CURIOUS

WHERE ARE WE AT WITH TELEPORTATION?

BURYING SCIENTISTS ALIVE IN THE SNOW?

IFLSCIENCE.COM | APRIL 2025



IFLSCIENCE

16

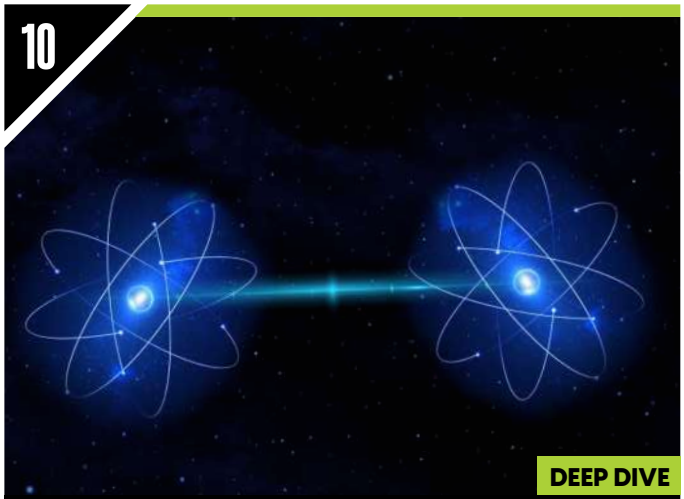


WHERE ON EARTH

AN "ALIEN EGG" HATCHERY

In the Bisti Badlands of New Mexico, bizarre "alien egg" rock formations abound.

10



DEEP DIVE

WHERE ARE WE AT WITH TELEPORTATION?

It exists – but perhaps not how you imagined it. Dr Alfredo Carpineti investigates.

4



OUR COVER STORY

DO ANIMALS MAKE ART?

Rachael Funnell explores what makes something "art", and whether animals can get involved in the creative process.

April 2025

CONTENTS

News Bites | page 2
What's new, what's weird, what's happening?

What On Earth | page 7
Like Blue Lava

We Have Questions | page 8
Burying Scientists Alive In The Snow?

Book Bites | page 14
Non-Life To Life

Meet The Author | page 15
Jennifer Lucy Allan on *Clay: A Human History*

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: angelinast/iStock, TopVectors/iStock Krišjānis Mežulis © Envato, ghostlypixels/Envato, Modified by IFLScience

Editors
Katy Evans
Rachael Funnell

Art & Design
James Rodrigues

Deputy Editor
Maddy Chapman

Contributing writers
Rachael Funnell
Dr Alfredo Carpineti
Holly Large

NEWS BITES



Planetary Defenders

Defending the planet is a real job – and in NASA's new documentary out this month, we get a peek behind the curtain at how these unsung heroes go about it on the front line. Earth is surrounded by Near-Earth Objects that astronomers across the globe are keeping an eye on. Occasionally a new one pops up whose trajectory suggests a potentially hazardous Earth impact; February's **Asteroid 2024 YR4** gave us all quite the ride as it went from the most dangerous asteroid on record to an impact level of zero in the space of two weeks, for example. But we have a plan in case one comes our way, right? Well, as space scientist Dr Vishnu Reddy **puts it**, "The dinosaurs went extinct because they didn't have a space program. We do have one." This gripping documentary delves into the high-stakes world of asteroid detection and how to protect our planet. Watch it for free on NASA TV+.



Fossils On Mars?

Sending lasers to Mars could be the new way to find life on the Red Planet – pew pew! At IFLScience, we love fossils, we love lasers, and we love Mars, so new **research** suggesting a potential way to discover the former using the latter on everyone's favorite Red Planet had us from the get-go. The question of whether life ever existed on Mars could be answered by a new instrument that could be carried on a rover and zap samples to see if they hold any traces of microfossils. Scientists successfully tested a miniature laser-powered mass spectrometer on Earth – turns out, we have life! – identifying trace fossils in gypsum deposits, which form under similar circumstances to sulfate deposits on Mars. This could be a new way of detecting biosignatures on Mars, now we just need a new mission to take it there.



Building Taste

Did you know babies have a preference for architectural styles? We neither, but that's true according to new **research**. What is the baby-faced connoisseurs' favorite you ask? They prefer Baroque over Brutalism, apparently. It seems babies as young as 4 months prefer more complex architecture over more simple designs, similar to adults, report psychologists from the University of Sussex's Baby Lab – the same lab that discovered in 2023 that babies also have a bias for Van Gogh and that our adult artistic preferences are present from as young as 4 months, too. Parents, you need to up your game: your basic square DUPLO® house isn't cutting it and that painting with the splodges that you turned upside down to interpret, that's *art*, man.

Attention!

Have we got yours? Good, now this is how you train your dog to get theirs. According to a new **study**, pointing and staring at an object – your slippers, the newspaper, etc – is the best way to get your pup to follow instructions. Both your gaze and the gesture work separately but together got a much stronger response. Dogs are one of the few animals that can follow pointing gestures, hence why owners love playing the "pretend throw" game. However, researchers suggest their findings show dogs follow human referential communication cues, not just directional ones, meaning they understand the information they are being given. Now, to teach my dog to bring me a cup of tea and the remote.

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



Take A Break With Nature

Grab a cuppa and escape the daily grind with the world's best nature photography as a glut of global competitions announce their 2024 winners. For some spectacular life under the waves, visit the **2024 Ocean Art** underwater photography contest, showcasing some incredible and rarely seen creatures from the deep. The **Nature Photography Contest** offers a stunning visual journey – sometimes dramatic, often humorous – through nature. The **Wildlife Photographer of the Year's People's Choice** winners are always fun and we're glad our vote – *No Access* featuring a rule-breaking badger – won!



Dumplings In Space

For the first time, pierogis are going where no pierogis have gone before: space. In a first for space cuisine, European Space Agency astronaut Sławosz Uznański-Wiśniewski will take the traditional Polish dumplings to the International Space Station (ISS) when he launches next month. Astronauts have a wide variety of food to meet nutritional requirements, but food for fun and social bonding makes up around 10 percent of the ISS menu. "Food brings psychological comfort, and I instantly thought it would be worth taking some Polish delicacies into orbit," Sławosz **said**. Not that developing space dumplings was easy; any food delivered to the ISS must be crumb-free, freeze-dryable, and keep for 24 months. "The first batches kept bursting!" Sławosz admitted, but they got there in the end.

WHAT'S UP?



Asteroid Flyby

Lucy, say hello to Donaldjohanson

Name: Lucy's flyby of asteroid 52246 Donaldjohanson
Appearance: Space probe goes "weeeee" (scientifically) past a space rock
Location: The asteroid belt between Mars and Jupiter

Who on Earth are Lucy and Donaldjohanson?
Lucy and Donaldjohanson aren't people, and they aren't on Earth either. Lucy is a NASA space probe currently whizzing along on a 6-billion-kilometer (4-billion-mile), almost 12-year-long mission through space to fly by 11 asteroids – 52246 Donaldjohanson, a main belt asteroid, is next on the list.

When is the flyby happening?
The two are due to meet on April 20. Well, we say meet; Lucy is due to approach Donaldjohanson at a distance of 960 kilometers (596 miles), slowing down from an average cruising speed of around 62,000 kilometers (39,000 miles) per hour to 48,240 kilometers (29,975 miles) per hour as it does so. That's the space equivalent of briefly slowing down to wave to your friend across the street and then continuing on your merry way.

Why is Lucy visiting?
Lucy's not just popping by for a cup of tea. The purpose of the visit is to be a full trial run for when the space probe visits the Trojan asteroids, the first mission of its kind. These bodies are thought to be leftover from the formation of Jupiter, Saturn, Uranus, and Neptune, and so finding out more about them could help scientists better understand the history of the giant planets and our Solar System.

Where's next on the list?
All being well with the Donaldjohanson visit, Lucy's next destination will be the first of the Trojan targets, the asteroid Eurybates and its satellite Queta on August 12, 2027.

Also, you still haven't told us – what's with the names?
We had a feeling you'd ask. Lucy is named in honor of the fossilized skeleton of an early hominin, *Australopithecus afarensis,* which changed our understanding of human evolution. The person who discovered that skeleton? A palaeoanthropologist called **Donald Johanson**.

Image Credit Top Left: © Ian Wood, Wildlife Photographer Of The Year, ***Bottom Left:*** LYOFOOD, ***Top Right:*** NASA

DO ANIMALS MAKE ART?

A chimpanzee paints on canvas. Is it art? Or something else?

By Rachael Funnell

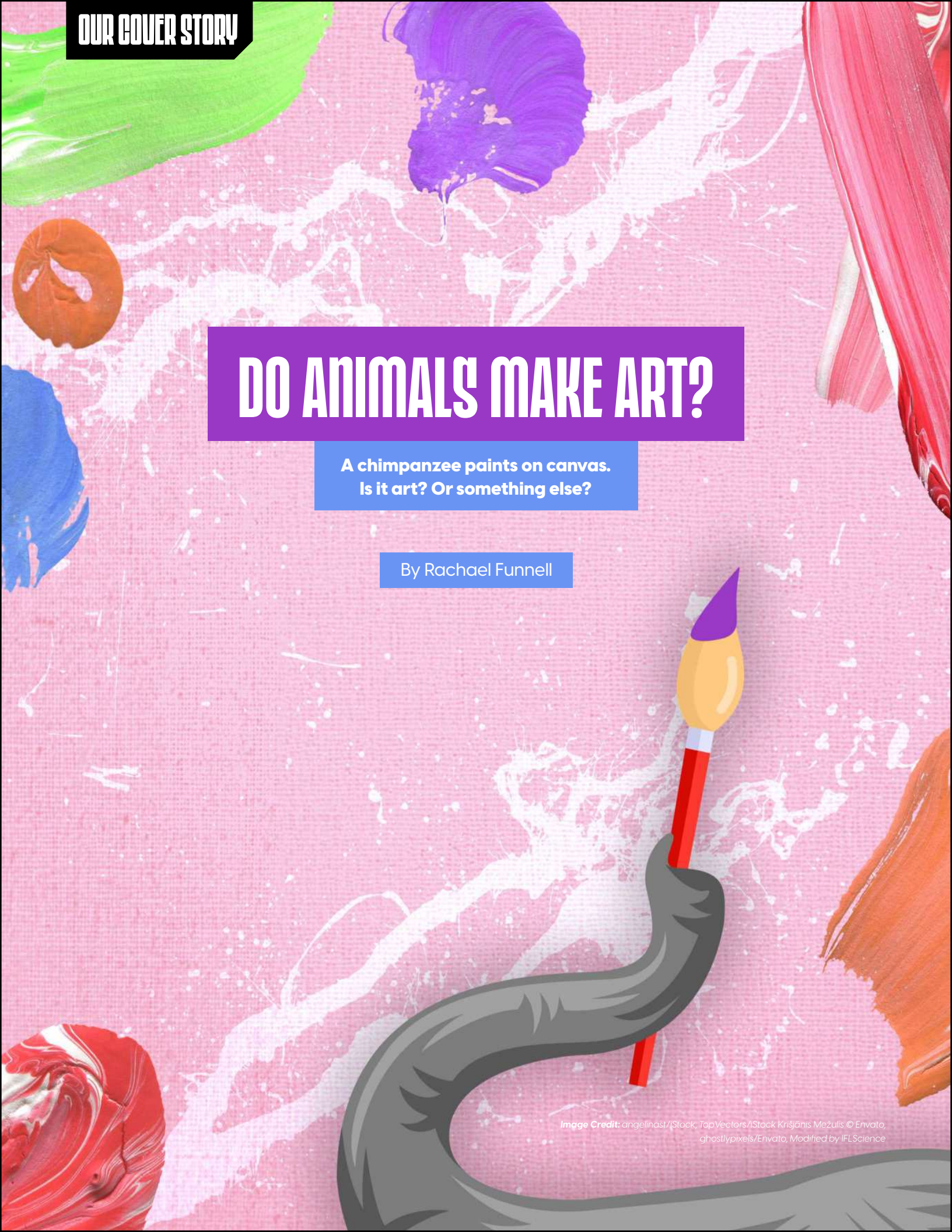


Image Credit: angelinast/iStock, TopVectors/iStock Krišjānis Mežulis © Envato, ghostlypixels/Envato, Modified by IFLScience

He grasps the brush and takes a moment to consider his options before dipping it into blue paint and sweeping it across the canvas. His movements are slow but deliberate, laying down lines that twist and intersect. With each stroke, he returns to the paint, selecting shades that blend and contrast. Patterns emerge through repetition as the composition builds and, with a last look at his work, he moves on to a new piece of paper. His name is Congo, and he's a chimpanzee.

The artistic prowess of this chimp was discovered by Desmond Morris, a zoologist and surrealist artist who took Congo under his wing from 1956 to 1959. During their time together, Congo produced around 400 drawings and 70 paintings, using pastels, charcoal, and paint. Congo wasn't alone in the project, but he was the only one of the chimps Morris studied that showed the same interest in creating art for the sake of it.

Morris believed that, "It is the work of Congo, not that of the **prehistoric cave artists**, that can truly be said to represent the birth of art," as noted by **The Mayor Gallery**. It seems fitting, then, that Congo's pieces were exhibited at the Institute of Contemporary Arts in 1957 and snapped up by collectors including Pablo Picasso, Roland Penrose, and Herbert Read.

What is art?

It feels like one of those philosophical questions: If a tree falls in the forest, and there's no one around to hear it, does it make a sound? The answer depends on your definition of sound. The same is true when we ask "do animals make art?". It depends on your **definition of art**.

"For me one of the attractions of this subject is that this is unanswerable – both because you can never truly know the intentions behind what another animal is doing but also because the idea of what is 'art' or not is still contested in relation to what people do, never mind animals," **Will Tuck**, an artist who co-curated "Art By Animals" at the University College London's Grant Museum of Zoology in 2012, told IFLScience. "I come from an art background and knew about the historical interest that Surrealist and Abstract Expressionist artists had in paintings by animals."



"Higher primates had been the main subject of interest for artists [up to now] but we thought that by widening the scope of species we might come to a better understanding of what was, wasn't, or may be, artistic. We wanted to concentrate on species that it could be argued might be showing independent creative engagement."

The show featured some of Congo's work alongside pieces by other species, including elephants, orangutans, and other chimps. As Museum Manager Jack Ashby said in a **statement**, there were some notable differences between the species' styles, as "While individual elephants are trained to always paint the same thing, art produced by apes is a lot more creative and is undistinguishable from abstract art by humans that use similar techniques."

Toddlers vs chimpanzees

They say art is subjective, and it seems the same is true of its definition. Look up "art" in different dictionaries, and you'll find varying definitions. For Tuck, the question of what qualifies as art applies not just across species but also to humans at different stages of life.

"I would say that most modern definitions of art involve an understanding on the part of the creator of a wider context that the work exists in and an expectation of a viewer of the work, and neither of these is the case with animal art," he said. "A possible exception would be in the case of 'Outsider Art', which covers works such as folk or fairground art, or work done by people in jail or psychiatric hospitals. It could be argued that work done as an enrichment activity in a zoo constitutes Outsider Art in a similar way to work made as art therapy in a penal or medical institution."

"A zookeeper once told me that they thought adult chimps had roughly the same intelligence levels as three-year-old human children. I don't know if that's true or not, but it did strike me that a similar question could be asked of whether a three-year-old's drawings were 'art' or not, and I suspect quite similar conclusions about intention and context would be drawn. It makes a toddler's drawing no less interesting or endearing that it may not be considered 'art', and I feel broadly the same is true of the higher primate's output."

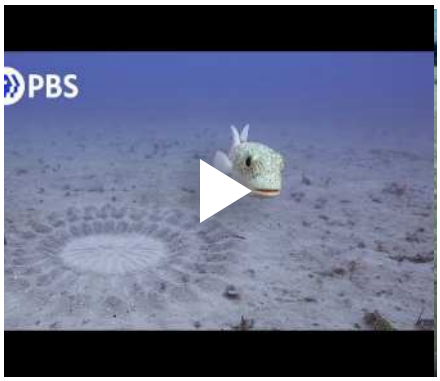
The team running the show observed that the most human-like art was, perhaps unsurprisingly, coming from the animals most closely related to us. There was, however, an impressive depiction of a **flower painted by an elephant**. The piece was hung to demonstrate the remarkable dexterity of these animals when painting with the help of a human trainer, a testament to the connection between the elephants and their handlers. The higher primates still won out when it came to Tuck's favorite, but it wasn't a piece of Congo's.

"My favourite piece is by a Chimpanzee named Betty who we worked with at the Tallinn Zoo in Estonia," said Tuck. "The chimpanzees there were interesting for us as they were all wild animals that had been rescued from smugglers. This meant they hadn't 'learnt' zoo enrichment behaviour from their group."

"Indeed, of the three only two engaged in mark-making. When we first met her Betty had grown bored of painting but we

gave her some charcoal (obviously the media has to be non-toxic which rather narrows down the options!) and rather gratifyingly she immediately started drawing again, using much the same combination of line drawing and smudging with her fingers that a human would do in the medium."

"In this particular piece, there is a print of her nail and the end of her finger in charcoal dust from doing just this. Something I found fascinating working with the Tallinn chimps was that with both animals there seemed to be an idea of the drawing being 'finished' – once it reached a certain level of working, they wouldn't return to it, but would start a new piece if plain paper was offered to them. This last point seemed important as it implied to me that they were still inclined to draw but didn't want to further alter their previous work."



Artists in the wild

Bowerbirds were also included in the exhibition, a species famous for the impressive effort they put into building thatched twig tunnels, decorating them with pebbles, shells, bones, and colorful bits of trash. The goal of the bower is to attract a female, but she'll have many options to choose from. As such, the male needs to give it his all if he's going to win her favor, inspiring some to question if they have aesthetic sense.

A **2012 paper** argued that these decorated bowers do constitute art because the males have to use their aesthetic sense to create something that will change the behavior of a female. While the males are the makers, it may be the females that show stronger evidence for aesthetics as they judge the bowers and mate with the male responsible for the best art. However, it is also possible that the inclusion of lots of bright objects could simply be more attention-grabbing, like a flashing siren.

Another remarkable courtship display in the wild is seen among pufferfish, which create **geometric circles** that can be 16 times greater than their body size. The male will painstakingly carve into the sand with its body, decorating it with shells and creating channels that redirect water so that the sand at the center of the circle is constantly being mixed. This central sand is the key, as it's here that a female will lay her eggs if the male is successful. While it undeniably looks like art from a human perspective, it can't be ignored that the shape of the circle seems to serve a function in mixing the sand. Does that count as art for art's sake?

Reflections on ape art

Artists like Morris and Tuck have long been fascinated by animal-made art. Expanding our focus beyond primates to other species broadens our understanding of creativity and its role, sometimes for pure expression, and other times as a functional advantage. We might tie ourselves in knots over semantics, but it's clear that observing the creativity to be found among animals can, at the very least, spark our own artistic curiosity.

"Humans have, I think, a great desire to find other organisms that experience life as we do, from the relationships and projections a person has with a dog or cat, right up to the notion of civilisations who think like us in faraway galaxies," said Tuck. "We wanted to show these artefacts to the public and hopefully get them thinking about the ways in which they were similar to things humans would make."

Now, if you'll excuse me, I'm off to grab a paintbrush.

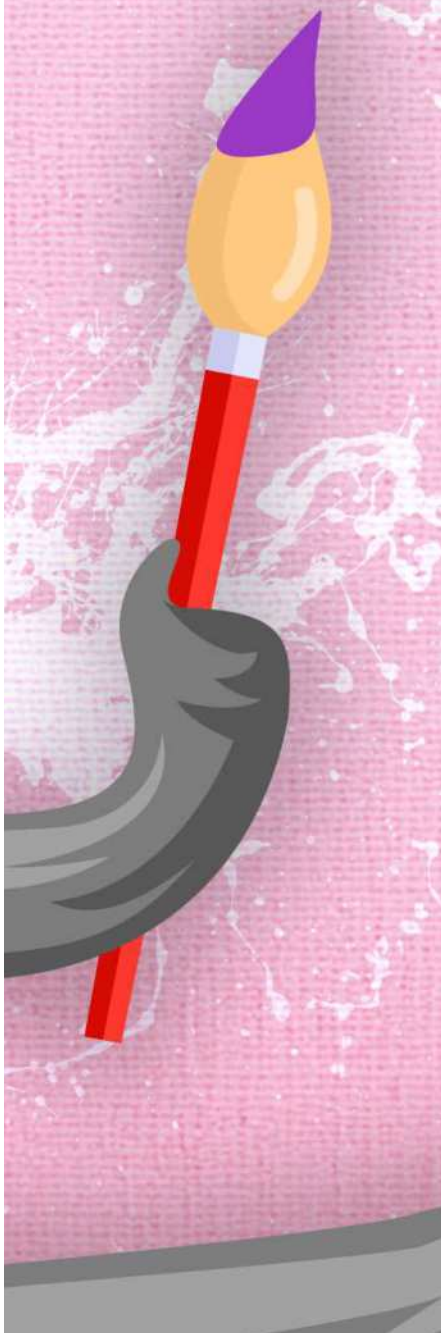


Image Credit: *ngelinast/iStock, TopVectors/iStock Krišjānis Mežulis © Envato,ghostlypixels/Envato, Modified by IFLScience*



Image Credit: © Petr Horalek, Astronomy Photographer of the Year

LIKE BLUE LAVA

Like Blue Lava by Petr Horalek is this year's winner of the Astronomy Photographer of the Year (APOTY) People's Choice Award. This photograph was taken on a northern beach of the small island of Medhufaru in the Maldives, the shore being lapped by waves of turquoise light from bioluminescent plankton. Above it, the night sky reveals the Southern Cross constellation, where the Gum Nebula and Carina Nebula sparkle. The winning image was chosen from a shortlist of 140 images from over 3,500 submissions to the competition in 2024. The winners of Royal Observatory Greenwich's APOTY 17 will be announced in September 2025.



Image credit: iStock/AndreAnita

BURYING SCIENTISTS ALIVE IN THE SNOW?

SCIENTISTS ARE FOREVER PUSHING THE BOUNDARIES OF WHAT CONSTITUTES A DAY AT WORK.

Q&A

By Rachael Funnell

Polar Bears International (PBI) is serious about protecting bears, and in the pursuit of reliable data have gone to some extremes in the past. From burying scientists alive out in the snow to novel collar-camera setups that have enabled them to predict when **polar bear moms** and their new cubs are going to emerge from their dens.

In an era of "**drill, baby, drill**," now is a tougher time for polar bears than ever before. An essential step towards getting them the protection they require centers around demystifying their denning habits and what young bears need to survive, so we caught up with **Dr Louise Archer**, PBI's Postdoctoral Research Fellow at the University of Toronto Scarborough, to find out what she's been working on with a team in Svalbard, Norway.

How do you find polar bear dens?

LA: Female polar bears will typically build their dens in areas where snow accumulates, so they can be extremely difficult to pick out against that backdrop. There are several different ways that researchers can identify dens. We know in some regions,

bears will go back to approximately the same area, so you know roughly where they might be.

Then there's different kinds of technology. One way to look at where polar bears might be denning is using forward-looking infrared technology. This has been used in the past to detect dens under the snow, but some research actually identified that this can miss over half of known dens.

Some recent work has looked at using other forms of radar to better zone in on where dens might be under the snow. For some female polar bears, they might be fitted with satellite collars as part of research and monitoring programs. You can download the data, look at the locations, and if you see a long period where a bear is not moving and they're on land, that might indicate that it's a female in a den.

Typically, they'll be in the den from late fall, October/November time, through the winter, and then come February/March/April, that's when we'd expect to see them leaving the den. So, it's that kind of stationary period that you're looking at an indicator of a female bear in a den.

There are photos of PBI researchers buried in the snow – why?

LA: As I say, dens are not as easy to find. Testing some of these newer technologies is a really important step in actually applying them in the wild with wild animals. As part of that testing process, some colleagues actually created artificial dens. They dug into the snow, and then they got in there, imitating a female polar bear inside the den. They then looked at whether some of these newer forms of radar were able to detect the fake human polar bears under the snow.

You do end up doing some unexpected stuff as part of this research, but it can be a really useful step to see whether this has potential for applications and detecting polar bear dens. Just channelling your inner polar bear for the day.

Is it dangerous work?

LA: For any work in the Arctic, there are lots of different precautions you're going to be looking at. The weather can change very quickly, some areas can be at risk of avalanche, particularly here in Svalbard, where you have these mountainous areas.

Then there's the polar bears themselves. They're the largest land carnivore, and they can be dangerous, so it's also really important to take precautions for polar bear safety. We do try and minimize any disturbance to the polar bear dens.

Our latest project is focused around monitoring bears as they're leaving their dens using cameras. So, remote camera systems can be installed up to about a kilometer [0.6 miles] away from the den. The idea is that we deploy the cameras before the females have even exited the den. They're left there for about a month, maybe longer, and then when we see via satellite collar that the female and her cubs have left the area, a field team can go out to collect the cameras once the bears are gone.



How big are dens?

LA: They can be pretty roomy, and the mother will continue excavating the den as she needs to, whether that's for size or for ensuring air flow so that there's enough oxygen coming into the den. She can continue to do that as the cubs grow, and if you think about their starting size, they're about the size of a **block of butter**. Very, very tiny initially, so that really doesn't have much of an impact on the den environment at all. Then they start to grow, and they're about 10 to 12 kilograms [22-26 pounds] by the time they leave the den. At that point, they're strong enough to deal with the outside. •

We have Questions with IFLSCIENCE

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

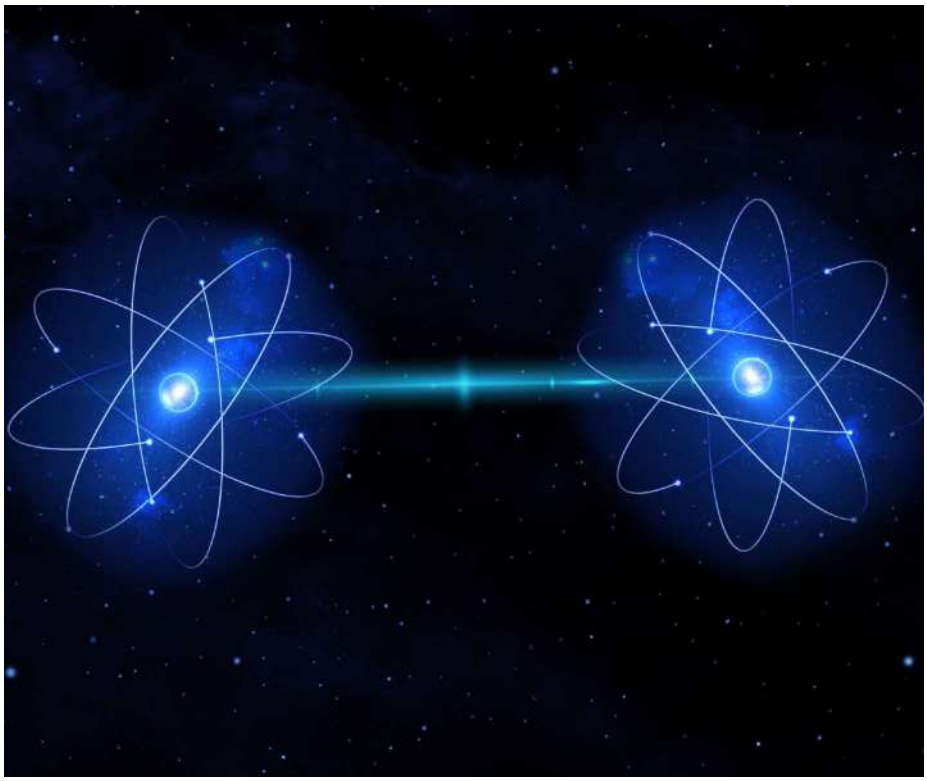


SCIENCE FACT OR FICTION:

WHERE ARE WE AT WITH TELEPORTATION?

Perhaps not a way to get off-planet, but a crucial step for future communication, Dr Alfredo Carpineti reports.

***Image Credit**: klyaksun/iStock*



The idea of teleportation is probably evoking the famous phrase "Beam me up, Scotty!" right about now. However, that is not quite right, for multiple reasons. First of all, nobody ever actually said that exact phrase during the original *Star Trek* TV series or subsequent movies. Secondly, but more relevant to this deep dive, there is only one type of teleportation that does exist – and that's not what it's all about. To understand why *Star Trek*-stye transport is not possible with our current knowledge, we will need to boldly go into the quantum world.

Teleportation – but not how you think

Quantum computers are the computational machines of the future as they can perform calculations well beyond what even the most powerful supercomputer is capable of. Their power comes from harnessing the properties of quantum mechanics so that their unit of information, the qubit (quantum bit), can be used to do more than a regular bit can.

Quantum teleportation is a crucial tool for transmitting quantum information, not matter, between locations. This allows for the transmission of a quantum state from one place to another without having to move the actual qubit.

"You can physically move the particle with its quantum state. That's what we call normal transmission, for example, with photons [the particles of light]. The photons are in a quantum state and you transmit the photon down an optical fiber. That's the physical transport of the quantum state along with the particle," **Professor Prem Kumar** of Northwestern University, who works on quantum communications, explained to IFLScience. "However, there is also the disembodied transfer of quantum state. That is teleportation – and that is not *Star Trek*'s transportation. We do not know how to do that!"

Quantum teleportation works in the following way. Imagine you have two people with a qubit each. Let's call them Alice and Bob – a standard naming convention, but you can think of them as Bert and Ernie (or whoever your favorite duo is) if you want. For quantum teleportation to work, you need a quantum channel and a classical channel.

Alice has a qubit in a certain state and wants to transfer that to Bob without sending it physically. Alice and Bob share a number of entangled photons. Entanglement is an intriguing quantum phenomenon: It is possible to entangle particles so that even though there are many components, they are in a single quantum state. Affecting one particle, such as taking a measurement, will affect the rest of the system instantaneously, even if the particles are across the universe from each other.

"There's one thing which is very commonly misunderstood: that entanglement allows instantaneous communication. That is a myth, that is wrong," Professor Kumar said.

"It is true if you have an entangled state, two particles that are entangled, they can physically move to very long distances away from each other, and if nothing happens to them and you make a measurement on one, the state collapse on the other side is instantaneous but that state collapse is unactionable."

This point is crucial to how the teleportation takes place. Alice combines her entangled photon with her qubit, performing a joint measurement on a 2-qubit state known as a Bell measurement. This will create a change in the entangled state that instantaneously affects the entangled photon that Bob has. This is the quantum channel, but this is *not* quantum teleportation just yet. Bob needs to know the details of Alice's Bell measurements.

That's why you need the classical channel too. Alice needs to communicate to Bob what she's done. Once he has that information, he can combine his photon and his qubit, this will turn his qubit into the one that Alice had.

The entangled photons are no longer entangled and the qubit at Alice's location is no more. But the qubit at Bob's location is exactly the same as the original one at Alice's location. The qubit has been "teleported".

Image Credit: *Roman Kulinskiy/iStock, Maliflower73/iStock, Vladlen Tian/iStock, Modified by IFLScience*

A "quantum internet"

That is the theory of quantum teleportation, the practice is a bit more complex. There is no quantum memory storage for Alice and Bob (or Bert and Ernie). Quantum teleportation requires those entangled photons to be produced by Alice or Bob, or even by Clara, and sent to the parties that need to teleport the state.

Quantum entanglement is a fragile state. Interaction between the photon and other particles might break it, so a lot of current work is focusing on transmission with high fidelity – the accurate reproduction of signals with minimal distortion or loss. The record for the longest distance used a satellite, allowing quantum teleportation to happen over **1,400 kilometers** (870 miles). This has demonstrated that long-distance quantum communication is indeed possible.

There is, however, the question of what infrastructure this quantum communication network of the future, a possible "quantum internet", might need. Professor Kumar and his team have just recently shown that we might not need to rip up the fiber optics infrastructure that already exists by demonstrating that it is possible to transmit entangled particles even **on noisy internet cables**.

This might almost seem counterintuitive – two paragraphs ago, I stated that entanglement is fragile, and now these special photons can zip past the regular light that makes up internet traffic? Somehow, yes. Kumar and colleagues chose a quantum wavelength of 1,290 nanometers to entangle photons and transmit them through a 30.2-kilometer (18.8-mile) optical fiber, which simultaneously carried 400 Gbps internet traffic in the widely used C-band transmission light (1,547 nanometers). To test the integrity of the entanglement, they disturbed the photons at one end and observed whether corresponding changes occurred at the other.

"We found we could perform quantum communication without interference from the classical channels that are simultaneously present," Kumar said in a **statement** at the time.

This work, like much in this field, is a proof of principle. Quantum computers and quantum communication have great potential, but they are not yet ready to tackle those unsolved problems.

If qubits, then why not humans?

Often enough, once the question of "what is quantum teleportation?" is answered, the following question is to wonder if, in a hypothetical future, we can teleport not just a qubit but a whole human being.



Unfortunately, as far as we know, quantum mechanics doesn't allow that.

In our experience of reality, if you know the properties of an object you can rebuild it, like following Lego instructions to make what it shows on the box. But quantum mechanics doesn't agree at all.

"A person is made up of molecules, atoms, or whatever atomic sub-constituents. The idea is if I can measure all of them, how they are arranged, given that the elementary particles are available universally, then I can reconstitute the object, the person, or table, or whatever. It's akin to a fax machine. You have information on a piece of paper, you can digitize, send the information; paper is universally available, you reprint it," Professor Kumar told IFLScience, before throwing a bucket of ice cold water on this idea. "But quantum mechanically that's not possible."

Let's ignore for the moment that for this teleportation, the original quantum state needs to be destroyed, and the ethical implications of putting a human through the transporter system (but hey, faster travel) – there are two things that stop you from having a *Star Trek* teleportation experience. Quantum mechanics has a no-cloning theorem. This means that you cannot create an independent identical copy of an unknown quantum state, so no *The Prestige*-type tricks either. Another technology in *Star Trek*, the replicator, cannot possibly assemble things from fundamental particles. It is simply not allowed. You try and a big red klaxon starts going off.

But do not start thinking that if we were to know the properties of the quantum states of the particles in our bodies, we could reconstruct them. First of all, let's consider the task itself from an information point of view. The average human body has about 7 billion billion billion atoms. That is a 7 followed by 27 zeros. Atoms are not fundamental particles, but let's make our lives easier and consider just those and state that we can somehow encode the properties of each atom on a single computer byte.

The total data stored in the world in 2024 was around 150 zettabytes, or 15 followed by 22 zeros. The data storage that you'd need for one single human being in our simplistic explanation is about 50,000 times the whole data stored in the world today.

However, we are in the realm of thought experiments. If we *could* get that data storage, could we use it to reconstruct a person? The big red klaxon is going off again. In quantum mechanics, you will never know enough to be able to reconstruct this person just as they were. This is due to Heisenberg's uncertainty principle.

This cornerstone of quantum mechanics states that you cannot know the position and velocity of a particle with arbitrary precision. If you were capable of exactly pinpointing an electron's position, you wouldn't know its speed and in which direction it was going. And you need to know both. Even lying still, we are a dynamic system; from the blood flowing through our veins to electrons orbiting around the atoms in our bodies, everything is moving.

"You cannot really measure the quantum state of the object that you want to send à la *Star Trek* and recreate it on the other side. The uncertainty just does not allow that. So this *Star Trek* transporter is not possible with the science we know currently," Professor Kumar explained, before adding with a smile: "Maybe there is science that we don't know yet, but that's a different story."

Quantum teleportation is very real and it will be extremely useful for the communications of the future. Regular teleportation, on the other hand, will require a complete overhaul of everything we know about fundamental physics. But hey, you never know, in a nice twist of fate, maybe quantum computers will be the ones that bring forth that revolution. •

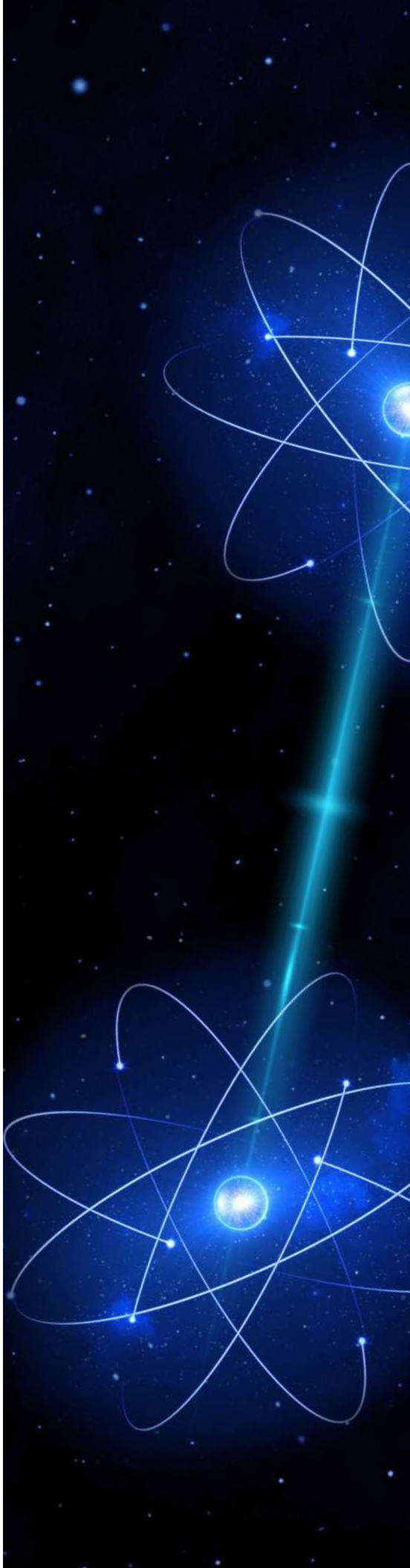


***Image Credit**: Roman Kulinskiy/iStock, Maliflower73/iStock, Vladlen Tian/iStock, Modified by IFLScience*



NON-LIFE TO LIFE

Clay: A Human History author Jennifer Lucy Allan explains theories of abiogenesis and how scientists have looked to clay to answer how non-life became life.

Over the last 70 years or so, clay has played a role in some scientific theories around the origin of life. This is nothing short of the ultimate question: how did organic life come from inorganic matter? How did something come from nothing? By way of clay, say some scientists.

The way life arises from non-life is called abiogenesis. Theories of abiogenesis explain how organic material gathered and formed to eventually turn into a living cell. Multiple theories feature clay minerals in crucial roles of one type or another. One suggests that the way chemical reactions happen in clays could have provided the spark for life to form. Others suggest that the plate-like structures of clays set the stage on which the material that eventually formed cells gathered.

One of the best-known theories was posed by a scientist called Graham Cairns-Smith in the mid-1980s. He suggested that the perplexing transition from non-life to life might have been down to the irregularity of the crystalline structures in clays. Simply put, as The New York Times described in 1985, Cairns-Smith proposed that it was "an accumulation of chemical mistakes" that led to life on Earth.

Scientist and writer Robert Hazen notes that, until recently, rocks and minerals have been outliers in theories of life's origins, sidelined by theories that begin with water and atmospheric conditions. He details the experiments of mineralogist Joseph V. Smith, explaining how a mineral such as feldspar can have "millions of tiny weathered pockets" in its surface, which provide a place for molecules to congregate, "each pore and crack a separate experiment in molecular self-organization".

More recently, emeritus biophysicist Helen Hansma told me about how she noticed a "green crud" that had collected around the edges of some mica sheets when she was, as she described, "playing with her microscopes", growing crystals and the like. She added a drop of water to the mica sheets, and realised it might be a perfect environment for the first inklings of life. "Granny Says Life Evolved Between the Mica Sheets" read one news story covering the paper she published of her findings. Others think that clays lack the complexity to have fulfilled this role. In *The Vital Question*, scientist Nick Lane, writing on the encoding of the RNA- and DNA-like material required for a cell to form, holds that "minerals are too physically clumsy to encode anything even approaching an RNA-world level of complexity, although they are valuable catalysts".

What theories involving clay insist on is that in the beginning, we may have our origins in clay in one way or another. If we did – and that's a big if that will likely never be proven – all these myths and genesis stories might contain a renewed imaginative force. The earthen bodies in our genesis myths could be understood as latent memories from the clayey soup we came from. Might this knowledge have been inherited as a cellular memory that passed into sacred doctrine – an echo in our bodies like J.G. Ballard's re-emerging reptile brains in *The Drowned World*?

But what is clay anyway? Defining it can either be so simple it's borderline redundant, or very complicated indeed. Anthropology professor and pottery specialist Prudence M. Rice writes that: "It is of little use to minimise its complexity, for it is clays' very diversity that enhances their desirability as raw material and leads to the variety of objects that can be manufactured from them."

Clay is made of lots of different things depending on where it is found, such as which rocks weathered to form it, what minerals are present, and where it has been deposited. •

Image Credit: Pegasus Books

AUTHOR Q&A



JENNIFER LUCY ALLAN

AUTHOR OF *CLAY: A HUMAN HISTORY*

We caught up with Jennifer Lucy Allan, author of *Clay: A Human History*, to find out how this ancient material has shaped and depicted our species' story, from ceramics in the home to museum artworks. Plus, find out why clay is literally out of this world.

When did you start working with clay?
What I remember is popping my head in the shop/studio of Richard Baxter in Leigh-on-Sea, in Essex on the edge of the [river] Thames. I asked if he taught classes, or if he knew anyone who did. He told me to go to the marina, find Madelaine, and see if she'd let me in. She taught in a shipping container studio in a working marina. I would walk on cold nights towards the golden light coming through steamed up windows, into this hidden space with people making all sorts of things – she didn't teach in formal or structured ways, and instead helped people gain the skills to make what they wanted to make.

Early on I knew that there was a book I wanted to read about this material that had so captivated me, and I'd begun doing my own reading and researching while I wasn't making, but I didn't think then that I'd be the one to write it. I thought I needed to be an archaeologist, or perhaps a master potter. Much later, while working on a project with the artists Keith Harrison and Beatrice Dillon that involved us vacuuming pink liquid from upturned car speakers every night (don't ask), Keith said, well, just because you don't know the most about it now, doesn't mean you won't have something valuable to say. He's an artist often working in ceramic, and that simple comment gave me permission to begin writing.

How did you approach writing the book?
This material permeates our lives, so I realised early on that there was no straight line through this subject; no simple chronology that wouldn't leave an awful lot out of the picture or be a dull exercise in collating material from an existing canon. Besides which, I am always drawn to the sidelines, to the esoteric or the neglected. I decided to lean into the notion of a cacophony, because I wanted to give the reader a sense of the enormity of it, how messy this material is literally and historically, how entangled we are with it, and how overlapping its histories are. That meant lots of different people from lots of times and places, talking about clay in lots of different ways.

What can clay tell us about earlier human cultures?
Everything and nothing! The massive void of time between us and them has created silences that will never be overcome. We will never know what their purpose was or what their emotional resonances were, but they were made with some intention and skill. They show that people were making art before almost all other aspects of so-called civilisation emerged.

I made a replica of the Venus of Dolní Věstonice to try and get some tactile understanding of her form and found that whoever formed her was a better sculptor than me, which was a humbling experience to say the least! I am drawn back to them, even now the book is out in the world.

Favorite chapter?
It changes, but I love the architecture chapter; loved thinking about different ways of building and designing houses, which in turn entail new ways for us to live. I could have written a whole monograph on fired houses, and there's an essay I need to find a home for about the question of whether the Casa Terracotta is fired as is claimed – I went all the way to Colombia and having got up close with its walls I am not sure it's even clay. Nobody from the site would answer my questions. That sounds like a disaster, but I love a failed quest. Nader Khalili's memoir *Racing Alone* was also really important to this chapter – he was an idealist and a dreamer, and he emerged as an important character early on in the research. I only wish I could have gone to Iran to track down the houses he fired, to see what they look like now, whether their glazed walls still stand.

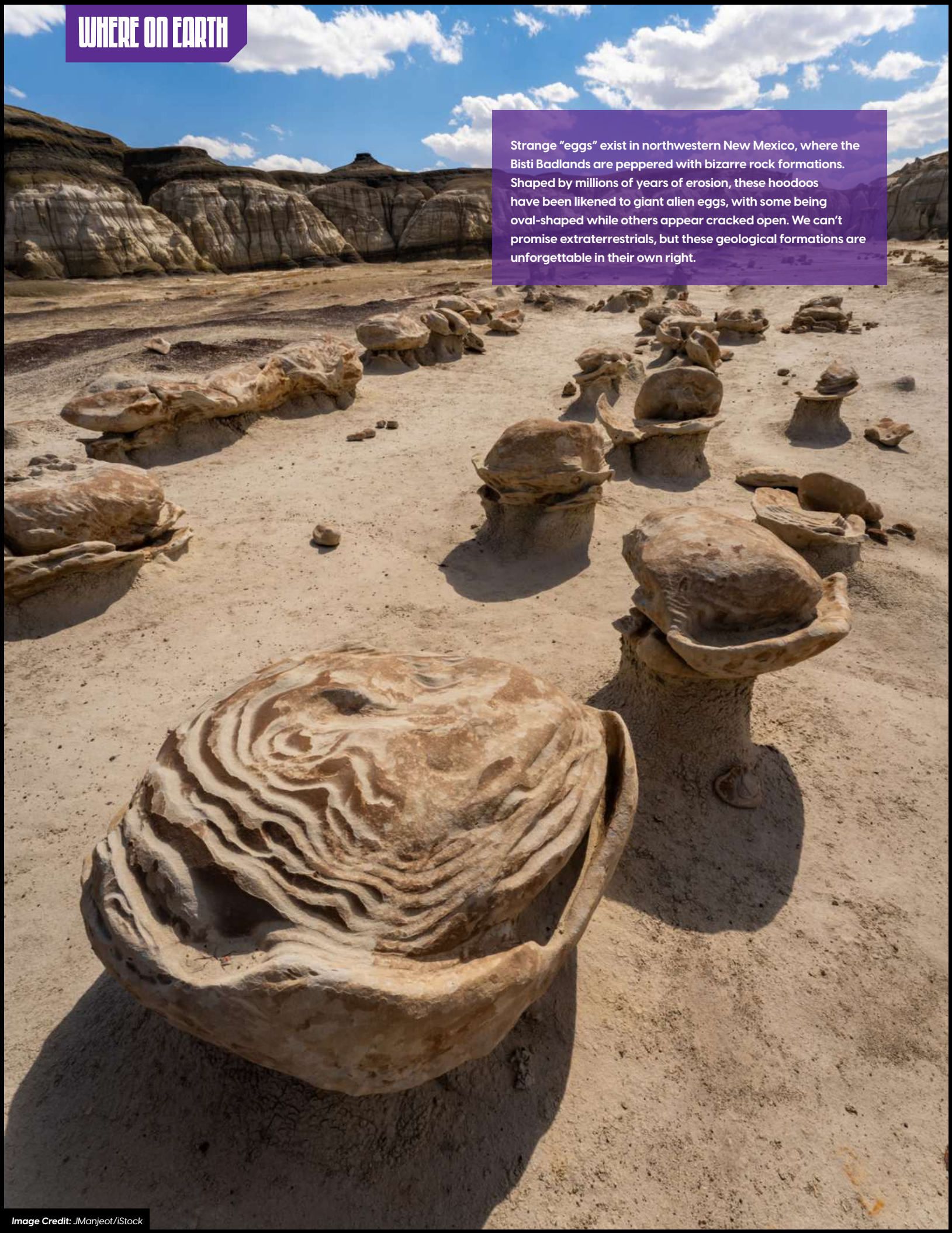
Favorite fact?
There is **clay on Mars**.

Nice. •

Clay: A Human History is published by White Rabbit and is available now in hardback.

Image Credit: Philomene Pirecki

WHERE ON EARTH



Strange "eggs" exist in northwestern New Mexico, where the Bisti Badlands are peppered with bizarre rock formations. Shaped by millions of years of erosion, these hoodoos have been likened to giant alien eggs, with some being oval-shaped while others appear cracked open. We can't promise extraterrestrials, but these geological formations are unforgettable in their own right.

Image Credit: *JManjeot/iStock*

An "Alien Egg" Hatchery

The Bisti Badlands ("Bisti" meaning "a large area of shale hills" in the Navajo language), also known as the De-Na-Zin Wilderness (from the Navajo words for "**cranes**"), has been shaped by millions of years of weathering and erosion. Back in the Cretaceous Period, it was covered by the Western Interior Seaway, but then a volcano coated the area in ash and the sea began to recede.

It created an expanse of wetlands and riverbeds that were home to ancient animals like dinosaurs and reptiles. One such creature was the "Bisti Beast", a tyrannosaur whose skull is now on display at the New Mexico Museum of Natural History and Science in Albuquerque.

It was declared a new-to-science species in 2010, getting the fancy scientific name *Bistahieversor sealeyi*. Named for the Bisti Wilderness Area and the Greek for "destroyer" (eversor), the second part is a hat-tip to Mr Paul Sealey, a research associate at the museum who discovered the holotype.

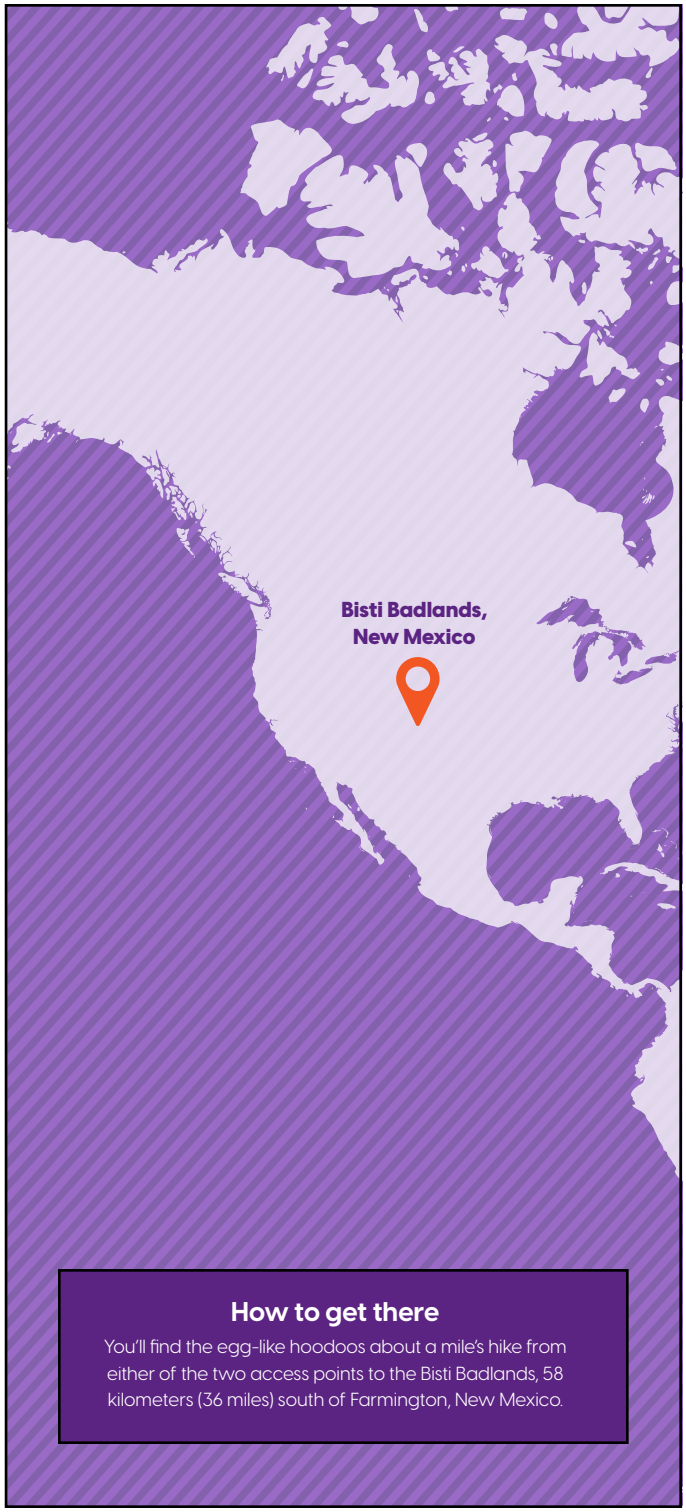
The ancient wildlife that's been found here is pretty cool, and the same is true when it comes to animals still alive today. Golden eagles, towhees, and ravens swoop around the sky in search of cottontails. You'll also be sharing the land with coyotes, and may get a visit from *Scolopendra heros*, also known as the giant desert centipede. "Giant" seems about right considering they can grow up to 20 centimeters (~8 inches).

When the water receded, it left behind layers of sandstone, mudstone, shale, and other sedimentary rock – and then when the last Ice Age ended, the landscape really started to get weird as waters from melting glaciers carved paths through the rock. The once-smooth landscape was shaped into channel deposits by water and wind, which is why one region of the Bisti Badlands has the nickname "Alien Egg Hatchery".

Regrettably, these are no alien eggs. The towering rock formations topped with psychedelic ovals are what's known as hoodoos, rocky features formed by erosion. Hoodoos can form anything from tall spiny sticks to "goblins" – as seen at **Bryce Canyon** – and in the case of the Bisti Badlands, can resemble alien eggs.

These remarkable hoodoos make for dramatic photos when the Sun is rising and as it sets, but conditions here can be testing. The best times to visit are between March to May and September to November when temperatures are mild, as winters can dip below freezing and the summer sees highs of 38°C (100°F).

The Bisti Badlands are proud to be a wilderness area and have been largely left alone, with no marked trails, facilities, or visitor centers. As such, it's a place for great adventures, but might not be suitable terrain for everybody. Check out the Bureau Of Land Management's **website** for more advice about exploring the Bisti Badlands. •



How to get there

You'll find the egg-like hoodoos about a mile's hike from either of the two access points to the Bisti Badlands, 58 kilometers (36 miles) south of Farmington, New Mexico.

EXPLORE



Museum Alive with David Attenborough

Documentary on PBS

Step inside the Natural History Museum, London, for a night to remember with Sir David Attenborough as extinct creatures are brought to life. After sneaking past security, he enjoys a lock-in like no other as a combination of CGI and cutting-edge science transforms fossils into living beasts, stomping their way through this historic building. From a fierce saber-tooth tiger to an enormous snake, a *Diplodocus*, and everybody's favorite extinct predatory bird, the giant moa, Attenborough has much to discuss in this humorous special.

Available on **PBS.**

READ



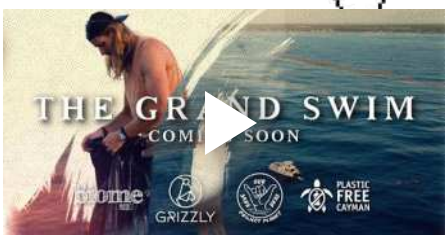
Change Is Possible

Book by William H. Foege, Paul Elish, Alison T. Hoover, Madison Gabriella Lee, Deborah Chen Tseng, and Kiera Chan

Change Is Possible explores the history of global health, highlighting its successes and failures through the lens of public health experts. Foege, former Director of the US Centers for Disease Control and Prevention, is joined by five Rollins School of Public Health co-authors. Together, they examine the devastating impact of colonialism on global health, and why military medicine has been so crucial. Drawing from Foege's experiences in the smallpox eradication campaign, the book offers critical insights and lessons for the future of public health.

Available ***now***.

SWIM



The Grand Swim

Documentary from Grizzly Productions

Oly Rush was a plasterer by day, but as a world-record-holding endurance swimmer, he gained a lot of experience with a major global issue: plastic pollution. To raise awareness, he launched the charity Project Planet Earth, which teamed up with Grizzly Productions, The Biome Project, and Plastic Free Cayman to document an epic non-stop swim around Grand Cayman island. "This swim engaged a huge community on the island and even created a dialogue with the Cayman government," said Rush in a press release. "To have the story turned into a film is wonderful, and hopefully it will propel the issue of plastic pollution to a new audience."

Available to ***watch now.***

SCIENCE IN MEDIA



TRAVEL



Time Travel Is Dangerous

Film from Shakespeare Sisters & Candr Pictures

This British comedy mockumentary film narrated by Stephen Fry follows best friends Ruth and Megan, who run a vintage shop in Muswell Hill, London. When they stumble across a time machine, it occurs to them that purchasing stock could be much cheaper if they "borrow" from the past. Their hopes for time travel are modest: They don't want to change history, or rob banks, they just want to find a nice Victorian lamp. The only problem is, well, time travel is dangerous, and they risk getting sucked into the hellish time-space vortex that is "the Unreason".

Coming to UK cinemas ***March 28***.

WATCH



Rule Breakers

Film from Angel Studios

Telling the true story of Roya Mahboob, an Afghan businesswoman who boldly led a team of female roboticists to a global competition at a time when educating girls was seen as rebellion. "*Rule Breakers* is a bold celebration of courage and defiance, showcasing young women who shattered expectations in their relentless pursuit of education and independence," said Brandon Purdie, Executive Vice President of Theatrical Distribution and Brand Development at Angel Studios, in a press release.

Available to watch in select theaters now.

Image Credit Top Left: © Atlantic Productions, ***Bottom Left:*** *Johns Hopkins University Press*

DATES TO REMEMBER

This April, find out how citizen science is changing the way we do research, marvel at the (off)-world's oldest meteor shower, and learn more about the delights of DNA – all while championing maternal health for World Health Day and protecting our planet with renewable energy.

APRIL

Citizen Science Month

Citizen science is changing the world – don't believe us? Find out how non-formally-trained scientists have been revolutionizing research **here**. To celebrate the incredible impact that each of us – irrespective of our expertise – can have on scientific discovery, Citizen Science Month is dedicated to promoting public participation in science. This year, that involves challenging us all to take part in one citizen science activity in the month of April, with the hope of inspiring "One Million Acts of Science". Find out more about what that entails **on their website**.





7 World Health Day

April 7 marks the anniversary of the founding of the World Health Organization in 1948 – and it is also World Health Day. Celebrated annually, the observance strives to draw attention to a specific health topic of concern to people all over the world. This year, that topic is "Healthy beginnings, hopeful futures", prioritizing the health of mothers and babies to secure the future health of our families and communities.



25 National DNA Day

National DNA Day is a unique observance that invites students, teachers, and the public to learn more about genetics and genomics. It commemorates the discovery of DNA's double helix in 1953 and the completion of the Human Genome Project in 2003.



22 Lyrids Peak

The Lyrids meteor shower will be active between April 16 and 25, peaking on April 22. First recorded in 687 BCE, the Lyrids is the oldest recorded meteor shower. If you're hoping to catch a glimpse of the historic spectacle, cast your eyes upward and you can expect to see 18 bright, fiery space rocks per hour.



22 Earth Day

Fifty-five years ago on April 22, Earth Day was established as an international event to honor the need to protect the environment. Since then, over a billion people have joined the coordinated global effort to safeguard the planet on Earth Day, and every other day. The theme this year is "Our Power, Our Planet", inviting everyone to unite behind renewable energy and clean electricity.

Image Credit Top Left: *AscentXmedia/iStock,* ***Top Right:*** *MSA STOCK/iStock,*
Middle Left: *TanyaJoy/iStock,* ***Middle Right:*** *bbsferrari/iStock,* ***Bottom Right:*** *FG Trade Latin/iStock*





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

Choose how you end each issue. For those who prefer the darker side, Holly Large explores the reason why blow fly larvae have "faces" on their butts. If you like your science lighter, discover how smelly labels could be used to influence your weekly grocery shop.

BUTT FACE BUGS

A stranger has infiltrated your colony. The problem? They look just like you. It sounds like something from a horror movie, but a **study** from a team of entomologists has revealed it's very much real life in a particular part of the insect world.

In this case, the masters of disguise are blowfly larvae from the genus *Rhyncomya* and their unwitting victims, a colony of harvester termites (*Anacanthotermes ochraceus*).

The team was carrying out research in the Anti-Atlas mountain range in southern Morocco when they lifted up a stone and discovered some of these larvae living amongst termites – not where you might normally expect to find them.

How had the larvae done it without arousing suspicion? By wearing a "mask" on their rear ends; their butts have evolved to mimic the head of a harvester termite, with similarly sized antennae and palps and two breathing holes disguised as eyes.

Not only that, but they're also able to imitate the specific scent shared by all members of the nest. "We quantified the chemical composition of these larvae and the result is surprising: they are indistinguishable from the termites in the colony where they live; they smell exactly the same," explained lead researcher Roger Vila in a **statement**.

Since termites recognize each other in the dark depths of the mound using shape and smell – their eyes are only to help them collect grass at dusk – the blowfly maggots seem as though they're just another member of the gang.

Normally, intruders in the nest are quickly attacked and dismembered. Thanks to their mimicry, it seems the larvae might instead be enjoying a pretty cushy lifestyle where they get preened and potentially even fed by their hosts.

"The larvae are not only tolerated, but they constantly communicate with the termites through contact with their antenna-like tentacles," said Vila. "The termites even seem to feed them, although this has not yet been unequivocally demonstrated."

Not bad work, weirdly adorable maggots. Not bad at all.

SUPERMARKET SCENTS

Let's be honest – food labels with statements about how healthy or nutritious a product is don't exactly get your mouth watering. The delicious smell of freshly baked bread, however? Get us straight to the bakery aisle. Turns out, scientists think there could be a way to combine these two things in order to help people make healthier food choices when grocery shopping.

In a recent **study**, a team of researchers sought to discover if giving food labels an odor could affect how people perceived food. In particular, they wanted to know if pleasant smells could lessen someone's negative expectations about a food – for example, they thought it wouldn't taste nice – based on its labeling.

To find out, the team imaged the brains of 63 people as they were asked to read and sniff the labels for either a mango or a chocolate drink. Each group of labels had five variations, with different nutritional statements on each one, and participants had to sniff and read a version both with and without an odor of mango or chocolate.

Directly after being presented with each one, the participants were then asked to rate how intense and pleasant any odor present was, as well as how pleasant they thought the drink would be, how willing they'd be to buy it, and how healthy they perceived it to be.

The results suggest that smelly labels really might hold some promise. Brain imaging revealed activity in regions that have been associated with processing odors and decision making. The behavioral survey, meanwhile, found that drinks where the label was presented with an odor were generally perceived more positively than the exact same label without an odor.

The authors don't make any grand claims that the answer to getting the population healthy is by sticking scented labels on everything – the sample size and study design prevent the results from being that generalizable. But it shows how important our senses are in the choices that we make – and that a simple smell could trick our brains more easily than we might think.