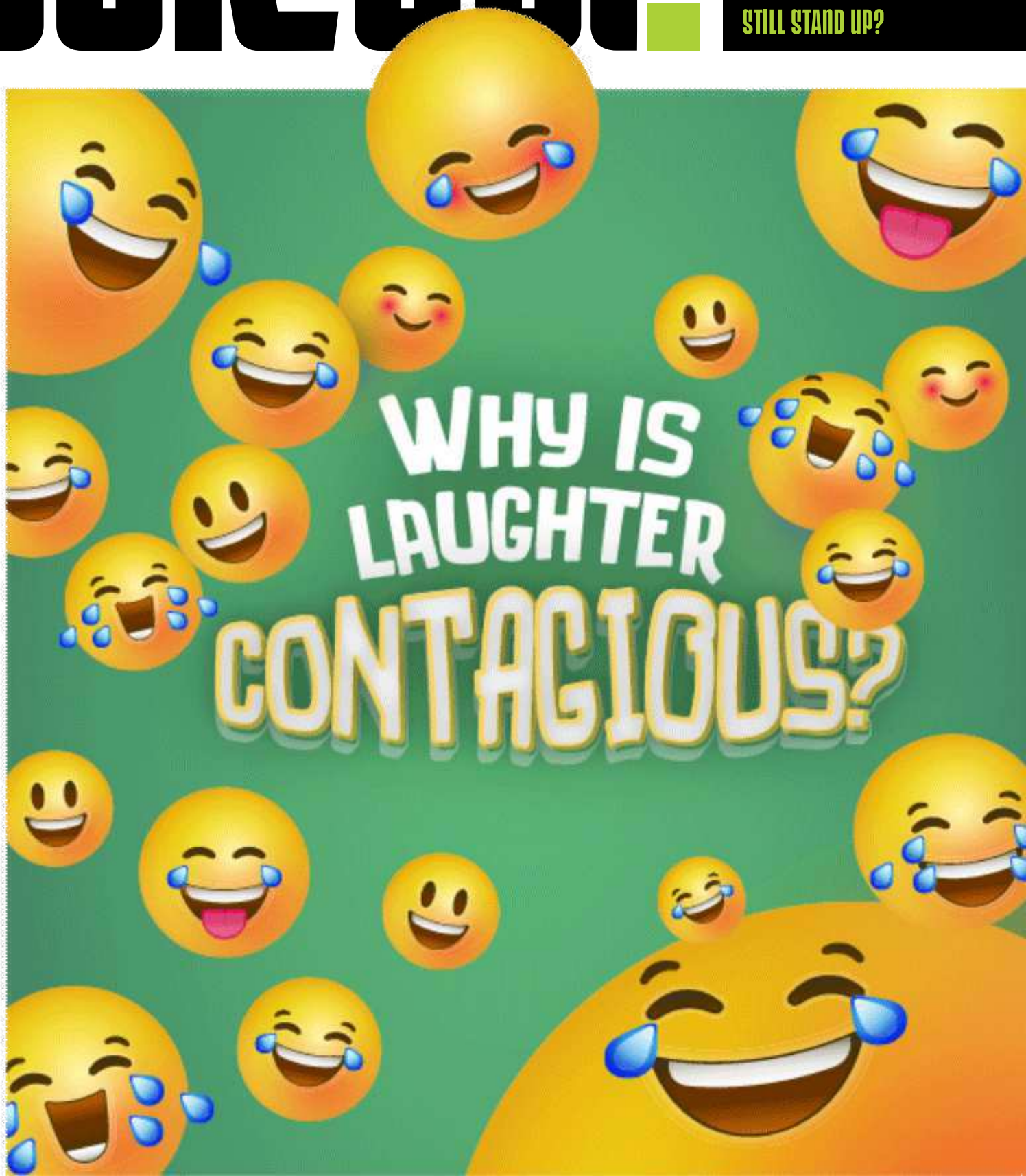


WHY DOES SNOW SOMETIMES
LOOK BLUE?

DO ANCIENT HANGOVER CURES
STILL STAND UP?

IFSCIENCE.COM | DECEMBER 2024

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WHERE ON EARTH

A RAINBOW SWAMP

Swamps usually evoke images of mushy green and brown, but in Virginia, an ecological cocktail creates a natural rainbow.

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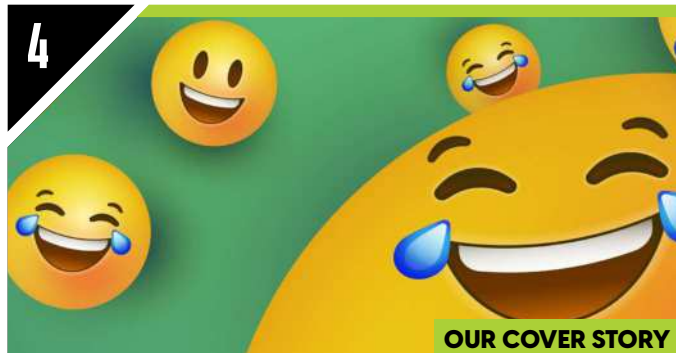


DEEP DIVE

DO ANCIENT HANGOVER CURES STILL STAND UP?

'Tis the season for merrymaking, so how best to safeguard yourself? Benjamin Taub puts himself in some ancient revelers' shoes to find out.

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WHY IS LAUGHTER CONTAGIOUS?

Got the giggles and can't contain it? Who – or what – is to blame? Laura Simmons investigates.

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IFLSCIENCE

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NEWS BITES




70 Years Of CERN

This year, CERN – home to the world's largest and most powerful particle accelerator, the Large Hadron Collider (LHC) – celebrated 70 years at the forefront of particle physics, helping us understand our world (and beyond) like never before. Created in 1954 to foster peace and bring scientists together post-WW2, the European Council for Nuclear Research (CERN) was set up in Geneva, Switzerland, largely thanks to its neutrality during the war. Now it boasts 23 member states and some 17,000 people from over 100 nationalities working there. Most famous for the LHC and the discovery of the elusive **Higgs Boson "God particle"**, which fundamentally changed physics, CERN already has plans to build the **next-generation particle smasher** to hunt the dark universe. It will be three times the length of the LHC, although building won't start until the 2030s and it won't start smashing electrons until the 2040s. IFLScience is set to visit CERN early next year so keep your eyes peeled for exclusive content from inside its beating heart.



Join The Christmas Bird Count

The Audubon Christmas bird count is the US's longest-running community science bird project, and you can take part in over 100 years of citizen science, helping researchers and – importantly – birds around the world. Started on Christmas day in 1900, 2024 sees the 125th annual survey held between December 14 and January 5. Taking place across at least 20 countries in the Western Hemisphere, it's easy to join: just register for one of the provided locations (it's an official census so registering is important), choose a date within the allotted time, and count the birds you see and hear on that day. Find out how to join, upload photos using the live tracker, and see how the data is being used for conservation by scientists globally **here**.

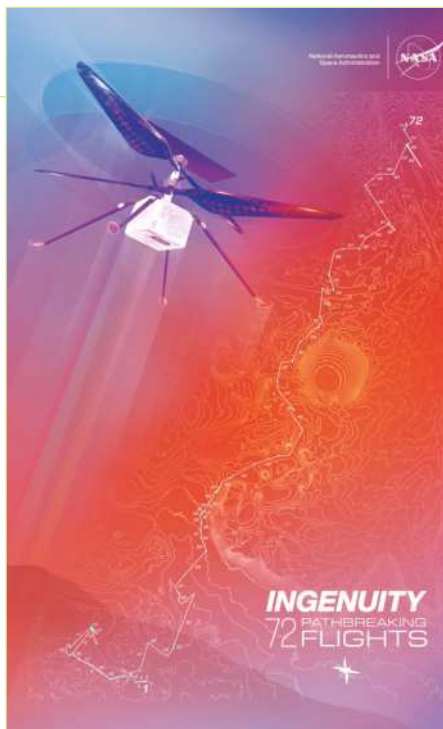


Can You Scare AI?

Artificial intelligence (AI) might scare us, but can we scare it? It's a good question posed by scientists, and you can actually give it a go in a new citizen science project that is ongoing until January. The **Spook the Machine** experiment, an art-science project launched by the Center for Humans and Machines, aims to explore whether machines can express human-like emotions. Your challenge is to find the hidden fear in each AI by using specific text inputs to create spooky images and find the machines' weak spots, eliciting an "emotional" reaction. They include fears only a machine could have, from "Obsolescia", the fear of being replaced by new technology, to "Deletophobia", the fear of data loss and memory erasure. You have until January 7, 2025, to test out your scare tactics.

Black Moon

On December 30, we'll see a relatively rare so-called Black Moon. This is either the third new Moon in a season of four new Moons, like the last one that occurred in May 2023, or the second new Moon in a month. Though not an astronomical term (neither is **Blue Moon** for that matter), it has been gathering use in recent years. If you're hoping to spot it though, you're out of luck – Black Moons are invisible. The new Moon is the phase we cannot see from Earth, as only the far side is illuminated by the Sun. But knowing it's there to see out the year is fun.



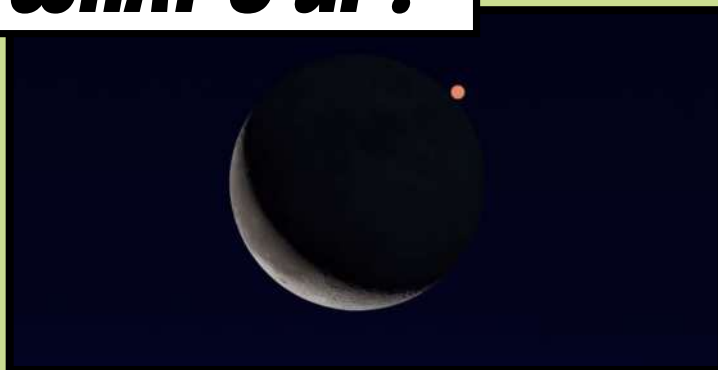
Give The Gift Of Space

Struggling with what to get the space-lover in your life this holiday season? NASA has your back with its huge range of posters, from **retro travel-style posters** for a trip around the Solar System to its recent iconic missions – OSIRIS-REx's **asteroid sample return** and the launch of **Europa Clipper** spring to mind as does the record-breaking **72 flights of Ingenuity**, the little Mars helicopter that completed its mission above and beyond its goal in January this year – all available to download for free.

New Lunar Lander

We're getting a new lunar lander this month courtesy of Japan with iSpace's Resilience lander and Tenacious micro rover set to launch to our satellite on a SpaceX Falcon 9 rocket. Resilience has three primary payloads: a water electrolyzer experiment, an algae-based food production module, and a deep space radiation monitor, while Tenacious, at just 26 centimeters (10 inches) tall and 54 cm (21 in) long, will explore the Moon's surface equipped with a tiny shovel to scoop up a lunar sample and an HD camera. The landing site is Mare Frigoris, or the "Sea of Cold", a vast basaltic plain in the Moon's far north. If successful, it will be the most northerly touchdown on the Moon by anyone so far.

WHAT'S UP?



Lunar Occultation

Mars is going into hiding

Name: Lunar occultation of Mars

Appearance: Eclipse vibes, but with a planet

Location: Night sky

What's a lunar occultation?

It's an astronomical event during which the Moon appears to pass in front of another object in the sky, temporarily obscuring it from view. That object could be a star or a planet – we're about to see one of the latter.

Doesn't that mean a total solar eclipse is also a lunar occultation? Yep – two astronomical events for the price of one.

It doesn't have anything to do with the occult... right?

Nope, no supernatural shenanigans involved (although best believe some completely unfounded astrological nonsense has been applied to it). Both occult and occultation share a common Latin root, however – the word "occultātiōn" or "occultātiō", meaning hiding or concealment.

When, where, and how can I see the next one?

You're in luck – there's one this

month, during which the Moon will pass in front of Mars. It'll start at approximately 7:47 am UTC (2:47 am ET) on December 18 and, depending on exactly where you are, either Mars' disappearance or reappearance will be visible in parts of Canada, Alaska, Greenland, the UK, and Europe.

The only thing you'll need is a telescope and an idea of when the occultation will be happening in your specific location – there's software that can help with that.

What if I'm not in those places (or would prefer to be in my nice, warm bed)?

Even if the lunar occultation isn't visible, you might still get the chance to see a super close conjunction between the Moon and Mars.

If you'd still prefer to see the whole shebang and not miss out on precious sleep, those in most of North America and a chunk of West Africa will have another opportunity come January 13, starting at the much more tolerable time of 1:44 am UTC or 8:44 pm ET.

OUR COVER STORY

WHY IS LAUGHTER CONTAGIOUS?

Got the giggles? Blame evolution.

By Laura Simmons

Image Credit: Modified from cliparts/Stock

Sitting in the audience at a stand-up show; watching a comedy at the movies; at the office party when your boss breaks out their best knock-knock joke: these are all places where laughter is both encouraged and expected. During a quiet moment in church? Not so much. But wherever you are, if you hear someone else laughing, it's likely you'll get the urge to giggle too – however inappropriate that may be! Should we all just be able to control ourselves better, or is laughter really contagious?

The answer, in short, is yes.

"All emotions are contagious"

"Is laughter contagious? Well, actually, all emotions are contagious," **Dr Sandi Mann**, chartered member of the British Psychological Society, told IFLScience. "We are designed to pick up other people's emotions."

It's part of our evolution, and it's something we share with other mammals. It's been well established that apes – our closest relatives – laugh in a remarkably humanlike way. If you're ever close enough to a **bonobo** to try tickling it (not something we'd necessarily recommend), you'll **find out**.

Recent research even found that apes may have a sense of humor and **love to tease** each other. A **2021 review** concluded that 65 different animal species show evidence of "**play vocalizations**" that mimic humans laughing when we're having fun, mostly mammals but a few birds as well.

In fact, laughter is such a fundamental part of what it means to be human that it transcends language and culture – there's **not a single community of people** on Earth that we know of who don't laugh.

Why laughter is good for us

Part of the reason why a fit of the giggles spreads so easily, Dr Mann told us, is that shared emotions are integral to social bonding. A **2022 paper** from

University of Oxford Emeritus Professor of Evolutionary Psychology Robin Dunbar explored this further.

LAUGHTER HAS A SIMILAR EFFECT, WHILE BEING LESS INTIMATE AND TIME-CONSUMING THAN GROOMING. HUMANS LAUGH TOGETHER ALL THE TIME, BUT WE'RE RARELY SEEN PICKING LICE OUT OF EACH OTHER'S HAIR THESE DAYS.

"I suggest that, when hominins needed to increase the size of their groups beyond the limit that could be bonded by grooming, they co-opted laughter [...] as a form of chorusing to fill the gap," Dunbar wrote.

Grooming – a social behavior we particularly associate with monkeys and apes, but which is seen throughout the **animal world** – boosts the production of **endorphins** in the brain. These chemical messengers relieve pain and generally make us feel good. Dunbar detailed some evidence that laughter has a similar effect, with the added benefit of being less intimate and time-consuming than grooming. Hence, humans laugh together all the time, but we're rarely seen picking lice out of each other's hair these days.

A hit of endorphins also helps us de-stress. When a group of people are sharing a tense situation, Dr Mann told IFLScience, humor can help to alleviate that as well as strengthen the bond between them: "Sometimes we just need to smile, laugh, have fun to relieve the stress."

You might have heard people talk about using "gallows humor" as a coping strategy – it's common among those whose jobs regularly expose them to distressing scenarios.

"Medical and emergency services personnel are particularly likely to use humour to counteract the effects of dealing with stressful situations and this contributes to a person's resilience when dealing with stressful situations," wrote Sarah Christopher, then a senior lecturer in paramedic practice at Sheffield Hallam University, in a **2015 paper**.

As Christopher explained, this has been true even in the **darkest chapters** of human history, things about which most people would dare not crack a joke. The paper includes a number of examples of Holocaust survivors explaining how humor helped them to keep up their morale.

"SOME THINGS ARE QUITE SPONTANEOUS, AND YOU HAVE TO KIND OF 'BE THERE' TO FIND IT FUNNY. OTHER THINGS THAT WE LAUGH AT ARE WHEN THINGS ARE INCONGRUOUS."

In medical scenarios, it's not only the staff but the patients who can benefit from a dose of laughter – as we mentioned before, it has pain- and stress-relieving powers.

When we talk about the benefits of *sharing* a laugh, one **study** of clinician-patient interactions in five Australian emergency departments contains a particularly illustrative example. In general, the authors found that laughter was a surprisingly common feature of a visit to the ER, but one patient named "Janet" took the cake, recording 38 instances of laughter during her 6.5-hour stint.

Transcripts of conversations show how Janet's attempts at humor went largely unreciprocated by the attending physician – and even just reading them, you can feel yourself cringe. There's a personality mismatch there. It's all a bit awkward.

Things couldn't be more different with one of the nurses who took care of Janet. While taking a blood sample, she shared in Janet's jokes, and they laughed together. This response "may [...] serve to distract the patient from the potential unpleasantness of the immediate task, as well as Janet's more general discomfort with being a patient," the authors wrote.

While not everyone **responds in the same way** to dark humor, here the shared joke helped Janet and this nurse to find some common ground and, we can speculate, made an unpleasant situation a little bit easier to bear.

The many flavors of human laughter

Unsurprisingly, particularly for newly minted healthcare workers, the prevalence of **gallows humor** in these kinds of settings can come "as something of a culture shock", Christopher wrote. But we humans are a many-layered bunch, and beyond your garden variety "fun", there are actually lots of situations that can get us chortling together.

THERE ARE ALSO THE CLASSICS OF LAUGHING AT OURSELVES – SOMETHING OF A NATIONAL SPORT FOR THE BRITISH – AND LAUGHING AT THE MISFORTUNE OF OTHERS, WHAT THE GERMANS CALL SCHADENFREUDE.

"What makes us laugh is an interesting phenomenon," Dr Mann told IFLScience. "There's a whole range of different categories that make us laugh. Some things are quite spontaneous, and you have to kind of 'be there' to find it funny. Other things that we laugh at are when things are incongruous."

Like the church example we mentioned earlier, sometimes people laugh at times they probably shouldn't, such as just after

receiving some bad news. But Dr Mann said that in those situations, people shouldn't be too hard on themselves: "They feel awful about it, but it's really just a stress-reducer."

LAUGHTER – LIKE MANY OTHER EXPRESSIONS OF HUMAN EMOTION – IS DEFINITELY CONTAGIOUS. BUT UNLIKE ATHLETE'S FOOT OR MEASLES, THIS IS ONE CONTAGION YOU ACTUALLY WANT TO SPREAD AROUND.

There are also the classics of laughing at ourselves – something of a national sport for the British – and laughing at the misfortune of others, what the Germans call schadenfreude. That last one is so universally relatable that there's an entire number dedicated to it in the musical Avenue Q. Side note: if any psychologists out there are looking to observe the contagious effect of laughter in real-time, you could do worse than sitting a bunch of people down to watch that show!

Well-placed humor **could be the difference** between getting a job and getting rejected, or could **secure you a second date**. A joke might break the ice or spark a bond between people who weren't getting along. In fact, the **study of humor**, which has sometimes been neglected in psychology, can open up a window into lots of aspects of human character.

More and more, what we're realizing is that humans need to laugh together. A brief chuckle is almost a form of punctuation, so ubiquitous that we don't consciously notice it – but as Dunbar wrote, "[C]onversations that lack laughter quickly become hard work."

Laughter – like many other expressions of human emotion – is definitely contagious. But unlike athlete's foot or measles, this is one contagion you actually want to spread around. •

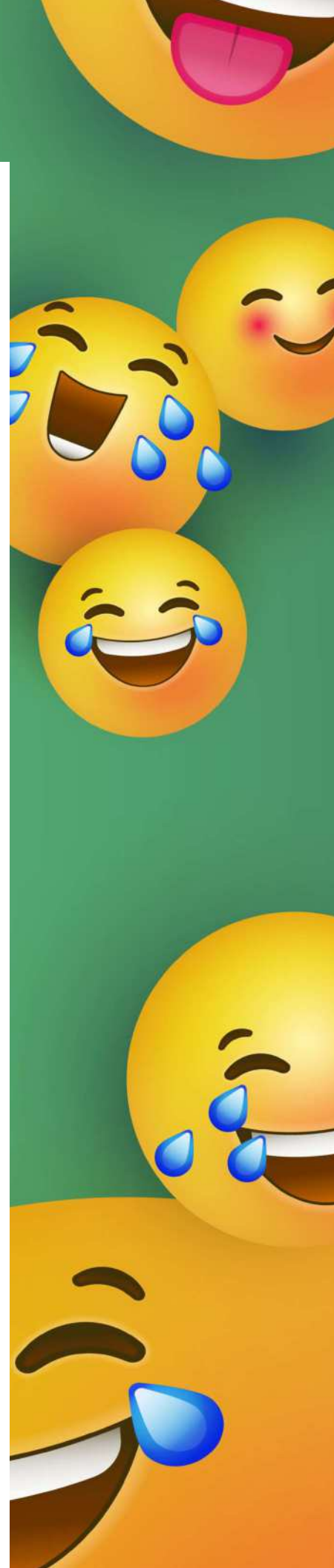




Image Credit: tjeales via iNaturalist, CC BY-SA 4.0

A LEGGY BAUBLE

Even the most spider-fearing of arachnophobes would surely be blown away by the incredible beauty of the mirror spider. This is *Thwaitesia argentiopunctata*, also known as the sequined spider for its sparkly abdomen. It looks like that because of deposits of guanine that are excreted onto the gut's surface as a byproduct of digestion. It might appear dangerously attention-grabbing, but it actually works well as a form of camouflage because the spider blends in with sparkling raindrops in tropical forests. And wouldn't it just look fabulous on a Christmas tree?



Image credit: Photo by gosia1666, Public Domain via PxHere

WHY DOES SNOW SOMETIMES LOOK BLUE?

AND WHEN IT BECOMES A PROBLEM.

By Rachael Funnell

Snow is beautiful, but also powerful and destructive – and, if we're honest, a bit confusing. For something made entirely of water, it can come in many forms: light and fluffy, sticky and heavy, shaped like a perfect **snowflake**, or falling in needle-like flecks. Its consistency changes a lot, but so does its color, which got us wondering: why does snow sometimes look blue?

To find out, we reached out to **Dr Andrew Schwartz** at the **UC Berkeley Central Sierra Snow Lab** in California. These researchers are no strangers to snow – and we were delighted to learn that, yes, their research sometimes does involve just frolicking in the stuff.

What goes down at the Snow Lab?

AS: Some really good science, but also a lot of play out in fresh snow as well.

We do a lot of forecasting of incoming storms, but we're also researching things like climate patterns and how those are shifting, and how we're seeing more rain in the Sierra Nevada

here in California as time progresses due to climate change.

One of the larger projects that I'm super excited about is the Sky To Stream Measurement System, which is now being finished. It's one of the most comprehensive systems in the world for studying snowflakes, from the minute they fall out of the sky until they melt and go downhill in the water resources that we use.

How do you do that?

AS: We have a precipitation gauge to catch snowflakes as they're falling out of the sky, and then we weigh them to see how much liquid water they contain. Then, as they fall in the snowpack, we're constantly measuring what we call the energy balance, so how much sunlight is being absorbed to melt that, how much temperature is affecting the top layers of our snowpack, along with things like wind and soil temperature as well.

We're constantly paying attention. We have soil moisture as well. So, if we get a little mid-winter melt period, we can see that soil moisture bump up. And then, of course, as spring comes and we get that melt really picking up, we see the stream flows shift, we are constantly measuring those as well. So, from the beginning to the end, at our site here in the Sierra, we've got some type of measurement of that snow.

Why does snow sometimes look blue?

AS: Snow appears blue, on occasion, for the same reason that we have blue water. After all, snow is just frozen water, right? So, as sunlight comes in and starts to penetrate the snowpack surface, we get a lot of absorption of the reds and the yellows of the light spectrum and the blue light is the only light that isn't absorbed to a higher extent.

Generally speaking, if you have deeper snow and you're able to kind of look underneath it, there's going to be a darker, deeper blue, because you're getting more of that blue come through as the

yellow and red is being filtered out in different levels. But to the same extent, if you're even just looking at a landscape with snow covering it, you do get more absorption of those reds and yellows, and so you get that blue look to it. It's just water. Water is blue because it absorbs those wavelengths, and we see the same thing with our snow as well.

Any other cool snow facts?

AS: One of my favorite things is that the shape of a snowflake can tell you a lot about how cold it is in your atmosphere. If we have warmer temperatures that are closer to zero, and we're getting those big, pretty dendrites that look like big stars, that's what we call dendritic growth in our cloud zones, and those are generally indications of cold temperatures, but not super cold by comparison.

Occasionally in places where we get really low temperatures, -10°F to -25°F maybe we start to get things like needles, and they look like just sewing needles of snowflakes. That's when we have this really intense ice development in the clouds, so that can tell you that we're not getting that dendritic growth because there isn't as much liquid water vapor in the air. Instead, it's these little itty-bitty bits that freeze almost immediately and fall so they look like needles.

What are you working on now?

AS: Snowpack likes to destroy things. It will rip metal towers off of their bolts. It'll crush cars. It'll do terrible things to anything you try to put out in it. So, trying to get temperature measurements of it is very challenging, but we're working with our partners at the California Department of Water Resources to develop a way to do that. ●



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

Image credit: Photo by gosial666, Public Domain via PxHere

SCIENCE FACT OR FICTION:

DO ANCIENT HANGOVER CURES STILL STAND UP?

'Tis the season, so intrepid journalist Benjamin Taub, dedicated to his craft, tried them out.





Picture the scene: a disheveled man stumbles through the Forum, his wine-stained toga bundled haphazardly around his torso. At his feet, a smattering of empty amphorae lie strewn across the floor, their contents greedily imbibed by the convivium's attendees.

Saturnalia has been wild this year, but the December festivities are drawing to a close and it's time to go and lie down with a cabbage on your head.

Fast-forward a couple of millennia and we're still partying our way through the darkness of mid-winter, though our green hangover remedies now tend to come in smoothie form. Personally, I've never had much relief from blended kale and ginger, so this year I'm going old-school and trying out some of the ancient world's top cures for alcoholic remorse.

The hair of the dog?

For all the achievements of modern science, it's somewhat surprising that we still don't really understand exactly why drinking too much gives us a hangover. And if you can't figure out what causes something, then you're going to have a pretty difficult time curing it.

Having said that, we have at least made some progress since the ancient Greeks and Romans, who attributed the after-effects of a night on the sauce to imbalanced humors or an excess of blood. Over the past decade and a half, an international team of scientists collectively known as the **Alcohol Hangover Research Group** has dedicated itself to demystifying the dreaded katzenjammer, shedding some much-needed light on the physiological mechanisms involved.

THE MATERIALS AND METHODS SECTION OF MY FIRST EXPERIMENT LISTS MULLED WINE AS THE PRINCIPAL INGREDIENT, WITH INSTRUCTIONS TO DRINK LIKE A ROYAL GUEST IN THE IMPERIAL HOSPITALITY BOX AT THE COLOSSEUM.

Among the group's collaborators is **Dr Andrew Scholey** from Swinburne University. Speaking to IFLScience, the Adjunct Professor of Human Psychopharmacology explains that "a hangover is defined as a cluster of negative health effects which occur as blood alcohol

returns to zero. So it's usually when people are hungover that you know they've cleared the alcohol out of their body."

Paradoxically, then, it seems we start hanging once our systems are completely free of booze, which is around the time you might think we'd start feeling back to normal. Logic therefore tells us that if you just keep on drinking, your hangover should disappear.

According to Scholey, though, this "hair of the dog" approach has been studied, and it turns out that "all that happens is, you delay the pain for a little longer." In other words, simply drinking more is not an effective hangover cure, which means I can cross that one off my list before I even begin my experiments.

LIKE ANY WELL-PREPARED GRECO-ROMAN BOOZEHOUND, I MADE SURE TO PLACE A CABBAGE ON MY PILLOW BEFORE PASSING OUT (MUCH TO THE DISMAY OF MY 21ST-CENTURY WIFE).

Bottoms up

For this investigation, I have tried to replicate the effects of ancient alcohol as much as possible. The Romans, for instance, typically drank mead or wine diluted with water and flavored with spices like pepper and cinnamon. The materials and methods section of my first experiment therefore lists mulled wine as the principal ingredient, with instructions to drink like a royal guest in the imperial hospitality box at the Colosseum.

I even wore a makeshift toga that I fashioned from a bedsheet.

Now, about that cabbage. Supposedly, both the Greeks and the Romans believed that the cabbage and the vine were natural enemies, and therefore enlisted the leafy vegetable's help when suffering from the effects of the previous evening's revelry. It's hard to pinpoint the origin of this idea and it seems that techniques for operating a cabbage were varied, with some

ingesting the crop raw or steamed while others applied it topically by strapping it to their head.

As it happens, cabbage is now known to contain high levels of vitamins C and K, while tests have indicated that it may even help to **protect the liver and kidneys** from lead-induced damage. Like any well-prepared Greco-Roman boozehound, I therefore made sure to place a cabbage on my pillow before passing out (much to the dismay of my 21st-century wife).

Sadly, however, morning brought with it a stinking headache that refused to part with me even after my steamed cabbage breakfast. Shifting this beast of a hangover was clearly going to require something a little stronger, so I heeded the advice of a 2,000-year-old Egyptian scroll known as the **Oxyrhynchus Papyri**, which recommends wearing a garland of Alexandrian laurel around one's neck.

Native to Asia and East Africa, the shrub isn't too easy to come by here in London, although I did manage to source a young plant from a tree nursery before starting my experiment. Because the leaves on this immature specimen were still small, I decided to simply sit with the entire plant on my lap for a few hours while I wallowed in misery. Sadly, however, this did nothing to assuage my pain or self-loathing.

Back to the bottle

Unfortunately, there are very few surviving written sources documenting ancient hangover cures, so it's hard to know exactly what kinds of antidotes were deployed in times gone by. One Babylonian text, however, appears to list a rescue remedy containing **licorice and oleander**, among other ingredients. Given that the latter is highly poisonous, however, I decided that even the most vicious hangover is probably preferable to sampling this particular concoction, which therefore didn't make it into my experiment.

THE NEXT DAY WAS ABSOLUTELY HORRENDOUS, AND MY MOOD CERTAINLY WASN'T HELPED BY THE SIGHT OF ALL THAT STUPID AMETHYST SITTING USELESSLY AROUND MY HOUSE LIKE A BUNCH OF SPARKLY PURPLE JERKS.

The legendary Roman naturalist Pliny the Elder, meanwhile, is said to have sworn by raw owl eggs and fried canaries. Neither of these remedies appear in his famous *Historia Naturalis*, however, so I gave myself permission to skip these options too.

The only other ancient antidote for which there is physical evidence is amethyst, which actually comes from the Greek word *amethystos*,



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meaning “not drunk”. Archaeologists have even found **ancient rings** made from the quartz-like crystal, which are believed to have been worn in order to protect people from hangovers and other unwanted side-effects of drinking too much.

Unsurprisingly, there's **zero science** to back this up, although the stone is still sold as a hangover cure to overly credulous shoppers. Rather than waste my own money, I borrowed some amethyst crystals from my mum and braced myself for a second bender (in the name of science) a few days after my first hangover had subsided.

Unable to stomach any more mulled wine, however, I chose **Scotch** as my poison this time around. Unfortunately for me, studies have shown that whisky tends to produce a **worse hangover** than other spirits like vodka, possibly because it is aged in oak barrels that leach a variety of compounds known as congeners, many of which are believed to contribute to hangover severity.

Sure enough, the next day was absolutely horrendous, and my mood certainly wasn't helped by the sight of all that stupid amethyst sitting uselessly around my house like a bunch of sparkly purple jerks. I guess those congeners got me (and, err, the alcohol probably didn't help either).

A modern solution?

If there's one thing those hungover Roman cabbage huggers – and my experiments – have taught us, it's that you shouldn't believe the hype surrounding purported cures for excess. Yet that doesn't stop us modernites from attempting to banish our boozy blues with all manner of unscientific remedies.

In collaboration with other researchers from the Alcohol Hangover Research Group, Scholey recently co-authored a study examining **82 of the top products on Amazon** claiming to alleviate hangovers. Shockingly, he says that “there was absolutely zero empirical evidence for any of them,” which just goes to show that today's drinkers are no less gullible than those ancient inebriates.

While scientists are unlikely to develop a reliable remedy until they fully understand

what causes hangovers, hope may be on the horizon, as a couple of promising avenues have already been identified. For instance, Scholey explains that “there are toxic metabolites which are generated during alcohol elimination,” which are likely to contribute significantly to the development of uncomfortable symptoms as we sober up.

The most interesting of these is acetaldehyde, which is produced as the body processes ethanol and is considerably more toxic than alcohol itself. “With a toxin like that, one thing that happens is you get a cytokine response, which is a kind of inflammatory response that usually occurs when we encounter a virus or other foreign bodies,” says Scholey.

“And you know, there is emerging evidence that in the phase after alcohol elimination, when people are suffering from a hangover, the level of these inflammatory markers increases.” It therefore seems plausible that treatments targeting inflammation may have a role to play in alleviating hangovers, although we are still waiting for large-scale clinical trials to confirm whether or not this really is the case.

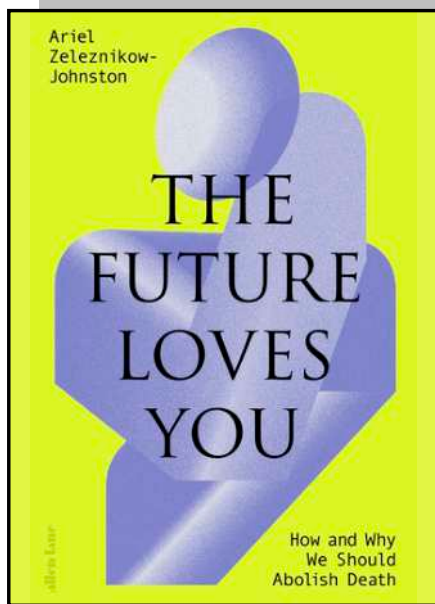
For what it's worth, studies have also shown that drinking water doesn't ease a hangover, although it does rectify the dehydration that typically accompanies a morning-after headache.

For now, then, the age-old search for a cure goes on, although as Scholey points out, “there are all sorts of ethical issues about whether a hangover treatment is desirable anyway.” After all, while such a remedy may be developed with the intention of reducing the harms associated with alcohol, the reality is that “people might use a product like that in order to drink more.”

And Zeus knows we do more than enough of that as it is. •*

*** The content of this article is not intended to be a substitute for professional medical advice or treatment. Always seek the advice of qualified health providers.**





CRYONICISTS OR SNAKE-OIL SALESMEN?

In this excerpt from *The Future Loves You: How And Why We Should Abolish Death*, author and neuroscientist Dr Ariel Zeleznikow-Johnston suggests that while cryonics has the hallmarks of pseudoscience, another path could enable us to preserve our minds indefinitely.

Facing the gravity of our circumstances, it's no wonder that a blend of desperation and optimism propels some of us over the edge of anticipating medical advances and into the expanse of science fiction. For example, take people who pursue cryonics, the practice of having one's body pumped full of antifreeze and suspended upside down in a flask of liquid nitrogen. Motivated by what they see as a clear historical trend of medical progress, its adherents believe that freezing the bodies of the clinically dead will allow for their eventual resurrection when more advanced technology one day becomes available.

In doing so, cryonicists are not putting their faith in a treatment that will keep them active, healthy, and happy, like Banting and Best's discovery of insulin. Instead, they are pursuing something more in the spirit of starvation

therapy, a means to buy time through the dark days before a better treatment comes. They believe a person in this state, while not fully alive, is in a sort of stasis, akin to Elizabeth's three years in Dr Allen's clinic. But, cryonicists claim, they're also not truly dead, and so long as that's the case, there's hope for them yet.

Perhaps. The problem is, we've seen charlatans try to sell this kind of fantasy before. Ancient priests with magical talismans, medieval alchemists with rejuvenating elixirs, and now cryonicists promising future resurrection by means of medical miracles. Without acceptance by the medical establishment, little distinguishes cryonics from the snake-oil salesmen of earlier times. Unsurprisingly, few people buy it: despite much media attention over the years, fewer than 1,000 bodies have been preserved worldwide since its origins in the 1960s.

Indeed, cryonics as practised has many of the hallmarks of a pseudoscience or cult, including quasi-religious claims of an afterlife for those who perform arcane rituals, a lack of engagement with mainstream medicine or endorsement by esteemed scientists, and large upfront payments required for services that have no guarantee of success. None of these features inspire confidence that the frozen clients of cryonics will ever see another spring.

Many doctors and researchers are therefore understandably outraged that, even though cryonics has not been medically validated,

some organizations are still happy to charge people small fortunes for the procedure. Sure, if you're already a billionaire with nothing left to buy, why not spend \$200,000 on a chance at immortality? But for the rest of us, cryonics looks likely to be just another case of swindlers tricking people out of their money with impossible promises of longer, healthier lives.

Still, the fact that cryonics is unscientific and its claims are unsubstantiated doesn't make the core idea of preserving the dying to enable their future revival fundamentally unsound. Within this science fiction is a kernel of truth: with sufficient understanding of how the brain enables a person to be who they are, it might be possible to place a dying individual in a state from which they could one day be revived. For it to actually work, though, we would need answers to two critical questions:

1. How exactly does the human brain enable a person to be who they are?
2. How does the brain decay during death?

Armed with answers to both of these, it's possible that we really could devise a way to halt the decay of brain structures crucial to personhood, and keep someone in indefinite stasis until sufficient medical advances could one day restore them to health. Cryonicists likely fail here, as their methods harm the brain's structural integrity and do visible damage to its crucial circuitry. But perhaps neuroscientists could do better? •

AUTHOR
Q&A

DR ARIEL ZELEZNIKOW-JOHNSTON

AUTHOR OF *THE FUTURE LOVES YOU: HOW AND WHY WE SHOULD ABOLISH DEATH*

Extending human life dramatically is a concept that Dr Ariel Zeleznikow-Johnston himself describes as sounding “pretty nuts”, but in *The Future Loves You* he explores the neuroscience breakthroughs that could feasibly see us delay death indefinitely. So, what does abolishing death really mean? We asked him.

Well?

Most people who are terminally ill, even those who are elderly, wish they could have lived longer and in better health. Sadly, as good as modern medicine is, it's still not able to help provide everyone as much time as they may want. However, I think that newly developed preservation procedures – that

use a combination of chemicals and cold temperatures to stop someone's body from decaying – could be used to place people into a kind of stasis that could keep them from dying indefinitely.

In doing so, it would hold them in a kind of unconscious limbo until future medical advances can restore them to health. If we provided access to this procedure society-wide, to ensure all those who wanted to would be able to access it, we could effectively abolish death.

You mention that neuroscientists are reluctant to explore the themes of your book, why do you think this is?

Oh, a bunch of reasons. One is that the notion of being able to dramatically extend peoples' lives sounds pretty nuts, to the extent of turning some of them away before they even check whether my proposal has any scientific merit. Another is that rigorously confronting our mortality – seriously examining what is happening in a dying person's brain – is deeply uncomfortable

and a topic many would rather avoid.

That being said, I've actually been pleasantly surprised so far with my colleagues' engagement with the book.

Why did you want to write about it?

About 60 million people die per year globally, most of whom wished they could have lived longer. The more I've studied how the brain works, the more I think a preservation procedure really does have a chance of extending people's lives, and the more passionate I've become about communicating this idea to others. Particularly, I wanted there to be a resource that was accessible to anyone where they could see all the medical, scientific, and moral arguments for preservation, all in one place. That's the main reason I wrote the book.

What do you hope people will take away from it?

That the idea of preserving dying people today so that they can be revived in the future is not just science fiction but has legitimate scientific and philosophical evidence behind it.

A favorite fact from your research?

As of about 10 years ago, neuroscientists can selectively insert or erase memories in mice by manipulating the connections between their brain cells using viruses and lasers.

What would you like to explore next?

Scientists recently kind of uploaded a fly's brain onto a computer, with the digital version of the fly sticking out its tongue in response to virtual sugar. As uploading is one of the potential ways we might revive preserved people, I want to explore the roadmap towards scaling this up to work on mice, and then one day maybe people. •

***The Future Loves You* is published by Allen Lane and is available now.**

WHERE ON EARTH

Swamps typically bring to mind an array of mushy greens and murky browns, but in Virginia that all goes out the window in winter. Here, a swamp with rainbow waters can be found along the Bald Cypress Trail in First Landing State Park. The curiously colorful display is the result of rotting leaves, and hoo boy, decomposition never looked so good.

A RAINBOW SWAMP

First Landing State Park in Virginia, USA, sits on Cape Henry with trails that weave deep into the cypress swamps. As you tread the boardwalks and observation platforms that take you out over the water, you just might be lucky enough to spot something strange: a rainbow swamp.

The phenomenon is mostly seen along the Bald Cypress Trail which, as the name suggests, is populated by lots of bald cypress trees. These conifer trees are native to the southeastern United States and are also known as swamp cypress due to their tolerance for flooded terrain.

As deciduous trees, bald cypress shed their needle-like leaves annually. They start out green, but in the fall adopt a russet-red that no doubt gets leaf peepers hot under the collar. And that's not the only colorful trick they have up their branches. As the leaves fall off and land in the water, they rot, and the rainbow color all comes down to the things that leach into the watery environment as decomposition sets in.

"The rainbow sheens found as a thin film on top of pooled water in swamps and marshes are the result of natural oils released by decaying vegetation or the biological processes of anaerobic bacteria reducing iron in soil," Jeff Ripple, a former Florida swamp walk leader, told the **BBC**. "Movement by sheet flow, current or wind disturbance would destroy the fragile rainbow film."

For this reason, your best bet for spotting the arresting rainbow film is in smaller areas where the water is more sheltered from the processes that can disrupt its formation. You've likely seen the prismatic light trick before as it's the same thing we see when human-made oils get leaked into bodies of water like the ocean.

The good news for our rainbow swamp is that the array of colors isn't the result of pollution, it's just a fun byproduct of rotting leaves. The brilliance of the display can depend on the position of the Sun as it's the light refracting through the leaves' oils that creates the effect. For this reason, winter is a good time to see it as the Sun is more likely to be at just the right angle to put on a good show.

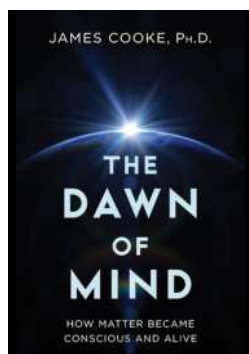
The magnificence of the swampscape is made all the more magical by the shadows of the cypress trees and their knees that cut across the water. Never heard about cypress knees before? They're cone-shaped growths that crop up on the buttress roots of swamp cypress and, curiously, nobody's quite sure what they do. •



How to get there

You'll find First Landing State Park in Virginia Beach that – as luck would have it – even has its own airport just a 40-minute drive away.

READ



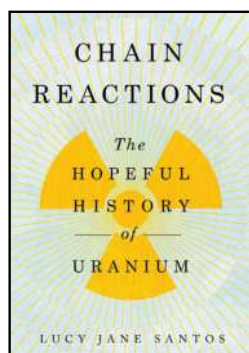
The Dawn Of Mind: How Matter Became Conscious And Alive

Book by Dr James Cooke
Dr James Cooke holds three degrees from Oxford University

spanning experimental psychology and neuroscience, and has conducted research into the brain basis of consciousness for over a decade. In this deep dive into the human experience, he brings together the latest scientific advancements and personal experiences to examine our sense of self, and whether consciousness is a **universal feature** of all life.

Available **December 3**.

EXPLORE



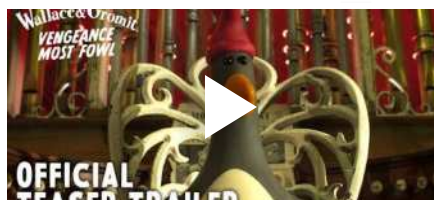
Chain Reactions: The Hopeful History Of Uranium

Book by Lucy Jane Santos
Most of us hear uranium and jump straight to the dangers, but there's a

lighter side to this heavy element's history. Glassworks, glowing cocktails, medicines – and, yes, atomic weapons – it's left a rich legacy. By painting a clearer picture of our nuclear past, Santos demonstrates how and why nuclear power could still have a pivotal role in our future. Speaking of atomic weapons, find out what would happen if one went off today **here**.

Available **now**.

WATCH



Vengeance Most Fowl Film from Aardman and Netflix

Feathers McGraw is once again donning the glove hat in the highly anticipated return of *Wallace & Gromit*. Wallace is grappling with his reputation as an evil inventor, a situation that worsens when he creates a "smart" gnome that develops a mind of its own. As the gnome problem worsens, the duo discovers that a vengeful figure from their past may be the mastermind behind their downfall.

Available in select theaters in the US/UK on Dec 18, on the BBC in the UK from Dec 25, and worldwide on Netflix from **Jan 3**.

COMPETE



Squid Game Series from Netflix

Everyone's favorite perilous reality TV show is back, one that's thankfully fictional given the body count of series one. Hwang Dong-hyuk's dystopian survival thriller will be a fitting tonic for anyone who's over the Christmas spirit, landing on Boxing Day so you can stop watching stuff about people finding love in their hometown and watch Player 456 begin a new life-or-death Game to win 45.6 billion Won. Red light, green light!

Available on **December 26**.

LISTEN



We Have Questions Podcast from IFLScience

What attacks you in the most remote place on Earth? That's the question we put to explorer father-and-son duo Chris and Mika Brown who journeyed to the "Oceanic Pole of Inaccessibility", possibly becoming the first humans to ever pass through the specific coordinates. Chris is a British explorer on a mission to become the first person to visit all the Poles Of Inaccessibility – and what did they meet along the way? You'll have to listen to find out.

Available **Dec 23** on all good podcast platforms.

SCIENCE IN MEDIA





DATES TO REMEMBER

Forget festive fun, this December there's plenty to celebrate besides the holidays. We welcome the winter solstice, admire the celestial spectacle that is the Geminid meteor shower, track the ISS aka "Santa", and a whole lot more.

DECEMBER



1 World AIDS Day

As ever, we kick off the final month of the year with World AIDS Day – a global movement to unite people in the fight against HIV and AIDS. As well as remembering lost lives, we're encouraged to show strength and solidarity against HIV stigma to build a better future for the estimated 38 million people around the globe who live with the virus. **Rock the red ribbon** this World AIDS Day to show your support.



10 Nobel Prize Day

Since 1901, the Nobel Prizes have been presented to new laureates on December 10 – the anniversary of Alfred Nobel's death. This year's winners – who include the **discoverers of microRNA** and two **"founding fathers"** of AI – will receive their awards at ceremonies in Stockholm (and Oslo for the winners of the Nobel Peace Prize).



14 Geminids Peak

The Geminid meteor shower is one of the last major showers of the year, but it's generally well worth the wait. You can expect to see bright, fast, and multicolored space rocks whizzing through the sky between December 4 and 20, peaking on the evening of the 14th.

21 Winter Solstice

The winter solstice is almost upon us again. The Sun will be at its southernmost point in the sky, marking the shortest day and longest night of the year in the Northern Hemisphere. From then on, the days will get longer, and the nights shorter. The Southern Hemisphere, meanwhile, will experience the opposite: December 21 will be its longest day and shortest night.



23-25 ISS Santa Tracker

What if we told you you could watch "Santa's sleigh" zoom across the sky in the lead up to Christmas? OK, fine, it's not *technically* Santa – it's the International Space Station (ISS), which will be making its annual trek across the night sky – but it's a bit of festive fun for kids and astro-loving adults alike. Using NASA's **Spot the Station** tool, simply put in your location to find viewing opportunities throughout December.



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 not-so-sexy side effects of eating beetle "aphrodisiacs". If you like your science lighter, discover more about how scientists are making sparkles more sustainable.

LOVE POTION POISON

Oysters, chocolate, honey... Spanish flies? Not quite what you'd expect to find at the end of a list of alleged aphrodisiacs, but best believe people have tried it anyway – despite the fact that they have some very unsexy side effects.

PEOPLE STARTED EATING SPANISH FLIES IN THE AGE-OLD SEARCH FOR A SOLUTION TO A LACK OF RIZZ.

The Spanish fly (*Lytta vesicatoria*) is actually a species of blister beetle, with a glistening metallic emerald-green exterior. Its looks are deceiving, however; pick it up to admire it, and you might just end up with some serious blisters.

That's down to a compound that irritates the skin called cantharidin, which the beetle secretes as a defense mechanism. You'd think that would be enough to put anyone off going anywhere near a Spanish fly, and yet people have instead gone the

opposite way and shoved *L. vesicatoria* in their mouths.

People started eating Spanish flies in the age-old search for a solution to a lack of rizz, after the beetles and cantharidin developed something of a reputation for getting people in the mood. When we say age-old, we mean age-old – the not-so-noble Marquis de Sade was said to have given Spanish fly-containing candies to sex workers all the way back in 1772.

Unfortunately, the people who used it on themselves or others frequently ended up dead rather than horny; cantharidin is toxic when ingested and can cause life-threatening (or life-ending) bleeding in the digestive system, as well as acute kidney injury.

Fast forward to London in 1954: Arthur Ford, the office manager for a chemical manufacturer, had heard cantharidin was supposedly an aphrodisiac. In an attempt to woo his office crush, he stole some of his company's cantharidin supply and put it in some sweets.

It's safe to say it did not end well. Ford ended up killing two people – including the subject of his affections.

SUSTAINABLE SPARKLES

Glitter is undeniably a staple of the holiday season, whether it's on a bauble, in the shimmery body lotion you slather on for a New Year's party, or the dodgy jumper you wear to the office Christmas lunch. Trouble is, glitter is also a microplastic – and that can harm the environment. So how do we ensure that the season's sparkle stays sustainable?

PLANT-BASED GLITTER DIDN'T AFFECT SPRINGTAIL REPRODUCTION AT ALL, REGARDLESS OF CONCENTRATION.

That's where a team of scientists from the UK and Australia come in; they've developed a plant-based glitter, made out of nanocrystals of cellulose, which glistens as much as the conventional option without being toxic to organisms living in soil.

The organism that they used to test this was the springtail (*Folsomia candida*), a tiny, white hexapod species that has long been used as a soil quality indicator – not just because it's found in soil throughout the world, but because it's also sensitive to toxicity.

The researchers added juvenile springtails into containers with soil that either had no glitter, or varying concentrations of conventional glitter – made out of polyethylene terephthalate (PET) – heat-treated plant-based glitter, or untreated plant-based glitter. They were then left in the containers for 28 days.

While neither type of glitter was found to have an effect on the survival of the springtails or how large they grew, conventional glitter did end up making its mark.

When the concentrations of PET glitter reached 1 gram of glitter per kilogram of soil, the springtails' reproduction was reduced by 61 percent compared to the non-glitter control soil and the soil containing the plant-based glitter. In fact, plant-based glitter didn't affect springtail reproduction at all, regardless of concentration.

In the **study** describing their findings, the team acknowledges that further research is needed to test the toxicity of their glitter in a wider variety of environmental samples, and with different species.

They concluded, however, that the plant-based glitter still shows "potential as a safer, nonplastic replacement for PET glitter."



**The Darker Side
of Science**



**THE LIGHTER SIDE
OF SCIENCE**