NOTTINGHAM FESTIVAL OF SCIENCE & CURIOSITY

8 - 17 February

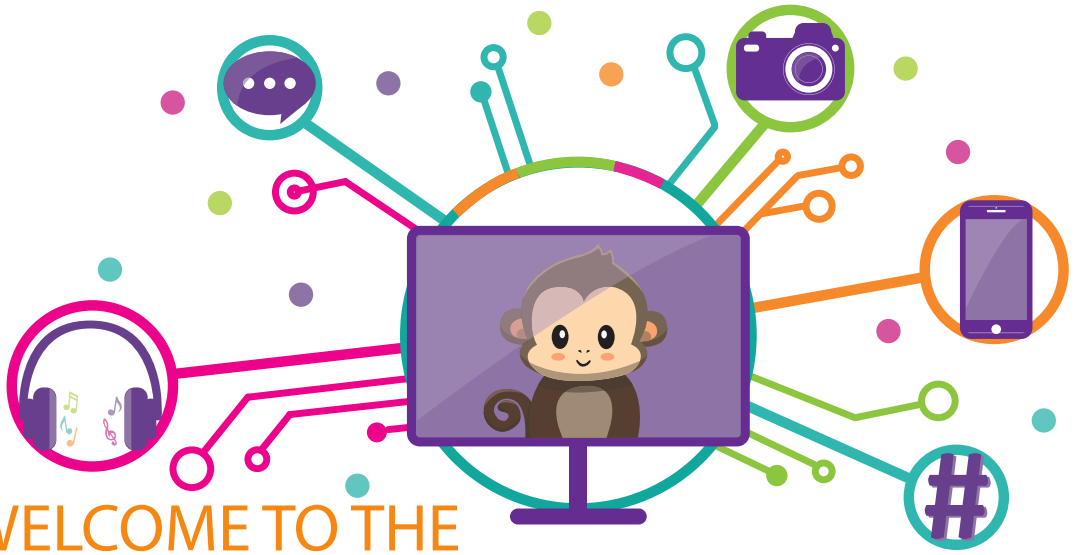
www.nottsfosac.co.uk

@NottsFOSAC

Articles, Events and Try It At Home Science Activities

FESTIVAL EVENTS - QUICK VIEW

Every Day Monday 8 - Friday 12				
Wollaton Watch	4-5pm	NottsTV and Live Stream via Facebook and YouTube	TV programme	All Ages
Ask A Scientist Q&A	10-10:45am	YouTube	Q&A	11+
Monday 8				
Daily Brain Tricks	12:30-1pm	Zoom	Virtual Workshop	All Ages
Wednesday 10				
Stories and Rhymes for little ones	11-11:30am	Facebook	Virtual Workshop	Under 5s
What does the research say? Clinical trials	6-7pm	Online via Facebook Live and YouTube	Virtual Talk and Discussion	14+
Thursday 11				
'Why do cats eat fish' with Dr David S Gardner	11-11.45am	Zoom	Virtual Talk and Discussion	14+
What does the research say? The Future of Medicine	5:30-7pm	Zoom	Virtual Talk and Discussion	14+
Friday 12				
Daily Brain Tricks	12:30-1pm	Zoom	Virtual Workshop	All Ages
Science Storytime with Stacey	6pm	Nottingham City Library YouTube Channel	Virtual Workshop	Under 7s
Saturday 13				
Sutton Observatory Open Dome Event	7-8pm	Sutton Observatory YouTube Channel	Virtual Talk and Discussion	All Ages
Monday 15				
Science Busking Make Along	11am-11:30am	Zoom	Virtual Workshop	All Ages
Mission to Mars #1	11am-12pm	Zoom	Virtual Workshop	7+
Daily Brain Tricks	12:30-1pm	Zoom	Virtual Workshop	All Ages
Build A Virus	2-2:45pm	Zoom	Virtual Workshop	All Ages
Tuesday 16				
Science Busking Make Along	11am-11:30am	Zoom	Virtual Workshop	All Ages
What does the research say? Sustainability	5:30-7pm	Zoom	Virtual Talk and Discussion	14+
Wednesday 17				
Science Busking Make Along	11am-11:30am	Zoom	Virtual Workshop	All Ages
DNA Bracelet Make Along	2-2:30pm	Zoom	Virtual Workshop	All Ages
Mission to Mars #2	2-3pm	Zoom	Virtual Workshop	7+
Plant Along	3-4pm	Zoom	Virtual Workshop	All Ages
Diversity in STEM Panel	5:30pm-7pm	Zoom	Virtual Panel and Discussion	14+



WELCOME TO THE

Nottingham Festival of Science and Curiosity

Ever seen a cat catch a fish? No? And yet they love to eat them? Wondered what it would be like if your mind could be uploaded to a computer and you have a conversation with yourself? Ever questioned why we grow up with teddy bears when avoid them in real life? Or imagined what type of superpower you'd have if you were a bat?

Welcome to the 2021 Nottingham Festival of Science and Curiosity! Ten days of creative, captivating and curious events, with plenty of fun and exciting activities to stimulate your brain, spark your imagination and answer those mind-boggling questions.

The festival looks a bit unusual this year; we're going to be experimenting with all sorts of different ways for you to be part of the incredible science, technology, engineering and maths that takes place in Nottingham and Nottinghamshire.

Highlights of the Festival this year include online talks that may change your mind about research and discoveries, workshops and make alongs for you to get stuck into, and competitions and teasers to explore what you think you already know.

We will delight you with artwork throughout the festival, and surprise you with your local environment. Look out for kits to collect, so you can take part in activities that will encourage you to be scientists, researchers and investigators for yourselves...

Schools and Colleges

We'll be running some exciting projects with schools this year,we'll be live-streaming careers events for secondary pupils across the county, pairing up scientists with pupils to develop their own science research projects, including taking your own virtual mission to Mars, and delivering special neuroscience sessions for primaries, secondaries and alternative provision schools.

To find out more about how you could be involved in our schools projects, look at our website:

Where to find the festival

Discover details about all of our online events on our website:
www.nottsfosac.co.uk

Follow us on social media:

@NottsFOSAC on Facebook, Instagram, Twitter and TikTok.

Share photos and videos of you taking part in the festival using the hashtag
#CuriousNotts

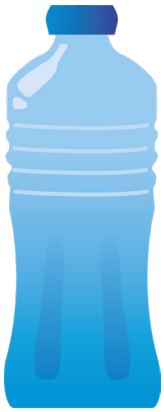
Subscribe to our YouTube channel: Nottingham Festival of Science and Curiosity

This magazine was designed and produced by Confetti students John Kidger, Michalina Jurek and Sophia Bensalem.

Make your own plastic using plant power!

Sustainable Process Technologies Research Group, University of Nottingham

What is plastic?



Plastic is everywhere! Different types of plastic have different properties, they can be strong, flexible or see-through as well as resistant to water, heat and electrically. If we zoomed in really close, we would see that plastic is made of lots of chains of molecules different combinations of molecules form different types of plastic.

Where does plastic come from?

Most plastic is made from fossil fuels - after millions of years of being squashed and heated underground, remains of plants and animals turn into oil, gas and coal. These fossil fuels are dug up and heated so that they break down into molecules, which can then be formed into chains. Unfortunately, this process releases a lot of harmful chemicals into the environment, contributing to climate change.

Biobased plastic to the rescue!

Another option is to make plastic from renewable or 'green' sources, including plants or microorganisms. Microalgae (which are like tiny seaweed!) and bacteria can produce the same molecules that make up plastic. Even better, they can consume some of the bad chemicals in the atmosphere at the same time!

How is this different to biodegradable plastic?

You might have heard of biodegradable plastic. Plastic is often so strong that it can exist on the planet for thousands of years. Biodegradable means that the plastic can be broken down into individual molecules. This can happen naturally in the environment like in compost, or by scientists using biology. For example, scientists have discovered some bacteria that like to eat plastic! This is different to biobased plastic, although a plastic could be both biobased and biodegradable.

Watch our video on the festival website and learn to make your own plant-based plastic. @UoNSPT

Viruses

Dr John Shaw & Dr Rebecca Rickaby
University of Nottingham

Unlike a hungry lion or a violent snowstorm, many of our most deadly foes are completely invisible. Every day, invading creatures try to attack our bodies to access the nutrients they contain. Almost every attack is successfully defeated by our amazing immune system's defences. These invaders come in all shapes and sizes, from tiny virus particles, single celled bacteria to large parasitic worms!

Despite their small size, viruses can cause some of the most common human illnesses, including the common cold and chickenpox, as well as more serious illnesses, like HIV, hepatitis and COVID-19. Because viruses infect our cells and live within them, they are called parasites. They take nutrients from our bodies to make new copies of themselves.

But some parasites can grow up to 25 meters long and live inside our intestines, and they are called parasitic worms. If you have a pet, chances are you will worm them regularly. This is because cats and dogs get these too.

With all these parasites trying to invade our bodies, scientists have developed many ways of protecting us. The most common way of fighting the invaders is to use medicines that destroy them. Scientists have also made medicines called vaccines. These medicines often use dead parasites to train our immune system, so our bodies are ready for it.

Find out more about parasites with our online resources from University of Nottingham pharmacist students, and join our Build a Virus online workshop on Monday 15 February, 2-2.40pm.
More details on the festival website.

BECOME A PLANT SCIENTIST

Plant scientists study plants to understand what they need to grow well. Knowing how plants respond to environments helps us to pick those that grow best, have large and tasty fruits and contain vitamins and minerals that are important for our health.
This helps farmers choose the best plants to grow on their farms so they have a secure income. It also means you can get safe and healthy food when you buy any vegetables in the super-market.

Try your own experiment!

To see what happens to plants when they are exposed to different conditions, perform your own experiment. You need:

- Several pots: you can use stuff from your kitchen like empty yoghurt pots and egg cartons
- Something to grow on: this could be cotton wool, soil from your garden, tissue paper. Check with a grown-up that you can be a bit messy inside, or do the activity outside!
- Seeds: Whatever you like! Find seeds outside, use dried seeds from a market or seeds from fruits you've eaten. Sometimes seeds just don't germinate, so don't be disappointed and just try again!
- Something to change the conditions: you decide! You could add salt, or pepper, or herbs to the soil. Make sure you check with a grown-up first.

Observe your results:

To have a good result, make sure you always have a control plant. This one you just grow normally.
Then compare all your other plants to it. Note your results down, take pictures of your results or measure your plants (for example their height or the number of leaves they have).

Note your results here:

Plant	Species	Treatment	Date	Visible Effect
1				
2				
3				
4				
5				
6				

Join our Plant Along Workshop

Wednesday 17 February
3 - 4pm

Join plant scientists with your seeds and equipment to plant and your questions as we conduct our experiments together.

More details on the festival website.

twitter @UoNFutureFood

facebook.com/ UoNFuture-Food

Linkedin.com/ future-food-beacon

Future-food@ nottingham.ac.uk

Wollaton Watch

Monday 8 - Friday 12 February

4-5pm

Live via Notts TV, Facebook Live and the Festival Website

A series of hour-long programmes delivered to you live from Wollaton Hall five evenings throughout the Festival. Wollaton Watch will feature footage from nature around Nottinghamshire as well as contributions from young people, schools and wildlife volunteers celebrating and protecting the environment in our county.

There will be live demonstrations and activities for you to take part in at home, and the opportunity to send in your photos and videos of nature near you.

Things to expect in Wollaton Watch:

- Stargazing from Wollaton Hall's roof; how many constellations can you name?
- Find out about tree-planting around Nottingham
- Guess that sound! Can you tell what kind of animal made that noise?
- Find out what kinds of birds you can spot at different times of year
- Discover why leaves have different shapes!

Share your clips!

- Footage of wildlife around Nottinghamshire (tell us what it is and where you spotted it)
- Videos of your favourite natural spaces, such as parks, canals, rivers, woodlands, nature reserves (tell us why it's so great)
- Videos telling us a new or interesting fact involving nature that you've recently learnt

Send to us:

wollatonwatch@nottsfosac.co.uk
or use the hashtag
#WollatonWatch on Facebook, Instagram, Twitter and TikTok

SUPER ANIMALS

Nearly everybody loves superheroes, like Spiderman, Hulk and Thor, but did you know that animals have some really cool superpowers too?

Super Shapes

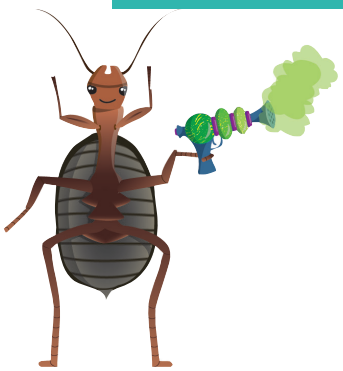
Animals come in all different shapes and sizes, but only a few can actually change their shape and size. The mimic octopus, that lives underwater around Indonesia, can change its shape and the smoothness of its skin to look like a snake, a poisonous flat fish or a spiny lion fish - in fact, they can mimic at least 13 different animals. It can also change its colour - from its usual light brown to black and white stripes, or orange splodges - making it the master of mimicry! The mimic octopus usually impersonates animals that are poisonous to protect the octopus from being eaten by predators, but it is also able to mimic prey such as small fish, luring them in before feasting on them.

Super Hearing

Bats cannot see in the dark, but they can use their hearing to find their way around via a process called echolocation. This is where the bat produces a very high-pitched sound and listens for the echo. If an object is close to the bat, the echo bounces back very quickly, but if the object is far away, it takes much longer for the echo to return. This allows the bat to build up a 'picture' of its environment, so that it doesn't bump in to objects in the dark.

Super Weapons

Ever heard of an animal using a weapon? Bombardier beetles are able to produce hot acid gas bombs that explode with a 'pop' from their bottoms, a bit like a really toxic trump! This helps the beetles to escape from predators such as ants. In extreme cases they bombard predators with so much of the acid bombs that they kill them!



Meet the Scientist!

10am - 10.45am each day

Join us on YouTube each day for a chat with scientists from a wide range of subjects and careers. Ask your own questions and hear what the scientists have got to say about what it means to them to be a scientist and to do science.

This activity is part of Gedling Apprenticeship Week - check out lots more careers activities online.

Animals are perfectly adapted to the environments that they live in. Perhaps it is time that some of the superheroes caught up with the amazing set of powers that have already evolved in the animal kingdom. Create your own superhero, using a power that exists in the animal kingdom - you could have super sight like a bird of prey, or super smell like a fox, the choice is up to you! Share your superhero with us on Facebook, Twitter or Instagram and tag #CuriousNotts or send to competitions@nottsfosac.co.uk and animal scientists from Nottingham Trent University will select their winner.

SWAT OR NOT?

Did you know that there are more than 5 million species of insect on Earth? They are a vital part of global biodiversity, and they also provide key ecosystem services, helping to keep farms and gardens healthy and productive. But identifying insects is really difficult! Beetles, butterflies, blowflies and bees often get lumped together as "bugs", and even professional entomologists (that's the word for someone who studies insects) can have real difficulty figuring out what they have seen.

It's not just humans that struggle to identify bugs and beasties. Predators need to spot the difference between tasty prey and nasty critters which might bite or sting. But prey species don't make it easy: it's often in their interest to trick predators into thinking that they are not worth attacking. The result is that many insect prey are mimics, looking, sounding or behaving like nasty-tasting or defended species in the hope of avoiding attack. The most obvious mimics you will meet in a British garden are hoverflies. These "true flies" are important pollinators, and their larvae help farmers and gardeners by hoovering up aphids. There are hundreds of species, and many of them look spookily like wasps or bees. Unfortunately, this similarity can also confuse people, putting the harmless hoverflies at the wrong end of a fly swat.

A team of entomologists and computer scientists from the University of Nottingham are exploring new ways to help us learn to identify insects and become citizen scientists. Learning to identify species from textbooks can be a little lifeless, so they're working on a website where you can interact with digital insect models, seeing what they look like and how they move.

COMPOSITE MATERIALS: STRONG AND LIGHT

When something is made of composite materials, this means that two or more materials have been used in a special way. This is usually done to make things stronger and cheaper. For example, most bridges are built from concrete with steel bars in it, called reinforced concrete which is a composite material. Using only steel would make it expensive, while making a bridge of concrete alone would be too brittle. In reinforced concrete the two materials work together: the steel stops the concrete from snapping under tension, while the concrete protects the steel from rust and creates volume.

Composite materials can be made from a lot of different things that would not work on their own. A car windscreen made just from glass, for example, would be very dangerous because glass breaks easily. Engineers have combined glass with other materials to make car windscreens safe. What do you think windscreens are made of, apart from the glass? We can mix other materials to make them work together. One common type of lightweight composite materials, used to build cars and planes, is called fibre reinforced composites. These composites are made using millions of very thin fibres (usually glass or carbon which are 5-10 times thinner than a human hair!) and a polymer resin. This resin is liquid and behaves like a glue during manufacture; when it sets it locks the fibres together.

Making complex structures like cars from fibres and resin may seem like a lot of work, but it is worth it in the long run. Cars made from lightweight materials use less fuel and emit less CO_2, because they need less energy to accelerate. Strong fibres used in composites can help cars to handle extreme accelerations and vibration, which is important e.g. for Formula 1 cars, planes and space rockets. Composite materials are everywhere. Bikes, tennis rackets, boats, bathtubs – they all are often made of composite materials to make them lightweight and strong.

Take a look around you and see if you can find items made of composites. Next time you get on your bike or board a plane or car, think about the materials used and the benefits of using composite materials.
Make your own composite at home using ice and spaghetti. Watch a guide at www.nottsfosac.co.uk.

MINER2MAJOR AND SHERWOOD FOREST

Mention Sherwood Forest and the first thing most people think of is Robin Hood. Robin is a really important part of the history of the area but dig deeper and there is so much more; Viking history, a royal hunting forest, famous connections (Nell Gwynne, Ada Lovelace, Lord Byron), impressive ducal estates (known as the Dukeries), the industry of mills and coal mines, the impact of the World Wars, a history of farming and land management, precious natural habitats and rare and special species.

Miner2Major is a Landscape Partnership scheme based in the Sherwood Forest area of Nottinghamshire, supported by the National Lottery Heritage Fund. Through a varied programme of projects and activities it connects with communities to help us better understand, explore and protect the diverse wildlife, important habitats and rich heritage of the legendary landscape of Sherwood Forest.

The natural importance of the area is huge. The Sherwood Forest National Nature Reserve, once part of the 10,000 acre Royal Forest of Sherwood, contains hundreds of ancient oaks most of which are known to be more than 500 years old. The most famous of these, the Major Oak, may be nearly twice that age.

The reserve has the highest concentration of ancient trees in Europe and provides habitat for very rare beetles, flies and spiders, many of which rely on the decaying and aging wood of the old trees. The surrounding heathland habitats support a diverse range of insects and ground nesting birds such as woodlark, nightjar and tree pipit.

Many of the biodiverse habitats across the Sherwood Forest area are increasingly under threat and it is essential that we collectively take action to preserve them for the future. You can find out more by visiting the Miner2Major website: www.miner2major.nottinghamshire.gov.uk/.

Sherwood Forest will feature in Wollaton Watch - so make sure you're wacthing to discover more!
www.inspireculture.org.uk/heritage/miner2major-real-sherwood-forest/how-sheets-and-activities

SCIENCE BUSKING MAKE ALONG

Monday 15 February 11-11.30am
Tuesday 16 February 11-11.30am
Wednesday 17 February 11-11.30am

Sign up via the website to receive the Zoom log-in details.

Join the Ignite! team to make some of their infamous science busking tricks with objects you can find at home!

You will need:

Trick One
A4 paper
Tape (masking, sello, gaffa, any will do!)

Trick Two
Baking tray, coat hanger, cutlery, toast rack (any fully metal object)
String

Trick Three
A cheap pair of sunglasses (that you don't mind breaking)
A curtain ring (or something similar that can be the end of a pendulum)

Trick Four
Plastic straw
Scissors

You can learn how to make all of Ignite!'s science busking tricks on their website: www.ignitefutures.org.uk/science-busking

EXPLORING CURIOSITY THOUGH CREATIVITY

The 2021 Festival Artist in Residence Roma Patel has developed an installation exploring incredible mycelium networks, fungi and fairy rings. Roma's installation is designed as a sensory and playful experience for young children under 5. Roma's installation will be available to explore at Wollaton Hall when it reopens.

Ryan Heath has been working with local young people to develop some Augmented Reality signage using Attenborough Nature Reserve as inspiration. These virtual signs will aim to encourage best practices and inform visitors about the reserve's fauna and flora. You will be able to experience these signs in your own home via the festival website.

Alfie Eyden is creating a series of videos exploring the questions children ask, including "What if humans had a tail like a monkey?", "What would school be like in space?", "What if Ants were the size of humans?", "What if we lived underwater?" and "Where do moths go in the day?". These videos will be available on the festival website during the festival.

Inspired by the beautiful and hypnotic movement of jellyfish, a curious and extraordinary mechanical sculpture by INSTAR entitled 'The Subumbrellar' will be on show at Wollaton Hall when it reopens. #subumbrellar @weareinstar

Chris Lewis-Jones is collaborating with colleagues at Primary and All Souls' Community Centre in Radford, with academics at the University of Nottingham and, with the help of Refugee Roots, with refugees living NG7. Participants will make art work exploring the science of food using materials delivered in pizza boxes. Each artwork will be presented and exhibited within a pizza box.

SHERWOOD OBSERVATORY VIRTUAL OPEN EVENT

Saturday 13 February, 7-8pm

Accessible online via Mansfield & Sutton Astronomical Society YouTube channel. Sherwood Observatory, home to Mansfield & Sutton Astronomical Society, warmly invites you to join them on a journey of exploration of astronomical proportions suitable for all ages!

This online adventure will take you through who the Society are, what they do and present to you an insight into the technology that is bound for the Hubble Space telescope successor, the James Webb Space Telescope (JWST). Soon to be launched to an orbit beyond the Moon, this will be crammed with exciting technology and the Society has been working with the people who have been building it so that they can demonstrate how this new telescope will operate with eyes that will see what no one has seen before!

Expect live views of a night-time celestial wonder (weather permitting), followed by a Q&A discussion.

SEE YOUR OWN JELLYFISH DESIGNS MOVE!

Spectacular

1. Colour the Picture
2. Download the 'Spectacular' App by QuiverVision
3. Use the app to scan the QR code

nottsfosac.co.uk

ignitefutures.org.uk

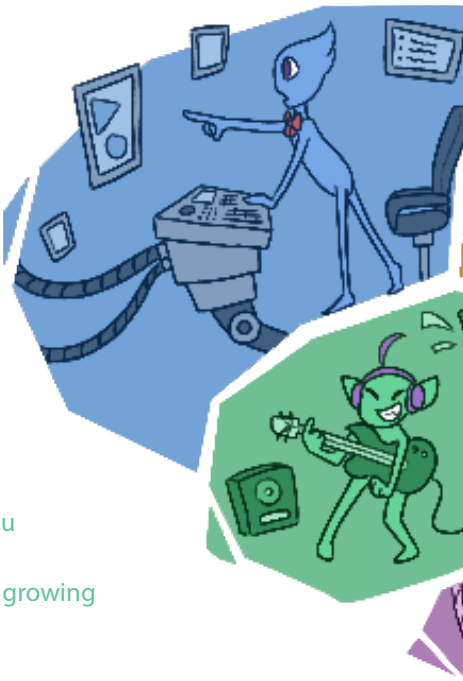
Video your jellyfish moving using the free app and share with us on social media by tagging #subumbrellar to create a Jellyfish Bloom

FRONTAL (fron-tal)

My name is Dr. Frontal and I live just behind your forehead. One of my jobs is speech - when you want to say something, it is my job to find the right words and put them in the right order for you. I also help you solve problems. When you are given a maths problem in school, I help you work it out, but I'm very imaginative and love being creative! I am in charge of planning and decision making, I get lots of information from all the other lobes in the brain to help me make these decisions. I put all this information together for you and tell you how to respond. Remember you will get better at all these things as you get older, as I don't develop fully until you are 25!

Activity:

Come up with a comic strip about a day in the life of your own Dr Frontal (or any of the other lobes in the brain)!



TEMPORAL (temp-or-al)

My name is Tempo and I'm in charge of your hearing, feelings and memory (which are much more connected than you may think!) Each ear has over 15,000 special hairs to help you hear all kinds of different noises. Sounds are closely linked to our emotions and memory, which is why the sound of an animal growling may make you nervous and scared whereas the sound of an ice cream truck makes you excited and hungry! I put your memories together for you and keep them safe, so you can look back on them anytime you want! Because I'm pretty awesome at my job, I'm the only part of your brain which keeps growing and changing throughout your life EVEN when you're an adult!

Activity:

Listen to your favourite song; Tempo is very good at linking sounds with memories so how does that song make you feel? What does it make you remember? Can you remember the lyrics and sing it back afterwards?

A DAY IN YOUR BRAIN

PARIETAL (puh-rai-uh-tal)

My name is Perry and I live in the parietal lobe of your brain. Put your hand on the top part of your head, that's where I live, but be careful because I am very sensitive. It's my job to feel all the things your body feels, like temperature, texture, pressure and pain and I tell you where exactly on your body you feel this. A very important part of my job is telling you when something hurts, so when you touch something hot or sharp I can feel exactly where it hurts and I quickly tell Dr.Frontal to move your hand away and keep you safe!

Activity:

Go and find some things from around the house and place them in a bag. With your eyes closed and using only your hands, and help from Perry, can you feel which objects are which? How many different things can you tell apart? How similar can you make the objects before they all feel the same?

OCCIPITAL (oc-si-pi-tal)

My name is O and I live in the very back of your head to with your vision. The eyes can see 10 million different colours and work in the middle of the day or in the dark of night. The eyes see the things around you and send super-fast signals to me so I can tell you what's going on. Your eyes actually see the world upside down and it's my job to fix this so that things are the right way up!

I work closely with Dr Frontal so that you can react quickly to what you see.

The human eyes have 3 different colour sensors called cones. Together these cones make up all of the different colours we see, but Mantis Shrimp have 16 different cones. Can you imagine what colours they must see?

Activity:

Using the three primary colours (red, blue, yellow) try mixing them together in different ways to see how many different colours you can make! Or try and

CEREBELLUM (ser-ruh-bel-lum)

My name is Bel and I'm in charge of your balance and movement. When you're climbing, running, jumping or walking, it's my job to make sure you stay upright and keep your balance.

If you challenge your balance every day by balancing on one leg or trying to walk in a straight line you can train me to be even better!

Did you know elephants have the largest cerebellums in the animal kingdom. A human cerebellum weighs around the same as a big apple but an elephant's weighs the same as a whole pineapple!

Activity:

Closing your eyes, see how long you can stay standing on one foot. If you are a true ninja and that's too easy, can you keep your eyes closed and hop up and down on one leg?

POOP POWER

We know that cows produce milk, and also lots of cow poop, but did you know that cows could be one of the most useful answers to climate change, by providing us with energy?

Anaerobic digestion is a technique used to digest poop and waste by bacteria. This produces biogas which can be burnt as a fuel to produce heat and electricity (and run Nottingham's buses).

Scientists in Nottingham have been working on a new machine to produce energy called the "Poopinator" (also known as the H2AD).

This new technology can clean up waste using the power of microbes, it's built in a factory and is easier to maintain.

How does it work?
Cows eat grass and produce a lot of poop (and burps); the poop is collected and put into the "Poopinator" where bacteria eat it and produce biogas that is used as an energy source for heat and electricity.

Quick Quiz - Answers on the next page

1. How many cows do you think there are in the UK?
   a) 23,000
   b) 230,000
   c) 2,300,000

2. How much milk does one cow produce each year?
   a) 6000 litres
   b) 500 litres
   c) 40 litres

3. How much "poop" does each cow produce a year?
   a) 30 litres
   b) 30,000 litres
   c) 300,000 litres

4. How much "poop" energy is produced from one cow per year?
   a) 6.4 megawatt-hour
   b) 10.8 megawatt-hour
   c) 22.4 megawatt-hour

5. On average, how many houses is one cow able to power through the energy produced from its "poop"?
   a) Half a house
   b) 1.28 houses
   c) 6.43 houses

THE STROOP TEST

NTU Psychology Department

Name that colour!

First, as fast as you can, say the words written on the right (ignore the colour of the word)

Next, as fast as you can, say aloud the name of the colour that the text is written in (ignore the written words)

orange	yellow
green	blue
black	orange
blue	black
red	red
purple	green
yellow	purple
blue	yellow
orange	red
black	orange

WHY DO CATS EAT FISH?

More than half of companion animals in the UK only eat what their owners give them on a daily basis. This is usually either wet pet foods such as tins or pouches, or pelleted dry food. Brand loyalty and personal preference often means the same product is fed for long periods of time (months to years). It is therefore important that pet food manufacturers produce a nutritionally-balanced, 'complete' feed that meets all the nutritional requirements of our dogs or cats. For cats, this is especially important, as they are what's known as 'obligate carnivores'; that is, cats have evolved to get all their nutrients from consuming other animals, they are 'obligated to', or have to, be carnivores.

So, what if cats do eat fish? In all likelihood, fish pose no real dietary threat to our domestic cats, but the principle remains true; if you have not evolved to eat certain foods, your bodies may not be able to handle all the tiny nutrients in that food and will try really hard to get rid of them, usually through the liver to your alimentary canal or through kidneys into urine. Otherwise, they may gradually build up in those organs potentially causing problems as the animal gets older, or provoke an immune reaction. Similarly, in many pet foods today, substitute ingredients are used that are relatively cheaper to produce (like palm oils) but are not necessarily what an animal may be used to as part of their 'normal' diet. Obligated carnivores would rarely eat plant matter. Hence, the question remains – why do we feed cats fish?

Fish are animals, and a good source of protein, fat and other micronutrients. When surveyed, many cat owners often fed their cats fish. Cats often like the taste of fish. Despite seeing cartoon cats on the TV (remember Top Cat or Garfield?) often sat next to the carcasses of fish, it's highly unlikely cats ever ate fish as a part of their natural carnivorous diet.

Why? Because domestic cats, as opposed to dogs, originated from the savannah where, for example, lions live now. In this environment, fish would be in very short supply!

Join David Gardner, Professor of Physiology in the School of Veterinary Medicine and Science at University of Nottingham, for his online talk 'Why do cats eat fish?' on Thursday 11 February, 11am.

More details about the event, and how to join at www.nottsfosac.co.uk

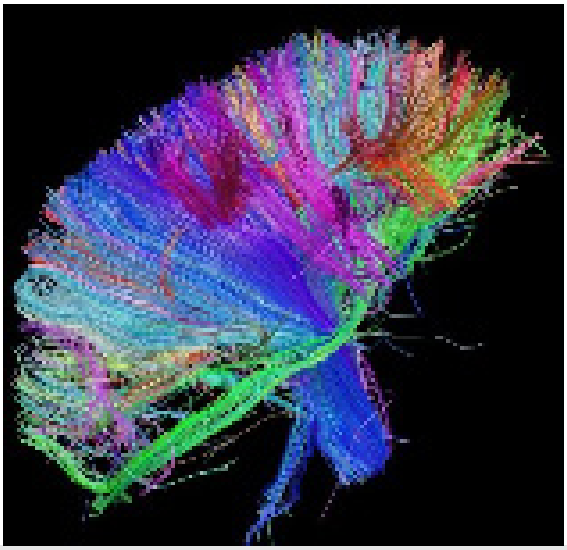
ANSWERS:

1. c – that's a lot of cows! 1 for every 28 people.
2. a – that's a lot of milk, but did you know that a whopping 1,000 litres of water is needed to make 1L of milk from a cow. This is for cows to drink and to wash milking parlours, lorries and equipment.
3. b – that's a lot of poop, AND did you know that the impact of cows on global warming is roughly the same as fossil fuel vehicles, through cows' burps!
4. a - that's a lot of energy - and all from cow poop!
5. b - so should we all keep a cow in the back garden? What do you think?

MIND UPLOADING - THE SCIENCE BEHIND THE SCIENCE FICTION

Imagine a world in the future when you could upload your mind perhaps to a super-fast computer. You might also be able to put your mind into a robot body. Sounds like Doctor Who doesn't it?

However, in the real world, billions of pounds are being spent on research into how to copy the human brain. Many scientists believe that our thoughts, feelings, memories, as well as our sense of who we are, are held within our brains. Not everyone agrees with this view and we will have to wait many years to see who is right.



Thanks to support from the UK Research Councils and the Carboncopies Foundation, the research team at the Horizon Centre for Doctoral Training at the University of Nottingham are looking to explore mind uploading. For example over the next year or so we will be running different projects finding out what you and other people know about mind uploading, how you feel about it and what it might mean if it becomes reality in the far future. Don't worry we won't put you in a lab, plug you into a computer and copy your wwbrain. We are still looking at ways that you can participate but it might include taking part in a discussion or workshop and other interactive activities like making a collage or helping to write a story.

If you would like to be included on a list of potential participants please email your name and say that you would like to be on the mind uploading research panel. You can take part if you are under 18 but you will need your parent or guardian's consent, so they need to be copied into the email.

Contact:
angela.thornton@nottingham.ac.uk

A TREAT FOR YOUR BRAIN

Find the words hidden vertically, horizontally, and diagonally within the grid. Try to remember them when you join us for an experiment at our live session!

SOUR	BITTER	HEART
SUGAR	CAKE	HONEY
TART	CANDY	NICE
TASTE	CHOCOLATE	PIE
TOOTH	GOOD	SODA

K A C S T Q J M I A F O O J P J B P C T
R C W X Y O U Z A A A H T E V C G O O D
W E J E L I O S U U B E A Q Z V K F T M
R J M A C J T T S O Z C R G Z L H E B V
P T Y G N H G K H B I T T E R C E Z Y W
F C E N K Z O T I B U R L L S Q O E T D
C X E Q D Z W D Z A A Z C V H R N S F S
N C K E I W J L J E C C A B A O O S F N
N D K Z Q P V B H S H D N O H X Y U O Z
X B P G B O K M I M O P D Y N P T G N X
E J X U N I R X N S C N Y Q E A W A P J
D K A N G T W D O O O D E H N I U R K L
C P K K Y V U E E D L N D T D I O A R Z
A I A E B M H A P A A D J M Z R C H Y D
K O A I F L P V H I T G D T A S T E A Q
E H V U H H W R I G E E G H Z T S O U R
I K L G P S K Y Q E E A V J P R X I L T
P W D H H F Y J Z Y D Q N M V D B E C W
M G F G X S N U F K K O O H C V Z H W S
S C E J E I O O R N E W N W U O T Z Q S

Catch psychologists Ifegenia Constantinou and Hannah Wright on Monday 8, Tuesday 9, Wednesday 10, Friday 12 and Monday 15 at 12.30 - 1pm for virtual Daily Brain Tricks. More details on the festival website.

YOUR FESTIVAL READS

If you are after reading inspiration to spark your curiosity, check out these specially selected books, there's something for everyone.

"The important thing is to not stop questioning. Curiosity has its own reason for existing."
Albert Einstein

If you're not already a member of Nottingham City Libraries it's free to join and it only takes 5 minutes to sign up online: www.nottinghamcity.gov.uk/joinalibrary

Baby Books - because it's never too early to learn and be curious!

Baby Robot explains…. Rocket Science by Dawn Sirett, illustrated by Victoria Palastanga (Dorling Kindersley)
Baby Robot wants to fly to the moon so their friend Rose-bot tells them about rocket science. A fun book introducing science vocabulary and big ideas.

Zoology for Babies by Jonathan Litton, illustrated by Thomas Elliott (Caterpillar Books)
Babies will love learning all about animals, their homes and habitats in this Baby 101 Science book.

Children's Picture Books - to inspire future inventors, thinkers and dreamers

Look Up! – Nathan Bryon; Dapo Adeola (Puffin)
Science-mad Rocket is going to be the greatest astronaut that has ever lived but her first challenge is how to get her brother to stop looking down at his phone and look up to the stars instead! Winner of the Waterstones Children's Book Prize 2020, this inspiring picture book about space and the wonder of the natural world will inspire all who read it.

Here we are: Notes for living on Planet Earth by Oliver Jeffers
So you're just learning about the world but what's it all about? Bestselling author and illustrator Oliver Jeffers seeks to answer lots of questions about what makes the planet Earth like it is and how do we go about living on it, in his own unique style.

Adult Non-fiction - to inform, inspire and entertain

Humble Pi: A comedy of Maths errors by Matt Parker
Maths is really useful when it is correct but what happens when it goes wrong? Join the author as he recounts tales of mathematical mistakes with sometimes funny, and sometimes disastrous consequences. A very funny and entertaining book with some useful information thrown in!

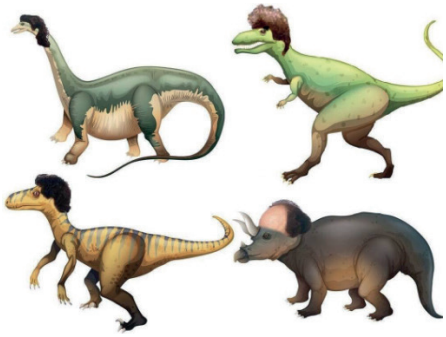
Letters from an Astrophysicist by Neil deGrasse Tyson
Every year Neil deGrasse Tyson, one of the most influential scientists, receives thousands of letters from people seeking understanding, meaning and truth. In this selection of letters read his funny and wise replies and get an insight into his passions, doubts and hopes for the universe.

SCIENCE IN THE NEWS

By the YouNG Project

Dino Dandruff by Ben

A few days ago some scientists whilst digging for dinosaur remains found small flakes like pieces of dinosaur skin embedded in rocks, so they have now come to the conclusion that dinosaurs had dandruff. It is also known that there is no way for dinosaurs hair to be preserved for long enough that we would know it is there, so dinosaurs could technically have hair also, and they could look like this!



Global Warming by Morgan

This can be a very controversial topic to talk about. As a reader you may think about the following questions:

- Isn't it the same as climate change?
- How can I help?
- Why does it matter?
- What are the impacts of it in the future?

Well I am going to explain all these in this article.

Firstly, global warming and climate change are not the same thing. Climate change is a change in global or regional climate patterns, whereas global warming is a gradual increase of the earth's overall temperature.

Global warming matters because the increase in cardon dioxide emissions means that plants are over crowded with carbon dioxide and can't keep up with it by photosynthesising. That impact includes:

- Tropical storms distribution and intensity will increase but the frequency may decrease
- The holes in the ozone layer become bigger
- It doesn't mean that all countries will get hotter, some like the UK may get colder and more rainy.

Now you may be asking "What can I do to help?". You could do many things. These things include:

- Reducing your carbon footprint
- Walking/cycling more instead of increasing the CO2 emissions coming out of your car
- Using less plastic
- Reusing more things and maybe buying reusable items such as reusable food bags and a water bottle.

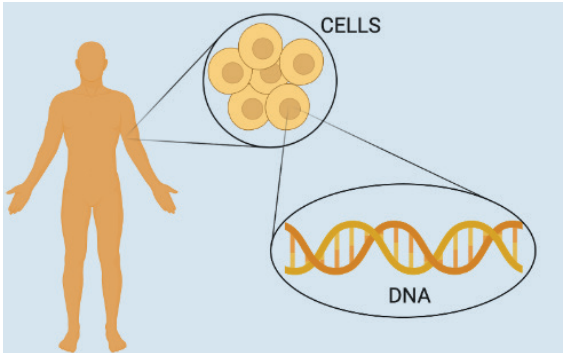
Will doctors be able to cure sensorineural hearing loss?

Sensorineural hearing loss is hearing loss in the inner ear due to damaged hair cells or nerves. There is currently no cure for sensorineural hearing loss, and the best option to improve hearing is by wearing aids. It can be caused by lack of oxygen at birth or viral infections e.g. measles. Damaged ears can also be caused by a blow to the head or exposure to extremely loud noise, such as explosions. A lot of diagnoses are made through audiometry (the science of sound), your diagnosis can be moderate, severe or profound. It is classed as disability. Prognosis hearing loss generally remains the same over time. It is also permanent, you also wear hearing aids which help improve hearing and speech.

AMAZING DNA

What is DNA?

DNA or Deoxyribonucleic acid is a molecule present in all our cells and that provides the information needed to keep our body working properly and to build a brand new organism from scratch. The DNA molecule looks like a microscope ladder that has been turned and twisted many times into a spiral, which we call a 'double helix'.



Why DNA is important?

DNA is like a recipe book that contains all the information needed to make all living things from bugs, spiders, cats, humans and trees. Each recipe of this big cookbook of life is called a gene. Genes are what determine our characteristics and traits such as our height, the colour of our eyes or if we can roll our tongue!

Unfortunately, sometimes DNA can be damaged and mutated and this can leadto many different diseases like cancer, heart disease or dementia, depending on which gene in the DNA is damaged.

Want to learn more about DNA?

Please join Mattéa Finelli from the University of Nottingham for a live online session on Wednesday 17 February 11-11:30am, where we will be making "DNA bracelets" whilst learning more about DNA, genes and mutations. Bring your questions about DNA and we will be happy to answer them during the session.
Book online via the Festival website and you will be sent a package of different coloured beads, elastic, instructions and the log-in details for the Zoom call for the session. Packs will contain resources to make four bracelets. There are limited number of packs available so book early to avoid disapointment.

Back Garden Scavenger Hunt

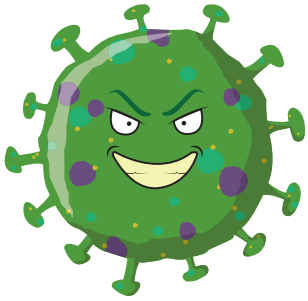
Although it's winter there's still lots of nature to look out for all around you.
Explore your back garden or local park to see how many of these you can find!

1. Five different types of leaves
2. Three different flowers
3. A beautiful rock or pebble
4. Something with six legs
5. Something that begins with the first letter of your name
6. Something with eight legs
7. Something that flies
8. Some lichen
9. A feather
10. Some moss
11. Something hairy
12. Three different types of seeds
13. Something man-made
14. Something that makes a noise
15. Something straight
16. Something hollow
17. A drawing of something unusual
18. A tree rubbing
19. Something that's been nibbled
20. Something you've never seen before
21. Something that you only see this time of year
22. A map showing where you found everything
23. An idea for helping nature

MICROBES: THE GOOD, THE BAD AND THE USEFUL

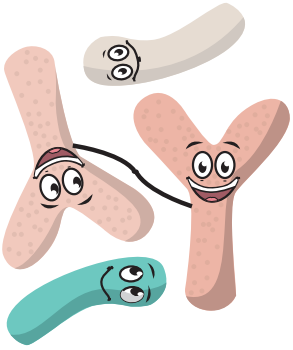
Shelly Kelly - The Synthetic Biology Research Centre Nottingham

Microbes are tiny living things, so small that we can not see them with our naked eyes. They live all around us, in water, in soil, in the air and even inside us!
There are different types of microbes - bacteria, viruses and fungi. Microbes can be good, they can be bad and they can be useful!



BAD MICROBES

Let's look at the bad guys first. I bet everyone can think of a bad microbe - the bacteria like Salmonella that make you sick, or the virus like the Rhinovirus that gives you a cold (or even the Coronavirus that we've all heard a lot about).

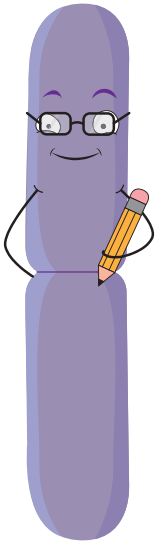


GOOD MICROBES

What about the good guys? Lots of microbes are really good, from bacteria that live in our intestines (like Bifidobacterium longum) that help us to digest our food, viruses like the latent herpes virus that can help our bodies identify cancer cells, to the mould that produced penicillin, discovered in 1928 by Alexander Fleming (he found it growing on some agar plates he had forgotten about when he went on holiday!).

USEFUL MICROBES

Now what about the useful? Well they really go hand in hand with the good. Here you have things like the bacteria Lactobacillus Bulgarias that is used to make yogurt, yeast (more about that later) that is used to make bread, the bacteria Clostridium Sporogenes that can be used to take drugs to the centre of cancerous tumours (SBRC CDEPT).



You also have some that can make useful things out of waste; this is what some researchers at the SBRC Nottingham are looking at. One of the bacteria we work with is Cupriavidus Necator, a bacterium found in soil and water. We can use Cupriavidus nectar as a factory to convert greenhouse gases into chemicals we need every day like 3HP (to make things like biodegradeable plastic, paint and varnish).

Let's looks at yeast. Yeast falls into the fungi category of microbes. Yeast has been used in bread-making as far back as Egyptians some 5,000 years ago - they thought whatever was causing the bread to rise was magic! In 1857 Louis Pasteur discovered that yeast was responsible for the rise due to fermentation (he also created the first vaccines for rabies and anthrax!). Fermentation is when yeast converts sugar into ethanol and carbon dioxide, causing the bubbles you see in bread dough.

You can learn more about the work we do at the SBRC at www.sbrc-nottingham.ac.uk
We've also made a video about doing your own fermentation for you to watch and then try yourself with household ingredients.

EAR FACTS

From the Nottingham Hearing Researchers

'Ear 'ear! If a tree fell down in a forest and no one was around to hear it, would it make a sound? Well, it depends on what we mean by sound. Is sound physical, something that happens outside the body? Or is sound something we sense to understand what is happening around us? Can it be both? We listen with our ears. But how? Do our brains get involved? Does what we see affect what we hear? And just what on earth is earwax for? To find out the answers to these questions and more, you can:

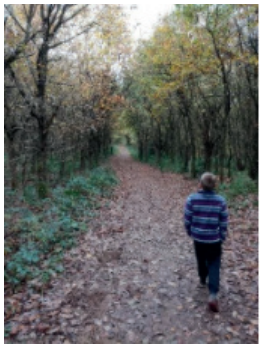
- Join us in Hearing Sciences at the University of Nottingham & the Nottingham Biomedical Research Centre on our website: www.nottingham.ac.uk/go/Ear-facts to learn lots about hearing and try some fun activities.
- Look out for our live events during the festival
- Follow us on Twitter @hearingnihr and @UoNHearSci and on Facebook @hearing.nihr
- Subscribe to our new channel 'Ear facts' on Youtube.

Got a burning question you'd like to ask us about sound and hearing? Ask us at: https://bit.ly/2K6f2Fb and we'll answer your question or similar ones on our ear facts website as soon as we can.

Scan me to see more ear facts!

Going on a sound walk

Next time you go to the park or take a walk in the woods, take some time to listen to the sounds around you. What can you hear? Can you hear different bird calls? Do you hear the wind? Can you hear someone kicking a ball or laughing? Can you hear a bee buzzing or are you lucky enough to hear a frog croaking at the pond? What about the rustling of your coat as you move your arms? Can you tell how far away things are by the sound? Can some sounds make you feel happy? Next time you are out, count how many different sounds you hear.



Bear Stories

What do we know about bears? You might recognize them as teddies, but did you know real live bears once lived in Nottinghamshire?
Archaeologists Hannah O'Regan and Lizzie Wright will be exploring Nottinghamshire's extinct animals as part of Wollaton Watch – keep an eye out for giant wild cows, woolly mammoths, and other long-lost but very definitely real creatures. We can tell a lot about an animal by looking at their bones and teeth - their age, size and whether or not they were eaten. But there are other things, such as our relationships with them, where we have to rely on other evidence such as pictures and stories.

One such story is about the real Winnie the Pooh. Winnie was a Canadian black bear who was an army mascot and was loaned to London Zoo when her regiment went off to the First World War. When her owner returned, he donated her to the zoo, where she lived until 1934. She was such a friendly bear that people were allowed to feed her, and one of those who visited was Christopher Robin, the son of writer A. A. Milne. When his father was naming the bear that lived in the hundred acre wood, Christopher suggested he call him Winne the Pooh, after Winnie from London Zoo.
There are lots of stories where bears and people intertwine – can you think of any? Or maybe you have a teddy bear? Have you ever wondered why we give stuffed versions of a very large and well equipped predator to our children? Tune into Wollaton Watch and join us in our very own Teddy Bears Picnic to find out!

SCIENCE STORYTIME WITH STACEY

Friday 12 February 6pm

Tune in on @NottinghamLibraries Facebook page for a special picture book reading for the Festival. Don't worry if you can't make the exact time as the video will be available for catch up for a week.

STORIES AND RHYMES FOR LITTLE ONES

Wednesday 10 February 11am

Join Shelley in a fun session for under 5s with a science-themed story and some rhymes. Head over to @NottinghamLibraries on Facebook to watch.

THE UNKNOWN CLIMATE CHANGE FIGHTER

What is a peatland?

Peat is a type of soil made of dead plants that haven't completely rotted, it's formed in wet conditions and takes thousands of years to form. Peatland environments are a unique biodiverse habitat that are an excellent store of carbon, which means we can trap the carbon dioxide that's released into the atmosphere through the burning of fossil fuels.

Worldwide, peatlands represent only 3% of land but contain more than 20% of all carbon on the planet, however this wonderful carbon store is at risk. Our use of peat for gardening and for fuel is destroying peatlands. Carbon that has been stored for over 10,000 years is released back into the atmosphere, increasing greenhouse gases and making climate change happen faster.

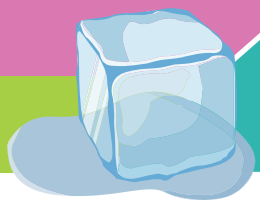
Wind farms are built to provide a source of renewable energy, but this can also destroy peatlands. Clear examples have been seen in Spain where peatlands have been destroyed to build wind farms. Instead of being good for the environment because it's a renewable source of energy, the impact of building them in peatlands mean the overall result is actually bad.

However, we still have time to understand this habitat and follow three simple steps in order to reverse this damage: protect, restore and fund. We must protect peatland, so that carbon remains trapped in the ground. We need to restore our peatlands, and reverse the current ongoing degradation. We need to fund research and projects to improve our chances of maintaining peatland.

Dr. Guaduneth Chico Lecturer in Environmental Sciences & Geographical Information Systems at Nottingham Trent University

Find out more about Peatlands in our virtual panel event `What does the research say? Sustainability, Tuesday 16 February 5.30 - 7pm. Details on the festival website.

THE FROZEN ARK



THE FROZEN ARK

How Many Animals Can You Fit In A Fridge?

Animals are going extinct at a really fast rate and sadly this is mainly due to human activities. The Frozen Ark is a charity based at the University of Nottingham and has aims of saving the DNA and cells of animals that are under threat of extinction before they disappear althogether. The Frozen Ark DNA and cell samples are frozen and stored at very low temperatures in a biobank, which is a giant freezer or stored in Liquid Nitrogen. When the animals become extinct, all the information stored in their DNA and cells disappears with them! The samples can be used by researchers so they can protect animals from extinction and increasingly can also be used in wildlife conservation. Find out more about what we do at www.frozenark.org

THE FROZEN ARK EMOJI GAME

1. 🦘🐀
2. 📯🦎
3. 👍🛣️🏃‍♀️
4. 👱‍♀️🦉
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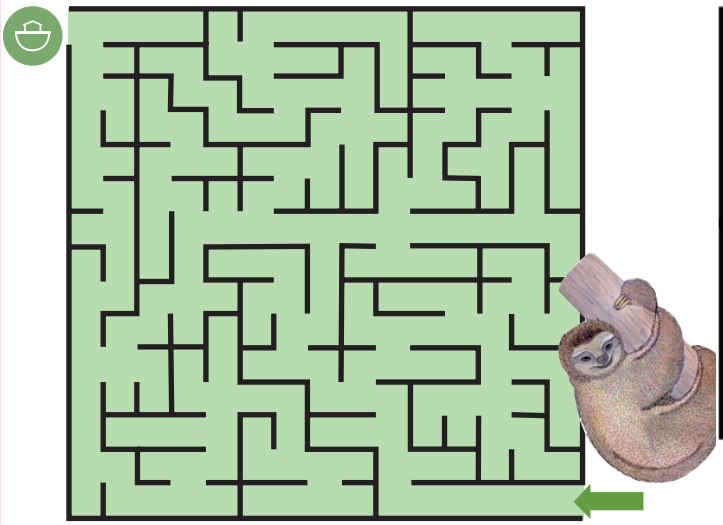
ANSWERS

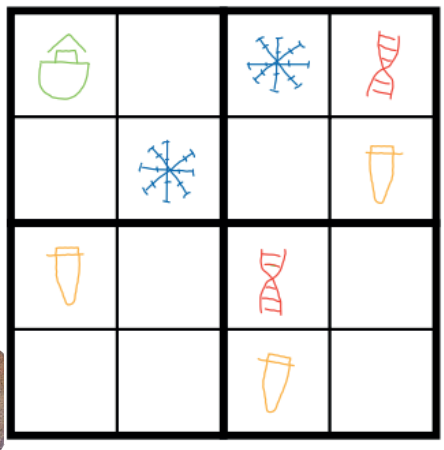
1. Kangaroo Rat
2. Horned Lizard
3. Greater Road Runner
4. Elf Owl
5. Dung Beetle
6. Desert Fox
7. South African Lion
8. Deathstalker Scorpion
9. Rattlesnake
10. Death Valley Pupfish
11. Chameleon
12. Hyena
13. Desert Tortoise
14. Armadillo
15. African Buffalo
16. Mountain Zebra

THE FROZEN ARK MAZE

Can you help the Three Toed Sloth get to its home?



THE FROZEN ARK SUDOKU



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