

CURIOS



WHY DO HUMANS HAVE SUCH
LONG CHILDHOODS?

WHY DO HUMANS
PLAY GAMES?

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DO ANIMALS THINK?



16



WHERE ON EARTH

SALT MINES OF MARAS

Thousands of salt wells on a hillside in Peru have been steeped in sodium for over 500 years.

10



DEEP DIVE

WHY DO HUMANS HAVE SUCH LONG CHILDHOODS?

Lengthy childhoods are an anomaly in the animal kingdom – so why do we have them? Dr Katie Spalding investigates.

4



OUR COVER STORY

DO ANIMALS THINK?

Stephen Luntz reveals everything we know so far about animals' sentience, consciousness, and intelligence.

August 2024

CONTENTS

News Bites | page 2

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

What On Earth | page 7

Bubble-Net Bonanza

We Have Questions | page 8

Why Do Humans Play Games?

Book Bites | page 14

Planet Of The Eggs?

Meet The Author | page 15

Jules Howard on *Infinite Life: The Revolutionary Story of Eggs, Evolution, and Life on Earth*

Science In Media | page 18

What to watch, read, and listen to this month

Dates To Remember | page 19

What to look out for this month

Dark Vs. Light | page 20

How will you end the issue?

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CURIOUS TURNS 2!

If you missed our first two **CURIOUS Live** events – where talks ranged from queerness in the animal kingdom to what would happen if a nuclear blast went off now – you can still sign up for on-demand access and you'll be the first in the know about our third event to be held later this year. If you enjoy our We Have Questions series, then our first CURIOUS podcast is for you. Launching **next month**, *We Have Questions* sees CURIOUS co-founder Rachael Funnell chat with the experts as we reveal the conversations that can't be condensed on the page. And if you never want to miss an issue of your favorite digital magazine, hit **subscribe** and get it delivered straight to your inbox.

The Sun is heading for its solar maximum, ramping up its activity, which could peak any time between now and October, according to experts. This means the spectacular auroras seen around the world recently are only going to get better. The Sun operates on an 11-year cycle and it had been due to hit maximum, when it is at its most lively, in July 2025 – however, everyone agrees it is peaking much earlier and is **far stormier than expected** too. High activity can last for one to two years, so we could be looking at sunspots, flares, and auroras well into 2025-6. So, are we ready for the next massive solar flare? **Find out here.**



Google is adding 110 new languages to its Google Translate tool, including endangered languages on the brink of extinction. The tech giant revealed that the new languages represent over 614 million speakers globally, with around a quarter of the new languages added from Africa, the largest expansion of African languages to date. By popular request, Cantonese and Punjabi have been added; on the other end of the scale, Manx – a Celtic language of the Isle of Man that nearly went extinct when its last native speaker died in 1974 – has been included, plus Romani and Breton, the Berber language Tamazight, and Tok Pisin, a creole language in Papua New Guinea. Google says it aims to support the 1,000 most spoken languages but also to promote the preservation of remote regions' languages.



It's the 50th anniversary of astronaut ice cream – that instantly recognizable freeze-dried pastel-colored powder packaged up in space silver that, curiously, has never been to space. Probably the most well-known space food that never was, "astronaut ice cream" is ice cream that has had the water removed from it by freeze-drying so it can be kept at room temperature. It's dry but soft and melts in the mouth. NASA first turned to freeze-drying foods for the Mercury missions of the 1960s, and by the Apollo missions, around 60 freeze-dried items were on the menu for space travelers. However, the only evidence ice cream was among them is a 1968 press kit that included an Apollo 7 menu listing it; the astronauts themselves had no memory of eating it. By 1974, the idea of it had so tickled the public that NASA approached what became known as Astronaut Foods to develop it for their gift shops, and 50 years later they're still at it.



Evolution Of Pop

It may be Taylor's world and we're just living in it, but according to **new research**, melodies from the most popular songs in the US have become steadily less complex since the 1950s. This follows recent research that concluded song lyrics have become **less sophisticated and more self-obsessed** since the 1980s. It's an adage that people think modern music isn't as good as the music of their youth, and whether the researchers coincided with the Boomer or Gen X age brackets wasn't divulged, but not many artists can claim to have set earthquake sensors off in multiple countries with the enthusiasm of their fans, which Swift has **done twice** in the last year, so we think modern music is in safe hands.

Climate-Proof Chocolate

We all know that the planet needs protection from climate change, but some people may need a better motivator than others. If getting to still eat chocolate in the future is your bag, then you'll be pleased to know scientists have discovered three new plants in the forest of South America closely related to the cacao plant of chocolate fame. These resilient plants could help ease the pressure on cacao and make chocolate production more sustainable. It's not often you get a **new kind of chocolate**, but this is a possibility too.

WHAT'S UP?



Blue Moon

Or is it?

Name: Blue Moon

Appearance: Big rock in the sky is full, but not actually blue

Location: About 384,400 kilometers (238,855 miles) from Earth

The most important question first – does the Moon turn blue?

Nope. It stays its usual shade of Moon-gray.

What actually is a Blue Moon then?

There are two different definitions. The first, more traditional one, is that it's the third Full Moon in an astronomical season. The second is that it's the second Full Moon in a month.

Is that rare?

Despite what the phrase "once in a Blue Moon" might have you believe, it's a relatively common occurrence. Because a full cycle of the Moon isn't the same length as a calendar month, there are 12 full Moon cycles in only 354 days. Thus, every two to three years, you get a 13th Full Moon – the next one is on August 19. However, there can sometimes

be two Blue Moons in a year, which is much rarer – we won't see that happening again until 2037.

If it's all about dates, then why is it called a "Blue" Moon?

No one's entirely sure, but some think it could be down to a mispronunciation of the now obsolete Old or Middle English word "belewe", meaning "to betray". This might be because a Blue Moon goes against, or "betrays" the standard of having one Full Moon a month, or because people who used the Moon to figure out dates like Lent got a bit peeved at it being unreliable.

Could it ever turn blue?

Yes, but it's very rare. When it does happen, it's usually following a volcanic eruption. After the violent eruption of the Indonesian volcano Krakatoa back in 1883, people reportedly saw blue-colored Moons for several nights, with similar reports after the 20th-century eruptions of El Chichón, Mount St Helens, and Pinatubo.

DO ANIMALS THINK?

If we hope to one day communicate with alien species, it might help to understand the minds of the creatures who share our planet, but it's not an easy task.

By Stephen Luntz



Image Credit: Imran Chowdhury/ELScience

The debate about whether (and, if so, how) animals think is an ancient one. Aristotle considered it important enough to write on the question extensively, and it's a safe bet people were debating it long before we have written records. Unsurprisingly, it's a major topic of research today, but one that tends to defy easy answers.

A big part of the story of zoology over the last 60 years has been learning we have been underestimating animals' intelligence. In the 17th century, René Descartes alleged animals were mere machines, incapable of sensations, let alone feelings or thoughts. This view is now so outdated the debate is usually not about whether animals think, but how much, and whether this meets certain definitions.

For example, we've gone from defining humans by our tool use – which we assumed was beyond other species – to learning **some birds** shape remarkably sophisticated tools, and appear to plan their use. Nevertheless, debate continues as to whether this reveals what we call consciousness or sentience, and how intelligent an animal needs to be to do what we have seen.

Are animals conscious?

"There are lots of different answers" to asking what it even means for animals to have consciousness, **Dr Alecia Carter** of University College London, an expert in animal behavior, told IFLScience. "A philosopher would argue that consciousness is being able to experience the world." On this basis, "Some philosophers, building on the work of neuroscientists, argue that [...] all animals are conscious because they have the ability to experience the world and react to it."

A **recent declaration** signed by 40 researchers stated that "The empirical evidence indicates at least a realistic

possibility of conscious experience in all vertebrates ... and many invertebrates," – including insects.

Looked at this way, **consciousness** may be so widespread that the more interesting issue to consider is sentience, which is **defined as** "An animal's ability to have subjective experiences."

Being subjective, sentience is harder to measure. It was only in 2021 that octopuses and squid were **legally recognized** as sentient beings in the UK, despite decades of evidence, and the US is **still debating** it.

"I DON'T THINK IT'S HELPFUL TO SAY THAT CHIMPANZEES ARE MORE INTELLIGENT THAN GORILLAS (OR SUNFISH, OR KOMODO DRAGONS, ETC). INTELLIGENT IN WHAT WAY?"

As an animal behaviorist, Carter added that she thinks neuroscientists are closer to determining how animals think than members of her own discipline, adding: "I wish there was more discourse between these fields."

Another angle on the topic – one that greatly interested ancient Greek philosophers – was whether animals could reason, specifically make logical deductions. More than two millennia later, Carter says the existence of animal logic remains debated. "The problem is always that minds are black boxes that we don't have access to, and all we can do is observe animals' behavior in response to stimuli. We have to guess what's going on inside a brain, and often two different hypotheses are possible from the same behavioral data."

Does measuring animal intelligence make sense?

The popular view of animal intelligence tends to be very hierarchical. Naturally, we place ourselves at the top. Chimpanzees, cetaceans, elephants, and a few birds tend

to get praised for their intellect, while other animals are considered steps below.

However, Carter disputes the usefulness of such hierarchies. "I think many researchers understand that 'intelligence' is a difficult concept to define and even more difficult to test 'fairly'," she said. "There is such a **fraught history** with even making tests within one species (humans) that I don't think it's helpful to say that, e.g., chimpanzees are more intelligent than gorillas (or sunfish, or Komodo dragons, etc.). Intelligent in what way?"

Considering a few of the species she has studied closely, Carter added: "Meerkats and lizards and **baboons** have to navigate their worlds. But, for the most part, it doesn't matter that they have different intelligences. They're intelligent enough in different respects to survive and, hopefully, thrive in the world, which is what matters. We focus a lot on the kinds of intelligence that we value, but animals have some pretty impressive intelligences that we don't have access to at all."

"WE ALSO DON'T UNDERSTAND HOW OTHER PEOPLE THINK, SO IT ISN'T A DIFFICULTY THAT IS SPECIFIC TO NON-HUMAN SPECIES."

"I think we are getting a better idea of the richness of how other species experience the world and process information about it, but I don't think we will ever really understand how they think," **Dr Corina Logan** of the Max Planck Institute for Evolutionary Anthropology told IFLScience.

Perhaps that is not surprising, when, as Logan notes: "We also don't understand how other people think, so it isn't a difficulty that is specific to non-human species."

"We have to have something to measure to be able to quantitatively evaluate cognitive abilities, we generally measure proxies of cognition using behaviors or phenomena that we can see and interpret," Logan

continued. "This means that we can never really know how another individual thinks because we can only measure proxies of their thought processes – regardless of whether they are an individual of the same or a different species."

It's hard to witness certain acts of **planning** or **tool use** and conclude animals don't think. However, we're much less likely to extend that generosity to animals lower down the hierarchy. This is a major contributor to differences in the way species get treated ethically, for example, the **widespread outrage** when chimpanzees are kept in small cages for scientific research, even among people who will happily eat chickens from cages too small for them to turn around.

ETHICISTS MAY ARGUE ABOUT WHETHER AN ANIMAL'S INTELLIGENCE MATTERS, OR ONLY ITS CAPACITY TO SUFFER, BUT IN THE PUBLIC MIND THE ANIMALS THAT ARE MOST OBVIOUSLY SMART ARE THOSE MOST WORTH SAVING.

As Logan points out, "The majority of the research on intelligence has focused on species that are expected to be more intelligent. This means that we don't actually have evidence that the other species aren't intelligent. So the ranking is unfair from the start."

Birds of a different feather

Logan is a specialist in the intelligence of birds, having compared the famously tool-proficient **New Caledonian crows** with North American grackles, even teaching grackles to **use computers**. She points out that the different lifestyles her subjects adopt promote different forms of intelligence. For jays, it is about social memory and identifying places where food caches are unlikely to be found, whereas birds

that need to dig food out of holes develop tool use that is more recognizable as intelligence to toolmaking humans.

"They might have other cognitive abilities they are able to use, but we just don't see them expressed in their usual behaviors so we don't think to look for their other abilities," Logan said. "This makes it pretty useless to try to compare species' intelligence. Instead, we should be taking the perspective of 'Hey, I'm really interested in spatial intelligence, so I'm going to go find species who are good at space use and figure out how they do that.'"

Survival of the smartest reputation

Animal species are dying at probably the highest rate since the dino-killing asteroid. With each extinction, we lose forever the opportunity to understand how it thinks. On the other hand, gaining even a little of that knowledge first may be key to their survival.

Ethicists may argue about whether an animal's intelligence matters, or only its **capacity to suffer**, but in the public mind the animals that are most obviously smart are those most worth saving.

Jane Goodall's discoveries about chimpanzee intelligence, beginning with the first observation of tool use in the wild, were a major step in building enthusiasm to save our nearest relatives. Last year, the **US Department of Agriculture** expanded restrictions on the way captive birds can be treated, which Logan considers a response to improved understanding of avian intelligence.

Learning how animals think may be practical, as well as motivational in keeping them alive. We may be a way off figuring out the inner workings of our fellow animals' minds, but every insight we gain gets us a step closer to understanding and protecting them. ●

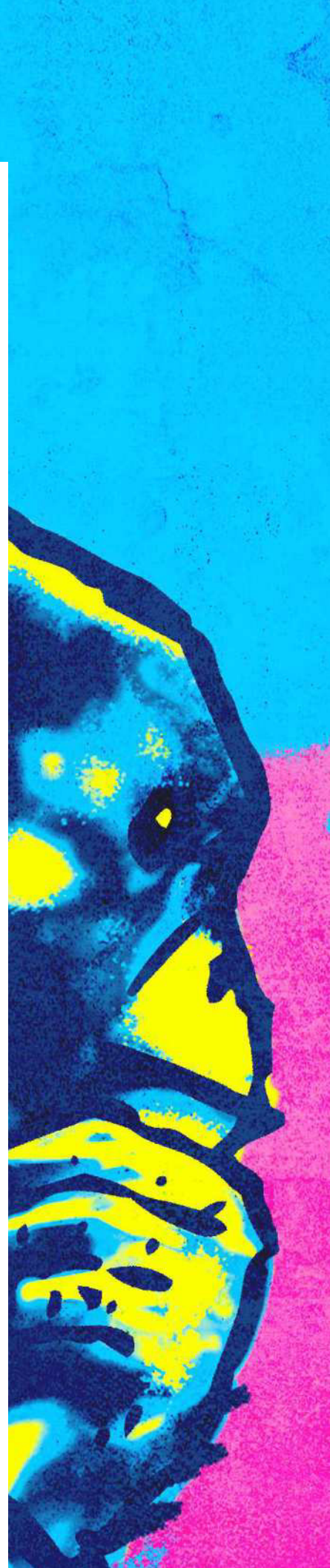




Image Credit: Bubble-Net Feeding by Scott Portelli, Aquatic Life Finalist, BigPicture Natural World Photography Competition

BUBBLE-NET BONANZA

This incredible photo taken by Scott Portelli shows humpback whales (*Megaptera novaeangliae*) engaging in bubble-net feeding. The feeding approach involves whales diving below their prey and using bubbles blown from their blowholes to disarm and trap fish at the surface. The whales surround the fish, swimming in a **spiral formation** to keep them within feeding distance, resulting in the mesmerizing photo seen here. This image was a finalist in the California Academy of Sciences' **BigPicture Natural World Photography Competition**. You can see all of the winning images and more finalists on **bioGraphic**, an online magazine about nature and regeneration and the official media sponsor of the competition.

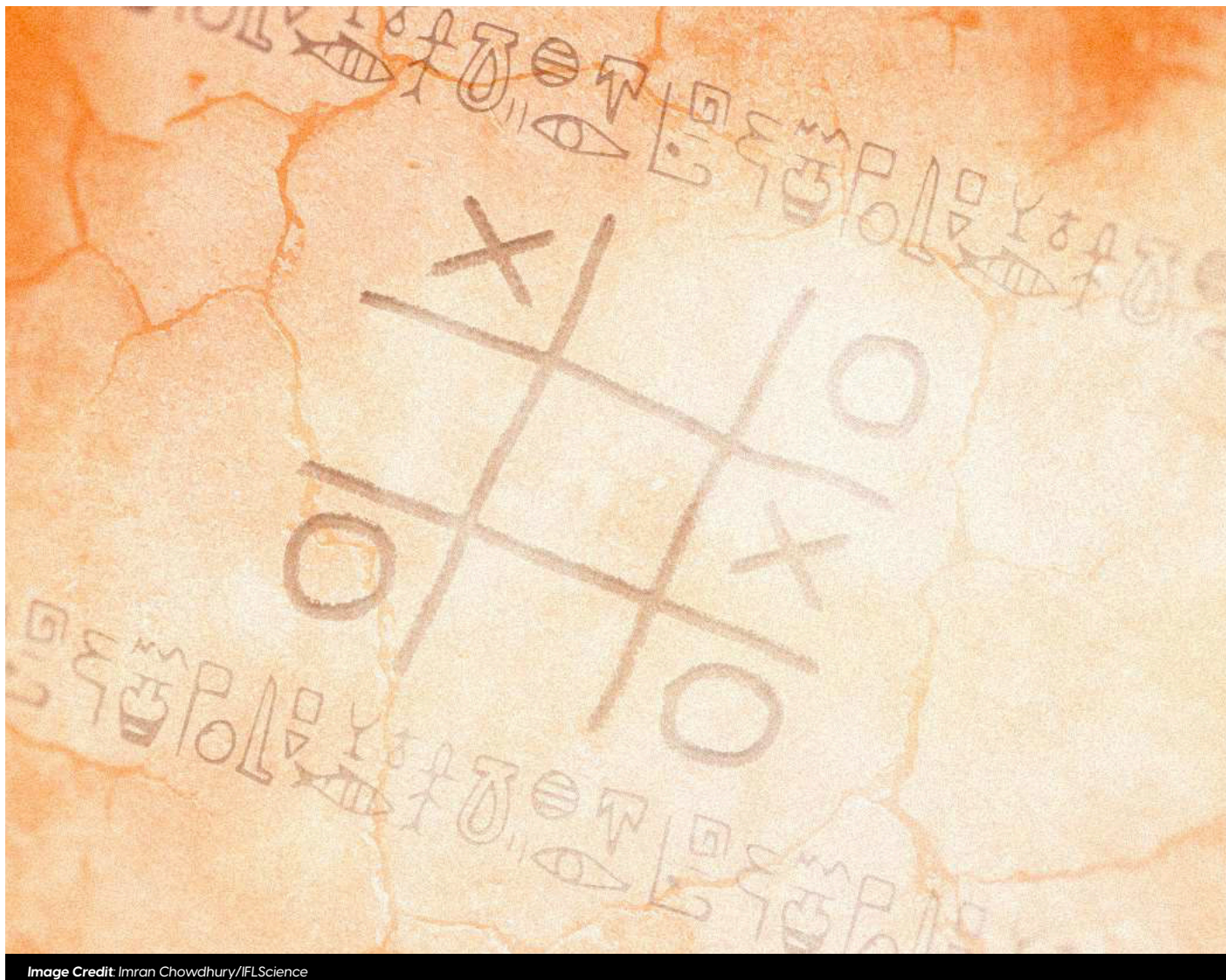


Image Credit: Imran Chowdhury/IFLScience

WHY DO HUMANS PLAY GAMES?

AND WHEN DID WE START?

By Rachael Funnell

Stick two humans in an enclosed space with nothing to do, and before long, someone is likely to suggest a game of I Spy. Kids are so hot for smartphone games that it inspired its own **memeformat**, and while certain generations might like to tell you this compulsion is a new thing – the fact is, humans have been playing games for thousands of years.

It's believed that gaming actually predates language, begging the question: why do humans play games? We spoke to **Kelly Clancy**, a neuroscientist and author of **Playing With Reality: How Games Shape Our World**, to find out.

Who plays games?

KC: It seems like it's a pretty universal thing. One of the great things about looking at game boards in the ancient world is that people will just make anything into a game board. I see people playing tic tac toe on the walls. In some Egyptian ruins, there are game boards

scratched into the roofs of old temples. [It's thought that] there were priests sitting on the roof of temples waiting for a particular astronomical event, and just passing the time playing games together.

How widespread is it?

KC: People scratched games all over the ground, and all over everything, in ancient Pompeii. We find games in royal tombs, the Royal Game Of Ur was in a kingly tomb, and we see senet boards in some of the pharaohs' nullification chambers. You can get these very ornate, beautiful game boards, but most people were just playing however they could play.

What sort of games?

KC: This was true of chess. In the 19th century, it was unbelievably popular, everyone played it, everyone subscribed to chess strategy magazines. It was what you talked about at work at the water cooler. The kings played it, nobility played it, poor people played it, call girls played it – everyone played chess. And so, it's this really cool universal language.

"PLATO THOUGHT THAT GAMES WERE REALLY IMPORTANT EDUCATION FOR YOUNG KIDS TO LEARN HOW TO FOLLOW RULES."

These games are often kind of didactic in nature, where some of them are explicitly designed to transmit a particular message. Some games are not really so fun to play when you're an adult, like snakes and ladders. But that's part of what the message was intended to be with that game. It was apparently originally invented by an Indian holy man to teach the virtues

of karma. If you do good things, you go up to heaven, if you do bad things, you slide down the snake. So, it's something that was meant to teach kids these ideas.

Why do we play games?

KC: Games are a really powerful form of education, and this is something that is becoming clear from neuroscience and also it's an idea that's been around for a long time. Plato thought that games were really important education for young kids to learn how to follow rules, so that as adults, they would know how to follow laws and make democracy work.

They're this very natural training principle for us, and it also turns out that they can be very addictive.

Do you play games?

KC: Video-game-wise, I really love puzzle games like Fez. I have this, kind of tragic, thing where I get nauseated very easily for like, first-person games. So, there are a lot of games in the world that I desperately want to play, but I cannot.

I end up playing a lot of third-person games like *The Legend of Zelda: Breath of the Wild* and *Tears Of The Kingdom*. I also admit that I indulge in the occasional *Animal Crossing* when I need some cozy time. ●



Hungry for more? Catch the full interview in IFLScience's newest podcast, *We Have Questions*, launching in September.

SCIENCE FACT OR FICTION:

WHY DO HUMANS HAVE SUCH LONG CHILDHOODS?

Lengthy childhoods are an anomaly in the animal kingdom – so why do we have them? Dr Katie Spalding unravels the enigma of our formative years.



For a species that has managed to take over an entire planet, humans spend a remarkable amount of time unable to tie their own shoelaces.

It's not a joke: each of us will live for **maybe a hundred years** if we're lucky, but a quarter of that time is spent in childhood – essentially, a practice run for the rest of our time on Earth. While clearly we're not the only species that goes through a juvenile stage, it has to be said that nobody else does it quite like we do.

Humans are “very unusual – in terms of time spent growing up as a proportion of total lifespan, we really are exceptional,” says **Brenna Hassett**, a biological anthropologist and archaeologist at the University of Central Lancashire, UK, and author of **Growing Up Human: the Evolution of Childhood**.

“You can think about something like a bowhead whale, which might have a lifespan of say 200, 300 years,” she tells IFLScience; “their offspring spend the same amount of time growing up that we do (about 25 years) and grow much, much bigger.”

But human childhoods aren't just long compared to other species – they're weirdly spaced out and filled with siblings and extended families. It's the time when we're at our most helpless and naïve, but also a period marked by the greatest levels of **brain development** and learning throughout our lives.

And, as it turns out, it's what makes us human on a pretty fundamental level.

The paradox of childhood

Let's be honest: spending upwards of two decades in a state of extended helplessness doesn't seem like it should be an advantage for a species. Children “need high energy foods for their high rates of growth,” points out **Siân Halcrow**, Professor of Biological Anthropology at the University of Otago, New Zealand; they also require intense, round-the-clock protection from the adults around them. They are, evolutionarily speaking, a high-risk investment.

And yet, not only have humans survived, we've prospered. “Normally in animals with

a long developmental period, this would mean relatively low fertility,” Halcrow tells IFLScience. “However, very interestingly, we do not find this in humans. Rather, for humans it is argued that their longer childhood leads to increased reproductive fitness.”

It seems counterintuitive – but a closer inspection of our developmental milestones reveals why it works. See, human childhood isn't just a longer version of other animals' – over the years, we've stretched and squeezed it into something unique to our own species, tailor-made for our needs.

“If you look at childhood as a proportion of life, primates are all very keen on having long childhoods,” Hassett explains, but in humans, the very first bit – the bit in between being born and weaning – is much shorter than other apes'. Compare our species to orangutans, for example, and our strange developmental process is thrown into sharp relief: the oranges will breastfeed their young for up to **six to eight years** – two to three times as long as even the most enthusiastic human mothers – but send them off into the world of adulthood as little as two years after that.

“HOW LONG OUR CHILDHOOD IS SEEMS TO BE A REALLY IMPORTANT FACTOR IN MAKING US THE SOCIAL, LONG-LEARNING SPECIES THAT WE ARE.”

In contrast, humans can spend as little as 4 percent of their childhood **breastfeeding** – and that's a change that has had a profound effect on how our species reproduces. “By reducing the length of the infancy stage [...] this translates into greater fertility,” Halcrow tells IFLScience, “with the earlier lifting of high energy expenditure the physiological demands of breastfeeding interfere with ovulation and pregnancy.”

It's part of what has made humans so successful – if you're not constantly feeding a baby, it frees up a lot of time for things like hunting and gathering – and it's also why, unlike most other animals, we're able to raise

multiple children at the same time, rather than having to wait until each kid matures and leaves the nest.

And it's only possible at all thanks to that other most human of characteristics: our extreme sociability.

To raise a child

Outside of humans, orangutans are the primate outlier when it comes to long childhoods, reaching adulthood at eight to 10 years old. With the noticeable exception of the families living inside the world of *Pokémon*, that's roughly half the age that human societies tend to consider their offspring ready to venture into the world alone.

But that's precisely the point, Hassett explains: humans *do* live in societies – and that's one major reason why we spend so long growing up. “How long our childhood is seems to be a really important factor in making us the social, long-learning species that we are,” she tells IFLScience.

“Actually all social species tend to have long childhoods – crows take a long time growing up, and they are hardly in our evolutionary line,” she says. “The fact that social species take so long growing up tells you one of the things that a species that is so social needs is time – time to learn how to get along in society.”

But in a beautiful example of evolutionary symmetry, the opposite is also true. Our social nature isn't just why we have such long childhoods – it's also key to how we do it.

“The reduction of the infancy period [is] made possible with the development of social structures of shared parenting within societies,” Halcrow explains. “Traditional societies solve the problem of childcare by spreading the responsibility among many individuals, including juveniles, adolescents, or adults.”

Becoming human

Nevertheless, this all raises some interesting questions. We're hardly the only social species out there – so why do human childhoods last so much longer than any others? When, on the

evolutionary tree, did we wander out quite so far along this particular branch?

"People have spent a lot of time looking at the biological markers of growth in our species, and the hominids that came before us, to ask just this question," Hassett tells IFLScience. "Since there seems to be so much evolutionary pressure on us to extend our childhood from the much shorter childhoods of ancestors like *Homo erectus* or australopithecines or more ape-like primates, we are really interested in using fossil skeletons and teeth to see at what speed we and the **species that came before** us grew."

And the answer, it seems, requires us to delve deep into what exactly makes us "human" at all. Our extended childhoods likely appeared somewhere along the *Homo* line, Halcrow explains – "potentially *Homo habilis*, with the increase in brain size and growth requirements for the brain."

Living more than 1.4 million years ago, *H. habilis* exists right on the edge of where "ape" meets "human". Indeed, so murky was its status when it was first discovered in the 1960s that even giving it the prefix *Homo* was controversial, forcing scientists to redefine the limits of the genus to allow for its inclusion. And yet, it had several very human-like qualities. It walked on two legs, used stone tools, and likely had some language capabilities. Most importantly, it had a surprisingly large brain – a feature that still defines our species today.

IT CAN (AND OFTEN DOES) LOOK LIKE CHAOS – BUT THE BUNDLE OF HYPERACTIVITY AND IMAGINATION THAT CHARACTERIZES SO MUCH OF CHILDHOOD IS MERELY A COVER FOR WHAT IS, ESSENTIALLY, A MENTAL SUPERPOWER.

And the best way to use that big brain? Spend a lot of time practicing. "It is believed that humans have such long childhoods to increase [the] time for brain development and social learning," Halcrow says. "That needs to occur to be fully competent within our socially complex world."

All fun and games

Now, figuring out how to exist in human society is – well, it's a life-long endeavor. So why is childhood so special? What makes this period, more than any other in our lives, so important to the process of learning that evolution has seen fit to extend it beyond that of any other species out there?

"We spend a lot of time in childhood, like many of our primate relatives," Hassett tells IFLScience. "We use the time to learn. Part of this is playing, and there are lots of interesting things you can say about play."

Humans are far from the only animals to play as children, she points out – but the way



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we do so “can tell us a lot about the type of species and society we are trying to be,” she explains. “Depending on the adult skills that a young animal needs, they will undertake different types of play. Human children as well will play in ways that will fit their eventual adult roles in society.”

“PSYCHOLOGICAL RESEARCH SHOWS THAT THESE BODILY PROPORTIONS (LARGER HEAD AND SMALLER BODIES) LOOK ‘CUTE’ TO HUMANS AND THEREBY ELICIT A NURTURING OR CARING RESPONSE.”

It can (and often does) look like chaos – but the bundle of hyperactivity and imagination that characterizes so much of childhood is merely a cover for what is, essentially, a mental superpower. Children’s brains have a lot of developmental plasticity, Halcrow explains – they are far more able than adults to adapt and reorganize neural pathways in response to new information.

A longer childhood is therefore “an adaptive advantage,” she says. “This is especially so for children as their brain is still developing a lot.”

Of course, there are trade-offs for such an intense training period. Kids screw up: they fall over, scrape their knees and elbows; they try to eat just about anything they see without even asking whether it’s poisonous; heck, when they first come out, they can’t even talk or wipe their own butts. But it’s here that the extended childhood pulls out its final ace: children, it turns out, are also kinda cute.

“It is [...] interesting that the growth pattern of humans means that children still retain a relatively infantile appearance,” Halcrow tells IFLScience. “During childhood there is relatively rapid brain growth and comparatively slower body growth, and this is argued to contribute to nurturing behavior in older individuals.”

“Psychological research shows that these bodily proportions (larger head and smaller bodies) look ‘cute’ to humans and thereby elicit a nurturing or caring response,” she explains.

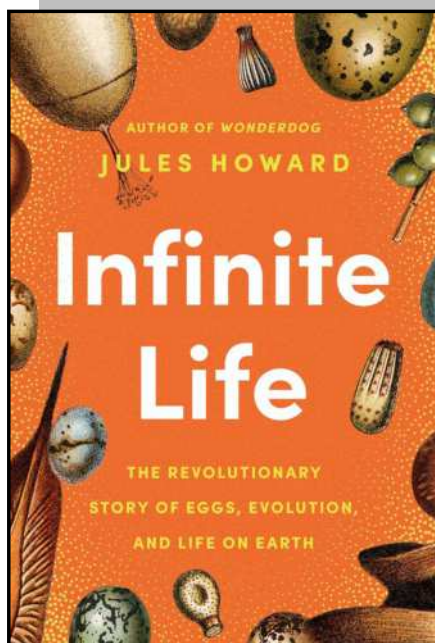
The children are our future

It may seem dishonest – maybe even manipulative – but you can’t deny that it works. Human children are cute, and so we forgive them for being basically useless for a frankly ridiculous length of time; we care for them in society-wide networks, and they use that time to learn how to exist in that society, furthering the species in turn by caring for the tiny, wide-eyed idiots that come after them.

“We have a social system that allows and encourages us to invest heavily in our children, backed by evolutionary changes over millions of years that have preferred to trade off expensive investments in brain size and long periods of growth against the speed at which we can reproduce ourselves,” Hasset tells IFLScience.

And while childhood certainly has its drawbacks – just ask any new parent when the last time they got a good night’s sleep was – the advantages are, undeniably, worth it for the species. After all, as Hasset points out, “they must be sufficient. [They] made us the most successful primate on the planet!” •





PLANET OF THE EGGS?

In this excerpt from *Infinite Life: The Revolutionary Story of Eggs, Evolution, and Life on Earth*, author Jules Howard introduces the often-overlooked egg that is – as his research revealed – the most unifying and resilient life structure that Earth has ever cooked up.

When you think of an egg, what do you see in your mind's eye? A chicken egg, hard-boiled? A mermaid's purse, the egg of a shark or ray, entangled in seaweed thrown onto shore? The eggs of headlice, perhaps, being scraped off a nit comb? Perhaps you see a human egg cell, prepared on a microscope slide and telegraphed onto a TV screen in a laboratory? Or the majestic marble-blue eggs of the blackbird? Each egg is unique, and that is one of the finest things about them. Each egg on Earth has its own charisma, allure, and evolutionary backstory, easily (I have learned) as diverse and interesting as the animals that hatch out of them. Every egg

there has ever been is an emblem of survival; a product whittled, chiselled and crafted by the unthinking forces of natural selection for the purpose of passing genetic lineages forwards in time – days, weeks, months, sometimes years. Eggs have an evolutionary depth to them that animal-lovers don't consider enough. And so, *Infinite Life* is a biography, of sorts; a true history of the egg – the most unifying, resilient life structure that Earth has ever cooked up.

In the chapters of this biography, we journey through the Cambrian explosion, when animal life surged into the lineages we recognise today, when eggs were first nursed and cradled; we chart the egg's magnificent assault on the land, first through the ancestors of spiders and scorpions, then insects, then fish that first walked the shores and, later, the forests. Our journey takes in Triassic ponds, brimming with mating amphibians; the rise of maggots and other insect larvae; the marsupials thriving in newly evolved pouches, and the rise of the most diminutive egg of all – the mammal egg as you and I know it. A single cell, the width of a hair, from which every human alive has passed. There is, naturally, a special place in our story for the eggs that encapsulated themselves in a layer of crystalline calcium and became the shelled eggs of some dinosaurs and, later, birds – a

model example of how natural selection can modify egg shape, structure, colour and form and how beauty can manifest itself upon nature without design or deity. But the evolution of the bird egg is just one story among hundreds of others that feature here.

To write this evolutionary biography has, at times, been challenging. It took time to shift my perspective and view animals as bit-part players in the story of life, for once. I have been writing books about animals for 15 years, yet this is the first time I have found myself having to look past them, at this new, earlier, evolutionary frontier. In time, as I worked through life's chapters, writing from this new perspective became clearer. In fact, by the end of *Infinite Life*, I began to see animals as little more than vehicles to make more eggs, which of course, in an evolutionary way, they are. However, there are times in this book when it may seem as if eggs have desires, wants, or needs: that eggs wanted to move from the sea to the land; that eggs sought safety in the mammal uterus or hid themselves in crystalline bird eggshells. Nevertheless, eggs – devoid of a brain and incapable of an instructive thought – can clearly do very little else than simply be an egg. Eggs are not capable of knowing their journey. I give them agency at particular moments only to tell an engaging story. •

AUTHOR
Q&A

JULES HOWARD

AUTHOR OF *INFINITE LIFE: THE REVOLUTIONARY STORY OF EGGS, EVOLUTION, AND LIFE ON EARTH*

Almost all organisms that have ever lived on Earth began life as an egg – and yet eggs are often left out of the picture when we discuss the evolution of life on our planet. In his new book *Infinite Life: The Revolutionary Story of Eggs, Evolution, and Life on Earth*, wildlife expert Jules Howard explains why it's time to give eggs their moment in the spotlight.

Was it difficult diving into the history of eggs?

Researching and writing this book was a bit like doing a detective story: there were plenty of characters, fossil animals galore, but very few “murder” weapons (by which I mean, eggs). But look more closely, and you can see eggs there in the fossil record: the fossil eggs from long before [the] Cambrian Period, when modern animal groups took off; the fossil eggs of the earliest shrimp-like organisms, their eggs glued to their body armor; the earliest umbilical cords of 380 million-year-old fish; the fossilized

embryos of early reptiles, encased in what would become (in birds and some dinosaurs) a crystalline covering. These are fragments, jigsaw pieces really. It was really satisfying putting them together.

Why did you want to write this book?

About six years ago, Patricia Brennan (of duck vagina fame) and I made a virtual reality app where users could travel through a 3D model of a duck vagina. It felt like a fun way to communicate to people the extraordinary complexity of egg tubes (otherwise known as oviducts).

Anyway, while setting up the 3D model of the egg tube, sorting the lighting out, and placing cameras in the right places, etc, I was struck by the fact that few authors narrate evolutionary stories from the internal perspective – mostly we think of natural selection acting on the external parts of animals; internal features such as oviducts rarely get a look in, but they're just as (if not more) evolved. So, I guess that I wanted to change that, framing a story about animal evolution through a different lens.

You write that you started to see animals “as little more than vehicles to make more eggs,” why?

I think it was from detailing eggs from so

many animal groups – from sea urchins to insects and scorpions to amphibians to reptiles. You just see so much variation in animal eggs, but also so many commonalities: the same armour-like adaptations to stop eggs drying out; the tenpin-like arrangements in which insect eggs, for instance, are laid; even the way that eggs hatch.

For me, when you come to understand the egg as a supremely evolved structure, one that exists to send genetic lineages forward in time, you start to see them as the central characters in evolution – the things from which animals hatch; animals that grow, develop, and continue the cycle with eggs of their own. Now, at the end of this writing process, I can see that [it] is as much a planet of eggs as it is a planet of animals.

Favorite egg fact?

There are too many! *Velociraptor* eggs were probably blue. There is a fossil egg almost the size of a beach ball that no one has yet properly identified. The fact that some bird embryos listen and learn their parents' song before hatching. Stick insect eggs look like tiny vases, flasks, and other rustic kitchenware. Some flies give milk to their maggots. You get the idea...

What do you hope people will take away from *Infinite Life*?

That the evolutionary story we're all familiar with... of the Cambrian explosion, of fish taking to the land and evolving into amphibians and reptiles; the death of dinosaurs, the rise of mammals... that this familiar scientific story can also be told through the story of eggs.

That eggs are big players in extinction events and lineage successes, just like the animals that hatch out of them. That there are untold characters, plotlines, and even the occasional murder – so many stories yet to be told. ●

***Infinite Life* is published by Pegasus Books and is available now.**

The Salt Mines of Maras have been keeping Peruvians in delicious sodium for over 500 years, dating back to before the Inca set up camp.



SALT MINES OF MARAS

A sprawling landscape of some 4,500 salt wells can be found arranged in stepped terraces on the hillside of the Qaqawiñay mountain, Peru. Known as Salineras de Maras, or the Salt Mines of Maras, they are located 52 kilometers (32 miles) northeast of Cusco city and sit at an altitude of 3,200 meters (10,500 feet) in the Sacred Valley of the Incas.

The shallow ponds are flooded with water from a hypersaline spring that's believed to have formed around 110 million years ago. The water floods the pools and then evaporates from a combination of wind and the heat of the Sun, leaving behind a thick crust of salt crystals that are scraped away for distribution.

Salt harvesting is dependent on the seasons and much quicker and easier in the dry season, which spans from May to October. The salt harvested in this window is considered to be of better quality according to **UNESCO**, and comes in aesthetic hues of pink as a result of its high mineral content. Come the rainy season, harvesting gets much harder as the salt turns a less appealing shade of brown.

The salt layers in the modern era are divided into their commercial uses, ranging from kitchen salt to industrial salt used for agriculture and livestock. On average, each well can produce between 150 to 200 kilograms (330 to 440 pounds) of salt per month, and the profits are divided up among those who own them.

It's thought that the cascade of salt ponds has been a crucial source of sodium for around 500 years. That means they've been in use since pre-Incan times, but they were developed and expanded during the Inca Empire around the 15th century.

Advancements in agriculture and irrigation made it possible to expand the Salineras de Maras and they have remained a valuable resource ever since. Over the centuries, ownership and maintenance of the ponds has been passed down through generations, cementing the importance of the UNESCO World Heritage site in Peruvian culture.

The Maras salt mines are also steeped in legend; in Inca mythology it's said that the hypersaline spring is actually the tears of Ayar Kachi, one of four brothers who founded the Inca Empire. Kachi was betrayed by his three siblings who, fearing his strength, tricked him into a cave so that he wouldn't rise to power.

His resulting anguish gave rise to the salt spring that floods the mountain hillside, and with a bit of ingenuity, we humans found a way to commodify his trauma. ●



How to get there

Salineras de Maras is 52 kilometers (32 miles) from Cusco, and the main road headed in the direction of Chinchero swings by the salt mines.

READ

Peeing And Pooping In Space

Book by Kiona N Smith

Science has enabled humans to boldly go where no human has gone before, but even in pursuit of deep space, we still got to go potty. In this "100 Percent Factual Illustrated

History," writer Kiona N Smith explores how astronauts have been navigating going to the toilet in zero gravity, from pre-flight rituals to farting etiquette onboard. Forget screaming – in space, can people hear you parp?



Available **now**.

PLAY



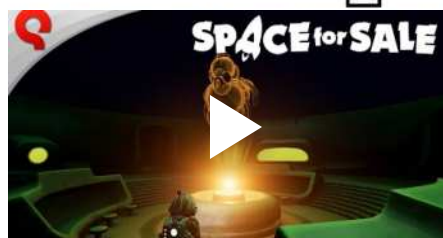
Bugaboo Pocket

Game from Elytra Games

Beetleback Ridge needs you! In this virtual pet game, you take the starring role as a research scientist working to recover the ecosystem following a fire. Collect and care for bugs in your cabin in the woods, with a pen pal for company as you get to know Beetleback Ridge's smallest and most precious residents. As you raise your bugs, you heal the forest around you in this creepy-cute game from a women-run studio.

Releasing on **Steam and Nintendo Switch** this summer.

SELL



Space For Sale

Game from THQ Nordic and Mirage Game Studios

So, you've found an alien planet? That's all very well and good, but did you stop to think about **real estate**? Live out your intergalactic property developer dreams in Space For Sale. Your mission is to build new and innovative properties on an alien planet, spanning from cozy lodgings to luxurious estates to satisfy the needs of your alien clientele. Ever wondered how we might begin settling on a planet like Mars? **We asked a space lawyer** for you.

Available this **summer**.

READ

SeaVoice Annual

Book from SeaVoice

The SeaVoice Annual: Issue 01 is the first-ever SeaVoice book. Backed by the United Nations Ocean Decade, it features 20 stories from 16 countries that amplify the voices of ocean advocates,

scientists, artists, and community members working and living around the ocean. You can expect captivating stories and insightful narratives as

SeaVoice sheds light on the intersection between the ocean and culture, inspiring collective responsibility for our blue spaces.

Available **now**.



LISTEN



The Big Questions

Podcast from IFLScience

Is evolutionary biology sexist? That's The Big Question managing editor Katy Evans tackles with zoologist and presenter **Lucy Cooke**, author of *Bitch: A Revolutionary Guide to Sex, Evolution and the Female Animal*. Join them as they discuss how these biases have affected – and sometimes prevented – what we know about animal biology in some truly eye-opening ways. New episodes of **The Big Questions** are coming out every two weeks, but if you're hungry for more, you can always check out our weekly podcast, **Break It Down**.

Out **now**.

SCIENCE IN MEDIA





DATES TO REMEMBER

The “best meteor shower of the year” is back this August, as is a chance to celebrate everyone’s favorite monster novel, and appreciate the medical marvel that is vaccination. The eighth month of the year also sees Earth Overshoot Day, so let’s not get complacent in appreciating our home planet.

AUGUST



National Immunization Awareness Month

In the US, August is National Immunization Awareness Month (NIAM), which aims to highlight the importance of routine vaccination for people of all ages. Vaccines can help prevent serious, sometimes deadly, diseases – and they not only protect the person receiving them but can help prevent the spread of illnesses to others too. NIAM is the perfect opportunity to talk to your doctor, nurse, or another healthcare professional to ensure you’re up to date with your shots to help protect yourself and those around you against serious disease.



1 Earth Overshoot Day

Earth Overshoot Day marks the point in the year that humanity’s demand on nature exceeds the planet’s biocapacity (the amount of ecological resources Earth is able to generate). This year, that date falls on August 1 – a whole five months before the year is out. For reference, the first Earth Overshoot Day was on December 29, 1970 – and it’s been mostly downhill from there. But it’s not all doom and gloom: “There is immense power of possibility in the many existing solutions,” reads the organization’s [website](#). “With them, we can make ourselves more resilient and #MoveTheDate of Earth Overshoot Day.”



12 Perseids

The Perseids – often referred to as the best meteor shower of the year – are back. The shower will be active from July 17 to August 24 and is expected to peak on the 12th, so don your binoculars to catch a glimpse of the (shooting) star of the season.



20 World Mosquito Day

On August 20, 1897, British doctor Sir Ronald Ross made a groundbreaking discovery: female *Anopheles* mosquitoes transmit malaria between humans. Today, mosquito-borne diseases kill more than 1 million and infect up to 700 million people each year. As such, the day is now **designated** as a much-needed opportunity to raise awareness of the dangers posed by the world’s deadliest creature and the ongoing efforts to combat them.



30 Frankenstein Day

Fans of *Frankenstein*, it’s your time to shine, as August 30 is Frankenstein Day – an annual (unofficial) holiday to celebrate the iconic 1818 novel and its author Mary Shelley, the “mother of science fiction”, who was born on this day in 1797. Happy 227th Mary!



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 animals turned hardened criminals. If you like your science lighter, discover how the world might be more positive than you think.

ANIMALS BEHAVING BADLY

Many of us are all too familiar with seagull food thievery or pet-related destruction of property (get a puppy and say RIP to your nice new rug), but there are plenty of animals out there with rap sheets that make those antics look relatively tame in comparison.

When Colorado resident Ron Cornelius and his wife woke up one morning in 2017 to find a car had crashed at the end of the driveway, they suspected a regular human robbery had taken place.

It wasn't until seeing all the damage inside the car, fit with fresh poop, that it became apparent a hungry bear had taken the vehicle for an accidental joyride.

Tell them to stick that in *Grand Theft Auto VI*.

Then there's the donkey that wound up spending three days in a Mexican jail for

assault and battery after biting and kicking two men outside a ranch.

"Around here, if someone commits a crime they are jailed – no matter who they are," said police officer Sinar Gomez in 2008, according to **NPR**.

And that seems to have been a popular approach in days gone past. While the donkey in question was released, if it had committed such an act back in the 1500s, it might've been put on trial for its crimes.

That was the fate of a bunch of grape-loving weevils plaguing the crops of the French town of St Julien in the 16th century. The weevils were even given a public defender, though sadly no one knows if they won their case, as some of the court documents have been destroyed – allegedly, maybe even by fellow bugs.

Nowadays, most people agree that animals don't have moral agency and thus can't be held culpable for their shenanigans – although anyone who's ever owned a cat may well disagree...

A HAPPIER WORLD

For the first time in a decade, the world's emotions are starting to take a more positive turn.

That's according to the Global Emotions Report 2024, an annual compilation of data collected by analytics company Gallup that aims to find out the way the world is feeling.

To do this, they conducted nearly 146,000 interviews with people across 142 countries and areas in 2023, asking questions about their experiences the day before, both positive and negative. These questions included "Did you smile or laugh a lot yesterday?" and "Did you experience sadness during a lot of the day yesterday?"

The results from those interviews were then totted up to create the Positive Experience Index – made up of "well-rested", "respected", "smiled/laughed a lot", "learned/did something interesting", and "enjoyment" – and the Negative Experience Index – consisting of pain, worry, sadness, stress, and anger.

Despite ongoing conflicts and economic crises, the data revealed that all five of the negative emotions assessed had dipped across the globe for the first time since 2014, with stress levels having declined the most.

There's a slight caveat, however – while each of the negative emotions and the overall index have dropped since last year, the scores are still much higher than they were a decade ago. On the scale of individual countries and areas, regions where there's been conflict and instability, unsurprisingly, had some of the highest negative experience scores.

But it seems people are still determined to find the positives in such a world, as the Positive Experience Index has gone back up to the level it was at before the COVID-19 pandemic.

Although much of the improvement in that score was attributed to people aged 30 and older, those younger than 30 were found to be the most positive age group in the world overall, a trend that's continued throughout the history of the report.

An excuse to bring some youthful joy back into our lives if ever there was one.



**The Darker Side
of Science**



**THE LIGHTER SIDE
OF SCIENCE**