

# St Benedict's SCIENCE NEWS Monthly

## Welcome to the January 2022 issue

SCIENCE NEWS *Monthly* is produced by the Science Department,  
St Benedict's Catholic Secondary School, Bury St Edmunds, Suffolk, UK.

The coming of a **NEW YEAR** is a time to look forward with expectation, hope and optimism. This is especially true in the world of Science, which continues to provide advances in all areas and further our understanding of the physical world. Of course, there are consequences for these advances: for example, at the height of the Industrial Revolution during the 19<sup>th</sup> century and into the 20<sup>th</sup>, who could have foreseen the environmental effect less than 100 years later – global warming and climate change.



In fact, the great advances in Science of the 19<sup>th</sup> century were not welcomed by all. In particular, the great American author and poet **Edgar Allan Poe**, who went so far as to compose a poem: **SONNET – TO SCIENCE**.

*Science! true daughter of Old Time thou art!  
Who alterest all things with thy peering eyes.  
Why preyest thou thus upon the poet's heart,  
Vulture, whose wings are dull realities?  
How should he love thee? or how deem thee wise,  
Who wouldst not leave him in his wandering  
To seek for treasure in the jewelled skies,  
Albeit he soared with an undaunted wing?  
Hast thou not dragged Diana from her car,  
And driven the Hamadryad from the wood  
To seek a shelter in some happier star?  
Hast thou not torn the Naiad from her flood,  
The Elfin from the green grass, and from me  
The summer dream beneath the tamarind tree?*

The poem begins with the speaker describing how he holds "*Science*" to be somewhat malevolent. It is the "*daughter of Old Time*" and is constantly seeking out a "*poet's heart*" and bothering it. Science reveals to the artistically minded the truth behind myths, art, and beauty. This corrupts an artist's view of the world.

The references to Roman mythology are numerous in the second half of the poem. Poe taps into this mythological history to try to convince a reader of the damage science does. It is constantly disrupting the lives of beings as mystical as *naiads* and *hamadryads*. One of the most important themes of 'Sonnet–To Science' is how science is removing the magic of myth, art, and beauty. To the speaker's eyes, this makes the world less special and less capable of inspiring him to write.

Science destroys the most magical and mystical parts of the world. He knows this to be true as it comes for him as he sits dreaming "*beneath the tamarind tree*."<sup>\*</sup>

With the benefit of hindsight, it is surprising that someone with such a vivid imagination as Poe could not bring himself to consider how Science might enrich their future. Perhaps we should be sympathetic. Poe published his poem in 1829 and died, tragically young at the age of 40 in 1849, so he missed the real acceleration in scientific knowledge that came towards the end of the 19<sup>th</sup> century – the discovery of radio waves, X-rays and the realisation that the atom was not a unique unit of matter when JJ Thomson discovered the electron in 1897, etc.



Throughout the 20<sup>th</sup> century humankind progressed more than in the previous 2 thousand years and there have been a succession of discoveries and inventions that have changed the way we live our lives. Perhaps more profound is the fact that we have adventured to the extremes of the natural world: from the summit of Everest to the deep ocean floor where, in 1977, we discovered a hitherto unforeseen ecological system around hydrothermal vents. We have peered into the sub-atomic world of matter and have released its energy. We have advanced medicine such that, although challenges remain, our life expectancy is significantly greater than even a hundred years ago. We have been to the Moon and will soon be going back, as a stepping-stone to Mars.

It is possible that, had Poe lived a generation or two later, he may not have been so pessimistic about the role of Science in human imagination. Rather than corrupting the artist's view, it more often than not inspires it.

*\* Editor's note: It is ironic that Poe misses the fact that, around 150 years before, one of the greatest scientists of all, Sir Isaac Newton, was inspired to the notion of gravity – supposedly while sitting beneath a tree!*

## HAPPY NEW YEAR WEATHER - It Ain't Half Hot Mum!

Although one is not able to directly link any individual weather event to climate change and global warming, the more events we have that are notable the more the evidence stacks up. Much fun is made of our preoccupation with the weather, so it is no surprise that we should make a big fuss about extremes of temperature – and this year's New Year has not let us down: not only was New Year's Eve the hottest on record in the UK, but New Year's Day was too. Just for good measure, the record for the highest minimum temperature (that is the overnight "low") was also broken.

**16.5 °C** was reached at Bala on 31st December 2021, which is a **New Year's Eve record** for the UK and Wales.

All other UK countries also set New Year's Eve daily maximum temperature records. Keswick in England reached **15.9 °C**, Kinlochewe in Scotland reached **16.1 °C**, and Magilligan reached **15.0 °C** in Northern Ireland.

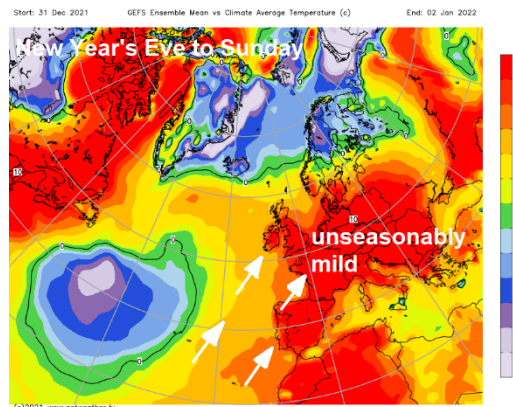
**New Year's Day** has also seen very mild temperatures with **16.3 °C** recorded at St James Park. This beats the previous record for New Year's Day of **15.6 °C** at Bude (Cornwall) in 1916.

A **daily minimum temperature of 13.2 °C** recorded at Chivenor, in Devon is provisionally a new UK and England record for January. This beats the previous UK record of **13.1 °C** set at Magilligan (Londonderry) in 2016 and the previous English record of **13.0 °C** set at London St James Park in 2008.

The extremely mild spell is driven by a flow of warm, moist air pushing across the UK from the Canary Islands and further south in the Atlantic and has resulted in the unusual situation of one weather system breaking weather records for two days in separate calendar years. As well as mild temperatures, it has also brought cloud and outbreaks of rain for some.

(Note: average daytime temperatures for this time of year are 7-9 °C)

<https://www.metoffice.gov.uk/about-us/press-office/news/weather-and-climate/2022/new-years-day>  
<https://www.bbc.co.uk/news/uk-59847641>



## ENVIRONMENT – Record summer temperature....in the Arctic!

We tend to think that the Arctic (and Antarctic) regions are inhospitably cold throughout the year. But, of course, these polar regions have their summers too, during which temperatures become at least less severe. In the Arctic, average **January** temperatures range from about **-40 to 0 °C (-40 to 32 °F)**, and winter temperatures can drop below **-50 °C (-58 °F)** over large parts of the Arctic. Average **July** temperatures range from about **-10 to 10 °C (14 to 50 °F)**, with some land areas occasionally exceeding **30 °C (86 °F)** in summer.



The **World Meteorological Organisation (WMO)**, a UN agency, has reported a new, record summer temperature for the Arctic: **38 °C (100.4 °F)**.

Worryingly, the temperature reading was taken last June in the Siberian town of Verkhoyansk – which is located **115 kilometres north of the Arctic Circle** – and is “*just one of a series*” of potentially record-breaking observations from around the planet in 2020, that the agency is seeking to verify. Describing the temperature as “*more befitting the Mediterranean than the Arctic*”, WMO explained in a statement that average temperatures over Arctic Siberia reached **10 °C above normal** for much of last summer. “*If you cast your mind back to last year, you will recall there was an exceptional, prolonged Siberian heatwave, as a result of this heatwave we saw devastating and very widespread Siberian fires and we saw massive Arctic Sea ice loss at the end of the summer season,*” WMO spokesperson Clare Nullis told journalists in Geneva.

While WMO has frequently warned that the Arctic is one of the fastest warming parts of the world, warming “*more than twice as fast as the global average*”, Ms. Nullis underscored that climate change has also pushed up temperatures elsewhere, which the UN agency is busy verifying. These include a new high in the **Antarctic** continent of **18.3 °C** that was recorded at the Argentinian base, Esperanza. WMO investigators are also seeking to verify temperature readings of **54.4 °C** recorded in both 2020 and 2021 in the world's hottest place, Death Valley in California. In addition, they are also assessing a new reported European temperature record of **48.8 °C** in the Italian island of Sicily this summer.

“*The WMO Archive of Weather and Climate Extremes has never had so many ongoing simultaneous investigations,*” said WMO Secretary-General Petteri Taalas, in a statement.

<https://www.bbc.co.uk/news/science-environment-59649066>  
<https://news.un.org/en/story/2021/12/1107872>



## PHYSICS - Here's why ducklings swim in a row behind their mum

There's science to having your ducklings in a row: baby ducks save energy by surfing their mother's waves in an orderly line astern, and now scientists know why. The babies take a ride on their mother's waves. That boost saves the ducklings energy. Researchers reported the new find in the December 10 issue of the *Journal of Fluid Mechanics*.

Earlier research studied how much energy ducklings burn while swimming. That showed that the youngsters saved energy when swimming behind mom. But how they saved energy wasn't known. So Zhiming Yuan made computer simulations of waterfowl waves. A naval architect, Yuan works at the University of Strathclyde. It's in Glasgow, Scotland. Yuan and his colleagues calculated that a duckling in just the right spot behind its mother has an easier swim. When it swims on its own, a duckling kicks up waves in its wake. This uses up some energy that would otherwise send it surging ahead. Called wave drag, this resists the duckling's motion. But wave drag is reversed for ducklings in the sweet spot. They feel a push instead of drag.

Like good siblings, the ducklings share with one another. Each duckling in the line passes along waves to those behind. So the whole brood gets a free ride.

But to reap the benefits, the youngsters need to keep up with their mum. If they fall out of position, swimming gets harder. That's fair punishment for ducklings that dawdle.

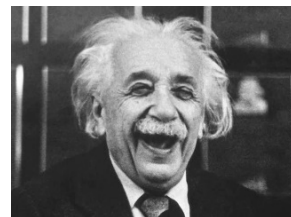
<https://www.sciencenewsforstudents.org/article/physics-why-ducklings-swim-row-behind-mother-duck-waves-energy>



## FUNNY PHYSICS!

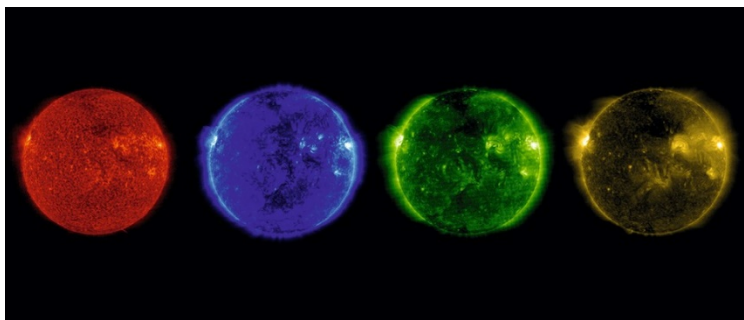
**Q: What sound does a sub-atomic duck make?**

**A: Quark!**



## EVERYDAY SCIENCE - What colour is the Sun really? (Hint: it's not yellow!)

Colours of stars depends on their surface temperature as well as the wavelength the human eye can perceive. The Sun emits light over a whole range of wavelengths (or colours). In fact, it does so in all parts of the electromagnetic spectrum, apart from gamma rays. The peak in the Sun's spectrum can be used to derive its surface temperature, about 5,780 Kelvin (roughly 5,500°C). The same process can be used to establish the surface temperatures of other stars.



The peak wavelength in a spectrum also generally determines an object's apparent colour. So, for example, cooler stars appear red and hotter stars appear blue, with orange, yellow and white stars in between. For the Sun, the spectrum actually peaks at a wavelength that we would normally describe as green! However, across the narrow range of the visible spectrum the amount of light emitted at each wavelength is almost exactly the same. But more crucially, the human eye doesn't perceive light by averaging the various colours of the spectrum together. So, a very slight excess of green light doesn't look green to the human eye – it looks white. The Sun would have to emit only green light for our eyes to perceive it as green.

This means the actual colour of the Sun is white. So, why does it generally look yellow?

This is because the Earth's atmosphere scatters blue light more efficiently than red light. This slight deficit in blue light means the eye perceives the colour of the Sun as yellow.

(PS. The more atmosphere the Sun's light passes through, the more blue light is scattered. Hence, during sunrises and sunsets there is a much greater percentage of red light in the Sun's spectrum, giving often spectacular results.)

<https://www.sciencefocus.com/science/what-colour-is-the-sun/>

## ARCHAEOLOGY - Pharaoh's temple reveals how Egypt's 'masters' carved their art

It is a matter of fact that the great Renaissance artists passed on their skills to younger pupils and associates, many of whom went on to leave their own works. Now, thanks to a painstaking study of an Egyptian pharaoh's temple, the same may be said of the master sculptors and artists of Ancient Egypt, according to a report in the journal *Antiquity*.

To better understand the work that went into decorating ancient temples, University of Warsaw archaeologist Anastasiia Stupko-Lubczynska and colleagues studied the **Temple of Hatshepsut**, who ruled between 1478 B.C.E. and 1458 B.C.E. and was one of Egypt's few female pharaohs. Her temple, which stretches 273 meters by 105 meters, was built almost 3500 years ago at Deir el-Bahari, near modern-day Luxor.



Stupko-Lubczynska was there as part of a painstaking—and ongoing—effort by the University of Warsaw's Polish-Egyptian expedition to clean and restore the temple's damaged walls. In the process, the archaeologist identified tiny details in the soft limestone of the chapel, including clumsy chisel strokes and later corrections. *"Because we have so many figures with repetitive details, we can compare the details and workmanship,"* Stupko-Lubczynska says. *"If you look at enough of them, it's easy to see when someone was doing it properly."* Slowly, she and her colleagues began to see subtle variations in what had seemed like an army of cut-and-paste icons. In addition, some figures were visibly worse — legs and torsos with sloppily chiselled edges, or multiple chisel blows to shape wig curls that only took two or three expert strokes elsewhere.

The analysis also showed the work was a team effort, done in phases by different artists. *"The wig can be awfully done, and in the same figure, the face is perfect,"* she says. *"Maybe the master artisans came in at the end to finish the figure."* The report likens the effort to the busy workshops of Renaissance painters, where the master focused on the most challenging tasks while delegating backgrounds, supporting characters, and prep work to trainees. Evidence that more skilled hands were correcting beginners' mistakes suggests that even a pharaoh's temple was seen as a place to school rookies. The master was training apprentices on the spot.

<https://www.science.org/content/article/female-pharaoh-s-temple-reveals-how-egypt-s-ancient-masters-carved-their-art>

## EARTH SCIENCE – Where has all the water come from? Could it have been the Sun?

Earth's surface is 70% covered with water. That's much more than any other planet in the solar system. But none of the existing theories can fully explain all of it. A dominant view suggests that asteroids rich in carbon, which bombarded the young Earth some 4.6 billion years ago, delivered this water to the planet. But detailed chemical analysis of meteorites known as carbonaceous chondrites, which are chunks of these carbon-rich asteroids, revealed that the water locked inside them doesn't quite match the chemical fingerprint of Earth's water.

This discrepancy in what scientists call isotopic composition led researchers to believe that there must be at least one additional source of our planet's life-giving liquid. Isotopes are forms of chemical elements that differ just by the number of uncharged neutrons they contain. The carbonaceous chondrites tend to have water that contains more deuterium, a form of hydrogen with one neutron, while Earth's hydrogen is mostly a lighter form called protium that has no neutrons. So where could all our water have come from?



Recent analysis of samples from asteroid Itokawa, collected by a Japanese space probe, suggest that much of Earth's water may have been created by the Sun. This water may have rained on the fledgling Earth in the form of dust grains produced by the interaction of the solar wind, the stream of charged particles emanating from the Sun, with various bodies in the solar system, a new study suggests.

*"The solar winds are streams of mostly hydrogen and helium ions which flow constantly from the sun out into space,"* Luke Daly, a planetary scientist at the University of Glasgow in the U.K., and a lead author of the new paper said in a statement. *"When those hydrogen ions hit an airless surface like an asteroid or a spaceborne dust particle, they penetrate a few tens of nanometres [one inch has 24.5 million nanometres] below the surface, where they can affect the chemical composition of the rock."* Over time, this space weathering effect of the hydrogen ions can eject enough oxygen atoms from materials in the rock to create water, which remains locked within the asteroid. When the asteroids then impacted the young Earth, they literally "rained down".

This mechanism may be the missing link explaining the abundance and chemical composition of water on Earth that has long baffled scientists.

<https://www.space.com/earth-water-solar-wind-asteroids>

<http://www.sci-news.com/astronomy/solar-water-10316.html>

## SPACE SCIENCE – NASA, SpaceX Launch DART: First Test Mission to Defend Planet Earth

According to the *Earth Impact Database* there have been at least 190 significant, ie., big(!), asteroid/meteor/comet impacts in the last 2 billion years that have left identifiable craters. With the advent of radio astronomy in the mid-20<sup>th</sup> century, we have been able plot the orbits of thousands of asteroids, as well as keeping an eye on meteor showers and comets that come into our vicinity. In the 1990s, a concerted effort was made to identify and catalogue objects in the solar system that could cross Earth's orbit at close quarters, posing a risk of collision. These are called **Near-Earth Objects (NEOs)**.

Any NEO greater than 140m across is further classified as a **Potentially Hazardous Object (PHO)**, as a large part of its mass would survive entry through the Earth's atmosphere ending in an explosive impact with catastrophic consequences. Probably the most well-known impact occurred 66 million years ago when an asteroid about 10km across impacted in the area we know today as the Yucatan Peninsula in Mexico. It created a huge crater we call **Chicxulub**, which is 150km wide and 20km deep. The resulting fallout from this impact had a global effect that was responsible for a mass extinction event that included the dying out of the land-based Dinosaurs.

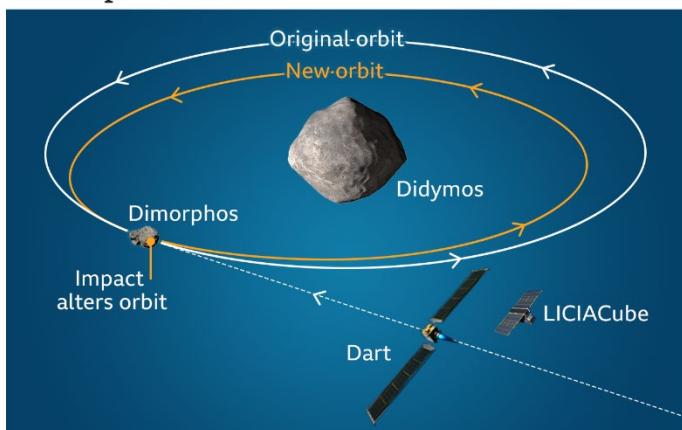
The possibility of Earth's next impact being sooner rather than later was brought to public attention by the impact of fragments of **Comet Shoemaker–Levy 9** hitting Jupiter, a highly publicised event in July 1994. Space scientists then began to consider ways in which we could attempt to prevent a future impact on Earth. In 1998 it was brought to public attention again by two Hollywood films – *Armageddon* and *Deep Impact*. The plot of both films centred on eliminating the objects by blowing them up with nuclear weapons. Very quickly, though, it was realised (and featured in *Deep Impact*) that this was probably the worst way to deal with the issue, as multiple huge fragments would impact instead!

The decision was made to look at ways of altering the course of the asteroid/comet so that it would miss the Earth completely, rather than to attempt to destroy it. In 2016, NASA set up its **Planetary Defense Coordination Office** and, in cooperation with the Jet Propulsion Laboratory (JPL), has worked various impact-threat scenarios in order to learn the best way to deal with the threat of an incoming impactor. This has resulted in **DART (Double Asteroid Redirection Test)**, the first planetary defence mission.

There is, at present, no predicted danger. DART is a "test mission" and will use a space probe to deliberately crash into the minor-planet moon **Dimorphos** of the double asteroid **Didymos** to assess the future potential of a spacecraft impact to deflect an asteroid on a collision course with Earth through a transference of momentum. The DART spacecraft was launched on 24 November 2021, using the SpaceX Falcon-9 launch vehicle. It will impact its target asteroid in September 2022.

*"DART is turning science fiction into science fact and is a testament to NASA's proactivity and innovation for the benefit of all,"* said NASA Administrator Bill Nelson. *"In addition to all the ways NASA studies our universe and our home planet, we're also working to protect that home, and this test will help prove out one viable way to protect our planet from a hazardous asteroid should one ever be discovered that is headed toward Earth."*

Nasa spacecraft will crash into asteroid's moon



Source: Nasa, Johns Hopkins Applied Physics Laboratory

BBC

<https://www.nasa.gov/press-release/nasa-spacex-launch-dart-first-test-mission-to-defend-planet-earth>

<https://www.nasa.gov/specials/pdco/index.html#dart>

### WORD(S) OF THE MONTH:

# ZERO (noun, "ZIR-o")

In everyday use we think of the word zero as describing "nothing", or "nil". However, in Science and especially Mathematics, the word means far more. It is a number that stands for nothing, and this is an important distinction. In many ways, zero is the most important of all numbers. When zero is added to or subtracted from a number, it leaves the number at its original value. Zero thus makes negative numbers possible. A negative number added to its positive counterpart always equals zero.

The use of the value, zero, is evident in ancient Egyptian texts some 4000 years ago and can also be seen in later Arabic, Chinese and Indian documents. It is a minor mystery to historians why neither the ancient Greeks nor the Romans adopted the zero in their numbering systems, although they were aware of its concept. In fact, the Romans never used their numerals for arithmetic, thus avoiding the need to keep a column empty with a zero symbol. Addition and subtraction were done instead on an abacus or counting frame.

THE ancient Mayans, 2000 years ago in what is now Mexico, also independently developed the concept of zero. Interestingly, they also developed a base 20, rather than base 10, arithmetic system.



## WEIRD BIOLOGY - A millipede with more than 1300 legs!

We all know the millipede, famous for having 1000 legs. That is why it is named so, (from *mille* "thousand" and *pes* "foot"). But you might be surprised to know that no millipede has ever been discovered with more than 750 legs.....until now!

Millipedes first appeared around 400 million years ago and were among the first animals to establish themselves on land. Today there are over 13,000 species. As reported in the journal *Science Reports* scientists in Australia have discovered an elongated millipede with more legs than any other known animal. The creature has been named *Eumillipes persephone*, and was found almost 60 metres (200ft) underground in a mining region in Western Australia and has an amazing 1,306 legs. The animal's scientific name means "true thousand feet". Persephone is a reference to Greek mythology, where the queen of the underworld has that name.

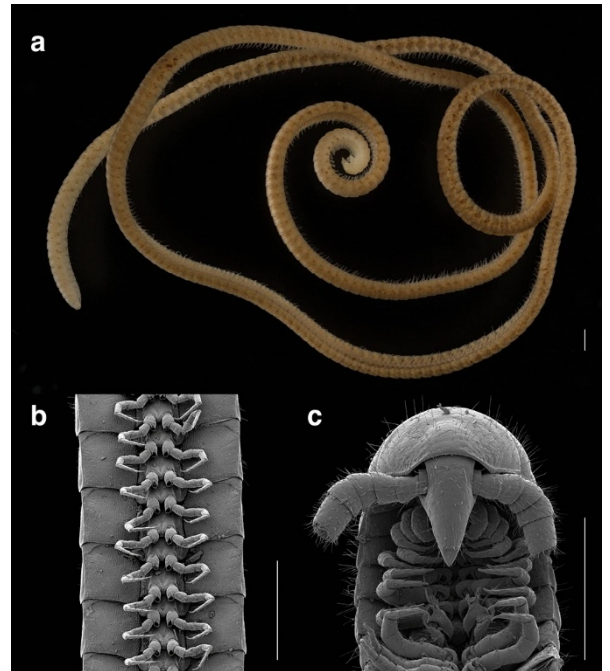
This diminutive animal (0.95 mm wide, 95.7 mm long) has 330 segments, a cone-shaped head with enormous antennae, and a beak for feeding. A distant relative of the previous record holder, *Illacme plenipes* from California, it belongs to a different order, the Polyzoniida. Discovered 60 m below ground in a drill hole created for mineral exploration, *E. persephone* possesses troglomorphic features; it lacks eyes and pigmentation, and it has a greatly elongated body — features that stand in stark contrast to its closest surface-dwelling relatives in Australia and all other members of its order.

"In my opinion this is a stunning animal, a marvel of evolution," said study co-author Bruno Buzatto, a principal biologist at Bennelongia Environmental Consultants in Perth, Australia. "It represents the most extreme elongation found to date in millipedes, which were the first animals to conquer land."

Note: although having a length of nearly 10cm might sound impressive, fossil evidence from the Upper Carboniferous period (340-280 million years ago) shows ancient millipedes growing up to 2m in length!

<https://www.bbc.co.uk/news/world-australia-59687427>

<https://www.nature.com/articles/s41598-021-02447-0>



## ENVIRONMENT - Climate change causing albatross divorce, says study

When relationships end it might be because the spark has disappeared, or maybe you just can't make time for one another. But can climate change cause break-ups? It might do, according to a new study published in the *Royal Society* journal, suggesting albatrosses - some of the world's most loyal creatures - are "divorcing" more.

Like humans, albatrosses also have an awkward growing-up phase, trying (and sometimes failing) to figure out the best way to get into a relationship. But ultimately, when they find a good match, they normally stick together for life. Just 1% of albatrosses separate after choosing their life partner - much lower than the human divorce rate in the UK, which some estimates put at over 30%.

"Monogamy and long-term bonds is very common for them," says Francesco Ventura, researcher at the University of Lisbon and co-author of the study. But in the 15 years covered by the study with warmer water temperatures, up to 8% of albatross couples split up. Research looked at 15,500 breeding pairs in the Falkland Islands.

Albatross divorce is basically just cheating, in human terms. It's when one part of a couple mates with a different individual. The study says "environmentally-driven divorce may be an overlooked consequence" of climate change. Normally, albatross divorce is triggered when a pair fail to breed, so they find new partners in the next breeding season. But the findings showed pairs were divorcing even if they'd had a successful breeding season.

Francesco says there are two possible theories for the rise - the first one being linked to the struggles of a long-distance relationship. Warming waters force the birds to hunt for longer and fly further. If birds then fail to return in time for a breeding season, their partners may move on with a new partner. Another theory is albatross stress hormones go up in harsher environments, such as when waters are warmer. With tougher breeding conditions, and food scarcity, it can cause more stress and a partner can be blamed for their "poor performance" - which can ultimately trigger divorce, Francesco says.

<https://www.bbc.co.uk/news/newsbeat-59401921>

<https://royalsocietypublishing.org/doi/full/10.1098/rspb.2021.2112>



## BIOLOGY - Two New Species of Tree Frogs Discovered in Australia

The two new frog species have been scientifically described with the help of citizen scientists and their recordings through the FrogID app. (Yes, there really is an “app” for everything these days!)

The two new species — named the slender bleating tree frog (*Litoria balatus*) and the screaming tree frog (*Litoria quiritatus*) — were once thought to be just one species, the bleating tree frog (*Litoria dentata*). The first species is known from south-eastern Queensland, while the second occurs from the mid-coast of New South Wales to north-eastern Victoria.



*“The bleating tree frog is well known to residents along the east coast of Australia for its extremely loud, piercing, almost painful call,”* said FrogID project leader Dr. Jodi Rowley, a herpetologist at the Australian Museum Research Institute and the University of New South Wales. *“These noisy frog bachelors are super loud when they are trying to woo their mates.”* Dr. Rowley and colleagues analysed many calls submitted to the FrogID project from across Queensland and New South Wales to differentiate between the calls. *“Our examination revealed that their calls differ slightly in how long, how high-pitched and how rapid-fire they are,”* Dr. Rowley said.

The team’s genetic work was the first clue that there are actually three species. *“Although similar in appearance, and in their piercing calls, the frogs are genetically very different,”* said Professor Steven Donnellan, chief research scientist at South Australian Museum. *“I’m still amazed that it’s taken us so long to discover that the loudest frog in Australia is not one but three species.”*

This also begs the question how many more undescribed species in the ‘quiet achiever’ category are awaiting their scientific debut?

<http://www.sci-news.com/biology/two-new-litoria-species-10292.html>

## QUIRKY SCIENCE - How crowds can make bridges wobble and sway

As a schoolkid, one was taught much about the Roman Army of the glory years of the Roman Empire, especially its conquest and occupation of ancient Britain. We were also told that, on the march, the Roman soldiers were always ordered to “break step” when marching over a bridge. This passed into the realms of urban myth and many people debunked the notion that simply walking in step across a bridge could destabilise it.



Now, with benefit of hindsight, we have to think again – and at last there is real scientific proof to back it up. Two incidents are particularly significant: In April 1831, a brigade of British Army soldiers marched in step across the Broughton Suspension Bridge in Manchester. According to accounts of the time, the bridge broke apart beneath the soldiers, throwing dozens of men into the water. After this happened, the British Army reportedly sent new orders: Soldiers crossing a long bridge must “break stride,” or not march in unison, to stop such a situation from occurring again – echoing similar orders given to their ancient Roman ancestors!

More recently there was the incident in June 2000 at the Millennium Bridge crossing the Thames in London. The bridge would begin to sway, eventually to an uncontrollable and dangerous degree.

In a new study published in the journal *Nature Communications*, a group of Georgia State mathematicians led by Professor Igor Belykh along with colleagues at the Universities of Bristol, Cambridge, and Leicester in Great Britain show how a suspension bridge – even one as highly engineered as the Millennium Bridge – can become suddenly unstable. If enough people are crossing by foot, each walking at their own natural speed, they transfer so much energy into the bridge that it may start to oscillate. Then, as each individual walker adjusts their steps to try not to fall, they destabilize the bridge even more.

The new work topples the long-accepted explanation for shaky, shimmying bridges – which for the last 20 years was thought to be due to mass synchronisation of footsteps. *“Our work shows that very tiny vibrations from each person walking can get amplified significantly,”* said Belykh. The new insights will help engineers and bridge designers *“build better, safer bridges,”* said Belykh.

Although the ancient Romans, and indeed the more recent British Army, may not have understood exactly why marching in step across a bridge could destabilise it, they came up with a solution long before now.

<https://www.sciencedaily.com/releases/2021/12/211215204114.htm>



## ASTRONOMY/SPACE SCIENCE – James Webb Space Telescope launched at last!

Intended as a successor to the aging Hubble Space Telescope, the long-delayed James Webb is named after NASA's administrator during the 1960s. NASA partnered with the European and Canadian space agencies to build and launch the new 7-ton telescope, with thousands of people from 29 countries working on it since its conception in 1989. Although the construction of the telescope began in the 1990s and its original launch date was planned for 2005, many issues arose to delay the telescope's completion and launch. However, at last.....

At 12:20 GMT on December 25<sup>th</sup> 2021 Ariane flight VA256 lifted off from launchpad ELA-3 at Europe's Spaceport in French Guiana carrying the JWST.

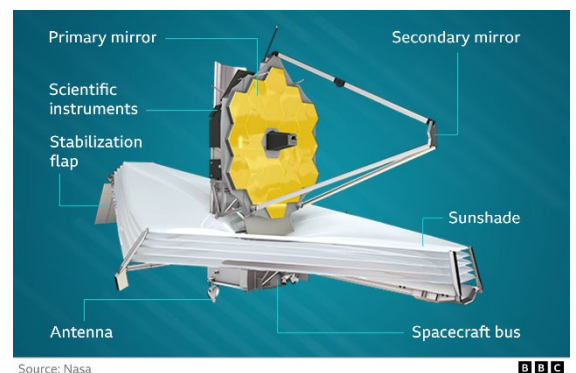
Why all the fuss? Two things, really:

1. Having now turned 30 Hubble, although still operational, is prone to hardware and software issues arising that will not be resolvable. This was brought into sharp focus earlier this year when a huge ground-based effort managed to fix a potentially career-ending problem. We may not be so fortunate next time.
2. Hubble "sees" the Universe in visible and UV wavelengths. However, if we want to resolve the most distant objects and effectively look back in time to the earliest years after the "Big Bang", we need to search in the infrared – and that is exactly what JWST is designed to do

**Webb's 10-year primary mission will address four key science areas:**

- Trace the evolution of galaxy formation
- Study star and planetary system formation
- Characterize exoplanetary systems and look for possible signs of life
- Observe some of the earliest stars that formed after the Big Bang

The telescope's primary mirror, 6.5 metres (21 feet) across, is made of 18 hexagonal gold-plated beryllium segments, resulting in a telescope 100 times more powerful than the 2.4-metre Hubble. Along with the Vera C. Rubin Observatory on the ground and the upcoming Nancy Grace Roman Space Telescope, Webb promises to push back the boundaries of modern astronomy. While missions such as NASA's Spitzer Space Telescope and the European Space Agency's Herschel Space Observatory have given us a tantalizing view of the infrared universe, Webb will blow the doors wide open on this field of astronomy. *"Webb will be transformative for astronomical research, just as Hubble has been,"* says Heidi Hammel (NASA/GSFC). *"Webb's infrared capabilities will open up a new frontier for imaging and spectroscopy."*



After it has reached its final orbital location at the end of January, it will undergo about 5 months of stabilisation and calibration. All being well the first observations should come in around June/July later this year.

<https://www.jwst.nasa.gov/>

[What Will the James Webb Space Telescope Uncover? - Sky & Telescope - Sky & Telescope \(skyandtelescope.org\)](https://www.skyandtelescope.org/)

## THE FUTURE TODAY – Soylent Green

In the 21st century with climate change making itself apparent in assorted ways on a daily basis - a world population cresting over seven billion - devastating global pandemics a constant threat - poisons in the air, water, and food supplies - and some people still insisting it's all a myth, the time seems right to reflect on a remarkable work of science fiction – **MAKE ROOM! MAKE ROOM!** – published in 1966!

This book by the American author Harry Harrison is unknown outside the niche world of science fiction disaster stories, although it was brought to some public attention in 1973 when it was used as the basis for the Hollywood film – **SOYLENT GREEN**.

**The spooky thing is that it was set in the future, and the future was 2022!**

The film greatly embellished the theme of the book and depicted a dystopian future of dying oceans and year-round humidity, due to the greenhouse effect and climate change, resulting in pollution, poverty, overpopulation, euthanasia and depleted resources. In 1973 the world population was 3.9 billion and the film predicted that, by 2022, the world population would be 7 billion – it is, in fact, 7.9 billion.

It is likely that Edgar Allan Poe would have been hugely impressed!

