



CORNWALL COLLEGE



ISSUE 4

Science, Technology, Engineering & Mathematics

New world land speed record for an electric car

International Student  
Science Fair comes  
to Cornwall

Greenpower 2013,  
were you there?



CORNWALL  
COLLEGE



FALMOUTH  
MARINE  
SCHOOL



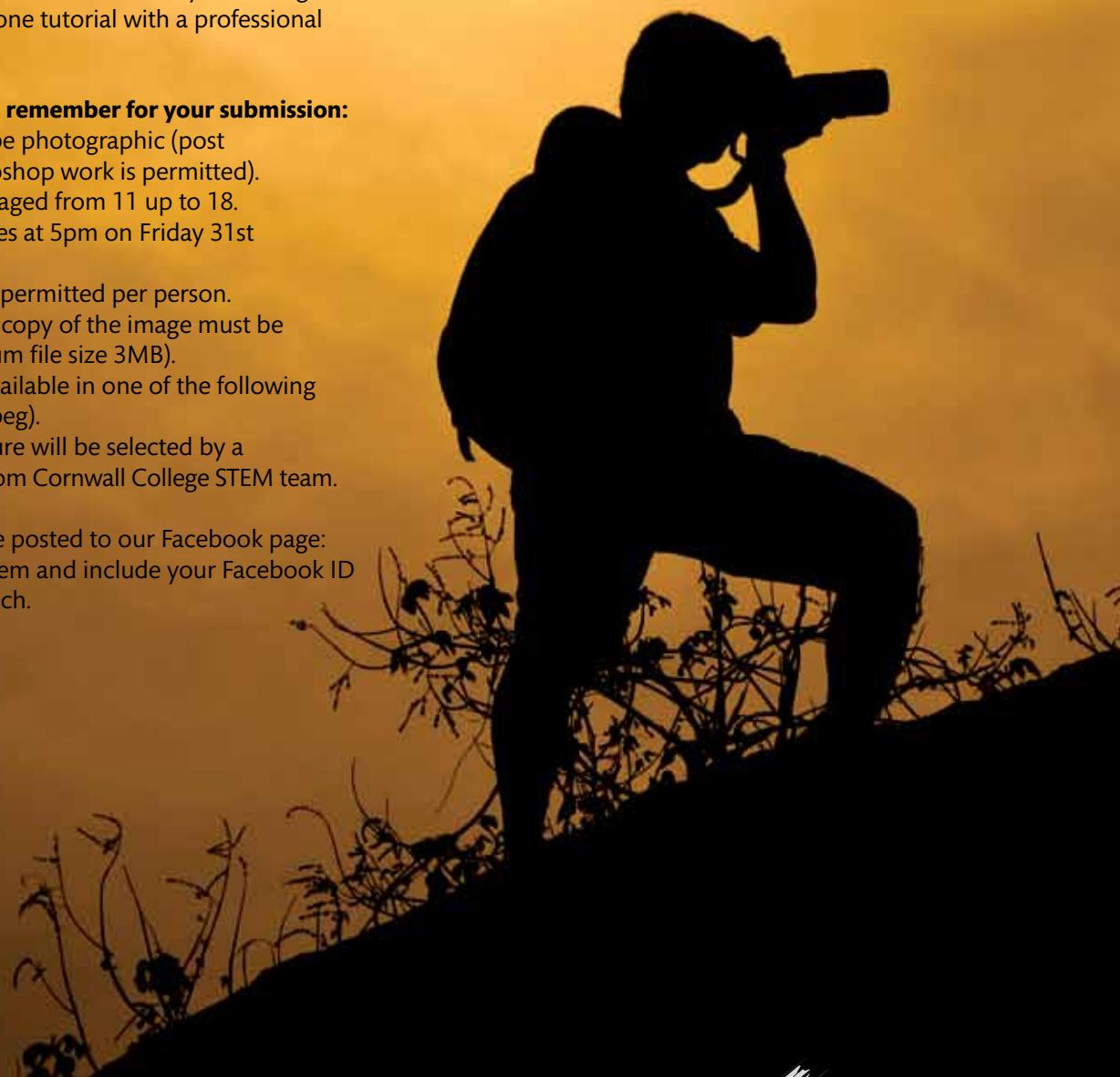
# Do you have an image that's front cover material?

We're looking for a cover image for the May 2014 issue of the STEM journal and we're giving our readers the chance get their image featured. The image must be around the theme of recurring patterns (in nature or made by man). The winner will not only have their image featured on the cover, they will also get a two hour one-to-one tutorial with a professional photographer.

**Important things to remember for your submission:**

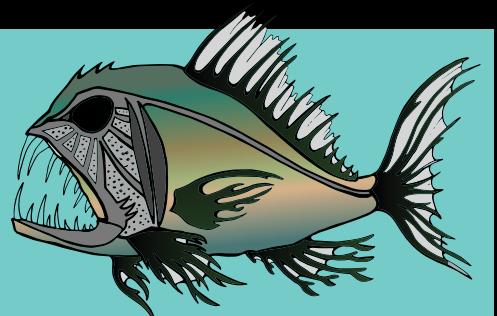
- The image must be photographic (post production Photoshop work is permitted).
- Entrants must be aged from 11 up to 18.
- Competition closes at 5pm on Friday 31st December 2013.
- Only one entry is permitted per person.
- A high resolution copy of the image must be available (minimum file size 3MB).
- Image must be available in one of the following formats: (gif, tif, jpeg).
- The winning picture will be selected by a panel of judges from Cornwall College STEM team.

All entries should be posted to our Facebook page: [www.facebook/ccstem](http://www.facebook/ccstem) and include your Facebook ID so we can get in touch.



## Fishy fangs

The biggest fish teeth: The nightmarish fangtooth is among the deepest-living fish ever discovered. The fish's normal habitat ranges as high as about 6,500 feet (2,000 meters), but it has been found swimming at icy, crushing depths near 16,500 feet (5,000 meters). Fangtooth fish reach only about six inches (16 centimeters) long, but their namesake teeth are the largest, proportionate to body size, of any fish.



# introduction

Welcome to the fourth edition of the STEM journal, with an underlying theme of speed we have articles on the latest British land speed record for an electric car, coverage of the plight of the superfast swift and an update on the Bloodhound Supersonic Car.

In June we went car crazy at the Greenpower event in Newquay with over 100 students involved in the Pneumatic and Solar Car races, as well as 87 teams taking part in the main Greenpower regional finals, we saw a record breaking track time set.

Our Lab on Loan kit has had several outings in the last few months even reaching an international audience. The Solar Car Challenge was a hit at Green Cornwall and Hayle Community School, who hosted the summer term's Comenius School Partnership event attended by a number of European

schools involved in the project. The timing gate has been out to a number of Bloodhound rocket car events including the first ever International Student Science Fair, find out what they got up to on page 10.

Our thanks for the Science Facts in this issue go out to Kobe Marshall-Stevens and Charlie Coggan of Fowey Community College, who were on work experience with us in the science department of our St Austell campus.

You can stay up to date with STEM activity at Cornwall College and find out how you can be involved by visiting our website at: [www.cornwall.ac.uk/stem](http://www.cornwall.ac.uk/stem), or follow us on Facebook at: [www.facebook.com/ccstem](http://www.facebook.com/ccstem).



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# get in touch

For more information about STEM with Cornwall College please contact Sarah Talboys at [stem@cornwall.ac.uk](mailto:stem@cornwall.ac.uk) or phone 01209 617818.  
For details of any STEM courses please call our course enquiries team on 0845 22 32 567  
[www.cornwall.ac.uk](http://www.cornwall.ac.uk).

## FEATURES

### What happened at Greenpower 2013?

Our own Solar Car challengers take to the track.



### Mapping hyaenas in Namibia

Read an account of the unique experience of Derek Dwane, a Zoological Conservation student, who recently went to help map the secret life of Hyaenas in Namibia.



### The International Student Science Fair

Visitors from across the world were welcomed to Cornwall last July for Europe's first ever Student Science Fair. See what visitors and our own students got up to on page 10.



# Greenpower 2013, were you there?

The annual Greenpower event returned to Cornwall last June with over 2,000 school pupils racing electric cars they designed and built from scratch.

The Cornwall College South West Regional Heat of the Greenpower schools electric car races, at Newquay Cornwall Airport, ran over two days to cater for the growing number of teams wanting to take part.

Teams from primary and secondary schools across the region had to design and build electric kit cars; finding their own sponsors, resources and the support they needed to make their designs reality. The project incorporates maths, engineering, physics, design, marketing, team building, technology, problem solving and communication. Following its success in these areas, many schools now incorporate Greenpower into their curriculum.

## Fact file:

73 primary school teams

Teams of six driving Formula Goblin cars

- Drag race winning team: St Columb Minor Primary
- Slalom challenge winning team: Bursley Primary
- Wheel to wheel knockout winning team: Bursley Primary



Event organiser, Vaughan Curnow, Cornwall College Liaison Officer said: "We are really pleased to be the organisers of the UK's largest and fastest-growing Greenpower event. The event really is outstanding as it engages pupils with all learning abilities and it encourages them to be involved in hands-on projects that encompass science, technology, engineering and mathematics. Not only is Greenpower an engineering project, it has now grown into a community project including working with the Devon & Cornwall Police."

Schools not already involved who would like to take part in next year's event, or companies able to provide sponsorship or help schools build their cars, can email [greenpower@cornwall.ac.uk](mailto:greenpower@cornwall.ac.uk).

## Fact file:

14 secondary school teams

Teams driving the Formula24 electric cars

- Four hour endurance race
- New extended two mile track

The overall winner of the F24 competition was Richard Lander School.

Second place Penair and third place Penryn will join them to go on to race at the national final, to be held at the famous Goodwood Motor Circuit, West Sussex later this year.



# STEM Tent at Greenpower

Action and excitement could be found not only trackside, but also in the main arena with a visit from Titan the robot, and in the STEM Tent which hosted the Pneumatic and Solar Car Challenges, part of Cornwall College's 'Lab on Loan'.

The tent included a live science stage hosted by some of our own students from St Austell. The audience took part in colour change experiments, saw how ice can boil water and were shown how crosswinds can lift rice.

On day one over 90 primary age pupils built cars from a very basic kit of paper and straws in just 30 minutes before firing them down the track using a pneumatic propulsion system (a compressor). Day two saw intense competition as eight teams of secondary students went head-to-head for first place in the more complex Solar Car Challenge. After judging their design and a series of races Lipson Community College were victorious, closely followed by Humphry Davy in second and Truro High in third.

Prizes were donated by Plug into the Sun and Bloodhound SSC. If you would like to get involved or use our kit to hold a similar event, email [stem@cornwall.ac.uk](mailto:stem@cornwall.ac.uk). You can read more about our Lab on Loan on page 19 for other free activity kits.





# Mapping hyaenas in Namibia

Research by zoological conservation student Derek Dwane

**In the depths of Africa Derek Dwane has been using camera traps to identify and track hyaenas as part of his research project for the Foundation Degree in Zoological Conservation he is studying at Cornwall College Newquay. Over the past two years he has worked closely with Lise Hanssen, wildlife researcher and project co-ordinator for the Caprivi Carnivore Project, to learn more about the animals' behaviour. This is his latest report.**

The Caprivi Carnivore Project launched in 2007 with the primary aim of tackling the conflict between humans and large carnivores in the Caprivi region of Namibia.

**The spotted hyaena so far has been the main focus of the project with over 50% of wildlife conflict in the area credited to the hyaena.**

Some of the main challenges faced by the project were calculating hyaena population densities, distribution and behavioural observations.

Initially, several hyaena were GSM-collared (Global System for Mobile Communication), these collars tracked the animals via the Global Positioning System, better known as GPS, with the hope of a better insight into the lives of these elusive species. However, after extensive research and review of resources it was decided by the project to try alternative forms of data collection. During the last two decades, wildlife

conservation has seen a dramatic increase in non-intrusive technologies carried out on similar studies to that of the Caprivi Carnivore Project. With this increased sensitivity to animal welfare and technological advances in research equipment, the camera trap has come to the forefront as an efficient, adaptable, low cost, easy to use replacement for collecting scientific data with minimal human-wildlife interaction.

**The camera trap is simply a device with a trigger or sensor that activates the camera into taking a photograph or video when an animal is present.**

From these pieces of data, natural behaviours can be observed, home ranges and populations calculated, and individuals identified.

During September 2012 I was lucky enough to spend two weeks assisting Lise Hanssen, the Caprivi Carnivore Project's co-ordinator, with setting up numerous camera traps throughout protected areas of the Eastern Caprivi. The days in the field were spent scouting for suitable locations for cameras and gathering data on human-wildlife conflict incidences among the local communities.

Active den sites offered prime opportunities to capture fascinating data and suitable trees were baited and scent trails laid to entice an inquisitive hyaena

within shooting range of a camera trap. Surveys on foot identifying hyaena tracks also helped to narrow down 'hyaena highways' most commonly used and offering advantageous sites for camera placements.

On returning to the United Kingdom and continuing with my zoological conservation degree at Cornwall College Newquay I was asked by Lise to attempt to establish an individual identification system for the camera trap data. By enabling the individual identification of hyaenas from camera trap photos and continuous strategic camera placements, a fuller picture could be established of hyaena movements, behaviours and populations.

To first be able to analyse the data in a satisfactory method a baseline process was established to be able to visually confirm individual hyaena species and establish a capture-recapture model. With direction from Lise and advice from other researchers, it was decided that hyaena spot patterns were the most recognisable and practical trait to use for individual identification.

**Each individual hyaena possesses a unique spot pattern on the fur that remains permanent after reaching adulthood.**

By using more visible and distinguishable patterns the capture-recapture method was possible. To enable exact identification and to avoid the risk of double counts I decided on a three

photo confirmation system for both the right and left-hand side of the hyaena. This would significantly decrease the possibility of error during identification. Spot patterns can appear altered when the body is photographed at different angles, distances and lighting. Using the three photo confirmation system the recognisable spot pattern would be confirmed on three separate occasions and recorded on a blank template along with the camera trap location and other relevant information to produce an easily accessible field guide for individual hyaena recognition.

With the Caprivi Carnivore Project using these field guides and data and through continuous monitoring and community involvement, the secret life of the hyaena in the Caprivi can be better understood and hopefully lead to new strategies to help reduce the human-hyaena conflict in the region.

The project is going to be continuing for the foreseeable future, Lise is looking at including all other larger carnivores in the region; lion, leopard etc and the effect on human-wildlife conflict. I've now finished viewing over 30,000 photos from the project and am narrowing it down to individual identification. Lise has asked me to return when I've finished my degree and spend some time teaching local game guards how to use and process data collected by camera traps. She hopes this will include the communities in the protection of the species rather than persecuting them. I'll have to get my qualification first!

**See more about the project here:**  
[www.caprivicarnivores.org](http://www.caprivicarnivores.org)



# Lecturer in focus

**Yvonne Oates, Geographic Information Systems (GIS) specialist at Cornwall College.**

## **What is your role at Cornwall College?**

I am the GIS specialist lecturer at Cornwall College. It involves teaching Geographic Information Systems on a number of degree programmes across multiple campuses and also providing consultancy and mentoring services to businesses as required.

## **What research activities are you currently involved in?**

Although I have an ongoing interest in plant tolerances and distribution with regard to metalliferous contamination, notably copper; I have focused this year on the provision consultancy and mentoring support for local business through the Business Innovation Knowledge Exchange project and Unlocking Potential.

## **During your career you spent some years working with the MoD; what experiences and skills did you learn that that you have brought to the College?**

With regard to my current role as a GIS specialist, pivotal work experience was gained whilst working for the Ministry of Defence's Defence Geographic Centre, where I undertook varied roles associated with the collection and application of geographic data in support of the Armed Forces. In a different but equally career developing role, I was responsible for the instigation and management of a council Geographic Information System - the first project of its type at the time.

Both these roles taught me that the skills you learn in an academic environment are very important but it is how to successfully apply these skills in the workplace that is critical. This led me to develop the degree-level short course in GIS, that I deliver for Cornwall College, to not only train the students in the basics of GIS, but also make them focus on how they will use the knowledge they have gained to enhance or develop their work role; leading to a range of benefits for their business in operational terms.

## **Do you have any memberships, what does that involve and how has it benefited you and your role?**

Amongst other things, I'm a Fellow of the Royal Geographical Society (RGS), Member of the Association of American Geographers (AAG) and Member of the British Cartographic Society.

Last year I went to the AAG Conference in New York, where I attended a number of excellent workshops delivered by lecturers and software specialists; the contents of which I have since passed on to the students on my courses. They are now very sick of me saying 'when I was at the conference in New York...!'

I also spoke at the RGS International Conference in London in August this year on the topic of 'The Rise and Rise of GIS Beyond the Realms of the Geography Degree'.

## **What exciting developments are being made in the field of GIS today?**

GIS and the use of geographical data is a rapidly developing field in the academic, commercial and leisure sector. We all look at Google Maps, Google Earth and other location finders I'm sure, or possibly use sat nav systems to get to our destinations - these all use geographical data or even simple GIS systems. This is becoming easier as such technology is now accessible via smart phones, iPads and other hand-held devices and this will become the norm in the future.

## **After studying a GIS course what careers could students go on to enjoy and succeed in?**

The applications of GIS are enormous and in recent years there has been a huge increase in demand for GIS skills from employers in the environmental sector and beyond. Unusually, there are not a similar number of graduates with relevant GIS experience leaving university; so students are in a good position having undertaken GIS training here at Cornwall College.

## **What did you study to get to where you are today?**

I have always loved geography - the physical bit! So my first degree was a BSc in Geography from London University, where I specialised in biogeography and biogeochemistry. In fact I loved it so much, I then went on to do an MSc in Geography specialising in remote sensing - the analysis of the earth from afar using satellite and other airborne imagery. I also have a master's in business administration, which has been very useful in my subsequent career.

## **Which notable STEM figure (past or present) would you most like to have dinner with and why?**

Michael Palin - although not a geographer by training, he is passionate about the subject and has just completed a term as President of the Royal Geographical Society. I'd like to hear his views on how geography can contribute to science and its application in the world today - and also his tales of travels around the globe!

## **What has been the most memorable project that you have been involved in?**

I'd love to tell you, but sadly I can't! It was when I was working for the MoD; having the chance to work with resources and in locations that would not normally be accessible was a fantastic way to start a career, although not being able to wash for a week on an Army exercise was not so glamorous.

Thinking about it, taking my GIS course to the Isles of Scilly was quite an experience too!

## **Where in the world would you like to travel and what would you study there?**

I'd like to travel to the Canadian Arctic region to study the effects of ice retreat due to climate change - both from a biogeographical point of view and also using my satellite analysis and GIS skills to map the emerging and changing habitats.

# LEGO CRUSH

The world's tallest Lego tower is a staggering 32m high and is made up of over 500,000 bricks but have you ever wondered how high the tower would need to be to crush the bottom brick? Dr Ian Johnston did, so he and his team set about finding an answer...

Dr Johnston, an applied mathematician and lecturer in engineering at the Open University, began by crushing a number of bricks to find their maximum load under compression.

The average maximum force the bricks can stand is 4,240N. That's equivalent to a mass of 432kg. If you divide that by the mass of a single brick, which is 1.152g, then you get the grand total of bricks a single piece of Lego could support: 375,000.

So, 375,000 bricks towering 3.5km (2.17 miles) high is what it would take to break a Lego brick. That's over four times higher than the world's tallest building, the Burj Khalifa, Dubai at 828m!

Burj Khalifa - 828m



## The only way is space

An American company plan to send eight astronauts to Mars by 2025. The trip will be one-way and will cost \$6 billion. The company plans to create a reality TV program that will follow the astronauts and fund the trip.

# The International Student Science Fair comes to Cornwall

Visitors from across the world were welcomed to Cornwall from 11th-15th July with clear blue skies and scorching temperatures as Europe hosted its first ever International Student Science Fair (ISSF).

The annual global event now in its 9th year saw 28 high performing specialist science schools from countries as diverse as Guam in the Pacific to China, Iran, Japan, Singapore, USA and Russia travel to Cornwall for the 5-day science extravaganza!

The opening ceremony on Thursday 11th, held at Princess Pavilions, Falmouth, was officially opened by Parliamentary Under Secretary of State for Education and Childcare, Elizabeth Truss.

Cornwall delivered world-class venues and exciting experiences throughout ISSF. A number of intriguing scientific research investigations took place at a range of must-visit locations chosen for their scientific significance including Camborne School of Mines, Pendennis Ship Yard, Eden Project, Falmouth Marine School, Rodda's Creamery, Scottish Power Wind Farm to name but a few.

ISSF, hosted by Camborne Science & International Academy, saw a jam-packed itinerary seeing participants experience once-in-a-lifetime activities. They boarded the world's largest single-mast super yacht, trekked deep underground at the Camborne School of Mines, designed their own versions of the

Bloodhound Supersonic Car, excavated and analysed a mock crime scene; to name a little of what the students got up to!

Activities undertaken during the week:

- Analysing the most successful ratio of water to air in a water rocket.
- Using infra-red sensors to scan their faces.
- Researching medical imaging.
- Exploring the beautiful Cornish coastline.
- Researching rocky shore ecosystems.
- Creating aspirin.
- The Lost In Space challenge.

At Falmouth Marine School, ISSF students were delivered a lesson in marine biology and watched shark and fish dissection demonstrations. Participants also built and tested their own marine diesel engine, discovered the art of boatbuilding and made their own miniature surfboards to take home.





See the full story at  
[www.issf2013.org](http://www.issf2013.org)



### Plasma paint propels planes

Plasma has been found to reduce the drag on planes. It has been found that ionized gas can have a dramatic effect on airflow; this could bring all kinds of benefits including the drop in prices of renewable energy and reducing the amount of fuel consumption in vehicles.





## Student Invasive Non-Native Group News

Student Invasive Non-Native Group (SINNG) based at Cornwall College Newquay, have had an incredibly busy year. The students have worked tirelessly creating action and awareness on the impacts of invasive non-native species. To date they have managed to clock up an incredible 5,938 volunteer hours!

**The local action group was proud to receive a national award for innovation.**

SINNG was judged to be the "best example of innovation in a STEM course or training programme" by the NEF Institute of Knowledge and Innovation. Nicola Morris, Project Co-ordinator, collected the award on behalf of the 170

plus members of SINNG. She said: "It was an absolute honour to be able to collect the award on behalf of the incredible, hard-working students I am privileged to work with. It is great to have all the hard work recognised and shows that volunteering is a very worthwhile and valued aspect of conservation work." SINNG was nominated for delivering effective action on invasive non-native species and increased student academic engagement.

The expansion of SINNG's STEM work has enabled them to run their interactive workshops in eight primary schools and nine secondary schools. They also offer field trips to some of their research sites which are proving very popular. Student research assistant Tracey Twomey has helped to make the field trips both enjoyable and productive with all data collected by the young scientists being

fed back into the research and practical clearance work currently being carried out by SINNG.

**Students from Hayle Community School & Camborne Science & International Academy worked alongside SINNG volunteers to conduct surveys of the ponds at Penrose Water Gardens, Shortlanesend.**



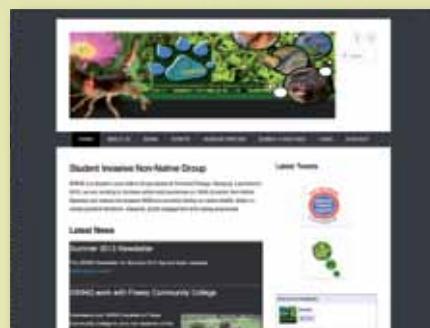
This work continues the mapping already begun by Newquay students and is proving incredibly valuable. The staff at the gardens are working with SINNG to remove invasive non-native plants and encourage native plants to flourish.

Requests are continuing to come in from schools across Devon and Cornwall for SINNG to run workshops; and organisations from as far afield as Ayrshire and the Isle of Wight have requested teaching resources. Recent funding has allowed the STEM education packs to be put into production. The packs will be aimed at primary and secondary schools as well as a resource pack for teachers.

The SINNG roadshow has been out and about again and has attended many events all over the South West. Volunteers had fun at Big Bang South West 2013,

with over 2000 children enjoying the interactive convention, learning about invasive plants and looking at native invertebrates under microscopes.

**For more information on SINNG and invasive species please go to [www.sinng.org.uk](http://www.sinng.org.uk)**



# WHAT IS THUNDER?

Any sound you hear is made up of vibrations, the vibrations travel through the air as waves until they reach your ear. This means lightning must cause some vibrations.

Lightning is a huge discharge of electricity. When lightning strikes, huge amounts of electricity shoot through the air, and this causes two things to happen:

1. The electricity passes through the air and starts it vibrating. The vibrations cause sound.
2. The lightning is also very hot and heats up the air around it. Hot air expands and the air gets bigger very quickly, and pushes apart the air particles.

These vibrations are what you hear and call thunder – the rumbling of thunder is caused by the vibration or sound bouncing of the ground and the clouds.

## Humans pushing evolution

Some birds in Nebraska, America have evolved smaller shorter wings so that they can evade cars on the road. This is not the first case that humans have been known to influence the evolution of creatures; some fish are maturing quicker due to commercial fishing.





## Staff in focus

**Sarah Talboys, STEM-Bloodhound Co-ordinator at Cornwall College.**

### What is your role at Cornwall College and what does it involve?

I am the STEM-Bloodhound Co-ordinator, which is a pretty cool job title although it sometimes results in puzzled looks and questions about hunting dogs and stem cell research. It doesn't really involve either of those, day-to-day I co-ordinate activities for the College's science, technology, engineering and mathematics departments and link them with the Bloodhound Supersonic Car project. It's largely about outreach, working with schools and business in the area to promote STEM learning and careers.

### What did you study to get here?

I'm not one of those people that knew from birth what I wanted to be, I hit 16 and realised I hadn't a clue so I went with my strengths; people and organising. I started off working in business administration, in fact my first full-time job was at Cornwall College in the Student Services department. Over the following years I worked for a range of companies in similar roles but I

realised I wanted something more from my career so I returned to Cornwall College to study FdSc Renewable Energy Technologies and BSc (Hons) Environmental Resource Management. I worked in the world of carbon and energy management for over two years before I took on this role, where I apply all the skills and knowledge that I gained in my first career path, right the way up to the carbon footprint verification training I had last year.

### What has been the most memorable project that you have been involved in?

Working for Duchy College Rural Business School on their project 'Clear About Carbon' was interesting and took me to Sweden, Denmark, and Germany exploring public and private low carbon schemes. However, I would have to say my current STEM role is the best job so far as I get to develop and test activities like the pneumatic cars, firing pressurised volumes of air into a tiny paper car, or assist with Chemistry experiments extracting DNA from a mock crime scene, both part of the 'Lab on Loan'

which I look after and take out to schools and colleges across the county.

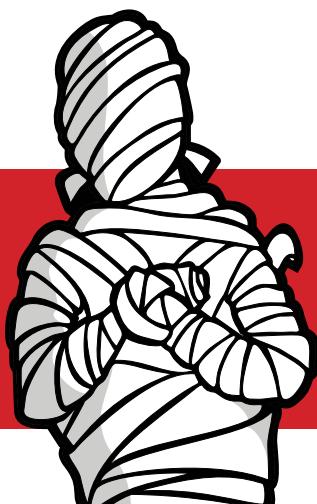
### Where in the world would you like to travel and what would you like to study there?

I would really like to see either of the Aurora Polaris, an amazing natural phenomenon that occurs around the poles of the northern (aurora borealis) and southern (aurora australis) hemispheres. As charged particles from solar winds enter our atmosphere they interact with the Earth's magnetic field and collide with the oxygen and nitrogen atoms at different altitudes, which is what determines the colours we see.

*Schools looking for any support to run STEM related activities and events, or with any ideas or requests for new 'Lab on Loan' kit (see page 19) should contact Sarah, email [stem@cornwall.ac.uk](mailto:stem@cornwall.ac.uk) or phone 01209 617818.*

### Historical heart ache

Heart trouble may not be recent in humans, a study on 137 mummified corpses has shown that they may have had similar problems to us today. Many mummies from all time frames from 3000 BC to the 20th century show the presence of similar heart problems or symptoms.



# Swifts under threat

The Creative Urban Biodiversity Education (CUBE) group is a student led initiative that focuses on conservation and scientific research in the fields of ecology, biology, and zoology. With the support of Cornwall College, CUBE has teamed up with the RSPB and Cornwall Wildlife Trust to combat the growing problems facing biodiversity in urban areas.

The recent release of the national report entitled 'The State of Nature' highlights the plight of much of our native wildlife.

One iconic species facing an uncertain future is common swifts (*Apus apus*)

which has seen a reported 47% decline in recent years mainly due to modern building techniques.

Their nest sites generally consist of holes in walls or small spaces under the eaves of buildings, with nest sites being destroyed or closed off as a result of restoration or modernisation works.

Cornwall Swift Conservation was established in 2010 by founder members of CUBE to provide vital assistance to this recently amber listed species.

Swifts are a migratory species spending our winter in Southern Africa before

traveling 1,000s of miles north to arrive on our shores in late April. They remain faithful to nesting sites allowing the same pair to breed together for many years, spending the summer here raising their brood prior to leaving in late September. As colonists, they are highly social birds and these amazing aeronauts can most often be seen hurtling throughout urban areas in groups called screaming parties, named for their distinctive social calls.

CUBE is responsible for the surveying and monitoring of swift populations throughout Cornwall. We have established excellent working links with the communities and local authorities in both our pilot towns of Newquay and Wadebridge and are now looking to further cast the net throughout Cornwall.

## Swift fact file:

- Swifts' taxonomic family, Apodidae, means without feet. Swifts spend almost their whole lives on the wing so have little need for legs (although their short legs are very strong for clasping to the walls of houses below nest entrances). One of the reasons swifts need higher nesting sites is to build up enough speed for take-off as their legs provide no forward propulsion.
- Swifts are among the fastest active flying birds, reaching speeds of over 100mph. Because of this speed swifts have no real natural predators, although hobbies will occasionally predate tired or hungry swifts.
- Swifts sleep on the wing. They achieve this by going into a state of torpor, effectively shutting down half of their body allowing it to rest. This technique is also used by chicks in periods of low feeding activity, slowing their metabolism and using their fat reserves to tide them through until their next meal.
- Despite their similarities swifts have no relation to swallows or house martins and are in fact most closely related to hummingbirds.
- Swifts travel great distances to forage. One researcher discovered that swifts nesting in Scotland occasionally travelled to Northern Ireland to catch their prey due to more favourable weather conditions.

**Volunteers from Cornwall College engage with communities, schools and local authorities in order to raise awareness about urban biodiversity.**

This includes the identification and protection of nest sites which we have contributed to with great success by the placement of over 40 boxes in Wadebridge alone.

It is an exciting time for the project with a great deal of opportunities for students of all ages to learn about, and engage in, front line conservation issues. Our future plans involve piloting new groundbreaking survey techniques; the design and development of specialist nest boxes, including the construction of ecological housing structures, allowing permanent unaffected residences for urban wildlife; and working closely with the development industry to implement more effective ecological considerations within new development sites.

Along with Cornwall Swift Conservation we have a variety of wide-reaching projects including community conservation; the importance of green spaces, allotments, and orchards in urban areas; and Newquay Bioblitz.

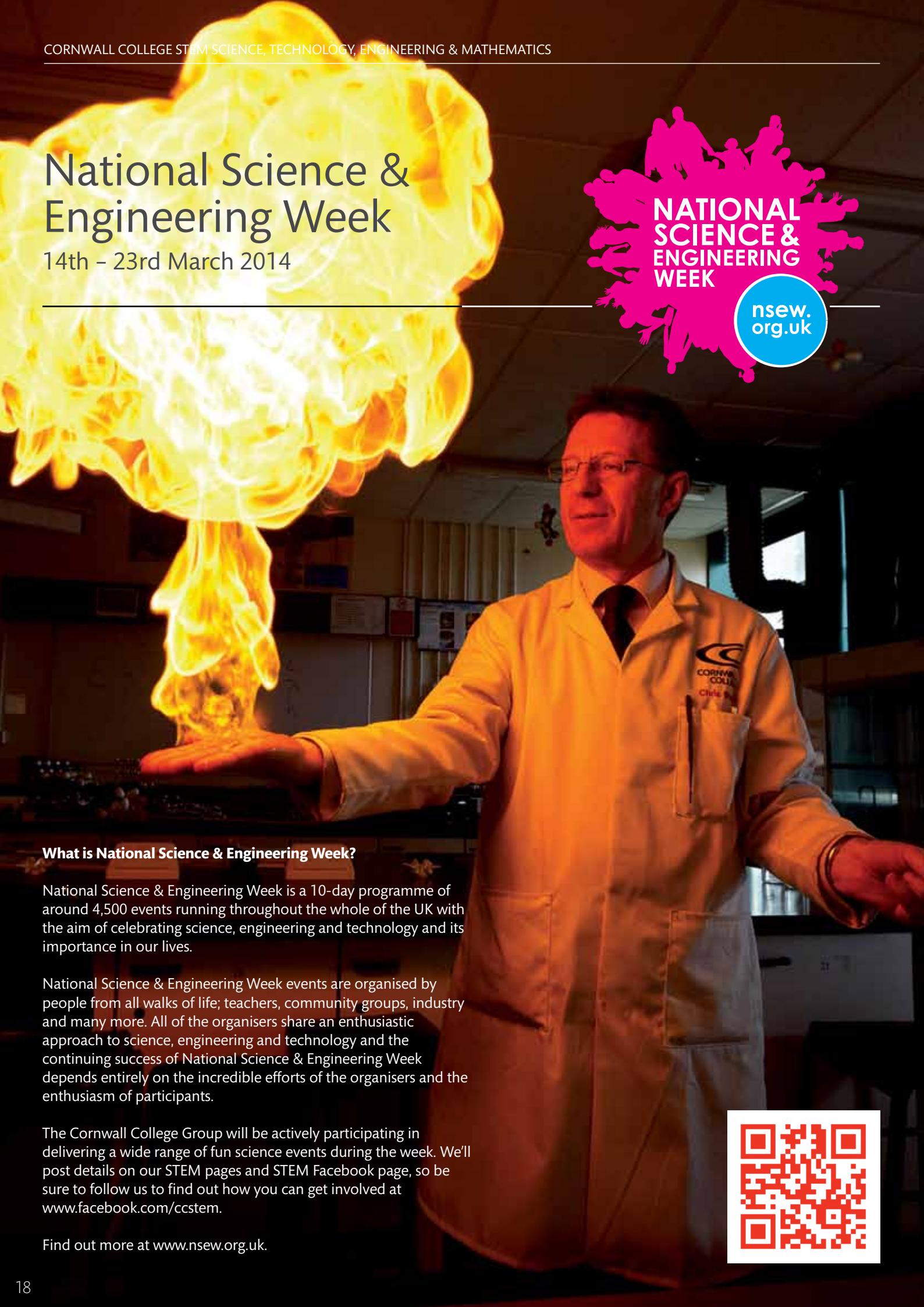
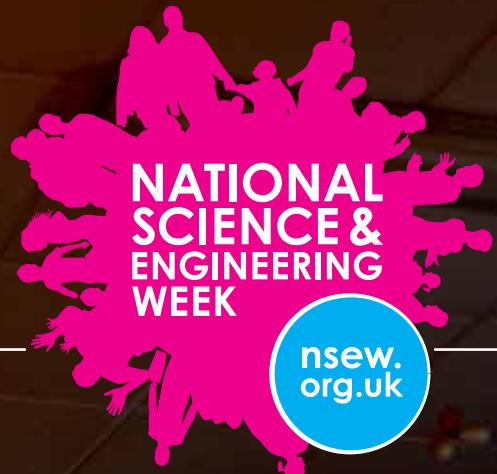
We are dedicated to working with our partners to establish Cornwall as an industry leader in conservation, setting trends and leading by example in tackling environmental issues.

**To learn more about swifts, urban biodiversity, and what you can do to help please visit our website [www.urbanbiodiversity.co.uk](http://www.urbanbiodiversity.co.uk) or email [luke.berkeley@cornwall.ac.uk](mailto:luke.berkeley@cornwall.ac.uk).**

**Go to the BBC iPlayer and search for 'Urban Jungle South West' to watch Luke talk to Urban Jungle presenter Nick Baker.**

# National Science & Engineering Week

14th - 23rd March 2014



## What is National Science & Engineering Week?

National Science & Engineering Week is a 10-day programme of around 4,500 events running throughout the whole of the UK with the aim of celebrating science, engineering and technology and its importance in our lives.

National Science & Engineering Week events are organised by people from all walks of life; teachers, community groups, industry and many more. All of the organisers share an enthusiastic approach to science, engineering and technology and the continuing success of National Science & Engineering Week depends entirely on the incredible efforts of the organisers and the enthusiasm of participants.

The Cornwall College Group will be actively participating in delivering a wide range of fun science events during the week. We'll post details on our STEM pages and STEM Facebook page, so be sure to follow us to find out how you can get involved at [www.facebook.com/ccstem](http://www.facebook.com/ccstem).

Find out more at [www.nsew.org.uk](http://www.nsew.org.uk).



# How can you get involved in STEM with Cornwall College this year?

## STEM activities

### March - July 2014

**Big Bang Fairs near you** The South West date is yet to be confirmed but registration is open, see more at [www.thebigbangfair.co.uk/nearme](http://www.thebigbangfair.co.uk/nearme).

### June 2014

**Greenpower** A two-day event for primary and secondary age children to race electric cars which they have built. This year saw the return of the STEM tent with live interactive science experiments and at Bristol kits. The Pneumatic Car races were run on the first day with over 90 students taking part and on the second day eight student teams competed in the Solar Car Challenge. Look out for more at next year's event!

### July 2014

**Bloodhound Supersonic Car.** A two-day event for primary and secondary schools with Cornwall College and the Bloodhound team. More details will be coming to you in the New Year. To keep up-to-date with our events follow us on Facebook at [www.facebook.com/ccstem](http://www.facebook.com/ccstem).

### Insect interloper

There is a caterpillar called the *Maculinea arion* which mimics the sounds of an ant queen and infiltrates its way into the colony where it will reside for around a year and feast on the ants inside. The caterpillar even pupates inside of the colony and will eventually become the large blue butterfly, an endangered species reintroduced to Cornwall.

## Lab on Loan

**TEACHERS:** We have the 'Lab on Loan' kits below which can be loaned to schools free of charge with further support available, from our STEM-Bloodhound co-ordinator, student ambassadors and lecturers to help run activities. Check out the pictures of past events on Facebook and contact us at [stem@cornwall.ac.uk](mailto:stem@cornwall.ac.uk) for more information or to book a kit.

**F1 track:** Get to grips with aerodynamics and more when you design, build and race your own car using compressed CO<sub>2</sub> canisters to propel it down a 20m track in a matter of seconds.



**DNA fingerprinting:** Test your CSI skills to find out 'who did it' in a mock crime scene investigation with a DNA comparison of key suspects.

**Solar Car Challenge:** Find out how solar panels work and how best to connect them. Test your engineering skills as you design, build and race a vehicle driven by solar panels and a motor that you and your team have wired.



**Pneumatic Challenge:** As seen in the STEM tent at Greenpower 2013. Design, build and fire rockets or cars that can withstand a blast of air compressed to over 50psi to make it travel fast and far.



# The Science behind our food

Ever wondered how much bacon there really is in a BLT, or whether those hands that do dishes really are as clean as you think? With a fully kitted lab at Duchy College, Glenn Coulson is just the man to help you find out. He is the new laboratory manager and lecturer for the Foundation Degree in Food Studies at Stoke Climsland, and what Glen doesn't know about food science wouldn't fill an egg cup! We caught up with Glenn to ask...

## Tell us a bit more about food science.

Microbiology, chemistry and biotechnology are key areas within the food industry and a well-equipped laboratory is essential for new product development and innovation. Product testing and investigation is an important part of a food manufacturer's due diligence to ensure good food safety management such as shelf-life testing, as well as to verify factory process controls and Hazard Analysis Critical Control Points.

## What sort of tests do you carry out?

The lab is equipped for a broad range of testing as you would expect in any food quality control laboratory. I can show you how to count the number of microbes living in your sandwiches; tell you how much protein is in your ham and whether it really is ham. Aside from testing the food itself we can also look at packaging and the processes; what is the root cause of product spoilage, what is lurking on your skin, tell you whether the disinfectant worked and whether a food preparation area meets

industry standard. There are the quicker and more technological methods or the longer and more traditional approaches always available to back up the tech.

## What goes on outside of the lab?

Have you ever wondered how they get a flawless finish on chocolate coated nuts and raisins or how they mass produce intricate desserts like layered cheesecakes? Food engineering plays a vital role in making mass production cost-effective and safe, without compromising the quality and finish of the end product. Using a device similar to a paint atomiser to spray chocolate, or a rotating container like a cement mixer to ensure a smooth finish, multi-head product depositors similar to those used in manufacturing are just a few examples of how machinery and technology have been developed in the food industry. It has also spurred the development of new ways of packaging food to ensure it lasts longer, like injecting nitrogen gas into bags and using materials that are more environmentally friendly such as starch-based polymers.

## Teachers, our facilities are available for you to use for that practical you always wanted to do but didn't have the equipment for!

Looking to add colour to your scheme of work with a Kim and Aggie style investigation maybe or investigate how microbes can be useful in making our food and drink? Then drop us a line to [stem@cornwall.ac.uk](mailto:stem@cornwall.ac.uk).

# Make your own **FAKE SNOT**

As disgusting as it might sound to some people, let's make some fake snot! Snot actually serves an important purpose in our body so this experiment is not all about grossing out your friends, although that's certainly part of the fun.

## What you'll need:

- Boiling water (be careful with this)
- A cup
- Gelatin
- Corn syrup
- A teaspoon
- A fork

## Instructions:

1. Fill half a cup with boiling water.
2. Add three teaspoons of gelatin to the boiling water.

3. Let it soften before stirring with a fork.
4. Add a quarter of a cup of corn syrup.
5. Stir the mixture again with your fork and look at the long strands of gunk that have formed.
6. As the mixture cools slowly add more water, small amounts at a time.

## What's happening?

Snot is made mostly of sugars and protein. Although different than the ones found in the real thing, this is exactly what you used to make your fake snot. The long, fine strings you could see inside your fake snot when you moved it around are protein strands. These protein strands make snot sticky and capable of stretching.



# Britain in the driving seat for EV revolution

## New fia World Electric Land Speed Record

**22.00 GMT 25th June - Elvington, UK - Drayson Racing announce that it had set a new World Electric Land Speed Record of 204.185mph.**

Former science minister, businessman and racing driver Lord Drayson was behind the wheel of the Drayson B12 69/EV electric Le-Mans prototype. In near perfect conditions, the Oxford-based sustainable motorsport company smashed the previous 175mph record, which had stood for nearly 40 years, by 29.2mph.

As the new world record holder, Lord Drayson commented: "I'm delighted we've beaten the record tonight and can show the world EVs can be fast and reliable. Drayson Racing is a laboratory for EV technology, testing it to the most extreme level, as we've seen today."

"It is not the outright speed of 203mph that is most impressive about this record, but the engineering challenge of accelerating a 1,000kg electric vehicle on a short runway over a measured mile. However I've got a great team and world-class partners, such as QualcommHalo, Michelin, Multimatic and Cosworth.

"This is a true celebration of Britain's leading position within the burgeoning electric vehicle industry and I'm delighted to be at the forefront of this electric revolution. We hope to set more records tomorrow."

Drayson Racing is a research and development business, pioneering the development of sustainable technologies in the challenging environment of motorsport. With the electric land speed

record it intends to showcase what is possible with an electric drivetrain and underscore Britain's leadership position in the EV industry.

**Read more at** [www.draysonracingtechnologies.com](http://www.draysonracingtechnologies.com)

**Follow us at** [www.twitter.com/DraysonRacing](http://www.twitter.com/DraysonRacing)

**Join us at** [www.facebook.com/DraysonRacingFE](http://www.facebook.com/DraysonRacingFE)



### Robotic raptor

Scientists have created a drone that mimics the way in which a bald eagle grasps fish whilst flying along. The drone is planned to be used to transport burdens without making them fall out of the air.



# Make your own lava lamp

Learn how to make an easy lava lamp with this fun science experiment. You can use simple household items such as vegetable oil, food colouring, Alka-Seltzer and a bottle to create chemical reactions and funky balls of colour that move around like a real lava lamp.

#### **What you'll need:**

- Water
- A clear plastic bottle
- Vegetable oil
- Food colouring
- Alka-Seltzer (or other tablets that fizz)

#### **Instructions:**

1. Pour water into the plastic bottle until it is around one quarter full.
2. Pour in vegetable oil until the bottle is nearly full.
3. Wait until the oil and water have separated.
4. Add around a dozen drops of food colouring to the bottle.
5. Watch as the food colouring falls through the oil and mixes with the water.
6. Cut an Alka-Seltzer tablet into smaller pieces (around five or six) and drop one of them into the bottle, things should start getting a little crazy, just like a real lava lamp.
7. When the bubbling stops, add another piece of Alka-Seltzer and enjoy the show.

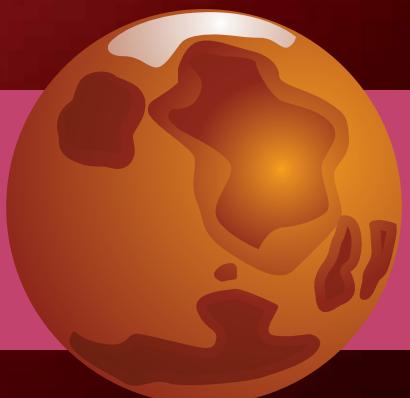
#### **What's happening?**

If you've tried our oil and water experiment you'll know that the two don't mix very well. The oil and water you added to the bottle separate from each other, with oil on top because it has a lower density than water. The food colouring falls through the oil and mixes with the water at the bottom. The piece of Alka-Seltzer tablet you drop in releases small bubbles of carbon dioxide gas that rise to the top and take some of the coloured water along for the ride. The gas escapes when it reaches the top and the coloured water falls back down. The reason Alka-Seltzer fizzes in such a way is because it contains citric acid and baking soda (sodium bicarbonate), the two react with water to form sodium citrate and carbon dioxide gas (those are the bubbles that carry the coloured water to the top of the bottle).

Adding more Alka-Seltzer to the bottle keeps the reaction going so you can enjoy your funky lava lamp for longer. If you want to show someone later you can simply screw on a bottle cap and add more Alka-Seltzer when you need to. When you've finished all your Alka-Seltzer, you can take the experiment a step further by tightly screwing on a bottle cap and tipping the bottle back and forth, what happens then?

#### **Martian mid-life crisis**

A company by the name of Inspiration plan to send a middle-aged couple to circle Mars and return to earth in the hope that they can inspire a new generation of space travellers. The couple will spend a total of 501 days in space and plan to leave on 5th January 2018.





# ARE YOU A FUTURE DOCTOR, DENTIST OR VET?

As a Cornwall College student you will be able to take part in the Future Medics programme, run in partnership with Peninsula Medical School. Future Medics participants will be offered:

- a guaranteed interview at the University of Exeter
- mentoring from a current medical student at University of Exeter
- medical careers summer event
- medical ethics conference
- specific medical experience and visits to the Peninsula Training Suite
- academic support
- work as a STEM ambassador.

For more information contact [stem@cornwall.ac.uk](mailto:stem@cornwall.ac.uk) or phone 01209 617818.



## Quiz

### Questions:

1. What is the next prime number after 7?
2. When light bends as it enters a different medium the process is known as what?
3. Now that Pluto is no longer included, how many planets are there in the Solar System?
4. What is the name of the largest ocean on Earth?
5. Electric current is measured using what device?
6. Solar power generates electricity from what source?
7. The perimeter of a circle is also known as what?
8. A magnifying glass is what type of lens?
9. What is the smallest planet in our solar system?
10. What are the two main metals in the Earth's core?
11. True or false? Batteries convert chemical to electrical energy.
12. Did the Apple iPhone first become available in 2005, 2006 or 2007?
13. Fred can eat 27 chocolates in a hour, Alice can eat 2 chocolates in 10 minutes, and Kelly can eat 7 chocolates in 20 minutes. How long will it take them to share and eat a large box of 120 chocolates whilst watching a movie?

**All answers over the page**

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Cornwall College, Newquay



#### Quiz answers:

1. 11
2. Refraction
3. 8
4. The Pacific Ocean
5. Ammeter
6. The Sun
7. Circumference
8. Convex
9. Mercury
10. Iron and nickel
11. True
12. 2007

13. 2 hours. In one hour, Fred eats 27 chocolates, Alice eats 12, Kelly eats 21. A total of 60 chocolates. Therefore  $120 \div 60 = 2$  hours.

Keep in touch with all the activities at Cornwall College STEM

Website:  
[www.cornwall.ac.uk/stem](http://www.cornwall.ac.uk/stem)

Facebook:  
[www.facebook.com/ccstem](http://www.facebook.com/ccstem)