NOISE

New Outlooks In Science & Engineering

TEACHER INFORMATION PACK

A brief introduction to the NOISE campaign

NOISE (New Outlooks In Science & Engineering) is a UK-wide campaign funded by the Engineering & Physical Sciences Research Council (EPSRC). Initiated in 2000, it aims to raise awareness of science and engineering among young people. www.epsrc.ac.uk

EPSRC

MAKING A NOISE ABOUT SCIENCE

What is NOISE?

NOISE stands for New Outlooks in Science and Engineering, a campaign that aims to engage 14-19 year olds with science and engineering. The campaign is fronted by early-career scientists and engineers, all working in wide-ranging research and industry roles, known as NOISEmakers. The NOISEmakers endeavour to communicate the excitement of science and engineering, and the many career possibilities. The message is reaching young people loud and clear.

NOISE in the Classroom

NOISE has created a website, www.noisemakers.org.uk, specifically with Key Stages 3 and 4 in mind. It's great for students to explore and for teachers to use for inspiration. There are experiments to try at home, inspiring 'did you know?' facts, and accessibly written features on engaging and wide-ranging subjects, from eco-friendly fashion to the science of Spiderman. The website also features NOISEmakers' blogs, profiles, and career paths, and an 'Ask a NOISEmaker' section for students to submit their own science queries. The emphasis is on the practical, hands-on application of science and engineering and the links between study, research and discovery. And there's plenty to get students excited about science careers as well.

How can teachers use NOISE?

The 2007 exam figures have certainly been encouraging, but we'd all agree that science, technology and engineering subjects need continued and imaginative support. So NOISE is here to help.

NOISEmakers aren't just faces on a page. They're out and about with gripping experiments and demonstrations – here at the BA Festival and the Manchester Science Festival in October. NOISEmakers are happy to talk about curriculum-specific subjects, or discuss their science careers with pupils.

NOISE (New Outlooks In Science & Engineering) is a UK-wide campaign funded by the Engineering & Physical Sciences Research Council (EPSRC). Initiated in 2000, it aims to raise awareness of science and engineering among young people. www.epsrc.ac.uk

Background to NOISE

NOISE (New Outlooks In Science & Engineering) is a UK-wide campaign funded by the Engineering & Physical Sciences Research Council (EPSRC). Initiated in 2000, it aims to raise awareness of science and engineering among young people. www.epsrc.ac.uk

For further information contact NOISE at noise@uk.grayling.com.

NOISE (New Outlooks In Science & Engineering) is a UK-wide campaign funded by the Engineering & Physical Sciences Research Council (EPSRC). Initiated in 2000, it aims to raise awareness of science and engineering among young people. www.epsrc.ac.uk

THE NOISEMAKER 'WHO'S WHO'

Sima Adhya

Sima had childhood aspirations to be an astronaut and now spends her days modelling the movements of spacecraft around the earth. Sima loves to take to the skies in her spare time, flying single aircraft. She also entertains a passion for Bollywood dance!

Emma Carter

Emma has recently completed a PhD which focused on modelling pedestrian and cyclist accidents. She is now an engineer at the University of Birmingham's Nanotechnology Research Group. Emma is a keen musician and plays the piano, keyboard and French horn.

Michael Chappell

Michael spends his days looking into the human brain and working out exactly what is going on using a technique called Arterial Spin Labelling. When he's not poking around in your head, Michael also enjoys scuba diving.

Amanda Chmura

Amanda is an American chemist in Bath. She specialises in creating new catalysts that help make biodegradable plastics, which can be used in anything from shopping bags to ink cartridges. Amanda is also a keen gardener and grows organic veggies in her back garden.

Helen Czerski

As a PhD student at the University of Cambridge, Helen likes to make things go bang by forcing them at each other very quickly and watching what happens. Helen also loves sports and plays badminton, hockey and also enjoys diving, running and dancing.

NOISE (New Outlooks In Science & Engineering) is a UK-wide campaign funded by the Engineering & Physical Sciences Research Council (EPSRC). Initiated in 2000, it aims to raise awareness of science and engineering among young people. www.epsrc.ac.uk

Daniel Espino

Daniel literally tugs at your heart strings. As a researcher for the British Heart Foundation, he uses computer simulations and lab modelling to find new ways to fit heart valves. Daniel is a rock musician, and plays bass guitar in a band.

Tim Gabriel

Tim is a firm believer that the best things really do come in small packages! Working as a chemist in Nanotechnology he also lectures in chemistry at the University of Huddersfield. Tim's days are spent working on the creation of materials, devices and systems through controlling matter on a miniature scale. Tim is also a keen percussionist and half-marathon runner.

Jenny Goodman

Jenny aims to make all our lives a bit greener with super-efficient wind turbines. She currently works on one of the UK's largest wind turbines, improving its generating efficiency. Jenny likes to get outdoors in her spare time and go hiking or cycling.

Nic Harrigan

Nic is another NOISEmaker who really appreciates the smaller things in life. As a PhD student at Imperial College London, Nic studies quantum mechanics and tries to work out what's happening on a really tiny scale. In his spare time Nic enjoys fire-spinning and pretending to be Spiderman.

Ceri **Harrop**

Ceri wants everyone to breathe easy and her work as a respiratory disease researcher is helping to do just that. Based at the University of Manchester, Ceri looks at diseases like asthma and tries to find new ways of easing the conditions and spends lots of her time looking at mucus and slime! Ceri is a keen runner and cyclist as well as being a seasoned Sale Sharks fan.

Anna Harvey

Anna is working hard to make green the new black by creating more environmentally friendly fabric coatings. As well as enjoying fashion and design Anna spends her free time mountain biking and surfing.

Phil Jess

Belfast-born Phil uses his perfect aim to help detect cancer cells earlier. As a Biophysicist at the University of St Andrews, Phil uses lasers to trace the evolution of cancer cells with the aim of detecting them earlier, as well as looking into gene therapy and genetic illness such as Alzheimer's. Phil is also a keen skier and cricketer.

Alex Katsanos

PhD student Alex is based at the University of Surrey, working to find new and environmentally friendly chemicals which can be used to de-ice our roads. When he's not studying, Alex can be found mountain biking through the mean streets of Guildford or jamming with his band. Rock on.

Erin Komi

Originally from America, Erin is a sports technology researcher at the University of Loughborough where she investigates the effect a golfer's grip on the club will have on their shot. Erin is also a competitive basketball player and is learning Finnish in her spare time.

Kate Lancaster

Kate spends her days using VULCAN, one of the world's most powerful lasers, to see how fusion works and atoms react with each other. VULCAN is about ten million times more powerful than a regular 100 watt light bulb – that's pretty powerful! Kate loves dancing and takes flamenco lessons in her spare time.

Alex Mckie

Alex is a PhD student studying water supply in developing countries, aiming to provide safe, clean, water to the communities which can reduce disease by up to 80%. Alex travels around the world with various charities, but when she's back in England she spends her time riding around the Surrey countryside on her pink motorbike!

Vicki Murdie

Vickie is an aeronautical engineer for Rolls Royce. She looks at the safety and thermodynamics of performance engines, including those used in the Airbus A380. Vickie also enjoys playing hockey and harbours a longing for owning a pet pig!

Greg Offer

Greg is a chemist at Imperial College, London and he uses his chemical techniques to produce more efficient fuel cells. Greg has recently finished his PhD and is a keen hiker and rock climber, despite living in London's concrete jungle.

Emma Schofield

Emma is a synthetic chemist specialising in increasing the efficiency of catalytic converters. Emma spends her days in the lab creating never before seen chemicals and watching how they react with each other. Emma is fluent in French and German from her years working abroad and is also a talented viola player.

Basil Singer

Basil's roots are in engineering, although he studied for his PhD in Quantum Physics, looking at cooling atoms to absolute zero. Basil is a well-versed science communicator and appears on a number of TV shows including 'Men in White' and 'The Bullshit Detectives'. Basil likes to kite-surf, skateboard and snowboard in his spare time.

Tristan Smith

Tristan earned his sea legs at a young age and has developed his childhood sailing interest into a career designing naval boats and working out how to make his designs more dynamic and efficient. Tristan also teaches on a postgraduate course and tries to get off dry land as much as possible in his spare time.

NOISE (New Outlooks In Science & Engineering) is a UK-wide campaign funded by the Engineering & Physical Sciences Research Council (EPSRC). Initiated in 2000, it aims to raise awareness of science and engineering among young people. www.epsrc.ac.uk

EPSRC

Dan Toon

Dan likes to make things go really fast. He puts his love of sports in to action by designing performance sportswear for elite athletes, helping them move even quicker. Dan is also a keen athlete and takes part in rugby, football, mountain biking and snowboarding to name but a few.

Aradhna Tripati

Aradhna is an American geochemist at the University of Cambridge where she looks at the marine environment to see how greenhouse gases and ocean chemistry affects the earth's climate. When she's not working, Aradhna loves to cook food from all over the world and keeps fit through a combination of running, riding and Thai boxing classes!

Tom Waller

Tom is a total sports fanatic and his passion has led him to become a Sports Technology Researcher at the University of Loughborough where he looks at ways to improve top athletic performance through product design. Tom is a seasoned athlete himself and has played rugby to national standard as well as competing in the tough Ironman Triathlon.

Nikki Woolmore

Nikki is a Ballistics Specialist for the Ministry of Defence in Bristol where she helps develop intelligent armour systems for tanks and military vehicles. Nikki is a talented musician and regularly plays in a local band; she also enjoys rally driving and drag racing.

TOP TEN EXPERIMENTS TO WOW YOUR CLASS!

Science doesn't have to take place in a lab and be performed by men in white coats – it can happen anywhere! We've put together some easy and fun experiments to inspire children of all ages and help bring science to life.

There are plenty more exciting experiments, fun facts and interesting information available at www.noisemakers.org.uk. NOISE (New Outlooks in Science and Engineering) aims to engage young people with science and engineering. NOISEmakers (early-career science and engineering ambassadors) have blogs and profiles on the site and there's plenty more to explore - from careers and chemistry to Rubik's cubes and reactions!

1. FIZZ, BANG, WALLOP – WHAT A REACTION!

Create a fantastic fountain by mixing Mentos and cola…

WARNING: Best performed outside!

Ingredients:

- 2-litre bottle of cola
- packet of Mentos sweets

Method:

Place the entire pack of Mentos directly into the cola bottle. Then make a hasty retreat, stand well back and watch the explosion that's about to take place!

What's happening?

When the Mentos are dropped into the bottle they begin to react with the cola. During this reaction carbon dioxide gas (CO_2) is released extremely rapidly, causing lots of pressure and forcing the cola to leave the bottle very quickly. The same thing happens when you shake a fizzy drink bottle and then open it.

See this happen on YouTube: www.youtube.com/watch?v=YNgl6z5Z7k4

NOISE (New Outlooks In Science & Engineering) is a UK-wide campaign funded by the Engineering & Physical Sciences Research Council (EPSRC). Initiated in 2000, it aims to raise awareness of science and engineering among young people. www.epsrc.ac.uk

2. TICK TOCK LEMON CLOCK

Harness the power of citrus and make time fly!

Ingredients:

- two lemons
- two copper coins
- two silver coloured screws or large nails
- an old digital watch or a small digital travel clock with the back taken off so you can get to the electric circuit
- three x 10cm lengths of copper wire or crocodile clips

Method:

Push one of the pennies just over half way into one of the lemons and one of the screws into the other side, making sure they don't touch. Copy this with the second lemon. Join the penny in one lemon to the screw in the other lemon by wrapping some wire around the screw and taping the wire to the penny. Join the other penny to one of the electrical connections of the digital clock in the same way and then complete the circuit by joining the remaining screw to the other side of the clock. The clock should work now.

What's happening?

The lemon juice is an acid and it reacts with the copper from the pennies and the zinc from the nails. These reactions cause the penny to lose electrons (negatively charged particles) and the screw to gain electrons. This means the penny becomes positively charged and the screw becomes negatively charged. The electrons in the lemon are then attracted to the penny because they are negatively charged and start to flow around the circuit, creating an electric current to power the clock.

3. SLIME SUBLIME

Create your own gooey slime to play with…

WARNING: Don't eat this!

Ingredients:

- PVA glue
- Borax dissolved in water
- food colouring
- water
- jug/bowl and something to stir with

TIP: you can find Borax (a detergent salt) in hardware shops and pharmacies

Method:

Add a few drops of food colouring to about a quarter of a cup of water and stir until evenly mixed. Add around a quarter of a cup of PVA glue and stir well until thoroughly mixed and until the glue and the water are the same colour. Slowly add the Borax, stirring continuously and watch the slime form!

What's happening?

Borax acts as a 'connector' for the glue molecules – groups of atoms – and when these join together they form long chains called polymers. This causes the mixture to thicken into a gel-like substance (or slime!). Long chain polymers are also present in most plastics and sugars such as carbohydrates.

4. CHARLIE AND THE GIANT MARSHMALLOW FACTORY

Make super-sized sweets in your very own factory!

Ingredients:

- pack of marshmallows
- an empty wine bottle
- a vacuum pump – they keep wine bottles sealed or lemonade fizzy

Method:

Cut the marshmallows into small pieces and drop them into the wine bottle. Place the pump over the top of the wine bottle and pump it repeatedly. The marshmallows will gradually grow large but when you let air back into the bottle by removing the pump they revert to their normal size very quickly.

What's happening?

As the air is removed from the bottle, the air trapped inside the marshmallow pieces compensates by expanding so the pressure is evened out.

Check this out on YouTube: www.youtube.com/watch?v=gl9gcd3kYqQ

5. THE PESKY POUND CORNFLOUR CAPER

Trick your class with this cunning experiment

Ingredients:

- a large mixing bowl or bucket
- 450g of cornflour
- water
- some pound coins
- a towel to clear up the mess!

Method:

Put the cornflour into the bowl or bucket and add water bit by bit until you get a thickish mixture. Drop a few pound coins into the bowl and challenge the class to grab the coins as quickly as possible – their hands will get stuck as the mixture 'magically' turns solid. You can get to the money by putting your hand in very slowly and gently.

What's happening?

The cornflour and water mix becomes a dilatent material. This means that under pressure and on mixing the cornflour becomes more viscous. Imagine the cornflour as a number of particles all separated by water, as you move your hands through the mixture you force the water molecules out creating a solid. When you stop moving your hands in the mixture you allow the water to move between the cornflour particles again producing a more liquid like material. The same is true of ketchup!

6. I'M A SUPER HUMAN EGG CRUSHING MACHINE!

Prepare to amaze the class with your astounding strength!

Ingredients:

- a large bowl
- a few eggs

Method:

Making sure they have no rings on their fingers, ask a pupil to take one of the eggs in the palm of their hand and gently wrap their fingers around it. With their hand held over the bowl or bin, ask them to try to crush the egg. They won't be able to! But, make sure to have a towel ready in case something goes wrong!

What's happening?

The structure of an egg is designed in such a way that it can withstand incredible forces. When you place the egg in your hand and squeeze, the pressure over the egg is distributed evenly and the egg remains intact. When you apply the pressure or force in one particular place the egg cannot withstand it.

7. SERIOUSLY SEVENTIES SULTANA STUNNER

Introduce your class to 1970s cool with this organic lava lamp!

Ingredients:

- some sultanas or raisins
- a tall glass or vase
- clear fizzy drink like lemonade or soda water

Method:

Pour the fizzy drink into a tall glass or vase and place the raisins into the liquid one by one. Bubbles will start to gather on the raisins and eventually they will float up to the top, where the bubbles pop and the raisins fall down again. This happens continuously causing a lava-lamp like effect.

What's happening?

The gas in the fizzy drink causes bubbles to form on the surface of the raisins. Eventually enough bubbles form to raise the buoyancy of the raisin and lift it up to the surface - here some pop and it drops back down again as the raisin is now less buoyant. In effect, the bubbles make the raisin less dense overall, and therefore lighter than the water which allows them to float. When the bubbles pop the raisin returns to its original density.

8. CHAMELEON CARNATIONS

Forget an apple for teacher – what about colour-changing flowers?

Ingredients:

- a few white carnations or daisies
- some coloured food colouring
- a vase and some water
- scissors

Method:

Cut the end off the stalks of the flowers and place the water in the vase, adding about 10 drops of food colouring. Stir the water until it's all the same colour. Pop the flowers into the vase and leave them overnight. You should discover a totally unique bunch of flowers the next day!

What's happening?

The food colouring is drawn up through the stem in the same way that water is through a mechanism called capillary action. The water and dye leaks into the petals and changes the colour of the flower. If you look closely at the petals you can see the path that the water travels to take nutrients around the plant.

9. LET'S GET LIFTED…

Raise the level of water Moses-style!

Ingredients:

- a lemon
- a cereal bowl
- a few matches
- a lighter
- a glass
- some water

Method:
Cut a thin slice of lemon and float it in some water you've poured into the cereal bowl. Push a few matches into the lemon with the heads pointing upwards (TIP: angle the matches so the heads are close to one another - it will make things easier). Light the matches and very quickly place the glass over the lemon. After a few seconds, the matches will go out and the lemon and the water level will rise up inside the glass.

What's happening?

Fire need oxygen to burn as part of the combustion reaction so once the matches have used up all the gas inside the glass the air volume is reduced. The water level inside the glass rises in compensation for the reduced pressure and the lemon floats up with it.

10. GROWN YOUR OWN CLOUD….

Rival Thor - Viking God of Thunder - and make your own clouds!

Ingredients:

- 1-litre clear plastic bottle with a cap
- warm water
- matches

Method:

Place just enough warm water into the bottle to cover the bottom. Light a match and let it burn for a few seconds before blowing it out and immediately placing the head of the match in the bottle. Let the smoke from the match fill the bottle. After a few seconds, the smoke will seem to disappear, but the invisible particles are still floating around in the bottle. Screw the cap on the bottle, being careful not to let too much smoke out. Squeeze the sides of the bottle really hard 6 or 7 times. Squeeze the bottle again, but this time hold the squeeze for a few seconds and then quickly release. The second you release the squeeze, you should see the formation of a little fog in the bottle. This is the cloud!

What's happening?

Although they are very small, there are water molecules (hydrogen and oxygen) in the air all around us. In the air they bounce around and don't tend to stick together but in the bottle you compress them by squeezing the sides together. When you release the bottle the pressure is reduced and you allow the molecules to expand and so cool down. When they get colder the molecules can stick together more easily and form really small water droplets – clouds! The matches make this process easier by allowing the solid particles to act as a nucleus.

DISCLAIMER: These experiments will all be safe if the warnings are adhered to and basic safety measures are followed to prevent swalloing chemicals and injury.

NOISE (New Outlooks In Science & Engineering) is a UK-wide campaign funded by the Engineering & Physical Sciences Research Council (EPSRC). Initiated in 2000, it aims to raise awareness of science and engineering among young people. www.epsrc.ac.uk