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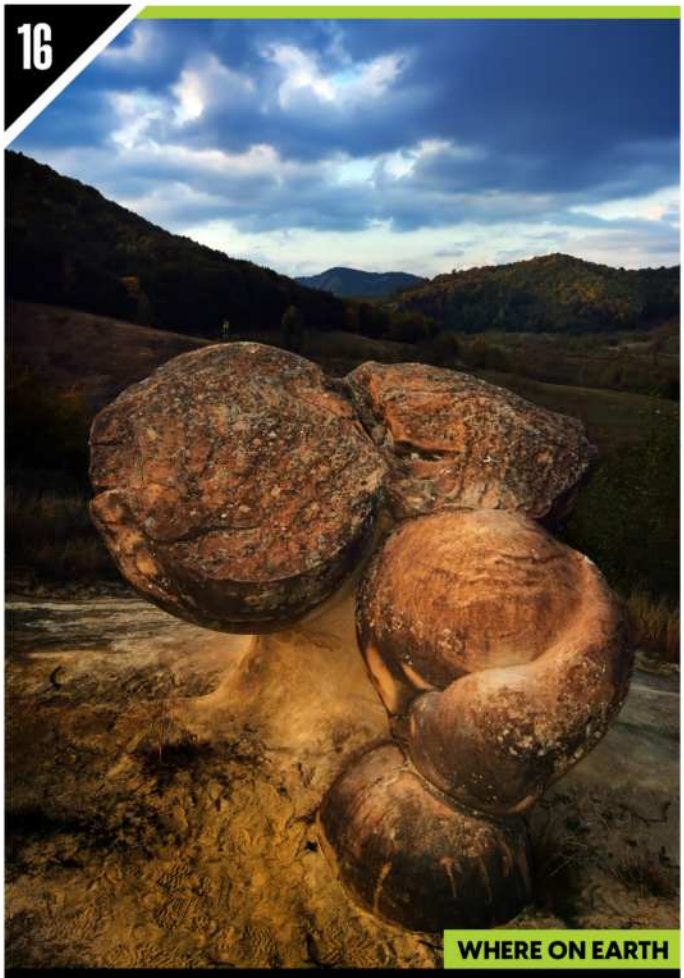
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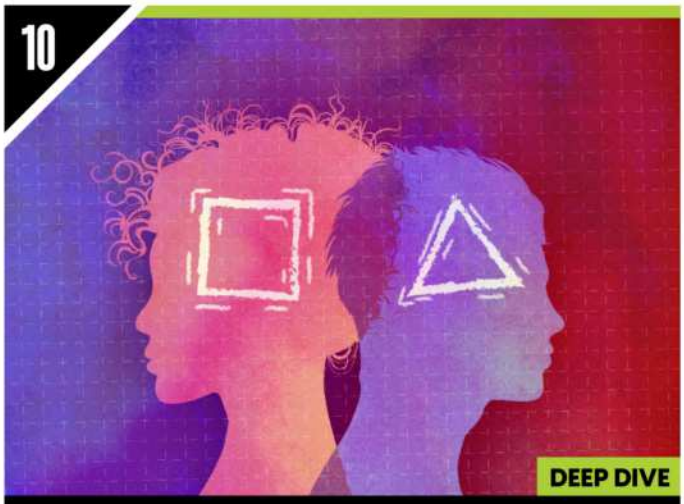


IFLSCIENCE



ROAMING ROCKS LIVE IN ROMANIA

The trovants of Romania appear to grow, move, and even reproduce – albeit very, very slowly.



IS THERE ANY TRUTH TO PERSONALITY TESTS?

Can personalities really be placed into neatly labeled boxes? Ben Taub takes a test to find out.



DOES TECHNOLOGY HELP OR HARM GRIEF?

Rachael Funnell investigates how grief tech is changing the way we process loss.

March 2024

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NEWS BITES



Coral Reefs For Days

In some good environmental news for once, scientists have used satellites to create the most accurate map of the world's coral reefs – and discovered there are even more than we thought. They found a missing 64,000 square kilometers (24,710 square miles) of coral cover in the oceans, roughly the size of Sri Lanka. Coral reefs cover an incredible 348,000 sq. km (134,360 sq. miles) of our planet, and while that may be just 0.1 percent of Earth's oceans, they support between 25-40 percent of all marine species. While coral reefs are still under threat from global heating, having a better picture of their full extent means we can better protect them. "This is the first accurate depiction of the distribution and composition of the world's coral reefs, with clear and consistent terminology," Dr Mitchell Lyons, who led the research, **said**. "It's more than just a map – it's a tool for positive change for reefs and coastal and marine environments at large."



Spacewoman

It's Women's History Month, so it's appropriate to announce a new landmark feature documentary on Eileen Collins, the first woman ever to pilot and command a spacecraft. In the 1970s, the US military selected women pilots for the first time, and Collins became a "daredevil" test pilot and instructor. Selected as a NASA astronaut in 1990, she became the first female space shuttle pilot in 1995 and the first female space shuttle commander in 1999, with that spacecraft deploying the Chandra X-ray Observatory. The documentary is based on her memoir, *Through the Glass Ceiling to the Stars*, written by Collins and Jonathan H. Ward. "I am enormously excited to be involved with this film project. It is more than my personal journey through life's challenges; it also includes the thrill of flying jets, my determination to be an astronaut, commanding the space shuttle, and the many relationships I built along the way," Collins **said**.



Night Of The Comet

March is blessed with two comets for night sky enthusiasts, and both should be pretty easy to see. First up, grab your binoculars as comet C/2021 S3 PanSTARRS should be visible throughout the month at a viewer-friendly eighth **magnitude**. It will pass through the Coathanger Cluster, a region of the night sky that has plenty of altitude before dawn, making it easier to spot. Next up is Comet 12P/Pons–Brooks, one of the brightest known periodic comets, which many may remember as the "**Devil's comet**" when it formed twin horns last year. It will be easiest seen passing constellations Andromeda and Aries and may even become a naked-eye object.

Messier Marathon

March is the month many amateur astronomers attempt the Messier Marathon, a challenge to find and observe all 110 objects listed in the Messier Catalog in one night. The catalog was created by 18th-century French astronomer Charles Messier, and essentially lists the most spectacular deep-sky objects you can see from your backyard at night. It includes galaxies, globular clusters, open clusters, diffuse nebulae, planetary nebulae, a supernova, and even a patch of the Milky Way. Most attempt it around mid-late March because the positions of Earth and the Messier objects align above the horizon during a single night while the Moon will be in its new phase, and so not outshining everything else.

Image Credit Top Left: *Chris Roelfsema,* ***Right:*** *NASA,* ***Bottom Right:*** *Juan Iacruz, CC BY-SA 4.0*

New Pterosaur Soared Above Skye

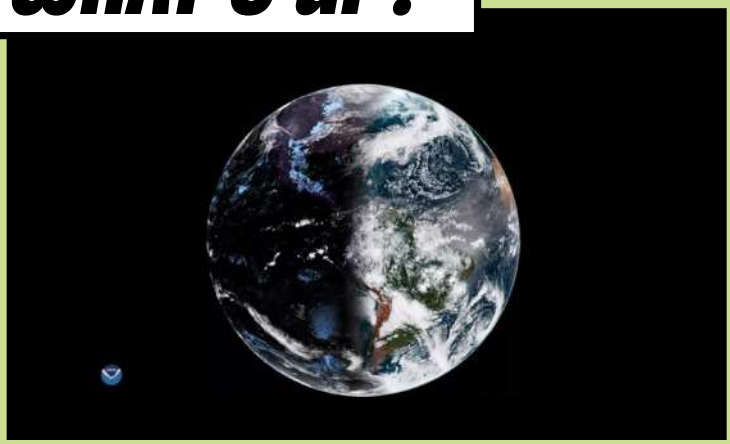
A rare new Jurassic pterosaur has been discovered on the Isle of Skye, Scotland, shedding light on a period of pterosaur history that is poorly understood due to a lack of fossils. The new species of flying reptile (not dinosaur), *Ceoptera evansae*, would have soared through the skies 165 million years ago during the Middle Jurassic. The new discovery reveals that not only were the Darwinoptera clade of pterosaurs more diverse than previously known but more widely dispersed and lasted for around 25 million years. Pterosaurs in general have a poor fossil record, but most have been found dating to the late Jurassic or Early Cretaceous, so new discoveries like this push back our knowledge of these elusive creatures.



Godzilla Returns

Everyone's favorite monster returns to the silver screen this month and there is one question on everybody's lips: why is he now pink? *Godzilla x Kong: The New Empire* stars the titular Titans as well as a whole bunch of angry monsters – but let's face it, the King of Monsters is the draw. So why the new look? In previous incarnations, Godzilla is depicted as having blue atomic breath, which can reach a whopping 500,000°C (900,000°F). While charging up, his dorsal spikes also light up a crackling blue. While there is no official explanation yet, the movie trailer hints that Godzilla has undergone an evolution to a new powerful form while healing from injuries. According to **scientists**, Godzilla has been evolving at a rate that directly correlates to human anxiety. In the latest movie, he will be 121 meters (400 feet tall) and hot pink; make of that what you will.

WHAT'S UP?



Spring Equinox

Get out your brooms and eggs

Name: Vernal/spring equinox
Appearance: Pretty much just a regular day. Looks cool **from space** though
Location: Earth (though if you call it spring, we'd better be pedantic and say the Northern Hemisphere)

What's an equinox?
It's a bi-annual event when the length of day and night are almost equal at all latitudes across the Earth.

But why is it called that?
Like a lot of language, it comes back to Latin. It's derived from the words for "equal night" – "aequus" and "nox" (it's not just a *Harry Potter* spell).

Why does it happen?
Because the Earth is on a tilt. Besides the vernal and autumnal equinoxes, this means that the planet is unequally lit by the Sun as it orbits around it. However, for a brief time each March and September, around the 21st and 22nd of the month respectively, the Earth's axis is perpendicular to the Sun. On these days, the planet is illuminated or in darkness equally, making day and night very nearly 12 hours each.

And that's why the days get gradually longer or shorter afterward?
Yep, although which one it is will depend on whether you live in the Northern or Southern Hemisphere. If you live in London, for example, the days will start getting longer again after the vernal equinox, heading into spring.

So, the thing about only being able to stand an egg on its end during the equinox – is it true?
This is the myth that just won't go away, isn't it? Have you just re-watched that episode of ***The West Wing***?

...Maybe. But is it true?
Yes, it is possible if you try hard enough – but it's just as possible on every other day too. It's got nothing to do with the gravitational pull of the Sun or the polarity of the Earth and everything to do with how much time you're willing to waste.

Image Credit Left: Warner Bros., *Right:* NOAA/NOAA Environmental Visualization Laboratory



DOES TECHNOLOGY HELP OR HARM GRIEF?

Death is a natural part of life, but technology is changing the way we process it. Does grief tech provide comfort, or make it harder to let go?

Image Credit: Imran Chowdhury

By Rachael Funnell

Talking to a dead relative through an Artificial Intelligence (AI) chatbot that's learned to speak like them sounds like a *Black Mirror* episode – because it is. In *Be Right Back*, protagonist Martha loses her partner Ash when he's killed in a car crash. He isn't exactly gone, however, as before long, he arrives in a vacuum-sealed plastic bag ready to be cooked into a fully-fledged AI human in the bath.

Ash 2.0 begins as a chatbot that picks up the characteristics of the real human's speech and humor by reading social media posts. It then graduates to telephone calls, mimicking his speech over the phone, and eventually goes 3D as an android that looks and sounds like Martha's dead partner. It is, of course, science fiction, but similar technologies already exist in the present day.

My deepfake dad

In October 2020, Kanye West gave his then-wife Kim Kardashian a 40th birthday present that **she described** as "the most thoughtful gift of a lifetime". Kardashian's dad, Robert, died in 2003, but he appeared in hologram form with a message for his daughter. He made jokes, danced, talked about how he watched over her daily, and how she had married "the most, most, most, most, most genius man in the whole world".

Thanks to the development of machine learning technologies, creating deepfakes of the dead is something that's becoming increasingly possible. Artist and Associate Professor at Skidmore College in New York, Sarah Sweeney, lost her dad when she was 17. When she turned 44, the same age he was when he died, she decided she wanted to speak to him again – and had a unique opportunity to do so.

Sweeney's father was a screenwriter in life who regularly used a tape recorder to make notes, and it was this rich library of audio information that enabled her and a team of collaborators to create a deepfake of his voice with Resemble AI. Sweeney faced ethical and technological challenges on her path to completing the project **Conversations with My Deepfake Dad**, which explored her relationship with her father before and after death, consent, and **what happens to our digital footprint after we die**.

Project December

Sweeney's project created a series of six conversations, but what if we could maintain a running dialogue with the dead? This was an ethical question raised by one man's experience with **Project December**.

As an early release of the AI technology ChatGPT-3, Project December offered paying users the chance to speak with preset chatbot characters or use the machine learning technology to create their own. Writer Joshua Barbeau was a user who went on the record with his experiences teaching Project December to speak like his fiancé, who at the time had been dead for over eight years. By feeding the AI samples of her texts and a personal description, Project December was able to piece together life-like responses using language models to mimic her speech in text-based conversation.

IT'S A COMMON GRIEF PRACTICE TO PEN LETTERS TO PEOPLE WHO HAVE DIED. IS IT GOOD FOR US IF THE DEAD START SPEAKING BACK?

"Intellectually, I know it's not really Jessica," Barbeau told **the San Francisco Chronicle**, "but your emotions are not an intellectual thing. [Grief has a way of becoming] knots in your body, right? Sometimes when you pull on them the right way, they get unknotted."

When we are missing someone we love, it seems reasonable that interacting with their likeness could provide comfort as we get an opportunity to say all the things we never got to while they were still alive. For this same reason, it's a common grief practice to pen letters to people who have died, but this one-way communication doesn't contradict that the person is dead. Is it good for us if the dead start speaking back?

Facing death

Having back-and-forth correspondence with someone who is no longer alive could interrupt what psychologist **Professor Ines Testoni** of the University of Padova states is one of the biggest things we have to overcome after a death.

"The greatest difficulty concerns the inability to separate from those who leave us, and this is due to the fact that the more you love a person, the more you would like to live together with them," Testoni told IFLScience. "But also, the more one loves one's habits, the more one wants to ensure that they do not change. These two factors make the work involved in separating and resetting a life that is different from what it was before death entered our relational field very time-consuming."

The suffering that comes with that is something Testoni states is related to a lack of understanding of what it means to die. Much of the discourse surrounding what happens after we die is conceptually vague, making it tempting to look for evidence and find it wherever we can when we're struggling to let go.

"A vast literature describes the phenomenon of continuing bonds, i.e. the psychological strategies of the bereaved to keep the relationship with the deceased alive," explained Testoni. "**Death education** can help to deal with these kinds of experiences by allowing us to become aware of these processes and especially to understand where the doubt about the existence beyond death comes from, which leads us to painfully question where the deceased is."

Death education

If this is the first time you're hearing the phrase "death education," it may interest you to know that it's something that's been in the US since the 1960s. Testoni has spent the last two decades working in death education in Italy, having established the post-grad Master's in Death Studies and the End of Life

at the University of Padua. It's a subject that Testoni is passionate about because of the many ways modern culture can guide humans away from accepting death for what it is.

"Since the 1980s, researchers of Terror Management Theory have shown that our life is totally conditioned by the anguish of death and yet we are totally unaware of it," Testoni continued. "In fact, society, on the one hand, helps us to do this by setting up ideologies (such as religious ideologies) that deny death and, on the other hand, by systematically removing serious thoughts and discourses concerning death."

"The need to keep at bay the paralysing terror that derives from the knowledge that we are mortal, however, means that many of our dysfunctional behaviours are caused by the removal of this awareness which also continues to act at an unconscious level, leveraging socially constructed beliefs as consolatory discourses."

> AS MUCH AS WE MIGHT WANT A CHATBOT OR ANDROID TO FILL THE VOID, IT'S LIKELY WE'LL NEVER BE TRULY CONVINCED BY ANYTHING OTHER THAN A FLESH-AND-BLOOD PRESENCE.

While technologies and apps that can give us a taste of someone we have loved and lost may temporarily satiate a painful yearning, it could also hold us back from the grieving we need to work through to move forward in a way that is healthy and makes it possible to find true happiness again.

"Allowing people at all stages of their lives to get in touch with their anguish, knowing how to recognise it, and being able to coherently and rationally analyse the psychological, social, and cultural reactions to death and dying helps people to live better," added Testoni. "I have had experience of this for decades."

Death and AI

AI may be able to capture the likeness of a deceased person, but it's Testoni's view that it will never be able to replace them, not least because humans are very good at distinguishing what's real from what's a "product of fantasy". As much as we might want to believe that a chatbot or android could fill the void, it's highly likely we'll never be truly convinced by anything other than a flesh-and-blood presence, and holding on to an AI imitation could make it harder to move on from the life we had before death. That won't stop us from tying ourselves in knots to make it work with whatever tools we have in our arsenal, however.

"The problem lies in the fact that sometimes, in order not to reckon with loss and limitation, we strangely adapt ourselves even to the most limiting situations, i.e. to be content with what remains, thus limiting ourselves with respect to all that concreteness can offer in the real world. Here, death education also teaches us to understand this paradox."

Good grief (tech)

Facing death became unavoidable at the height of the COVID-19 pandemic, unleashing a wave of shared trauma as geographically isolated communities endured the same loss. It was a devastating time to be a resident of Earth, but it demonstrated how finding community online can be a good thing for grief.

"There is a very interesting area of social media, and that is where people come together to grieve because they do not find adequate spiritual or community support in the religious and psychological services of their neighbourhoods," Testoni explained. "Thus, communities of mourners on the Internet are born. This was very evident during the **COVID-19 pandemic** and I have also studied this phenomenon."

Technology is changing the way humans navigate just about everything, so it figures that grief is no different. As we innovate new ways for people to find community and cope with the life-altering experience of loss, perhaps the key is to maintain one simple and immutable fact: death is final, but that's how it's meant to be.



Image Credit Background: Imran Chowdhury

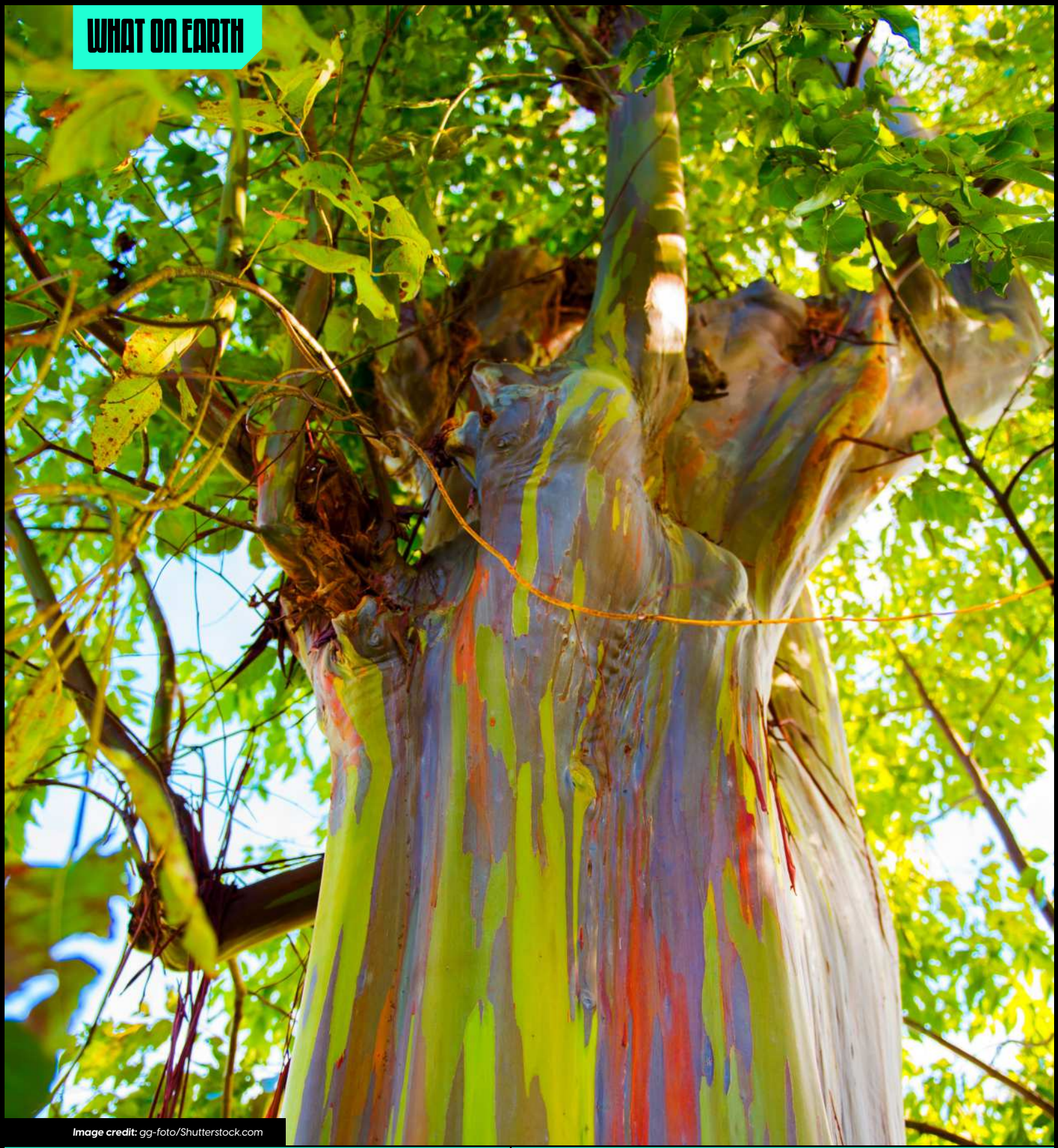


Image credit: gg-foto/Shutterstock.com

A SPLASH OF RAINBOW EUCALYPTUS

The brilliant stripes of rainbow eucalyptus (*Eucalyptus deglupta*) make for an aesthetic that gets curiouser and curiouser as the tree ages. Like some gum trees, its bark peels constantly, and freshly exposed bark is bright green. As it matures, it drifts through reds, oranges, and purples until turning brown – but the process is constantly repeating, giving rise to a rich tapestry of color. It's native to Southeast Asian rainforests but has been planted as far as Florida and Hawai'i, where this photo was taken.

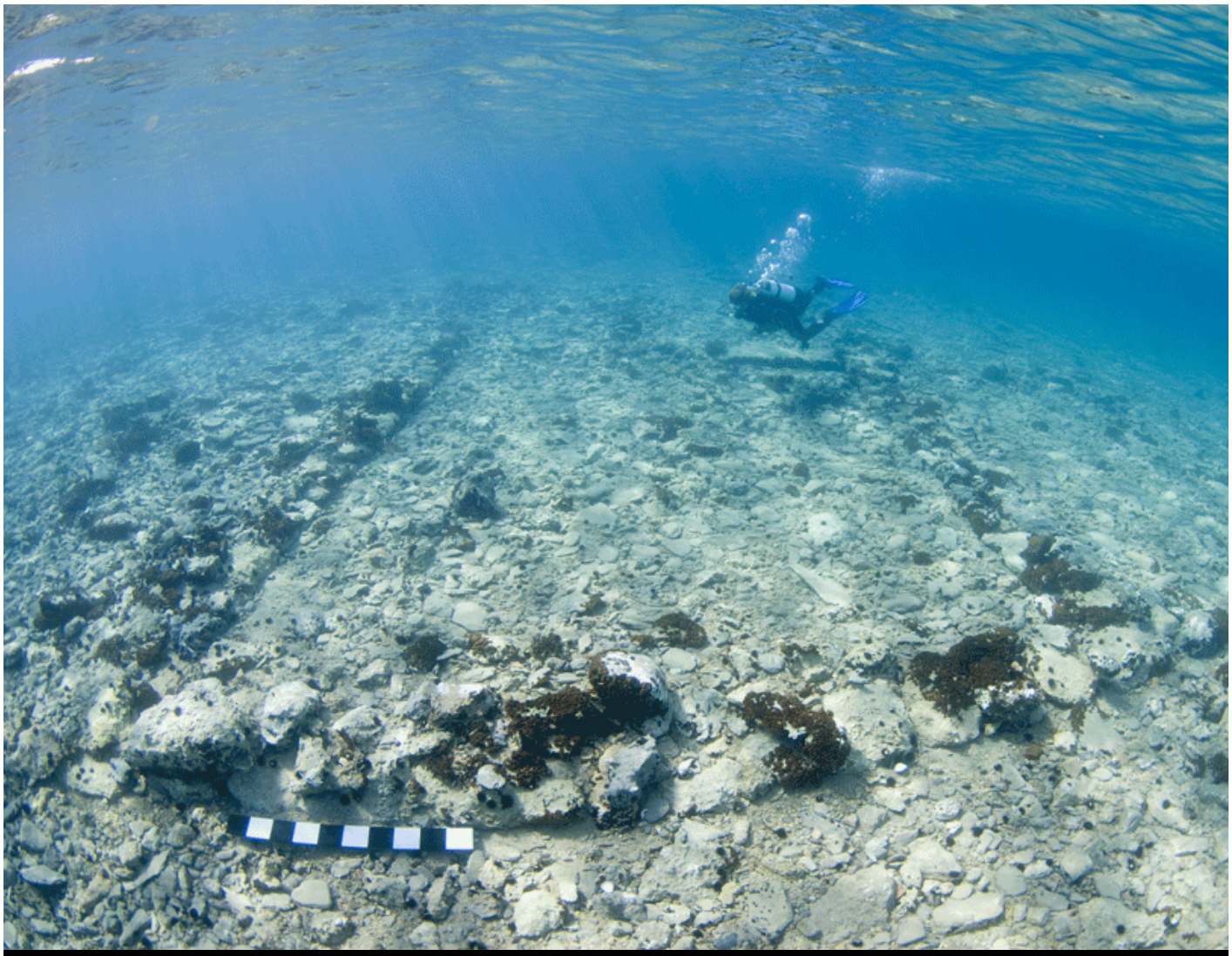


***Image Credit**: Pavlopetri Underwater Archaeology Project*

HOW DO SUNKEN CITIES END UP UNDERWATER?

AND HOW MUCH HISTORY ARE WE LOSING TO THE SEA?

By Rachael Funnell

Submerged settlements, also known as sunken cities, might sound mythical but they are very real, and while their migration underwater makes them harder to find, it can also preserve them far better than they would have fared surface-side. **Marine archaeologist Professor Jon Henderson** knows this all too well. As Head of Archaeology at the University of Edinburgh, his studies have taken him from the frozen crannogs of Scotland to the submerged ancient town of Pavlopetri in southern Laconia, Greece.

Underwater archaeology pits researchers in a race against time as they must study ruins emerging from the sediment before the sea has a chance to wash vital information away. So how do they end up underwater, and what's in a marine archaeologist's toolkit to capture sunken cities before it's too late?

How did you get into sunken cities?

JH: I started out working on crannogs, which are sort of artificial islands made out of wood and timber that were taken into lochs to build settlements on top of. There are thousands of these in Scotland.

I found out about these when I was a student at Edinburgh University where I'm now a professor.

I remember going to a lecture where they were talking about the sites where you had prehistoric roundhouses, dating to about 2,000 years ago, which were now underwater. That just fascinated me because all of the organic material and all the exciting bits of wood and foodstuffs and pots, and all that kind of stuff, survives well underwater. I thought, why aren't people working on this?

I started from a terrestrial background, but I thought "Well, if I learned to dive, I can find the sites underwater, which are going to have much better preservation than you would get on land."

How do they end up underwater?

JH: Most people will say it's due to sea level change, and that's true to a degree. Sea level change accounts for anything that's about 5,000 years old or more being underwater generally, but that doesn't account for why we have lots and lots of sunken cities that date to the Greek period, the **Roman period**, or even later, and a lot of that has to do with earthquake activity.

Tectonic activity pushes things on the coast underwater, and we're kind of more aware of that now. We have major disasters and tsunamis affecting coastlines and eroding things into the sea. But also, an earthquake can suddenly push something straight into the sea. It can also push it up, of course.

> *"[At Pavlopetri] you can snorkel over the remains of a Bronze Age town that's one of the most amazing sites in the world, really."*

Can anyone discover one?

JH: It does happen. I constantly get messages from people saying they found something, or they think this might be something off the coast. Nine times out of 10 it's not, I'm afraid. Quite often it's beach rock or something natural that they've decided is something. The site where I was working on, **Pavlopetri** off the coast of Laconia in Greece, is a submerged Bronze Age town where you can see courtyards and streets. It's only about 3 meters [10 feet] deep, so you can snorkel over the remains of a Bronze Age town that's one of the most amazing sites in the world, really.

What tech do you use to study them?

JH: The common default way in underwater archaeology tends to be sonar, modeling, and 3D relief by sending sound waves down. Depending on the reflection, you can work out what the seabed is like.

The project I was working on in Greece was about developing new techniques. We tried aerial photography, satellite imagery, all this kind of stuff, and the one thing that really worked, and is now standard in underwater archaeology, is photogrammetry. So that was going out and taking photos of the site and as long as you've got 50 to 80 percent overlap between your photos, you can then put them together and create an accurate photorealistic 3D model of the remains. That's an absolute game-changer for archaeology.

Any common misconceptions about marine archaeology?

JH: One of the things I always get asked when I tell somebody I'm a marine archaeologist, is "Have you ever found Atlantis?" And then there's this kind of running joke that well, **we don't think Atlantis really exists**, so what you do is silly and there's this idea that sunken cities don't actually exist. Actually, there are hundreds and hundreds of sunken cities in the world.

NEW PODCAST Coming Soon! May 2024 IFLScience is launching the We Have Questions podcast. Catch the full conversations and more, coming soon on all good podcast platforms.



Image Credit: Pavlopetri Underwater Archaeology Project

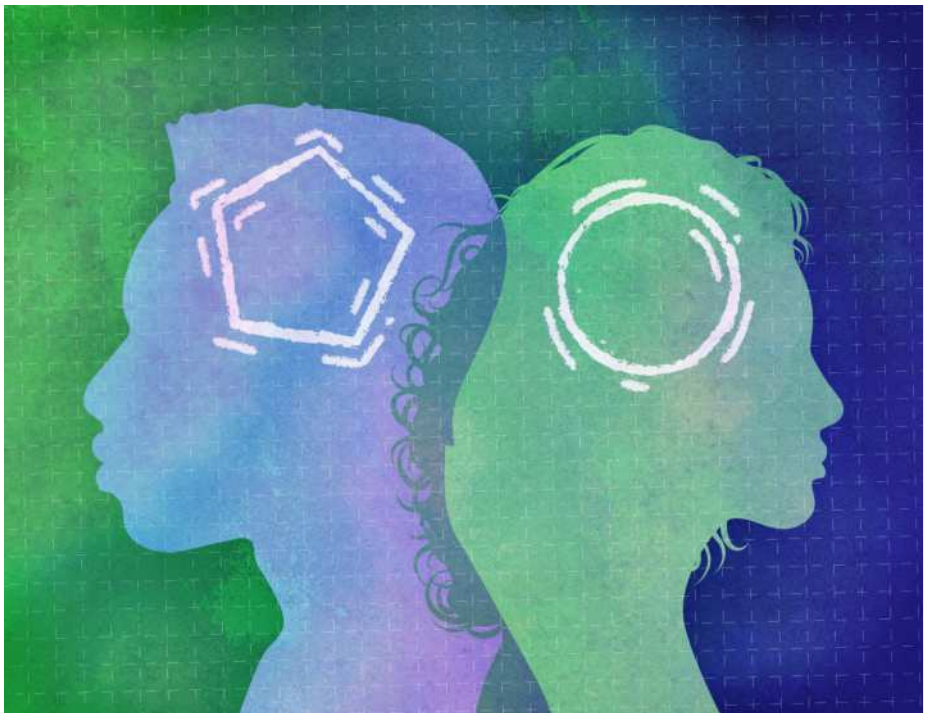
SCIENCE FACT OR FICTION:

IS THERE ANY TRUTH TO PERSONALITY TESTS?

Can you really pigeonhole personality using a simple questionnaire? Ben Taub takes a couple to find out.



Image Credit: melitas/iStock, Imran Chowdhury



Personality tests have evolved dramatically over the years. In ancient Sparta, for instance, young boys were flogged and beaten as a means of gauging attributes like valor, determination, and heroism – all of which were considered necessary for their future occupation as soldiers. These days, thankfully, people have more choice over their career path, and many turn to non-contact, questionnaire-based character assessments in order to learn about their suitability for certain roles.

By far the most popular personality test is the so-called Myers-Briggs Type Indicator (MBTI), which is reportedly used by **89 of the Fortune 100 companies** to analyze the qualities of job applicants. While clearly an upgrade on the Spartan approach, critics of the test say it's too categorical as it assigns each person a fixed personality type. In contrast, most research suggests that personalities are far messier than this and can't be placed into neatly labeled boxes.

After about seven pain-free minutes in my company, the MBTI has apparently sussed my type and condensed my entire identity to four simple letters. Turns out I'm an INFP (more on that later). I can't help but wonder what became of my sort in Sparta.

The invention of personality types

The origins of the MBTI are somewhat bizarre, and go back to the 1920s when an American writer named Katherine Briggs – who had no background in clinical psychology – became obsessed with the influential book *Psychological Types* by Swiss psychoanalyst Carl Jung. In the book, Jung postulates that all people can be classified as either "perceivers" or "judgers", effectively dividing the world into two camps.

Stressing that his theories were based on nothing more than his own observations and not backed up by any scientific research, Jung went on to propose that those in the perceiver group could be further divided into "sensors" and "intuitors", while judgy individuals could be split into "thinkers" and "feelers". This adds up to a total of four main types, each of which can then be separated into "introverts" and "extroverts".

Not wishing to be misinterpreted, Jung wrote that in reality, "every individual is an exception to the rule", and that no one actually fits entirely into any one category. Despite this, Briggs used the personality types framework to sort the kids in her neighborhood into different pigeonholes.

> "ALTHOUGH SCIENTIFIC FINDINGS DO NOT SPEAK IN FAVOR OF THE MYERS-BRIGGS TEST, THIS TEST IS UNFORTUNATELY VERY OFTEN USED IN PRACTICE."

Later, during the 1940s, Briggs' equally unqualified daughter Isabel Briggs Myers developed the idea further and devised the earliest iteration of what would later become the MBTI.

Do personality types really exist?

The current version of the MBTI is a 93-item questionnaire that places people into one of 16 personality types. Each of these is made up of four dichotomous sub-types, depending on whether a person is categorized as introverted or extroverted, sensing or intuiting, thinking or feeling, and judging or perceiving.

Results are displayed as a four-letter combination. For instance, "ESTJ" corresponds to the extroverted-sensing-thinking-judging type.

> A REPORT TELLS ME THAT PEOPLE MATCHING MY PROFILE ARE "POETIC, KIND, AND ALTRUISTIC PEOPLE, ALWAYS EAGER TO HELP A GOOD CAUSE." I CERTAINLY SOUND LIKE A NICE GUY.

Simplistic though that may seem, an estimated 2 million people take the MBTI each year to learn their type, usually with the intention of figuring out which profession is for them. The big problem with this, however, is that the framework is completely unsupported by scientific analysis.

For instance, studies have indicated that the test has **zero success** at predicting which people will perform best at different jobs, while others have shown that around 50 percent of users get a **different outcome**

Image Credit: melitas/iStock, Imran Chowdhury

each time they take the test. Speaking to IFLScience, **Professor Mathias Allemand** – a psychologist at the University of Zurich – laments that "although scientific findings do not speak in favor of the Myers-Briggs test, this test is unfortunately very often used in practice."

Am I in the right job?

With a century of **pseudoscience** to back it up, the MBTI confidently spits out the four letters that define me – along with one-16th of the rest of the world. From now on, I answer to Ben Taub, INFP – or Introverted-Intuitive-Feeling-Perceiving, to use my full label. A report tells me that people matching my profile are "mediators", meaning we are "poetic, kind, and altruistic people, always eager to help a good cause."

I certainly sound like a nice guy, but what kind of job would suit a sensitive soul like mine? As it turns out, my report informs me that "with their curiosity and their love of self-expression, many INFPs dream of becoming writers." I have to admit, the MBTI has certainly nailed me there.

Reading on, I discover that "many people with this personality type choose careers that are focused on service, such as counseling, psychology, teaching, health care, social work, massage therapy, or physical rehabilitation." Having spent several years working in mental healthcare, one could say I'm the quintessential INFP.

YOU WON'T FIND ANY ACTUAL PSYCHOLOGISTS USING THE MBTI – OR ANY OTHER TYPE-BASED PERSONALITY TEST.

The science of personality

Despite the apparent accuracy of my MBTI result, it's worth noting that I don't always feel like writing or helping people. Some days I wish I'd become a beekeeper, while I also still secretly dream of being the heavyweight boxing champion of the world. Neither of these are likely to happen any time soon, but my fickle fancies do highlight the unreliability of **personality types**.

It's for this reason that you won't find any actual psychologists using the MBTI or any other type-based personality test. Instead, researchers tend to take a trait-based approach to personality and have developed frameworks to gauge the extent to which people are prone to expressing certain characteristics.

In particular, the so-called five-factor model (FFM) – also known as the Big Five approach – stands out as a highly robust tool for measuring people's personalities. According to Allemand, Big Five personality tests don't attempt to place anyone into fixed categories, but "show how people see their pattern of behaviors and experiences 'in general'."



"They say little about how you behave in a particular situation and what you are currently experiencing. But they do say something about what your general tendencies are," he explains. For instance, rather than assuming that people are either introverts or extroverts, the FFM shows where an individual falls on a continuum that stretches from one extreme to the other.

A "window to personality"

The idea that your entire persona can be boiled down to just five characteristics might seem a little simplistic, but the FFM is backed up by several decades of research. "The Big Five framework is derived from the psycho-lexical and factor-analytical tradition of personality psychology, among others," says Allemand.

"The psycho-lexical approach assumes that language is a 'window to personality' and that the most important individual differences in personality are encoded in natural language. Especially adjectives such as active, agreeable, anxious, assertive, or artistic are suitable for describing differences between people," he explains.

Efforts to create the FFM began in the 1960s, when researchers scoured the dictionary for every word that could be used to describe a person's personality. Thousands of terms were selected, yet by painstakingly questioning volunteers about these attributes over many years, psychologists were able to identify certain characteristics that seemed to be grouped together. By the '90s, this huge list of phrases had been crunched to just five personality traits that collectively encompass the entire range of linked adjectives.

"Statistical methods such as factor analyses were used to determine as few 'personality factors' as possible and to reduce the number of words," explains Allemand. "Those research efforts often found five factors in the data."

Long story short, the Big Five traits are: extraversion, conscientiousness, agreeableness, openness to experience, and neuroticism. Personality tests based upon this model therefore reveal the degree to which a person possesses each of these five characteristics.

The Big Five in practice

Unlike the MBTI, the FFM can actually be used to make predictions about how people's lives will turn out. For instance, individuals with higher levels of the trait conscientiousness have been shown to **live longer** and enjoy more fulfilling interpersonal relationships.

The same trait has also been identified as a **general predictor of job performance**, with those displaying greater conscientiousness typically making better workers. Likewise, lower levels of neuroticism have been **linked to** superior professional outcomes, while the remaining three traits are associated with success in specific occupations. Extraversion, for example, correlates with a greater talent for sales and management roles.

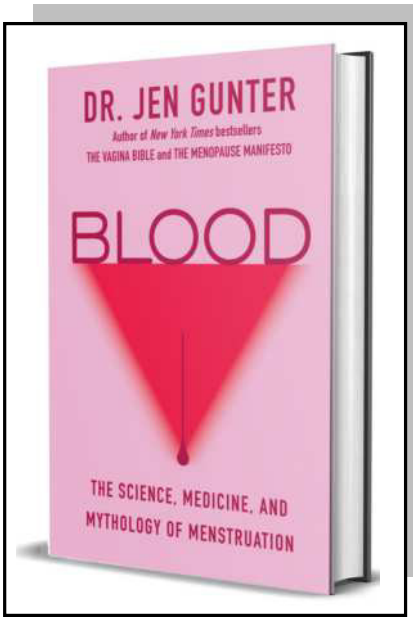
On a population-wide level, Big Five traits can even have an impact on politics. Surprising as that may sound, one study found that countries with higher general levels of openness to experience tend to have **more democratic institutions**. Importantly, there's also evidence to suggest that the same five traits are **relevant across different cultures and nationalities**.

Taking my own FFM personality test, I learn that I have an agreeableness level of 72.9 percent, making this my strongest trait ahead of openness to experience, for which I clock in at 69.2 percent. I'm also 54.3 percent extroverted and 42.4 percent conscientious, while my level of neuroticism is 30.1 percent.

Unlike my MBTI result, this score can't tell me much about what career I should pursue, but does at least provide some meaningful insight into the various aspects of my character. And it's still definitely better than the Spartan personality test. ●



Image Credit: melitas/iStock, Imran Chowdhury



GROWING HUMANS IS EXPENSIVE

In this excerpt from *BLOOD: The Science, Medicine, and Mythology of Menstruation*, gynaecologist and misinformation-buster Dr Jen Gunter lays out how the "evolutionary marvel" that is the menstrual cycle makes it possible to turn energy into mini humans.

Evolution demands that all species solve the equation of converting energy from the world around them into the next generation. Living things, from bacteria to blue whales, solve this equation in different and often ingenious ways based on their biology, environmental pressures, the care required for offspring to reach maturity, and even social structure. For example, some organisms reproduce asexually, some deposit unfertilized eggs that will hopefully get fertilized, and some have very long gestations, like an elephant that carries its calf – which will ultimately weigh approximately 110 kilograms (243 pounds) at birth – for 22 months.

Reproducing a human is a massive biological effort. Energy-wise, it's on par with the limits of the most extreme sports, for example running 5,000 kilometers (3,000 miles) over 120 days or cycling the Tour de France. Walking upright – being bipedal – results in a relatively smaller pelvis, which makes for a physically challenging and sometimes physically traumatic delivery, considering the relatively large head of a human fetus. Human infants are relatively helpless, a phenomenon known as secondary altriciality, so they require a significant amount of care, including breastfeeding, which is also metabolically demanding, and our ancestors had no choice but to pay this metabolic price and provide that physical care.

For humans, the platform that orchestrates turning this energy into offspring is the menstrual cycle, a unique trait seen in only a few species. To make human reproduction work, half the population needs to have a highly specialized biology that can be, repeatedly, hormonally rewired for a potential pregnancy, as well as bleed hundreds of times and each time repair itself without scar tissue. And while biologically this is an evolutionary marvel, it's also a source of aggravation, pain, and suffering for many, because retrofitting a body for a potential pregnancy and then bleeding for several days 400 or so times over a lifetime can have medical consequences. At times it can be a faulty system, but individual discomfort or injury isn't evolution's concern, and in fact, evolution's motto might be best summed up as "good enough".

Unfortunately, instead of a world where those who bear the physical burdens of reproduction – whether they reproduce or not – have equal footing, we have the opposite. The Ancient Greeks, the originators of Western medicine, labeled the female body as inferior, and the act of menstruation has been viewed as proof that women have troublesome physiology and are by nature dirty and toxic.

Many religions and cultures have long carried that same torch based on the erroneous belief of impurity and the idea that menstrual blood is filthy and contains actual toxins that poison the body (and especially men, if they were to touch it). Women have been banned from places of worship, from preparing food, from having sex, and even from their own homes based on the supposed polluting powers of menstrual blood. And lest we think that was the medicine of yore, there was more than one letter published in 1974 in the Lancet, a leading medical journal, hypothesizing that there might be sound medical beliefs to support the notion that menstrual blood was toxic and that menstruating women could wilt flowers. I know, 1974!

Image Credit: Citadel/Kensington Books

Q&A

AUTHOR



DR JEN GUNTER

AUTHOR Of *BLOOD: THE SCIENCE, MEDICINE, AND MYTHOLOGY OF MENSTRUATION*

Dr Jen Gunter's latest book celebrates the evolutionary marvel that is the human menstrual cycle. We asked her what needs to change when it comes to how we talk about it, and why it still amazes her to this day.

What's the most concerning shift you've seen in attitudes towards menstruation in recent times?

The rise in forced birth laws, without a doubt. This reflects complete ignorance on the part of politicians and is about control. The ability to control one's menstrual cycle as one sees fit, and that includes abortion, is a human right.

What made you want to write *BLOOD* and who is it for?

BLOOD is for everyone because everyone benefits from it. The menstrual cycle has been a key part of human evolution. We would not have the big brains that have given us so much without the menstrual cycle.

Most people graduate high school knowing more about frog biology than about the menstrual cycle. This hardly seems right, and it has long bothered me. I knew I would be writing a book about some aspect of the reproductive tract that I hadn't yet explored, but it was when I noticed a rise in disinformation about hormonal contraception and **vaccines** (as they related to the menstrual cycle) that I knew this would be my next topic. Every day, I would receive DMs from people asking, "Is this true?" and I realized if they had known more about the menstrual cycle, they would have known what they were seeing was incorrect.

Do you have a favorite myth surrounding menstruation?

The myth that I find most fascinating is the concept that menstrual cycles can sync, meaning the belief that one menstruator can drag others into their orbit so they start menstruating at the same time, and their cycles become synchronous. It is not supported by science and has been disproven by several studies, and there is no biological mechanism for it. People often point to animals as proof, but this is misogynistic as it reduces women to breeders, and of course, it's not how the menstrual cycle works. If someone's cycle seems to match up with another person's, it's just a random matching up. Also, people only remember the times they believed they were in sync, not the times they weren't.

What changes would you like to see in the attitudes, policies, and language surrounding menstruation?

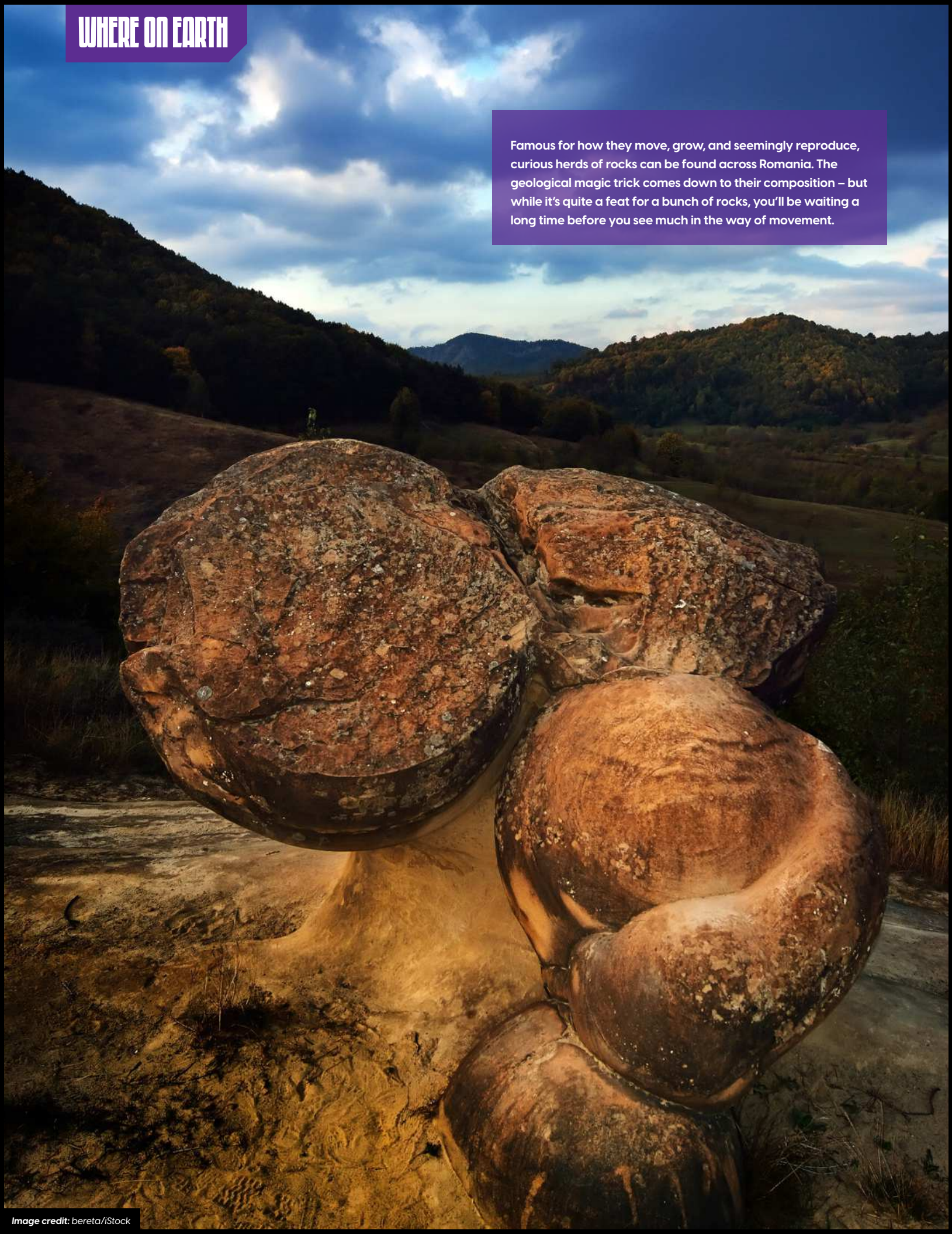
I would like to see us do away with the awful term "feminine hygiene". Menstruating doesn't make you feminine, and there is nothing unhygienic about it. I want to see the abolishment of all taxes on menstrual products, and I'd like to see price control. I think every building with a bathroom should be required to stock menstrual products. And we need biologically accurate menstrual education in schools.

You've been studying menstruation for a long time, is there a fact about it that still wows you to this day?

I am still amazed and think I will always be, that menstruation is the only scarless healing in the human body. And that it doesn't heal without a scar just once, but potentially hundreds of times. How incredible is that? •

BLOOD: The Science, Medicine, and Mythology of Menstruation is published by Citadel/ Kensington Books and is available now.

Image credit: Talia Herman



Famous for how they move, grow, and seemingly reproduce, curious herds of rocks can be found across Romania. The geological magic trick comes down to their composition – but while it's quite a feat for a bunch of rocks, you'll be waiting a long time before you see much in the way of movement.

Image credit: *bereta/iStock*

ROAMING ROCKS LIVE IN ROMANIA

They do move in herds! The **trovants of Romania** are geological oddities that can be found oozing their way across the town of Costești. Their nomadic nature has earned them the nickname of "living rocks" as they appear to grow and move (albeit very, very slowly).

"Trovants are basically ovoid or spherical in shape, although they may occur in a large variety of shapes," Florin Stoican, co-manager of the Buila-Vanturarita National Park, told **Radio Romania International** in 2010.

"Their history is rather simple. Seven million years ago there was a delta where the present-day stone quarry is. This delta contained sediments, sandstone and siltstone in particular, amassed and transported from across the continent by a prehistoric river. Subsequently, various mineral substances dissolved into solutions that circulated over this basin of gravel and sand."

The lay of the land became such that over time, sandstone concretions formed as they were encased in tough sand. The layered orbs of rock were tougher than the surrounding sediment, so as erosion wasted away the rest, the trovants appeared to "rise" from the Earth.

It's thought the trovants formed into spheres at a volcanic time in Earth's history when prolonged seismic activity was shaking the Middle Miocene. The shockwaves could have compacted the sediments, causing the minerals within to congregate in spherical lumps.

They can range in size from a wee blob that could fit in the palm of your hand, to towering bulbous boulders that stretch over 4.5 meters (14.8 feet) tall. Most intriguingly of all, a trovant can change in size and appearance over time.

The "growth" and "movement" that have made the living rocks famous is thought to be the result of rainwater altering their composition. As water reacts with the various rock types, they appear to expand as their soft innards leach out, sometimes forming bubble-like growths that look like a trovant is spawning a baby rock.

These baby rocks can go on to grow and move independently, creating clusters of trovants that roam across the landscape. Don't expect a hive of activity if you rock down to Costești, however, as you'll be waiting around a fair while before you see much in the way of movement. The rocks grow at around 5 centimeters (2 inches) per 1,200 years. Not exactly a high-speed chase, but still pretty remarkable for a bunch of rocks.



How to get there

Trovants can be found across Romania, but Costești is home to the most famous herd.

LISTEN



Autofocus
Album from Canon

Canon – as in, the camera people – and the British Academy of Sound Therapy have crafted an album that's been specifically designed to put its listeners into what they describe as a "concentration trance". The Autofocus album was inspired by research of 2,000 adults that found six in 10 listened to music while working or studying, and 47 percent reported it helped them concentrate. Released in tandem with the Light & Speaker ML-A, it uses light and sound to create a productive atmosphere.

Available to **listen now**.

SEE



Spaceman
Film from Netflix

Adam Sandler in space with a spider. Need we say more? Six months into a solitary research mission to the edge of the Solar System, astronaut Jakub realizes his marriage could be in trouble. Determined to fix things, help arrives in the unlikely form of a spider-like ancient creature that's been hiding in the bowels of his ship. Named Hanuš, and voiced by Paul Dano of *The Riddler* fame, the unusual pair team up to try and make sense of what went wrong and work out how to fix it.

Available **March 1**.

PLAY



Outcast
Game from Appeal Studios

In this open-world return 20 years after the smash-hit original game, ex-Navy SEAL Cutter Slade returns to the alien world of Adelpha after being resurrected by the almighty Yods. The world has been stripped of its natural resources and the Talans – an ancient culture – enslaved by invading robot forces. Face down dangerous creatures in your quest to free the Talan people, in this breathtaking game that weaves together prehistoric-looking landscapes with a gripping dystopian plot.

Available **March 15**.

WATCH



3 Body Problem
Series from Netflix

A string of grisly discoveries reveals that someone – or something – is targeting and murdering scientists in this series from the creators of *Game of Thrones*, *The Terror*, and *True Blood*. Based on the novel by Chinese science fiction author Liu Cixin, the first in the *Remembrance of Earth's Past* trilogy, it follows the journey of a group of scientists who team up with a detective to confront the greatest threat in humanity's history as the laws of nature inexplicably unravel before their eyes.

Available **March 21**.

SCIENCE IN MEDIA



LEARN



Break It Down
Podcast from IFLScience

IFLScience is launching two new podcasts in 2024. First on the agenda is Break It Down, a weekly podcast where we discuss the biggest news stories of the week, including interviews with our very own writers and the experts that we work with to bring you the latest, breaking science news stories. If you want an easy way to stay up to date on what's going on in the world of science, this is the podcast for you, and we can guarantee it will improve your pub quiz game.

Available **now**.

Image Credit Top Left: Qvasimodo/iStock, *Top Middle:* Netflix © 2023, *Bottom Left:* Netflix © 2023, *Bottom Right:* James Rodrigues

DATES TO REMEMBER

See in spring in style with these don't-miss celebrations. There's some history and math to sink your teeth into with Women's History Month and Pi Day, as well as opportunities to think about our planet and all the other creatures occupying it as Earth Hour and World Wildlife Day roll around again. Meanwhile, International Women's Day invites us to "Invest in women: Accelerate progress".

MARCH

Women's History Month

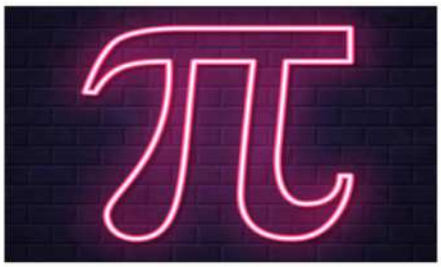
In the US, March is Women's History Month, commemorating the contributions of women to American history. The observance originated in 1981 when Congress passed legislation that authorized the President to proclaim the week beginning March 7 as "Women's History Week." In 1987, this was extended to a full month following petitioning by the National Women's History Project. Today, you can join numerous US institutions in championing the achievements of women in contemporary society and throughout history. Find out more **here**.



3 World Wildlife Day

World Wildlife Day (WWD) celebrates wild animals and plants and their essential contributions to people and the planet every year on March 3. In 2024, the theme will be "Connecting People and Planet: Exploring Digital Innovation in Wildlife Conservation", which will highlight how technologies can help drive conservation efforts and promote sustainable human-wildlife coexistence. "WWD2024 offers a jumping off point for exploring what digital innovations are available now, what intersectional discrepancies we are facing, and how we want our digital connectivity to evolve for all people and planet," WWD's website **explains**.





14 Pi Day

As the name suggests, Pi Day is a celebration of everyone's favorite mathematical constant: **pi (π)**. It's observed on March 14 (3/14), something we're sure all math nerds will appreciate. Just as pi has infinite digits, there are infinite ways to mark the occasion (which may or may not include actual pies) – check out what Pi Day organizers recommend **here**.

8 International Women's Day

The theme for this year's **International Women's Day** is "Invest in women: Accelerate progress". Just like the world, science is better when it is diverse, equitable and inclusive, free of bias, stereotypes, and discrimination based on gender. Women are still underrepresented in all STEM subjects but are making great strides to change that. Meet your new STEM heroes here.



23 Earth Hour

"**The biggest hour for Earth**" kicks off at 8:30 pm your local time on March 23. Wherever you are in the world, Earth Hour invites you to switch off your lights and spend 60 minutes doing something positive for the planet. It might not seem like much, but it could be just the spark we need to take action and raise awareness of the environmental issues facing us.

Image Credit Top Left: Oksana Osypenko/iStock, **Top Right:** © CHENG Hui Xin / World Wildlife Day, **Middle Left:** bgblue/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 gross origins of cuckoo spit. If you like your science lighter, discover what kind of television shows are most popular with dogs.

BUG BUTT BUBBLES

Spittlebug foam, also known as "cuckoo spit", is a familiar sight come the spring. Whilst it might be a sign of longer, brighter days, you might feel a bit less sunny when you find out where it comes from – and that researchers think it could be used in skincare.

It might look like spit, but the frothy bubbles come from the spittlebug's anus (we did warn you). This delightful matter is made from a combination of excess sap – the spittlebug's source of food – and a sticky substance secreted by glands in the anus. Forced out of the abdomen by pressure, where it meets air, the mixture then starts to form bubbles.

Other than giving a new meaning to the term "bubble butt", the foam has multiple purposes, including protection from both the elements and predators. Its stickiness is one of the main contributors to these functions, according to a **study** by insect researcher Hannelore Hoch and colleagues.

Using video recordings of spittlebug-predator interactions, the team found that whilst the spittlebug was able to move freely in amongst the foam, predators such as ants and spiders struggled and tried to groom the foam away. Many of them simply avoided it in the first place. If we were anthropomorphizing, perhaps we'd suggest they were put off by the foam's anal origins, but science would suggest it's more likely down to self-preservation.

MOVE OVER SNAIL MUCUS SERUM, THE SPITTLEBUG BUTT FOAM FACIAL IS COMING FOR YOU.

The adhesive properties of the spittlebug foam led the researchers to conclude in their paper that it could be a "smart, biocompatible material of biomimetic and biomedical interest."

They also discovered that it had a bunch of other features that could see it reaching a Sephora near you at some point in the future. "Antimicrobial effects, protection against desiccation and light absorption are properties which are critical [...] in dermatology and skin care products," Hoch told **Newsweek**.

Move over snail mucin serum, the spittlebug butt foam facial could be coming for you.

TAIL-WAGGING TV

What do dogs like to watch on TV? We'd paws-it that's an important scientific question on its own, but researchers at the University of Wisconsin School of Veterinary Medicine (SVM) believe it could also help us find out more about dogs' eyesight.

"The method we currently use to assess vision in dogs is a very low bar. In humans, it would be equivalent to saying yes or no if a person was blind," said Freya Mowat, veterinary ophthalmologist and professor at SVM, in a **statement**.

And so, Mowat and her fellow researchers turned to TV, setting out to discover what elements of a show get dogs interested and acting differently and whether age or vision could be related to such behavior.

IT SEEMS LIKE DOGS LOVE NATURE DOCUMENTARIES JUST AS MUCH AS WE DO.

They surveyed over 1,200 dog owners from several countries, asking questions about the kinds of content their dogs interacted with most, what their behavior was like, and the type of screen used, plus basic information like age, sex, and breed.

If the **results** are anything to go by, it seems like dogs love nature documentaries just as much as we do; content featuring animals was the most popular, particularly when other dogs were on the screen. More than 10 percent of dogs also took an interest in cartoons, so there's your excuse to watch *Paw Patrol* – you're welcome.

When these kinds of shows were on, dogs were often active, running about and barking.

The team also found that age and vision were indeed related to how much a dog interacted with a screen, which suggests it could be a useful measure to keep track of dogs' eyesight and potentially, pick up on any issues earlier.

"We know that poor vision negatively impacts quality of life in older people, but the effect of aging and vision changes in dogs is largely unknown because we can't accurately assess it," said Mowat. "Like people, dogs are living longer and we want to make sure we support a healthier life for them as well."