

Welcome to the October 2022 issue

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

This month's front page news was spotted by our own Ms E Coogan (Teacher of Science) CRAZY CHEMISTRY – Spray on clothes...and more!

Your morning alarm doesn't go off. You oversleep. You wake up and realise the time. You're going to be late for that urgent appointment. But you've got to shower and get dressed. Panic! <u>But what if you could shower and get dressed at the same time?</u> That would solve your problem, but the idea is crazy, isn't it?! Maybe not as crazy as it sounds......

On 3rd October, during Paris fashion week, French Label Coperni delivered performance involving a spray-on dress Palestinian/Dutch model Bella using Hadid. Hadid was, quite literally, spraypainted with a spray-on fabric dress thanks to innovator Dr Manel Torres, founder and Managing Director of Fabrican Ltd founded in 2003 to explore the use of technology in fashion, healthcare, products, and other industries. Torres studied fashion at the Royal College of Art in London and developed the patented tech that, once sprayed onto any surface, including liquids,



dries up instantly and results in a non-woven fabric layer. The spray-on fabric is applied using the likes of aerosol tech, industrial sprayers, and 3D printing. "It can be used to make innovative clothes that can be washed, re-worn and even integrated with diagnostic devices that can monitor the health of the wearer", says Coperni.

Fabrican's patented spray-on fabric technology starts as a liquid suspension which is sprayed by a spray gun or an aerosol can. The fabric is formed by the cross-linking of fibres which adhere to each other and to the surface sprayed to create an instant non-woven fabric. Fabrican uses different types of fibres, from natural to synthetic, including keratin fibres such as wool and mohair, cotton, nylon, cellulose, and carbon nanofibers. Much of the fibres are obtained from old clothes and materials that have been marked for recycling.

Fabrican is at the forefront of innovation in material science, developing smart fabrics incorporating nanotechnology, "second skin" for the medical and cosmetic industries, and sprayable conductive fabrics to interface with wearable technology. For example, if you break your arm or leg, no more cumbersome bandages or plaster casts, just spray the limb with Fabrican.

On the face of it, spraying chemicals around may not sound so eco-friendly, but Fabrican's stated ethos is to provide industry with production processes that reduce environmental impact. Working with greener, non-volatile organic compounds, Fabrican's spray-on fabric technology uses non-ozone-depleting substances. They work with non-flammable propellants with the lowest global warming potential of 1 (equivalent to CO₂), as defined by the U.S. Environmental Protection Agency. This technology is very new but offers great potential not just in the fashion world, but throughout all aspects of material science.

https://wired.me/technology/all-you-need-to-know-about-the-technology-behind-bella-hadids-spray-on-dress/

HUMAN BIOLOGY - Your face is mighty mite-y. And that's a good thing!

WARNING: The following article is not for persons of a nervous or queasy disposition

When you go to sleep at night, you are not alone - things emerge from your face skin and play around!

We have come to terms with the fact that our bodies are covered in bacteria that are actually good for us and help keep the bad bacteria away. However, what is less well known is that there are other creatures that lurk in the pores of our face skin during the day, but creep out at night to mate – skin mites. Most people have face mites crawling over their skin. But don't worry. They're there to help. And we, in turn, help them.

They creep out of your pores and mate. During the day, they hide from the light, sucking on your skin grease. This sounds gross, but the mites might help to keep your skin healthy. And a new study, published in the journal *Molecular Biology and Evolution* shows that the mites living — and pooping — on people's faces need humans just as much as humans need them.

Two species of face mite live on people's skin. Both are tiny and secretive. *Demodex folliculorum* (image, right) lives in groups in the pores at the base of hair follicles. They hang out mostly on the nose, forehead and ear canal. *D. brevis* prefers the sebaceous (Seh-BAY-shuss) glands that stick out on the sides of the hair follicle. More than



90 percent of people have them and most people get their face mites from their mother. The mites are arachnids, related to ticks and spiders, but you will never actually see them as they are microscopic in size.



The mites depend on their human hosts completely. Face mites might have started out as parasites, living in skin and maybe even causing disease. But over time, we developed a symbiotic relationship with our mites, where each species benefits the other. They are cleaning our skin and keeping our pores unblocked. In return, we give them homes and food.

"I love to study these creatures because they are part of our bodies," says Dr Alejandra Perotti, an invertebrate biologist at the University of Reading in England. She goes on to say "When we get up, and our mites go to bed, people should wake up every morning, look in the mirror, and say 'Hello' to the mites."

https://www.snexplores.org/article/your-face-mites-pores-skin-good-thing

ASTRONOMY – Jupiter seen in a new light: infrared!

Naked eye observation of Jupiter dates back to at least the Babylonian astronomers of the 7th or 8th century BC. In 1609 Galileo Galilei made the first observation of Jupiter using a telescope. It was a modest instrument by later standards and did not reveal any detail of Jupiter itself, but Galileo did discover 4 of Jupiter's moons. Over the next 50 years, as telescopes became more powerful, various observers noted Jupiter's coloured banding and spots, including the famous "Great Red Spot". Within the last 50 years there have been space probes sent to Jupiter and observations by the world's most powerful modern telescopes, including the Hubble Space Telescope. We have come to know Jupiter in all its coloured glory – but now we can see it in a completely new light (literally!) thanks to the James Webb Space Telescope, launched in December last year.

The images were taken using the telescope's NIRCam infrared instrument on 27 July 2022. NIRCam uses three specially designed filters to reveal details of the planet at wavelengths invisible to the human eye, which can then be combined to produce incredibly detailed composite images. In general, longer wavelengths are shown in red and shorter wavelengths are shown in blue. *"We hadn't really expected it to be this good, to be honest,"* said planetary astronomer Prof Imke de Pater, of the University of California, Berkeley who led the observations.

The images clearly show Jupiter's iconic Great Red Spot – a giant, whirling storm found in the planet's atmosphere – although seen as blue by the NIRCam.



Also clearly visible are Jupiter's aurorae (North and South) which, unlike Earth's aurorae, are always present. Jupiter's faint ring system is also evident, as are two if its smaller moons.

https://www.sciencefocus.com/news/james-webb-telescope-releases-spectacular-images-of-jupiters-great-red-spot-and-ghostly-glowing-auroras/

MORE ASTRONOMY - James Webb sees its first exoplanet*

(*EXOPLANET - a planet that orbits a star outside the Solar System)

For centuries scientists, philosophers, and science fiction writers suspected that planets orbiting other stars in our Milky Way galaxy (and others) existed, but there was no way of knowing whether they were real, how common they were, or how similar they might be to the planets of the Solar System. On 9 January 1992, radio astronomers Aleksander Wolszczan and Dale Frail announced the discovery of two planets orbiting the pulsar PSR 1257+12. This discovery was confirmed, and is generally considered to be the first definitive detection of exoplanets.

Any planet is an extremely faint light source compared to its parent star. For example, a star like the Sun is about a billion times as bright as the reflected light from any of the planets orbiting it. In addition to the intrinsic difficulty of detecting such a faint light source, the light from the parent star causes a glare that washes it out. Initially exoplanets were discovered by indirect means, the commonest being the '**transit method**', where the light observed from the star dims slightly if a large planet passes in front of it during its orbit. However, in the last 10 years or so '**direct imaging**' methods have been developed and it is this method that the James Webb Space Telescope uses.

For this method to work, it is necessary to block the light from the parent star in order to reduce the glare while leaving the light from the planet detectable; doing so is a major technical challenge and is achieved by a device in the telescope known as a *coronagraph*. As the best wavelengths for detection are in the infrared, great thermal stability is also required. This is what makes JWST the ideal instrument.

The image, as seen through four different light filters, shows how Webb's infrared gaze can capture worlds beyond our solar system. The exoplanet is HIP 65426 b, and we see it here in different bands of infrared light. The left 2 insets are from NIRCam at 3.00 micrometres and 4.44 micrometres. The right 2 insets are from MIRI at 11.4 micrometres and 15.5 micrometres. The white icon of a star blocks out the light of the host star so that we can see the exoplanet. The bar shapes in the 2 left images are optical artifacts and not actual objects. The HIP 65426 b planet is more than 10.000 times fainter than its host star in the near-infrared. And it's a few thousand times fainter in the mid-infrared. (Image via NASA/ ESA/ CSA/ A Carter (UCSC)/ the ERS 1386 team and A. Pagan (STScI)).



Astronomers first discovered the planet in 2017 using the SPHERE instrument on the European Southern Observatory's Very Large Telescope in Chile. They took images of it using short infrared wavelengths of light. The exoplanet orbits the star HIP 65426 and is about 6 to 12 times the mass of Jupiter. The star system is 385 light years away and is relatively young being only 15-20 million years old, compared to the 4.6 billion years of our own Solar System. Webb's view, at longer infrared wavelengths, reveals new details that ground-based telescopes would not be able to detect because of the intrinsic infrared glow of Earth's atmosphere.

https://blogs.nasa.gov/webb/2022/09/01/nasas-webb-takes-its-first-ever-direct-image-of-distant-world/

WORD(S) OF THE MONTH:

COGNITION (noun, "Cog-NIH-shun")

Cognition is how the brain gains, stores and uses knowledge. Learning and solving problems are examples of cognition. So are perceiving the world and remembering experiences. Using language and imagination are also aspects of cognition. These brain functions form the basis of our thoughts and actions in daily life. They help us understand and interact with the world around us. In short, cognition is all the processes involved with thinking.

Cognition arises from many parts of the brain working together. Memory is ruled by regions such as the *hippocampus* and the *amygdala*. Tissues across the brain's wrinkly outer layer, the *cerebral cortex*, help people understand language.

A person's genetic code affects some aspects of cognitive ability. A person's environment and experiences do, too. Disease and injury, for instance, may impair cognition. But healthy diet and exercise can help keep the mind sharp.

The *amygdala* is an area deep within the brain near the temporal lobe. Among other things, it plays a role in emotions. The term comes from the Greek word for an almond, which this region resembles in shape.

MEDICINE - Malaria booster vaccine continues to meet WHO-specified 75% efficacy goal

The 2021 annual World Malaria report from the World Health Organization, showed that malaria deaths had risen year-on-year, to 627,000 in 2020, the highest level in nearly a decade. Children under 5 in Africa continue to bear the brunt of malaria. However, new figures show thousands more children than previously thought are dying of this preventable and treatable disease. Children under 5 are especially vulnerable, accounting for 80% of malaria deaths on the continent in 2020. Around 481,500 children under 5 lost their lives to this deadly disease in Africa over the last year alone. This new report showed a child is dying every minute from malaria. The situation is worrying, the fight against malaria is at risk, and without immediate and accelerated action further ground may be lost.

Clearly, anti-malarial drugs and physical preventive measures are not succeeding in reducing the disease, which makes the development of a reliable vaccine even more imperative. Researchers from the University of Oxford and their partners have reported new findings from their Phase 2b trial following the administration of a booster dose of the candidate malaria vaccine, R21/Matrix-MTM – which previously demonstrated highlevel efficacy of 77% over the following 12 months in young west African children in 2021.

It has taken more than a century to develop effective

vaccines as the malaria parasite, which is spread by mosquitoes, is spectacularly complex and elusive. It is a constantly moving target, shifting forms inside the body, which makes it hard to immunise against. Trial results from 409 children in Nanoro, Burkina Faso, have been published in the journal *Lancet Infectious Diseases*. It shows three initial doses followed by a booster a year later gives up to 80% protection.

The vaccine has been developed at the University of Oxford's Jenner Institute in collaboration with other partners. Professor Adrian Hill, the University of Oxford's Director of the Jenner Institute and Lakshmi Mittal and Family Professor of Vaccinology, and co-author of the paper, said: 'We are delighted to find that a standard four dose immunisation regime can now, for the first time, reach the high efficacy level over two years that has been an aspirational target for malaria vaccines for so many years.'

The team will start the process of getting their vaccine approved in the next few weeks, but a final decision will hinge on the results of a larger trial of 4,800 children due before the end of the year. The world's largest vaccine manufacturer - the Serum Institute of India - is already lined up to make more than 100 million doses a year.

https://www.bbc.co.uk/news/health-62797776

PHYSICS - quantum batteries can reliably store energy into electromagnetic fields

Quantum technologies, i.e. technological devices obtained by building and manipulating quantum mechanical systems, are becoming a reality in recent days. The most prominent example is certainly given by quantum computers, where the unit of information, the bit, is replaced by its quantum mechanical counterpart, informally called the qubit. Quantum technologies need energy to operate. This simple consideration has led researchers, in the last ten years to develop the idea of quantum batteries, which are quantum mechanical systems used as energy storage devices.

In the very recent past, researchers at the Centre for Theoretical Physics of Complex Systems (PCS) within the Institute for Basic Science (IBS), South Korea, have been able to theorise the possible charging performance of a quantum battery. Unlike the cells of a conventional battery that are charged individually, the cells in a quantum battery are charged simultaneously. Specifically, they showed that a collection of quantum batteries can lead to an enormous improvement in charging speed compared to a classical charging protocol, thanks to quantum effects.



Energy source

Energy source

Experimental realisation of this theory proved difficult, but now the researchers are revisiting a quantum mechanical system that has been studied heavily in the past: the **micromaser**. Micromaser is a system where a beam of atoms is used to pump photons into a cavity. Put in simple terms, a micromaser can be thought of as a configuration of the experimental model of a quantum battery mentioned above: the energy is stored into an electromagnetic field, which is charged by a stream of qubits sequentially interacting with it.

All the results so far suggest that micromaser could be considered as a promising new platform that can be used to build quantum batteries. The fact that these systems have been already implemented in experimental realisations for many years could give a serious boost in building new prototypes of quantum batteries.

https://www.sciencedaily.com/releases/2022/08/220824103034.htm



PALAEONTOLOGY - World's oldest heart found in a prehistoric fish

All vertebrates (animals with back bones) have a heart that pumps blood around the animal's circulatory system. But there has always been a bit of mystery about when and how the heart evolved, due to the fact that there is very little fossil evidence. This is because the heart, like other organs, is composed of 'soft tissue' that is not preserved as part of the fossilisation process, unlike hard parts like bone.

According to work published in the journal Science, researchers in Western Australia have discovered a 380million-year-old heart preserved inside a fossilised prehistoric fish. They say the specimen captures a key



moment in the evolution of the blood-pumping organ found in all back-boned animals, including humans. The heart belonged to a fish known as the Gogo, which is now extinct. The lead scientist, Prof Kate Trinajstic from Curtin University in Perth told BBC News about the moment she and her colleagues realised that they had made the biggest discovery of their lives. "We were crowded around the computer and recognised that we had a heart and pretty much couldn't believe it! It was incredibly exciting," she said.

Usually, it is bones rather than soft tissues that are turned into fossils but at this location in Kimberley (Western Australia), known as the Gogo rock formation, minerals have preserved many of the fish's internal organs, including the liver, stomach, intestine and heart. Her collaborator, Prof John Long from Flinders University in Adelaide, described the find as "a mind-boggling, jaw-dropping discovery". "We have never known anything about the soft organs of animals this old, until now," he said.

The Gogo fish is the first of a class of prehistoric fish called placoderms. These were the first fish to have jaws and teeth. Before them, fishes were no bigger than 30cm, but placoderms could grow up to 29.5ft (9m) in length. Placoderms were the planet's dominant life form for 60 million years, existing more than 100 million years before the first dinosaurs walked the Earth. Scans of the Gogo fish fossil showed that its heart was more complex than expected for these primitive fish. It had two chambers one on top of each other, similar in structure to the human heart. The researchers suggest this made the animal's heart more efficient and was the critical step that transformed it from a slow-moving fish to a fast-moving predator. It was a step along the evolutionary path to the 4-chambered mammalian heart we see today.

https://www.bbc.co.uk/news/science-environment-62912225

SPACE ROCKS! - Extra-terrestrial water has been found in a British meteorite

In February 2021, in the town of Winchcombe, Gloucestershire, a 4.6 billion year old meteorite fell to the Earth. Remarkably it landed on the driveway of a local family who recovered it and handed it over to the Natural History Museum in London where it could go on display. Not just that, though, as it could also be scientifically examined in fine detail. The museum has now announced that, for the first time in a UK meteorite, they have found extra-terrestrial water.

Dr Ashley King, of the Planetary Materials Group at NHM and the UK Fireball Alliance, told delegates at a British Science Festival in Leicester: *"What's really exciting for us for us is that the Winchcombe meteorite*



was collected about 12 hours after landing, so the water that's in the rock hasn't been contaminated with the water that we have in our atmosphere. So it's basically really fresh. We can be really confident when we measure the water that it is extra-terrestrial water."

The meteorite contains about 12% water that is locked up in a sort of mineral 'mud'. The most interesting thing about the water is that it is virtually identical to the water found in Earth's oceans. This adds to the evidence that a significant proportion of the Earth's ocean water came by way of the early bombardment by meteorites in the first 500 million years after our planet's formation. Some have suggested that comets, which are themselves largely made of water ice, may have played a major part, but Dr King says that the analysis of the Winchcombe meteorite places that theory in doubt - "The composition of water on comets, at least a few that we visited, doesn't really match the Earth's oceans, but the composition of the water in the Winchcombe meteorite is a much better match. So that would imply that carbonaceous asteroids were probably the main source of water for Earth."

https://www.msn.com/en-gb/news/world/meteorite-that-fell-on-a-cotswolds-driveway-contains-extraterrestrial-water/ar-AA11UFZt?ocid=msedgdhp&pc=U531&cvid=004182e661004ccbbc7b32c27904d14c

MATHEMATICS - enables scientists to understand organisation within a cell's nucleus

Science fiction writer Arthur C. Clarke's third law says that "any sufficiently advanced technology is indistinguishable from magic." This could be applied to the "technology" of the living cell's nucleus – exactly how it is organised to carry out its crucial role is still something of a mystery. Dr Indika Rajapakse is associate professor of computational medicine and bioinformatics, mathematics, and biomedical engineering at the University of Michigan (US) and he has developed a new mathematical technique to begin to understand how a cell's nucleus is organised.

The technique, which Dr Rajapakse and collaborators tested on several types of cells, revealed what the researchers termed self-sustaining transcription clusters, a subset of proteins that play a key role in maintaining cell identity. The research is published in *Nature Communications*. The team improved upon an older technology to examine chromatin, called Hi-C, that maps which pieces of the genome are close together. It can identify chromosome translocations, like those that occur in some cancers. Its limitation, however, is that it sees only these adjacent genomic regions. The new technology, called **Pore-C**, uses much more data to visualise how all of the pieces within a cell's nucleus interact. The researchers used a mathematical technique called **hypergraphs**. Think: three-dimensional Venn diagram. It allows researchers to see not just pairs of genomic regions that interact but the totality of the complex and overlapping genome-wide relationships within the cells.



Self-Sustaining Transcription Clusters

"This multi-dimensional relationship we can understand unambiguously. It gives us a more detailed way to understand organizational principles inside the nucleus. If you understand that, you can also understand where these organizational principles deviate, like in cancer," Dr Rajapakse said. "This is like putting three worlds together—technology, math and biology—to study more detail inside the nucleus."

They hope this understanding will expose vulnerabilities that can be targeted to reprogram a cell to stop cancer or other diseases. "More and more cancer biologists think genome organization plays a huge role in understanding uncontrollable cell division and whether we can reprogram a cancer cell. That means we need to understand more detail about what's happening in the nucleus," said Dr Rajapakse.

https://phys.org/news/2022-09-mathematics-enable-scientists-cell-nucleus.html

BIOLOGY - How boa constrictors squeeze their prey without strangling themselves!

The boa constrictor's choke hold is an iconic animal attack. Once coiled around its prey, in mere minutes a snake can squeeze the life out of a victim. The boa then gulps down its dinner whole. In doing this, it is remarkable that the boa doesn't actually strangle itself. Now, X-ray videos show just how these snakes squeeze so hard — or swallow something as big as a monkey — without suffocating.

Researchers shared their finding in the *Journal of Experimental Biology*. When one part of a Boa constrictor's rib cage is compressed, the part of its lungs enclosed here cannot draw air. But the new videos reveal that a snake can simply move another section of its ribs to inflate its lungs there. That allows a boa to keep breathing even while one part of its body is squeezing. Some people had reported seeing this behaviour in snakes before, but no one's ever empirically tested that.

Researchers implanted metal markers on the ribs of three boa constrictors. One set of markers was placed about a third of the way down the animals' bodies. The other set was placed about halfway down the snakes. Those metal markers showed up in X-ray videos of the animals. This allowed the researchers to map rib motions over different parts of the snakes' lungs. The team wrapped



a blood-pressure cuff around different parts of the boas' bodies. The cuff's pressure slowly increased until a snake's rib cage could not move in that area. This mimicked the effect of a snake using that part of its body to grip prey or gulp it down.

Controlled breathing may be one of the key innovations within snake evolution that allowed this group of animals to explode and become one of the most successful groups of vertebrates we've ever had.

https://www.snexplores.org/article/how-boa-constrictor-squeeze-prey-without-suffocating-snake-science-comic

ARCHAEOLOGY - Rats can chronicle human history

People might not like to see rats, but their habits — and their love of people's stuff — mean scientists can study the animals to learn more about our own history!

Buttons. Old nails. Ancient fishing nets. Sandals, silver spoons, football tickets and old hair pins. It's quite a collection. But it wasn't assembled by people. These items were all brought together by rats. The contents of their nests can teach archaeologists, historians and the rest of us not only about those rats but also about the people they lived among. After all, where people go, rats tend to follow. Scientists can learn about where people have been and what they did by sifting through what's been collected by the rats that have shared their environment. The rodent nests can show how a single building gets used over time. Even their build-up of sticks and poo can tell us about the environments in which people lived thousands of years ago.



When the first Europeans arrived in Virginia (USA), black rats (*Rattus rattus*) hitched a ride in their ships. They went on to live with the Europeans and often built nests in the walls of people's homes. Those nests are full of information about those early settlers. One good example comes from Orrell House in Williamsburg. A family of rats built a nest behind a staircase in the building. When the rats moved in, they lined their nest with objects from Orrell House's human residents: buttons, pins and lots of thread, because the Orrell family were tailors. They show what specific materials these people used, which is important because it helps historians find out what the early settlers could make and produce for themselves — and what they had to import from across the ocean.

Another building, known as the Bray School had even more rats. Rats in the walls, rats by the chimney, rats in the roof beams. In 1760, this building became a school for Black children. Eventually the school moved on to a bigger building. But the rats remained. They stayed as the house became a women's dormitory. And they stayed as it became a place to study military science. The rats stayed and stole — until the historians found their nests in November 2021. The rats were collecting the personal items. These were "things that often travel with people." Once discarded, they'd be lost to time. There were combs and pins, maybe even hand-written letters. People might have thrown out old football tickets or shoes. But once rats found them, they kept the bounty. Historians are studying the nests now to find out more about the many people who lived in Bray School over the centuries.

By studying such rats' nests archaeologists are gaining a much more personal insight into the people who lived in close proximity to their rodent residents.

https://www.snexplores.org/article/rats-archaeology-human-history-paleontology

NATURE - Why do animals migrate?

Many animals make long, treacherous journeys year after year, so why do they go to all that effort? You may have heard about some of the animal kingdom's epic migrations, such as humpback whales travelling from the poles to the equator, or hundreds of thousands of monarch butterflies arriving in Mexico every winter. Many birds, mammals, fish, reptiles, amphibians, crustaceans and insects migrate, and they usually do it to find food, a safe place to breed, or a suitable climate. For example, European



swallows migrate south every winter to Africa or Asia where the climate is warmer, and food is more plentiful. Flying 320km a day, they use fat reserves to avoid starvation on their long journey. Another famous migration is that of wildebeest in the Serengeti, which follow the seasonal rains that nourish the grasses on which they graze.

But not all migrations are seasonal: Atlantic salmon spend most of their lives in the sea, and when it is time to reproduce, they travel thousands of kilometres to return to the exact river where they were born. A study published in 2021 found they can travel up to 2,940km to return to their birth river, all to ensure their offspring get the best start in life. The furthest may be the bar-tailed godwit, flying over 10,000km from New Zealand to Alaska.

Migratory animal species navigate their journey using a variety of methods. Some, such as starlings use the Sun. Other bird species use the stars for navigation at night. Many animals also sense the Earth's magnetic field. Some follow the familiar terrain or, in the case of Wildebeest, the scent of rain. Whales can also sense the Earth's magnetic field, as well as being able to follow the terrain of the ocean floor.

https://www.sciencefocus.com/nature/why-do-animals-migrate/

PLANETARY SCIENCE – Is life brewing in the ocean of a moon of Saturn?

Enceladus is the sixth-largest moon of Saturn (19th largest in the Solar System) and is about 500 kilometres (310 miles) in diameter. Enceladus was discovered on August 28, 1789, by William Herschel but little was known about it until the two Voyager spacecraft, Voyager 1 and Voyager 2, flew by Saturn in 1980 and 1981 In 2005, the spacecraft Cassini started multiple close flybys of Enceladus, revealing its surface and environment in greater detail. In particular, Cassini discovered water-rich plumes venting from the south polar region. These plumes reinforce the theory that Enceladus has, beneath its thick, icy crust, a liquid water ocean. As we know from our own planet, Earth, where there is water there could also be life!

Now, new and more detailed examination of the data Cassini sent back in 2008 suggests this Saturnian moon's water contains bounties of a critical building block for life (as we know it. anyway). It's phosphorus, an important ingredient in genetic and cellular material. It's the second most abundant mineral in our bodies. "We found evidence that one of the key elements that's needed for life on Earth should be present in high abundance in the ocean of Enceladus," says Christopher Glein, a senior scientist at the Southwest Research Institute. "It shows Enceladus is more habitable than previously thought," he added. The research, which simulated how minerals dissolve into the moon's sea and allowed researchers to estimate the quantity of phosphorus



on Enceladus, was recently published in the journal Proceedings of the National Academy of Sciences.

The data for the study comes from a legendary NASA mission back in 2008, when the space agency's legendary Cassini probe dove through jets of icy water vapor, gases, and organic material that sprayed from Enceladus' south pole. This latest research used more detailed computer simulations of how Enceladus' rocky seafloor geology interacts with the salty seas, a natural process that dissolves phosphorus minerals into the water. Taken together, Glein and his research team are confident they know what's dissolving into Enceladus' ocean. And it's plenty of phosphorus. "Phosphorus has a critical role in life as we know it," he emphasised.

https://mashable.com/article/enceladus-saturn-moon-ocean-discovery-habitable

WEIRD SCIENCE – French physicists make a bubble that lasted for more than a year!

The typical bathtub or dish soap bubble lasts just moments before popping due to the gravity-induced drainage and/or the evaporation of the liquid inside the sphere. But when researchers formed bubbles with a high concentration of glycerol — a compound commonly used in a host of foods and medicines — the compound was highly effective in staving off the bubble's inevitable death by pop. University of Lille physicists published their work in the journal *Physical Review Fluids*, recounting how they extended the "fragile and ephemeral" lifetime of a single bubble to a mind-blowing 465 days!

The team says that the increased longevity of the water-glycerol bubbles comes from the stabilising effects of the glycerol,



according to a synopsis of the French team's work published by the American Physical Society. Glycerol has a strong affinity with water and is known to absorb water from air. The team thinks that this absorption of water compensates for evaporation, while the presence of the particles prevents drainage of water from the shell, both of which are known causes of bubble rupture.

While the French bubble achievement could seem needless to a layman, New York University math professor Leif Ristroph said there could be some very real applications to be drawn here. Ristroph, who specialises in fluid dynamics and has studied the science of bubbles, said any number of researchers in medicine and consumer products always want to know more about ways to fight evaporation. "I'm daydreaming here, but I could imagine it might be useful to 'armour' little droplets in aerosols and sprays to make them last longer in air. For example, some sort of medicine that's administered by spraying and breathing in the aerosol," he said.

It wasn't immediately clear if this French super bubble set any kind of world mark. Guinness World Records maintains a host of bubble-related records, such as tallest free-standing bubble (35.25 feet), longest free-standing bubble (105 feet) and largest bubble-gum bubble (20 inches in diameter) – but not the longest-lasting.

https://www.nbcnews.com/news/world/french-physicists-developed-bubble-didnt-burst-year-rcna13077