

EVENTS 6TH - 17TH FEBRUARY 2023 www.nottsfosac.co.uk



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Welcome to the Nottingham Restival of Science and Curiosit

We're really pleased to be back for our eighth festival, bringing out science from behind closed doors and into everyday lives, starting conversations about what makes us curious and coming together to find the answers to our most burning questions!

The festival is taking place over two weeks, with the first week focusing on activities in schools and colleges and the second week out and about with events all over Nottinghamshire.

Our schools programme includes a Secret Science show at Wollaton Hall where pupils will be hearing from researchers about Urban Nature and the Real Science in Schools Symposium at the Council House, where pupils will showcase their own science research projects. There will be Curious Open Days at Newark and West Notts college, workshops about pharmaceuticals, engineering and biomedical science at Nottingham College, Colonel Frank Seely School and Queen Elizabeth's Academy. All this and more including activities about soil science, product design and kites in primary schools across the city and county.

Our public programme reaches far and wide, and over the half term, families across Nottinghamshire will be able to drop in to our 'Science Fun Days' where you'll be treated to hands-on activities about physics, plant science and chemistry. You can book onto workshops about neuroscience, food science and slime, as well as heading into an inflatable planetarium, see a maths show and go on a walk bringing together engineering and nature.

In your hands you have our Festival Magazine, which features articles, puzzles and activities written by scientists, researchers and experts about a wide range of topics. There should be something to pique everyone's curiosity.

We hope you find something to get involved with over the two weeks, and we look forward to seeing you out there!

Find out all the latest information via our website www.nottsfosac.co.uk or by following us on social media

@NottsFOSAC



BASSETLAW Bassetlaw Museum Bridge Skills Hub Bassetlaw Museum Worksop Library Langold Library Retford Library

NEWARK & SHERWOOD

Bilsthorpe Library Blidworth Library Museum of Timekeeping Newark Palace Theatre Southwell Minster Bean Block

See colour-coded events pages 5-9 for events in each area

NEWARK 8

SHERWOOD

GEDLING

BASSETLAW

GEDLING

Woodthorpe Library Burton Joyce Library Arnold Library

<u>Saturday</u>

Science Fun Day

Meadows Library 10am - 2pm

Hands on fun science actviities in your local library.

The Secret Science Show

Wollaton Hall I Iam - 3pm

Exciting STEM activities linked to the galleries and museums, including talks.

Hands-on Science

Nottingham Industrial Museum I Iam - 3:30pm

Exciting STEM activities linked to the galleries and museums.

Women In STEM

Green's Windmill & Science Centre

Times -TBC

Science Fun Day

Mansfield Library 10am - 2pm

Hands on fun science actviities in your local library.

Home Zero

Mansfield Museum 10am - 3pm

Children and families take centre stage in reimagining a climate-safe future.

Slimes & Spells

Bilsthorpe Library 10am - 10:45am & 11am - 11:45am

Make maths fun with Maths Blast!

Art Club

Blidworth Library 10:30am - 12pm

Crafty, creative activities exploring STEM.

PlacentArt

City Arts Ipm - 4pm

Learn about the placenta through lino-printing.

Amazelabs

Bassetlaw Museum 10am, 11am, 12pm & 1pm

Crafty, creative activities exploring STEM

Unbelievable Science

Lakeside Arts Ipm & 3:30pm Æ

Family Fun science show at Djanogly Theatre with Morgan & West

Sensory Nature Walks

Bennerley Viaduct 10am - 11:15am & 2pm - 3:15pm

Families explore the nature surrounding the Viaduct.

KEY

- Drop in Activities
- Bookable Activities
- Paid Activities
-) To Be Confirmed

Please check nottsfosac.co.uk for further information and booking details.



Wednesday

Home Zero

Tuesday

Mansfield Museum 10am - 3pm

Children and families take centre stage in reimagining a climate-safe future.

Science Fun Day

Bridge Skills Hub I 2pm - 2pm

A variety of fun hands on STEM activities.

Playdough Circuits

Bridge Skills Hub 10am - 10:45am & 11am - 11:45am Create your own circuit in this hands on workshop.

World Of Science

Lakeside Arts 10am - 12pm

An interactive and curious science workshop for children.

Slimey Science

15

Green's Windmill & Science Centre Ipm - 4pm

Slippery experiments with NTU physics.

Science Fun Day

St Ann's Library 10am - 2pm

Hands on fun science actviities in your local library.

Sensation Station

Kirkby Library 12pm - 1pm & 2pm - 3pm

Fun sensory workshops.

Home Zero

Mansfield Museum 10am - 3pm

Children and families take centre stage in reimagining a climate-safe future.

Build Your Own Robot

Mansfield Museum 10am - 12pm & 1pm - 3pm

Workshops with Cobot Maker Space.

Ministry of Science

Newark Palace Theatre 7:30pm

Dive deep into the world of science.

Animation

Basseltlaw Museum 10am - 12pm

Stop-motion animation activity.

Sensory Nature Walks

Bennerley Viaduct 10am - 11:15am & 2pm - 3:15pm

Families explore nature surrounding the Viaduct.

Information correct at the point of printing. Please check our website for further information and updates - nottsfosac.co.uk



Home Zero Fractal Fun Burton loyce Mansfield Museum Library 10am - 3pm 10am - 10:45am & 11am - 11:45am Reimagining a climate-safe future. Make maths fun with Maths Blast! Friday Home Zero Mansfield Museum 1 10am - 3pm Reimagining a climate-safe future. Science Fun Day Dales Library **Sensory Nature** 10am - 2pm Walks Hands on fun Bennerley Viaduct science actviities in 10am - 11:15am your local library. & 2pm - 3:15pm Families explore **Slimey Science** nature surrounding Green's Windmill the Viaduct. & Science Centre Ipm- 4pm **City Of Dreams** Lakeside Arts Slippery experiments with 10am - 11am NTU physics. & 11:30am - 12:30pm Secrets Behind Repurposing, **Forming Memories** reusing and recycling to create a city of the Arnold Library future. 10:30am - 11:30am & 12:30pm - 1:30pm Home Zero Learn about memories Mansfield Museum in these workshops 10am - 3pm with University neuroscience students. Reimagining a climate-safe future.

A

You Are Visiting An Aquarium

You are visiting an aquarium. It's the first time you see a Tiger Shark, you don't know what it is, and you ask your parents...

Your parents tell you it's a shark.

680,680

The next time you go to visit a different aquarium with your teacher and there is a Bull Shark. You ask your teacher what it is...and they reply it's a shark.

You repeat this process a few times when you go to multiple aquariums. After a few times, when you see a shark, will you be able to tell it's a shark?

This is exactly how we teach computers to identify an object in the data that we give to the computer. The computer can even make some predictions for the future according to the patterns or relationships they can find in the data.

My research consists of using computers to look at some specific data (a huge amount normally) and predict how much energy is being produced on wind turbines or being used on oil platforms. Using these predictions, we can control and improve the production of energy or the use of energy for these systems. This can help to combat climate change and can play a role in saving our dear planet Earth.

Written by Khivishta Boodhoo



GLOSSARY Bull Shark - Commonly found worldwide in warm, shallow waters along coasts and in rivers.

Tiger Shark - A large shark. Found in tropical and warm waters, especially around central Pacific islands.





Marine biologists study the fascinating animal, plant and microscopic life in oceans. An estimated 80% of all life on earth is found under the ocean surface!

Plants and animals act as indicators of the effect of human activities on the planet, including pollution and climate change.

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BRAIN JOURNEY WHAT IS A NEURON?

Think of a Neuron like the local postman but instead of delivering letters to houses, the Neuron delivers information and messages around the brain and from the brain to your nervous system. Now if we think of the brain like a computer, a Neuron relies on electrical impulses and chemical signals to send all of the different information and messages to all of the different locations.

Myelin Sheath: my-lin sh-ee-th Acts like a jacket for the axon which protects it and helps speed up the messages it passes along.

Neuron: new-ron The cell of your brain and nervous system that carries 'messages' through an electrical process

> Cell: sell Very small building blocks that make up everything that's alive.

Nerve Ending: nur-v end-ing The finish line where the final message from the neuron is released as a chemical which travels to the next neuron

Angus

YAY!

I now?

has arrived at the Cell Body which is the control centre which tells the cell what to do. It can process the messages so they can be processed for the Axon.

Welcome to the Cell body. I have The key a message worked! for you to Where am take over to the Axon.

Angus is nearly at the end of his journey. He's found himself in the Axon which is like a corridor where the messages can be passed down to the final part of his journey. With some

help from Thank you Angus! the myelin, we can send this off

me!

super fast!!

Sheath

I have a special message, wait for

Angus has finally made it to the Nerve Ending, which is the end of his journey in the neuron. At this point, the message has been processed and is ready to be send to the next neuron friend.



Tortoiseshell Cats

Tortoiseshell Cats are all female and one of a kind thanks to 'X-Chromosome Inactivation'

Ever wondered how some cats you see are a mixture of black and orange patches? All of these cats are female, and their fur pattern is unique thanks to a process called 'X-Chromosome Inactivation'.

Chromosomes are like big noodles in every cell of your body, made up of 'DNA'. Both you and that cat have chromosomes in pairs. Genes are hidden in your chromosomes with different "flavours". These flavours are called 'alleles'. You may have brown hair, while your friend has blonde. This is because you have different alleles of the hair colour gene.

Males have an X and a Y-chromosome while females have two X chromosomes. How can females have two X-chromosomes and males only one? Like a light switch, one is turned off, leaving only one turned on. Which chromosome is inactivated is random, just like flipping a coin.

The fur colour gene in tortoiseshell cats is found on this X chromosome, with alleles for orange and black fur. If the 'orange' allele chromosome is turned off, and 'black' allele chromosome turned on, the fur in this area will be black. The opposite would give an orange patch. The random choice of which chromosome is turned off is what gives the unique appearance.

GLOSSARY

Inactivation - To make inactive or to stop a process from working.

Chromosomes - Acids and proteins found in most living cells, carrying genetic information in the form of genes.

Unique - Being the only one of its kind; unlike anything else.

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Alleles - a variation of a sequence of nucleotides on a DNA molecule

By Connor Levers, Scientist at Sygnature Discovery

Spinning Around

Around 7000 years ago, people began to make clay pots. Doing this by hand takes time and people looked at ways they could make pots more quickly.



They invented a machine to help, called a Potter's Wheel, which had a circular flat plate (a wheel) connected to a cylinder (an axle) at its centre. The first machines were heavy and took a lot of effort to use. It took another 1000 years to make a Potter's Wheel that was easy to use!

We still use "wheel and axle" machines today and the design has barely changed. Can you think of any examples?



Cylinder - (syl-in-der) - two circular shapes joined by straight parallel sides.

Binary Birthdays

Here's how to a "magic" trick with numbers

- 1. If your birthday falls on the 22nd, you will choose cards 4, 2, and 1.
- 2. You add up the first number printed on each of those cards.
- 3. In this example, the numbers are 16 (card 4), 4 (card 2), and 2 (card 1).

This equals: 16 + 4 + 2 = 22 The example birthday is the **22nd**

Note that the first number on cards 0 to 4 are in order: 1, 2, 4, 8, and 16. Notice the doubling pattern? These numbers are called **powers of two**

This technique works for any number between 1 and 31. Why dont you try it?

Why does it work?

When you select cards containing your birthday you are in fact writing the number in 'binary.'... Surprised?

The numbers we use day-to-day are written using ten digits from 0 to 9. This is called 'decimal'; where each place in the number is worth units, tens, hundreds, thousands, and so on.

These numbers are powers of 10, 10², 10³...

So for example, 546 in decimal stands for 5 hundreds, 4 tens, and 6 units.

Using binary:

In binary we only use 0's and 1's, and each place in a number is worth units, twos, fours, eights, and so on, doubling every time. For example, the number eleven in binary is **1011**

1 unit plus 1 two plus 0 fours plus 1 eight, so 1+2+8=11.

The fundamental thing is that any number between between 1 and 31 has a unique binary sequence of 0's and 1's. Since we're using 5 places to write a number, all possible strings of 0's and 1's from 00001 to 11111

give you 31 different possibilties!

Card 0	Card 1	Card 2
1 3 5 7	2367	4 5 6 7
9 11 13 15	10 11 14 15	12 13 14 15
17 19 21 23	18 19 22 23	20 21 22 23
25 27 29 31	26 27 30 31	28 29 30 31

Card 3	Card 4
8 9 10 11	16 17 18 19
12 13 14 15	20 21 22 23
24 25 26 27	24 25 26 27
28 29 30 31	28 29 30 31

Doubling pattern - The sequence of powers of 2 (e.g, 1, 2, 4, 8, Technique - (tek-neek) - A process or routine Containing - To have or hold something or someone Worth units - The value of a unit (e.g 0-9) Binary - Having two parts (ones and zeros!) Fundamentals - (fun-da-ment-al) - An important property

A CURIOUS CHALLENGE..! By Civil Engineer Paula McMahon



My name is Paula and I am a Civil Engineer. Civil Engineers help build the world around you and that includes bridges, roads and buildings. In doing this we have used lots of materials and we want your help to think about how we can use materials that will otherwise be thrown away as waste.

My curious challenge to you is to find what you can around the house and build me a bridge.

Send photos if you wish, for us to share on our website to: we.are.engineering.together@gmail.com

Remember - Stay safe

- Don't climb onto a homemade bridge unless an adult says it is safe.
- Ask first before using anything from home to build your bridge.
- Only use tools if an adult says it is ok and is supervising you.



DECK (d-e-k)

The deck of the bridge is the roadway or walkway of the bridge and is the main surface.

ANCHOR(an-k-or)

Bridge anchors are normally solid rock or concrete blocks in which the bridge is attached to the ground.

PIER (pee-er)

A bridge pier is a type of structure that extends to the ground below or into the water to support the bridge.

SPAN(S-pan)

The length of a bridge from one end to the other.

An Introduction To The Mind



With Dr. Christine Norman

Do you ever find yourself wondering why people act in a certain way? This question is what Dr Christine Norman, a psychologist, aims to answer.

Christine started out working as a nurse, but due to her work in a mental health ward, she soon found her true passion was psychology. Psychology is a form of scientific study which looks at the human mind and emotions so that scientists can better understand why people behave differently.

Christine specialises in Forensic psychology- this is the study of people that commit crimes - to better understand the thought process of people that leads to them committing crimes. This means that we can prevent people from doing crimes and offer people treatment to change their ways and ultimately turn over a new leaf.



FUN FACTS ABOUT CHRISTINE

- Her favourite book is 'The Happiness Hypothesis' by Jonathan Haidt
- Her favourite film is The Matrix
- Her favourite psychologists are Belinda Winder and Brené Brown

FUN PSYCHOLOGY FACTS

- Psychiatrists mostly prescribe medicines, but psychologists work with patients through therapy.
- Most of your decisions aren't actively made, your brain makes the decision for you, these are impulses.

IMPULSE CONTROL

Impulses are when our brains make decisions for us, this is totally normal and everybody will experience this, here are 3 ways to limit impulses:

- 1. Before making a decision, take five deep breaths and question what you are going to do.
- 2. If you are stressed or angry, take time to yourself and do something you love to help you cool down as we make bad impulses when we feel like this.
- 3. Do Martial arts! These often give you the discipline that may come in handy when limiting impulses.

What is...? PSYCHOLOGIST: (si-kol-o-

jist)

a professional who helps people learn healthy ways to handle mental health challenges

FORENSIC: (for-en-sik)

scientific tests or techniques used in connection with the detection of crime

IMPULSE: (im-pul-s) a sudden strong urge or desire to act **DISCIPLINE: (Dis-i-plin)** being able to behave in a controlled way

Dynamic Aerodynamics

Can you fill in the blanks using the spaces below, to find out all about the Typhoon?

The Eurofighter ______ is a twin ______ engine fighter aircraft capable of speeds of up to 1320 miles per hour. It can go from brakes off to take-off speed in eight ______ and brakes off to _______ speed in less than thirty seconds. It can fly at a maximum of sixty-five thousand feet and weighs eleven thousand kgs when it is empty. The ______ can carry thirteen externally mounted ______ and has an onboard cannon which holds one hundred and fifty rounds. These rounds can______ at a speed of sixty per second meaning the ______ can hold the trigger for three seconds before they're all gone!

jet	supersonic	fire	typhoon	
pilot	seconds	aircraft	weapons	

Experiment at home

Why not try building a few types of paper aeroplanes and see how the airflow over the wings changes when you change the shape? Experiment with making flaps in the front and back of the wings, shift them up and down and see what happens to the aeroplane. Why does this happen?

What Is It Like To Study Cancer?

Have you heard of cancer, a serious disease that is very hard to cure?

Often, it is not clear what causes cancer. It might be smoking or chemicals from our environment, but did you know that viruses can cause cancer too?

A virus is a tiny organism that can attack our cells and make us sick.

In my research, I looked at cancer cells from sick people and searched for a virus. I wanted to understand if the virus caused their cancer.

This information is important for scientists because if we know what causes cancer, we might be able to cure it.

I looked for the virus in the cancer cells by searching for its DNA. DNA carries the important information that enables viruses to grow and spread inside our bodies.

So far, I haven't found it - that could mean that the virus simply isn't there.

You might think that I wasted my time, but in science, it's just as important to not find things as it is to find things!

That means I can move on and explore some other ideas of what could cause cancer. This is what makes studying cancer so hard. There are many different tiny organisms or chemicals that could cause it and we have to find the ones that do. Then, scientists will be able to make better medicines for all cancer patients!

Written by Marina Nikolić

Cure - to heal or treat Virus - a tiny germ Chemicals - the different groups of things that everything is made of DNA - Deoxyribonucleic acid, the information inside a cell that tells it what to do Organism - a living thing Cells - all living things are made up of lots of cells





Glossary

0

EXPLORING DENSITY This is what you will need



What to do...

- 1. Fill the glass about a third full with water. Mix in the food colouring (blue gives a good contrast with the other liquids).
- 2. Squeeze the honey or syrup in a steady stream into the glass – it will go straight to the bottom and form another layer. Squeeze enough so the honey/syrup fills another third of the glass.
- 3. Pour the cooking oil in gently to fill the glass. It will float on top of the water.
- 4. Drop in the objects one by one: first the marble (which goes right to the bottom).
- 5. Then the grape (which goes to the bottom water layer, where it floats on the honey).
- 6. The Lego brick (which floats between the water and oil).
- 7. And the ping-pong ball (which stays right on top)

WHAT'S GOING ON ..?

Density is simply the weight of a fixed volume of stuff: how heavy a cupful is. Water is denser than cooking oil, but honey is even denser than water. So the honey goes to the bottom of the glass, then the water sits on top of that, then the oil floats on the water.

The solid objects you add have different densities, too. The marble is denser than honey, so it sinks right to the bottom. A grape is denser than water but not as dense as honey, so it floats at the boundary between them. A Lego brick floats on water but is denser than oil; the pingpong ball is the least dense of all, so it floats on the oil.

What is..?

Density (*d-en-sit-ee*): how compact (solid) an object is. Weight (way -t): how heavy an object is 2 [Volume (vol-yoo-m): the amount of space an object occupies



One third oil One third water **One third honey**

A PING PONG BALL

All you need for this experiment is a hairdryer and a ping pong ball.

Turn on the hairdryer to its highest setting and point it straight up.

Place the ping pong ball in the flow and watch it float!

WHAT'S GOING ON ?

Air moves faster around the ball. Faster air has lower pressure.

The slower air outside of the column has higher pressure. This difference keeps the ball in the air stream.

The hairdryer _____ creates the flow

IT'S HOW PLANES FLY!

The air above the wing (aerofoil) of the plane is faster than below the wing.

This causes a pressure difference and helps produce the lift needed to fly!



Meet Nicola Richards -

Your friendly biomedical scientist!

What is a biomedical scientist?

A biomedical scientist is someone who investigates what causes disease in our bodies they help doctors understand what's causing our illnesses without having to talk to patients.

Biomedical scientists just don't have the patience for patients! (joke!)



Did you know? That biomedical scientistis are responsible for

70% of diagnoses (identifying someone's illness by assessing symptoms!)

So, what exactly does Nicola do?

Nicola is a biomedical scientist who focuses on investigating blood, particularly an element of the blood called a **red blood cell.**

Red blood cells are responsible for moving oxygen around our bodies!

While working in the NHS, Nicola was responsible for testing our blood and investigating what exactly is causing an illness or disease through a series of tests. Nicola would then give her findings to a doctor who would find ways to treat that illness or disease.

Behind every doctor you will find a **biomedical scientist!**

Did you know... the human body has four different blood groups!



Fun fact!

"If I had to eat one meal for the rest of my life, it would be duck pancakes!"

Now it's time for you to become a scientist and design your own personal lab coat!



Science Is Fun At The Wells Academy

Science is really interesting and fun to learn about.

This is a bunsen burner invented by Robert Bunsen. A bunsen burner is an ambient air gas burner used as laboratory equipment.

It produces a single open-gas flame, and is used for heat sterilization and combustion.

The gas can be natural gas, or liquidized petroleum gas; such as propane, butane, or a mixture.



Elephant's Toothpaste

Elephant's toothpaste is caused by the rapid decomposition of **hydrogen peroxide**. It is commonly activated using a mixture of **warm water** and **yeast**.

How concentrated your hydrogen peroxide **(H2O2)** is will determine how rapid your reaction is, and the amount of the solution will determine the size of the bubbles.

When the reaction happens, it's extremely **foamy** like soap bubbles.

The formula for this decomposition reaction (when you add warm water and yeast) is:

H2O2 --> 2 H2O + O

First you would mix soapy water with concentrated H202, then add warm water and yeast (very rarely, potassium iodide can be used).

This causes the fascinating reaction known as

'Elephant's Toothpaste'.

Fun facts:

Did you know that biology, chemistry, and physics are all parts of science?

Science helps us learn more about our planet - and even our bodies! For example, did you know humans have **206 bones**? We also have 600 muscles!

Without science there is no human growth, no technological advances, and no knowledge generation. Without science, we would be helpless!



Did you know?

Your eyes blink around 20 times a minute!

You produce 40,000 litres of spit in your lifetime.

Your eye is your fastest muscle.

Science lab safety rules:

1. Always work standing up

2. Pay attention and listen!

3. Don't eat or drink in the lab.

4. Don't run or play in the lab.

5. Always wear safety goggles.

Confused?

Let me help!

0.,

Liquidized petroleum (lick - wi - dised - pet - row - leeum)

- Fuel used for heaters, cars, ovens, barbecues, etc.

Natural gas - A 'fossil fuel' found deep beneath the Earth's surface

Fossil fuels - Coal, oil, and natural gas made from dead plants and animals

Ambient air - (am - bi - ent) - Natural, un-polluted air

Hydrogen peroxide - (hi - dro - jen - per - ox - ide)

- A pale blue chemical, slightly thicker than water.

Why Do We Care About Space?

Space is really interesting, but why do scientists and engineers spend so much time and money investigating things not on Earth?

Well, did you know space can be used for...

Developing medicine and helping to cure cancer

Because cells grow differently in zero gravity, scientists can better understand how cancer grows in the human body and develop new cures.

Global communication

Satellites are used for mobile phone signals, providing internet signals - and broadcasting television programmes!

Detecting earthquakes and saving forests

Scientists can use satellites to scan the Earth and monitor anomalies, as well as watch for deforestation and monitor the success of conservation activities.

Predicting the weather

Satellites can see the Earth from afar, allowing meteorologists to watch storms and their development through the movement of clouds.

Stopping pirates

Satellites can look outside the range of normal human eyesight, which means they can detect people smuggling things they shouldn't across the seas.

Answering the BIG questions

Are we alone in the Universe? How did life on Earth start? There is so much we don't understand, and the more we look at space and the further we travel, the more we learn!

Anomalies - (an-oma-lee) - Something irregular or 'different' Satellites - (sat-eh-lite) - A man-made object placed in outer space. Zero gravity - No gravity = you become weightless, and you will 'float'! Predicting - (pre- dict- ing) - Trying to assume the result of an experiment.

Make your own spacecraft lander!

Engineers have helped send landers to Mars, the moon, Venus, and even asteroids for lots of different science experiments.



Now it's your turn!

Your challenge is to design and build a lander spacecraft to protect an Egg-stronaut during landing.

Things to think about:

Legs – help with stability at landing, but increase weight Parachute mechanism – slow you down by increasing drag Impact protection – provide a crumple zone and reduce the force on your astronaut

Have a go - can you make your own egg parachute spacecraft using the equipment listed below?

- 1. A raw egg
- 2. A small plastic cup or similar
- 3. A plastic bag or food bag
- 4. Bubble wrap, foam, and/or tissue paper
- 5. Pens, paper and/or card
- 6. Scissors, cellotape, and glue
- 7. Any other craft items you have available (e.g. string)
- 8. Somewhere to drop your lander from make sure this is an

area that can get messy!

How To Draw A Crab



1. Draw 2 circles and a traingle.





5. Erase the lines inside the shapes.



2. Round them out and add claws.



3. Erase the lines inside the shapes. 4. Draw the eyes, legs and pincers.



6. Draw the pupils and mouth. Decorate however you like!



Fresh Air in Nottingham

Air pollution – a mix of particulates and gases that are all around us. Did you know that switching to walking or cycling for short journeys can not only help to improve air quality but also make you healthier? There has been a lot of research showing that poor health can be caused by air pollution, and recently looking at the effects on mental wellbeing.

Here in Nottingham, we have been working on an exciting study with DEFRA Air Quality and Nottingham City Council, exploring ways of monitoring air pollution across our city using low-cost sensors. The 'Enviro-IoT' device uses a range of small, low-cost environmental sensors, inside a 3D printed box to capture changes to pollution in our environment in real time.

Early results from this work are showing us how low-cost sensors can be used to detect air pollution. These devices are part of a bigger study investigating the impact of air pollutants on mental wellbeing.



Let me help you with some of these words...

Pollution - a substance which has harmful or poisonous effects on the environment.

Particulates - a tiny portion of matter e.g - "tiny particles of dust"

Wellbeing - the state of being comfortable, healthy, or happy.

DEFRA - Department for Environment, Food and Rural Affairs

Sensors - a device which measures, records and responds to the properties of its environment.

Real time - information that is delivered immediately.

By Thomas Johnson. Lecturer in Computer Science At Nottingham Trent University. 0 0

FORMULA STUDENT

Students at the University of Nottingham are building mini-F1 cars.



We are the University of Nottingham Racing team, a big group of students who design and build electric racing cars. Our car is two-wheel-drive. That means it is powered by two motors, one in each rear wheel. The capacity of our battery is about 1/6 of a typical electric car, and it lasts for 2 hours of racing.



Every July, we compete at the Silverstone F1 Circuit with other teams from around the world. There are different races to test how fast the car is: in a straight line, in a figure of eight, and on the track. More teams are designing electric cars, like us, and this is making motor-sports greener for the future!

Did you know?

It takes lots of people with different skills to run a successful racing team. Mechanical, electrical and software engineers make the car. Designers and writers market the team to raise money to build the car. Project managers organize the team and plan the work. Maybe you can join our team in a few years!

Puzzle Time!

Cut out the pieces and complete the car

Wheel: Wide wheels are designed to have lots of grip with the road so that the car doesn't slip/ slide when steering around a race track.

Motor: Inside the motor, electricity is converted into a spinning motion to drive the wheels with lots of force ("high torque"), which makes electric cars fast off the start line.

Battery: Our lithium-ion rechargeable batteries can store a lot of energy in a small volume (they have "high energy density"), which makes the car more compact.

Roll hoop: This is part of the chassis, the solid structure of the car. It helps protect the driver and all of the parts inside the car.

Bodywork: This covers all of the parts inside, and the smooth shape helps the air glide around the car, so that it takes less energy to drive quickly.

Suspension: This attaches the wheels securely to the chassis, and is also designed to squish ("compress") to absorb the bumps in the road for a smoother ride.







Genes, not jeans!

The right fit

DNA carries our genetic information, providing everything our bodies need to function and become who we are.

Our DNA is made up of two chains of chemicals which wrap together into a spiral structure called a **double helix**.

DNA has four different bases (A, C, G, T) arranged in a pattern along the two strands of DNA.

These bases help to hold the DNA together because the bases on the two DNA strands can fit together, a bit like jigsaw pieces.

Only certain bases can fit with each other, in the same way that not all jigsaw pieces fit together.

Look at the different shapes of the bases, and draw lines to connect the ones you think will fit together!



Caterpillar

The sequence of bases in our DNA is a code to control what our body makes from DNA.

Our body uses the code in our DNA to pick the right building block to put us together properly. **Codons** are what we call a group of three bases in a row in our DNA.

Different codons, which have a different sequence form the three bases, form the code for different building blocks.

These codons (or set of **three bases**) are what our bodies use to pick each building block.

The table below shows us a code and what colour our section of the caterpillar should be for each code. Have a go at using the code underneath each caterpillar section to pick the right colour.

A TG	
Code	Caterpillar Segment Colour
ATG	Green
TAG	Pink
G G A	Orange
TAC	Purple
ССТ	Blue



Answer: 2nd Caterpillar (from right to left) – orange, blue, green, purple, pink 2nd Caterpillar (from right to left) – orange, blue, green, purple, pink



EXPLODING RAINBOWS

#amazelabathome

YOU WILL NEED ...





SCAN ME!

To see video demonstrations of other fun experiments, scan the QR code and watch on your phone, tablet or computer.

INSTRUCTIONS

- 1 Prepare your clear containers ideally do this outside on a good day or make sure to use a protective sheet as it's a bit messy!
- 2 Add baking soda to each container using a spoon. A small spoonful should do it but this does depend on the size of your container. This experiment works just as well with a small container.
- 3 Add two drops of food colouring to each container red food colouring to your first container, orange to the second, yellow to the third, green to the fourth, blue to the fifth, indigo to the sixth and violet to the seventh or the closest colours you have.
- 4 Pour your vinegar into the container.
- **5** The reaction will happen quickly so be sure to watch carefully and enjoy your exploding rainbows!

THE SCIENCE!

Baking soda and vinegar form a chemical reaction. This chemical reaction produces carbon dioxide gas which causes our rainbows to explode! The carbon dioxide gas escapes causing it to overflow the container.



REMEMBER TO ASK FOR ADULT PERMISSION AND/OR SUPERVISION WHEN REQUIRED!

We'd love to see how you get on with the experiment! Please share on social media using #amazelabathome

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amazelab 🕹 MAKE YOUR OWN LAVA LAMP

#amazelabathome





SCAN ME!

To see video demonstrations of other fun experiments, scan the QR code and watch on your phone, tablet or computer.

INSTRUCTIONS

- 1 Add the baking soda to your jar/container.
- 2 Add the oil to your jar/container.
- 3 Using another small container, add the vinegar and food colouring.
- 4 Add your vinegar solution to your oil and baking soda.
- 5 Watch as the reaction creates the effect of a lava lamp!

THE SCIENCE!

Oil and vinegar are different densities. As vinegar is more dense than the oil it sinks to the bottom of the container. When the vinegar touches the bottom it reacts with the baking soda. This chemical reaction releases bubbling carbon dioxide gas that rises, creating the lava lamp effect.



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We'd love to see how you get on with the experiment! Please share on social media using #amazelabathome

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Carbon Neutral Nottingham

In Nottingham we're doing our bit to help tackle climate change. Did you know that Nottingham is planning on being the first carbon neutral city in the UK? What does carbon neutral mean?

The burning of fossil fuels to give us energy also produces different gases, such as carbon dioxide, and these gases contribute to the effects of climate change. To be carbon neutral means that we put no more carbon dioxide into the atmosphere than we can take out, through things like trees and technology. To do this, first we must get the amount of carbon dioxide we produce as low as we possibly cap



A lot of the emissions produced in Nottingham come from people's homes. Every time we switch on everyday things such as lights, a TV, or a games console, it uses energy. Some of our energy is produced by things that don't harm the planet, like solar panels or wind turbines, but a lot of our power and heating still comes from fossil fuels. Everyone should be warm and enjoy themselves in their homes, but we also need to make sure we're not wasteful with the energy we use, so less fossil fuels are needed.

Let me help you with some of these words...

Fossil Fuels - Fossil fuels are made from natural materials e.g Petroleum, Natural Gas, Coal

Gases - a substance or matter with no fixed shape (unlike a solid) and no fixed volume (unlike a liquid).

Emissions - the production and discharge of something, especially gas or radiation.

Thank you

A huge thank you goes to everyone who's helped put the festival together this year, including our Festival Network, our partners, and everyone who's getting out there and running activities.

Thank you also to our Confetti students Fay Davies, Devon Fjeld-Jarvis, Robin Weedon and Jay Robinson for their exceptional hard work and creativity designing, illustrating and creating this years magazine, as well as the Year 7 pupils from The Wells Academy who helped us copy-edit the magazine with their feedback and ideas, through support from Read On Nottingham.

Find out all the latest information via our website www.nottsfosac.co.uk or by following us on social media @NottsFOSAC



We would love to hear your feedback on this year's magazine. Scan here to let us know what you think.



Produced by



PARTNERS





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