



UNIVERSITY OF
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Science Festival



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Speaker spotlights

Professor Ashok Venkitaraman

Professor Ashok Venkitaraman FMedSci is the Ursula Zoellner Professor of Cancer Research at the University of Cambridge, and the Director of the Medical Research Council (MRC) Cancer Unit. He is internationally recognized for his research explaining how inherited mutations affecting certain genes, like the BRCA2 breast cancer gene, predispose families to different types of cancer. His research has revealed how these cancer predisposition genes normally work to protect the genetic information encoded in human chromosomes, and how their inactivation leads to carcinogenesis. His work has led to the development of new approaches for treatment now being applied in clinical practice.

On Sunday 23 March, the MRC Cancer Unit will host events at the Clinical School on the Cambridge Biomedical Campus from 11am-4pm, offering an opportunity to the public to take a look behind the scenes of cancer research as part of the Cambridge Science Festival.

The Science Festival asked Professor Venkitaraman about his career and his research

CSF: When and how did you decide to work in cancer research?

AV: I learnt and practiced clinical medicine in India before I began my research career at the MRC Laboratory of Molecular Biology in Cambridge, trying to understand how white blood cells rearrange their genomes to generate antibodies. This led me to think about the mechanisms that normally protect genomic information, and how their breakdown might lead to cancer. In 1998, my laboratory discovered that the breast cancer gene BRCA2 is a crucial component of these protective mechanisms. Since then, we and others have identified many 'cancer predisposition genes' that work in this way. Understanding how their inactivation leads to early-onset cancer in certain families, and how this knowledge can be used to develop new approaches to treatment, has remained my focus.

CSF: Why are these scientific problems important in the fight against cancer?

AV: Any one of the millions of cells in our bodies could become a cancer cell – but this is a very rare event. We do not understand why. However, the mechanisms that normally prevent cancer are clearly disordered in patients who inherit mutations affecting 'cancer predisposition genes' like BRCA2, because these individuals frequently develop cancer at a relatively young age. So, studying genes like BRCA2 provides unique and powerful insights into the protective mechanisms that prevent the emergence of cancer, and the expectation that this knowledge will ultimately lead not only to better treatments but also to opportunities for cancer prevention. That's why I find these scientific problems so important and interesting.

CSF: What have you learnt so far through this research?

AV: Not enough! But there have been some interesting and important developments. To protect genomic information, human cells when they divide must carefully ensure that no mistakes are made in genome duplication, that any damage created during the copying process is repaired, and finally, that the copied genomic information is correctly distributed to the two daughter cells. We have discovered that BRCA2 works in all of these processes – genome copying, the repair of DNA

damage, and the distribution of genomic information. So, when BRCA2 is inactivated, a large number of genomic errors are created whenever cells divide. These errors – called mutations – affect many different genes and cause cellular defects that lead to cancer. This work highlights the importance of the mechanisms that protect genome integrity in preventing the earliest steps in the development of cancer. It has also shown that certain drugs, which cause DNA damage that is normally repaired by BRCA2, can effectively kill BRCA2-deficient cancer cells.

CSF: What types of cancer are you currently working on?

AV: BRCA2 is not just a breast cancer gene – families who inherit mutant BRCA2 also suffer from ovarian, prostatic, pancreatic and other cancers. We are currently working to understand how BRCA2 is involved at the earliest steps of the development of pancreatic cancer, which is very hard to detect and treat early, and therefore often fatal.

CSF: What can we hope to see in the next 10 years?

AV: Advanced cancer is difficult to treat and often recurs despite the best available treatments. But most cancer research continues to focus on late-stage disease. Our work on ‘cancer predisposition genes’ emphasises for me the importance of understanding the earliest steps in cancer development in order to detect the disease early, to find radically new approaches for treatment, and eventually to develop methods for cancer prevention. I hope that over the next 10 years, we will see the impact of this work on the survival of patients. I should say that these problems – understanding the earliest steps in carcinogenesis and using this knowledge to improve clinical practice – are the core focus of the MRC Cancer Unit and my faculty colleagues all work on different aspects.

CSF: Why is it important for the MRC Cancer Unit to take part in such events as the Cambridge Science Festival?

AV: For several reasons. Cancer is a problem that affects so many of us – it is vital to disseminate information about the disease and what we know about its causes. Our work is largely supported by the community via our MRC and charity funding, and so I think it is important that we offer the opportunity for people to see what we do. I also hope that events like the Cambridge Science Festival will interest and encourage young people to consider careers in scientific research.

Professor Barbara Sahakian

Barbara Sahakian is Professor of Clinical Neuropsychology at the Department of Psychiatry, University of Cambridge School of Clinical Medicine, and Honorary Consultant Clinical Psychologist, Cambridge University Hospitals NHS Foundation Trust.

Professor Sahakian has an international reputation in the fields of cognitive psychopharmacology, neuroethics, neuropsychology, neuropsychiatry and neuroimaging. She is co-inventor of the CANTAB computerised neuropsychological tests, which are in use world-wide. Professor Sahakian is probably best known for her research work on cognition and depression, cognitive enhancement using pharmacological treatments, neuroethics and early detection of Alzheimer's disease.

The Science Festival caught up with Professor Sahakian to ask her about the talk *Overcoming stress and anxiety: healthy brains for a flourishing society*, which is on Tuesday, 11 March.

CSF: What is anxiety and stress, and what are some of the causes?

BS: All of us have felt anxiety from time to time. Will we perform well in the exam? Will we be selected at interview for a job? Will my blind date like me? The difference is that for healthy people, this anxiety does not interfere with our ability to function in daily life and our sense of wellbeing overall. Anxiety disorders are debilitating and affect people's wellbeing and stop people from being able to perform their normal activities of daily life.

Stress is a somewhat subjective concept. What some people would regard as stressful, such as public speaking, others may regard as a positive challenge which they look forward to. Mild stress that we show mastery over and overcome helps to build resilience to stress. However, chronic, severe stress is very detrimental to physical and mental health.

CSF: In the 2013 CBI/Pfizer Fit for Purpose survey, stress, anxiety and depression were listed as the main causes of employee absence. Why do you think anxiety is on the increase?

BS: Debt, extreme levels of competition, extreme levels of performance demand all lead to greater levels of stress. In 2014, in an environment where there is global competition and unemployment and other factors which lead to stress, this also leads to an increase in anxiety and depression.

CSF: Are there clear physical and mental ailments that can be a direct result of stress, worry and anxiety? What are the long-term damaging effects of stress and anxiety to an individual?

BS: In general, chronic severe stress exacerbates both physical and mental illnesses. We know that in many people stress leads to both depression and anxiety. There is strong data that outcomes are worse for diseases such as cancer and in medical patients for hospital stay if the patient also has depression.

CSF: What are the long-term repercussions on society as a whole if half its populace are suffering with these ailments? Are we seeing these repercussions now?

BS: I have participated in a number of neuroscience and mental health policy projects. For example, I was recently at the World Economic Forum 2014 in Davos, and governments around the world

finally understand that there is no greater financial or societal challenge than the impact of mental health disorders. Dementia, depression, anxiety and other neuropsychiatric disorders destroy mental capital and wellbeing. One in four of us will suffer from a mental health disorder at some point in our life. Alzheimer's disease, schizophrenia, anxiety, depression and mania all have associated cognitive symptoms. It is these problems with attention, memory, decision-making, planning, problem-solving and impulse control which lead to an inability to work and difficulties in activities of daily living. Absenteeism and presenteeism at work for those with depression and anxiety constitute major financial problems for global productivity.

CSF: There are countless treatments for stress and anxiety; which are currently proving to be the most effective?

BS: There are psychological treatments that are effective, including cognitive behavioural therapy. There are also drug treatments, which include selective serotonin reuptake inhibitors (SSRIs) and serotonin-noradrenaline reuptake inhibitors (SNRIs).

These treatments can be used in combination with relaxation therapy.

For very short-term use, anxiolytics including benzodiazepines and buspirone can be used.

It may be that combinations of psychological or cognitive and drug treatments are most effective.

CSF: Are there any new treatments?

BS: New psychological treatments include mindfulness therapy.

There have also been some experimental studies of phobias which combined the drug D-cycloserine with cognitive behavioural therapy during virtual reality sessions designed to accustom them to fearful situations. This combined treatment saw symptoms improve faster in the active drug group compared to those given placebo.

Elizabeth Phelps and Joe LeDoux and colleagues have shown that propranolol blocks reconsolidation of fearful memories. This experimental approach is being examined for anxiety disorders such as post-traumatic stress disorder (PTSD).

Professor Dame Sally Davies

Recently named one of the top 10 most powerful women in the UK, Professor Dame Sally Davies is the Chief Medical Officer for England, guiding the UK Government on all medical issues, particularly Public Health. She is the first woman to fill this post.

As a researcher, Dame Sally focused on sickle cell disease, before becoming involved in research and development in the NHS. As Director-General, she established the National Institute for Health Research (NIHR) with a budget of £1 billion. She continues to be responsible for Research and Development within the Department of Health.

Sally has been awarded a DBE (Dame Commander of the British Empire) for services to medicine and is an Emeritus Professor at Imperial College London.

Dame Sally will be speaking at the Cambridge Science Festival on Sunday 23 March about the consequences of our long-term abuse of antibiotics: *The drugs don't work: a global threat*.

CSF: Do you think we can turn the tide on the effects of antibiotics overprescribing or is it too late?

SD: We have reached a critical point at which we must act now as the situation will only get worse: 25,000 people a year already die in Europe due to Antimicrobial Resistance and some infections, such as gonorrhoea, are already resistant to our drugs of last resort. There is currently no effective technology that can reverse the resistance that has already developed. However, we can act to slow down the development of further resistance and ensure that there is a pipeline of new drugs in development. Behaviour change at the personal, national and global level is required to preserve our remaining antibiotics and the effectiveness of any new antibiotics that are developed. At the personal level, patients and GPs need to ensure that they are taking and prescribing the right antibiotics, for the right amount of time and at the right dose. At the societal level, we need systems of surveillance and monitoring for resistant bacteria and antibiotic use, in both humans and animals. At the global level, international collaboration is required to foster commitment to the appropriate use of antibiotics and to create a market that incentivises research and development into new antibiotics and diagnostics.

CSF: What kind of actions do you think we need to take on a global scale?

SD: AMR can only be successfully addressed on a global scale: resistant bacteria easily transmit between countries and any mechanism that incentivises the development of new antibiotics will only be effective if applied to the international pharmaceutical market as a whole. We therefore need to galvanise international collaboration to prevent the global spread of AMR: this includes prevention and control, surveillance and monitoring and stewardship and conservation. We also need to garner international support for a 'one health' approach to tackling AMR: action is required not only in the area of human health but also animal and agricultural health as 70% of antibiotics worldwide are used in animals.

To this end, the WHO executive board adopted a resolution on AMR in January which, if passed by the WHA member states in May, will call for the development of a global action plan to tackle this significant issue and commit the WHO to supporting individual countries to develop their individual

strategies for dealing with AMR. The Commonwealth can also be instrumental here in providing support to countries to develop their laboratories and surveillance and monitoring systems. Similar action is needed in the animal arena, in terms of monitoring, surveillance and the enforcement of guidelines regarding the appropriate use of antibiotics. This may be achieved through a resolution passed by the Food and Agriculture Organisation (FAO) or another form of high-level action within the UN. There is also a need to further develop the international evidence base regarding AMR; both in terms of the link between animal antibiotic use and human health and the costs of inaction to society, the economy and our health.

In order to ensure a supply of effective antibiotics, there is an urgent need to stimulate the development of new antimicrobials (including antibiotics) and rapid diagnostics. Pharmaceutical companies are currently not incentivised to focus on antibiotics as drugs for long-term conditions, such as statins, are far more profitable. Such drugs for chronic conditions are taken every day for the rest of a patient's life, whereas antibiotics may only be taken for a week once every few years. As the science behind the development of new antimicrobials is complex and expensive, pharmaceutical companies in the current climate struggle to offset R&D costs. New models for innovative financing and regulatory (licensing) approaches are required – whether these be public private partnerships, advanced purchase agreements or something entirely novel.

CSF: Why do you think there has been such an overprescribing of antibiotics?

SD: There are a number of factors that likely contribute to the overprescription of antibiotics. Patients' expectations that they will come away from the doctors with antibiotics may cause them to put undue pressure on their GP to prescribe. Greater education is needed regarding when antibiotics are effective (eg for a bacterial illness) and when they are not (eg for a virus). Furthermore, when faced with an ill patient of unknown diagnosis, it is natural that doctors would rather prescribe an antibiotic that may not be needed than take the risk of not doing so, for the less immediate benefit of preserving antibiotics. What is vital here is the development of new rapid, point of care diagnostics that can easily decipher whether the illness is due to a bacteria or a virus and if a bacteria, which one. I hope that large international prizes can play a role here in rewarding the development of such diagnostics.

Globally, certain countries' payment and reward systems may also encourage prescribing, for example where healthcare workers are paid according to prescriptions written.

CSF: If new drugs are developed to combat the 'bugs' now resistant to antibiotics, could we see the same thing happening again in the future?

SD: The development of resistance is due to the natural Darwinian process of evolution. Any bacteria will therefore eventually develop some form of resistance. However, we are responsible for exacerbating and expediting the process. By ensuring that antibiotics are used appropriately we can preserve the antibiotics that we do have for as long as possible. Likewise, it is vital that any new antibiotics that are developed are conserved to ensure that they do not rapidly become resistant.

CSF: Who do you think are most at risk? Or is it more a case that it affects everyone?

SD: Clearly, this issue affects us all as we are all vulnerable to infections and rely on antibiotics to treat them. Currently, only approximately 7% of deaths are caused by infections. However, without effective antibiotics, there is a risk that we will go back to a post-antibiotic era in which nearly 50% of people died from infections. A lack of antibiotics may place a particular burden on populations in developing countries, where infections already contribute to a significant proportion of the burden of disease.

Certain patients with chronic conditions also heavily rely on antibiotics: without antibiotics for example, people with diabetes would suffer far greater morbidity. Furthermore, certain modern hospital treatments such as chemotherapy and hip and organ transplants will no longer be able to take place as the risks of such procedures without the availability of effective antibiotics will be too great.

CSF: We have seen huge advances in medical science over the past half century. What do you think will predominate over the next 50 years?

SD: Improved computing power, data collection and processing is likely to make medical diagnosis quicker, cheaper and more accurate. Through implementation of global standards, medical information, including patient records, could be shared by clinicians in different countries. With a globalised medical information network coupled to many millions of sensors, advanced analytical systems could identify, track and predict the spread of disease, providing information so that preventative measures can be put in place quickly. Similarly, portable medical devices that can be linked to medical networks may mean that remotely operated (or automated) medical systems will allow patients to be treated and cared for in their own homes.

The field of pharmaco-genomics (the study of how an individual's genetic inheritance affects the body's response to medicines) is in its infancy, but holds the promise that medicines might be tailor-made to a person's genetic makeup – making medicines more effective and safe. Similarly, the use of Whole Genome Sequencing for patients with cancer or rare diseases will allow for faster and more accurate diagnosis.

CSF: Aside from the effects of the overuse of antibiotics, what do you think are going to be the other serious health issues we will have to contend with?

SD: Modern technology and advancements in healthcare mean that people are living longer. This ageing population leads to an increased burden of chronic diseases such as diabetes and sensory conditions as well as a greater prevalence of dementia. These shifting demographics will have a significant impact on health systems, both in terms of cost and the focus away from communicable diseases to long-term care and management.

Our lifestyles are also leading to an ever-increasing burden of conditions such as diabetes, obesity and liver disease. These are largely linked to our behaviours: our levels of physical activity and what we eat, smoke and drink. In 2012, 67% of adult men, 57% of adult women and 28% of children in the UK were overweight or obese. Rates of liver disease are dramatically increasing, especially in young women. Such non-communicable diseases are now the most frequent causes of death in most countries and this pattern will only get worse unless a wider societal preventative approach is adopted.

CSF: You're the first woman to hold the post of Chief Medical Officer. What do you think you bring to the role?

SD: I think that it is important to have both genders represented in senior posts, to provide varied perspectives, strengths and characteristics. However, I believe that I bring more to the role of CMO as a result of my attributes and experience rather than solely because I am female. My previous experience as a clinician and my background in research means that I can ensure that my policy approach is both patient-focused and based on sound, scientific evidence.

Professor David Spiegelhalter

David Spiegelhalter OBE is Winton Professor for the Public Understanding of Risk in the Statistical Laboratory, University of Cambridge and author of *The Norm Chronicles*. He is a fellow of Churchill College, Cambridge, a Fellow of the Royal Society and has a string of honorary fellowships and doctorates. He is an ISI highly-cited researcher.

Professor Spiegelhalter's background is in medical statistics, particularly the use of Bayesian methods in clinical trials, health technology assessment and drug safety. In his post, he leads a small team that attempts to improve the way in which the quantitative aspects of risk and uncertainty are discussed in society. He also works closely with the Millennium Mathematics Project in trying to bring risk and uncertainty into education.

You can catch Professor Spiegelhalter talking about coincidences, *What a coincidence!* on Thursday, 13 March.

The Science Festival asked Professor Spiegelhalter a few questions about coincidences, taking risks and how to measure whether it's worth taking a risk.

CSF: What is a coincidence?

DS: I use the definition suggested by some famous statisticians: "a surprising concurrence of events, perceived as meaningfully related, with no apparent causal connection."

CSF: Why do we take such stock of coincidences?

DS: The phrase 'perceived as meaningfully related' says it all – humans seem to be hard-wired to construct meanings to events, even if the rational part of our thinking (if such a thing exists) tells us that it's just good or bad luck, with no reason at all.

CSF: What's the most surprising coincidence you've come across?

DS: Personally, I don't experience coincidences much, but that's probably because I'm not only spectacularly unobservant, and also uncommunicative with strangers, and so I miss all the wonderful connections that we may have had. I believe that mindful, social people will experience more coincidences, but I don't have empirical evidence for this. But some great ones have been sent to our website – I particularly like the occasions in which someone is walking past a phone box, which rings, they pick it up and it is for them (which also happened in an episode of Sherlock, but that wasn't chance).

CSF: Is chance the same as probability?

DS: When putting numbers on events, I try to use *chance* for situations which, practically speaking, have agreed odds due to the physical set-up, such as flipping fair coins, lottery balls, radioactive decay and so on. I say 'practically speaking', since the movement of coins and lottery balls might be considered completely physically determined, but just too complex to analyse and predict. In contrast, I use *probability* for the more common situations where our uncertainty is due both to what we *can't* know and also to what we *don't* know, such as the voting intentions in Scotland,

future climate change, who will win the World Cup, or what happened to Lord Lucan. In fact, any situation where we have to use judgement, rather than just maths, to make reasonable bets.

CSF: Based on probability, can you predict the outcome for most things?

DS: No, using probability is not about making predictions, but producing good odds. People say that Nate Silver got all the US States right in the last election, but in fact he did not make any concrete predictions – he just gave more than 50% probability to the winning candidate in each State (and he was extremely lucky with Florida, where he was only just in favour of Obama, with a probability of 50.3%).

CSF: What's the difference between a bad risk and a good risk?

DS: Every action in the face of uncertainty carries risk – things may turn out as you would most like them to, or not. I would say a bad risk is where a reasonable observer would feel the odds are stacked against you; a good risk is when they appear in your favour. Of course, these are all just judgements about 'good' and 'bad' – neither the odds nor the value you give to the consequences are objective states of the world. In fact, I believe that the entire edifice of risk assessment is a human, subjective construction, and that it is pointless, although tempting, to talk about the 'true' risks (except in the situations of 'pure chance' I discussed above, where we would generally agree on the odds).

CSF: What are the chances of someone winning the lottery? And could they increase their chances?

DS: There's around 1 in 14,000,000 chance of winning a share in the jackpot. And, in spite of what some websites claim, there is nothing you can do to increase these chances except buy more tickets, possibly 14,000,000 of them. Of course, if you want to increase your share of any jackpot you are lucky enough to win, maybe you could choose less popular numbers, such as above 31 to avoid birthdays.

Professor Gerry Gilmore

Gerry Gilmore FRS is Professor of Experimental Philosophy at the Institute of Astronomy, University of Cambridge. He leads the effort to understand the structure and origin of our Galaxy and how the masses of stars are distributed at birth. Professor Gilmore is also the UK Gaia satellite principal investigator and was recently made a Royal Society Fellow.

On 10 March, Professor Gilmore will be giving a talk alongside Dr Patrica Fara and Dr Rosie Bolton – *What's new in space?* which will reveal the latest discoveries. He will also be giving a presentation during the *Cambridge Stars* event on 11 March.

The Science Festival caught up with Professor Gilmore and asked him about experimental philosophy and what we can expect to discover as a result of the Gaia mission.

CSF: For those that don't know, can you explain what experimental philosophy is?

GG: The title is a very old term left from the days – Newton's time – when our modern concept of scientific research was being developed. Thinking of big questions – natural philosophy, a term in use since the Greeks – became based on observations, testing ideas against observations of the world. This became specialised into, eventually, physics, a word that dates from about 1580. The word 'scientist' dates only from 1834. In modern terminology, experimental philosophy means in my case studying big questions about the Universe through observations. Experimental astrophysics, if you will. Though, of course, we cannot experiment in astrophysics beyond our own solar system – merely observe and deduce.

CSF: You were a driving force behind the Gaia-ESO survey. What are you hoping this survey will eventually show?

GG: The Gaia-ESO survey (www.gaia-eso.eu) is the largest ground-based survey in astronomy using large telescopes. It has some 400 scientists actively involved, from 100 Institutions across Europe. It has two Principal Investigators, leading the project, myself and Sofia Randich, who works at Arcetri Observatory in Florence, Italy. Such a huge project has many specific aims, not least among them building the many European groups who study stars in the Milky Way, and the chemical elements of which they are made, to work as a united community. The top-level science goal is however to provide the precision measurements of the different chemical abundances found in stars in different parts of the Milky Way to complement the Gaia space mission, and so to allow us to understand the history of the Milky Way. Chemical elements shortly after the Big Bang were only hydrogen, helium and lithium. Everything else, including most of what you are made, was created later in stars. By measuring the growth of the different types of chemical elements in different parts of the Milky Way we can determine when and where the elements were created, and how they moved around in the growing Milky Way. We have a 60-second cartoon introducing this on our Gaia website at <http://gaia.ac.uk/multimedia/why-we-need-gaia> as well as several other handy introductions.

CSF: How long did it take to plan and execute the Gaia mission?

GG: The Gaia mission (see our website: gaia.ac.uk for lots more information and videos) is a massively ambitious European Space Agency project to map the Milky Way, providing for the first

time a 3D picture of what our Galaxy is really like. I was part of the team that first proposed Gaia, developed the science programme for it, and sold the idea to the astronomical community. I am the UK Principal Investigator for the Gaia mission. Work on Gaia started in the early 1990's, and has continued since, happily culminating in a successful launch on Dec 19, 2013. Gaia is currently one million miles from Earth, in its operating orbit, and is being checked out and set up to begin its work.

CSF: What is so unique and exciting about the Gaia mission?

GG: Everything!!! Gaia is awesome! The technology is quite remarkable. Gaia's primary task is to measure distances to stars. This means parallax – the very same process that you use, with your two eyes, to judge the distances of things – by measuring the different angle to something as seen from each eye. Or, in Gaia's case, from across the Earth's orbit, by comparing angles measured in Spring with those in Autumn. The special feature is that the Universe is VERY BIG. Things are very far away. The angles are tiny. Hence, Gaia needs to measure angles so small they correspond to being able to tell the left side from the right side of a human hair on a person's head in Paris when you are in London. Pretty neat! And Gaia will do that for one billion stars, 80 times each. That will give us the first 3D map of the Milky Way, measuring not only where everything is, but also how fast and in what direction a star is moving. We'll be able to walk through the Milky Way!

CSF: It's very early days, but have there been any discoveries so far? If not, when could we hope to see something?

GG: For a satellite as complex and high-precision as Gaia it takes months to turn everything, to check it and such like. This month most of the time is spent getting Gaia's telescopes in perfect focus. We already know Gaia's camera – a billion-pixel camera, the largest ever launched in astronomy – is working well. As is its ultra-precision propulsion system, the atomic clocks, and the computers. And our ground-based data-processing systems – we are processing the Gaia photometry in Cambridge, with a dedicated processing centre and extremely powerful computer. So we're confident Gaia will work successfully. But checking it out fully and getting it tuned up as well as it can be will take until late April.

CSF: When and what is the next Gaia milestone?

GG: Gaia will start science observations in May. The first big step after that for us is to start delivering science to people – including the public, amateur astronomers and schools. As part of our photometric data processing in Cambridge, we compare each new Gaia measurement with previous Gaia observations of that patch of sky. When new things appear supernovae, interestingly variable stars... we find them and make them public, through our gaia.ac.uk website. They become available for everyone, world-wide, with no restrictions. We are working with the observatories that provide access to robotic telescopes for school classes to ensure these Gaia science alerts are observed, allowing schools to be the first group on Earth to observe a new Gaia discovery, to contribute essential science information to determine just what the new thing is, and allow the school students to learn science by doing original science. And get credited in the eventual science analysis publication. We will start these Gaia Science Alerts as soon as we can, hopefully in late summer this year.

CSF: Do you think we will very soon know the answers to the age-old questions such as how old is the Milky Way and when did it form?

GG: Not very soon... These are big questions, involving complex processes acting over 13 billion years so far, and far from complete today. Gaia will provide the information we need to make the next really big step in our understanding. We will certainly know how old things are quite soon. But I suspect we will also discover, from Gaia, things we currently don't know exist, and events we don't know happened. The age-old questions just might turn out to be, not so much the wrong ones to be asking, as only some of those we should be asking.

Ian Harvey

Ian Harvey is Head of Biology at Hills Road Sixth Form College in Cambridge as well as being staff governor. He is a Patron of the Cambridge Science Festival, co-ordinator for the Cambridge Biology Network, Trustee of STEM team East, a STEM Ambassador, lay member of the Babraham Institute Animal Welfare, Ethics and Experimentation Committee, Vice-Chair and Education Officer for the East Anglia Branch of the Society of Biology and a member of the national Society of Biology Education Committee and the Biochemical Society Education Committee.

Ian created and runs Big Biology Day, which is now firmly established as a key component of national Biology Week each October. This public engagement event in Cambridge attracts over 1,000 visitors and is now being replicated around the country.

In January 2014, Ian, whose mission is to spread a love of science and biology in particular, was listed among the 100 greatest science minds in the UK by the Science Council.

Ian also coordinated the Society of Biology/Hills Road Sixth Form stand at CSF @ Corn Exchange on 15 and 16 March.

The Science Festival caught up with Ian and asked him about being listed as one of the 100 greatest science minds in the UK, his love of teaching biology and how he thinks the gender gap in science education could be addressed.

CSF: Were you surprised to have been one of only three teachers listed in the top 100 UK Scientists? How did it feel when you found out?

IH: Total surprise. I didn't know the Science Council were preparing a list let alone that I'd been nominated. When I looked at the rest of the people on the list I thought, "Wow, I'm in some impressive company!" The headline to an article in the Cambridge News was 'Hills Road teacher Ian Harvey, billionaire Lord Sainsbury and Cambridge University professor Lord Martin Rees among top 100 UK scientists, says Science Council'. If only the comma had come after the word 'billionaire'. As the news sunk in and I read the criteria for inclusion on the list, I realised how special it was. To be nominated by people who I work with in my various roles and to be selected by an illustrious panel for inclusion on the list was very heart-warming. I've had lots of lovely emails, texts and even a cake! The most touching aspects are the congratulations and kind words from my current and former students. That's job satisfaction for a teacher. In these days of Ofsted inspections and appraisal, the only endorsement I truly value is by my students. The comments I've received from them and their parents has made me very happy.

CSF: What is it about teaching biology that you love so much?

IH: That question has two parts, teaching and biology.

Teaching is more than imparting knowledge and preparing students to get a good grade. It's about enthusing, engaging and providing opportunities. The way things are today in education with all the emphasis on league tables, target grades and training to pass exams, something can get lost. I want my students to enjoy the experience of studying biology. I want it to be fun, eye-opening, challenging and rewarding. I remember my biology teacher, Pam Carter. She went the extra mile for

those of us who were interested. She made me realise that a kid who liked birds, plants and natural history was in fact a biologist. Her enthusiasm and support helped me to get into Cambridge and to do what I do now. What Pam did for me, I want to do for my students. Without meaning to be too grand, teachers really do make a difference in people's lives. Many of the eminent scientists I know pay tribute to the influence of a few people in their journey and that often includes a teacher who encouraged, guided and inspired. I'm still in touch with lots of former students and follow their careers with interest. Quite a few I now work with in various ways. I taught them the fundamentals of DNA structure and now they're pushing back the boundaries of genome research. On a visit to the Sanger Institute, I bumped into a section leader who I taught and his first words were, "This is all your fault!"

The second part of the question is biology. At the risk of offending my chemistry and physics friends, biology is very much in the forefront of contemporary science. The application of DNA technology, use of stem cells, conservation of ecosystems, tackling degenerative diseases, advancing medical procedures and lots more are challenges and opportunities. My role is to enable my students to play a part in addressing these challenges at university and beyond. In the last two years, my students and I have worked on projects with MedImmune, University of Cambridge and the Wildlife Trust. Each of these projects gives a chance for students to engage with professional biologists, learn about biology in the real world and maybe embark on a career that will have true value in medical treatments, addressing new ways to face our future needs for energy and conserve important ecosystems and enhance biodiversity.

So for someone who loves teaching and communicating and who has a passion for biology, I guess I was destined to be a biology teacher. I love it just as much today as I did when I started.

As a teacher, I don't push back the boundaries of science. What I do is equip young people with the basics to go on and take biology to the next level of knowledge and understanding.

CSF: What do you find most challenging about teaching biology?

IH: The lovely thing about biology is that everyone can relate to it so it's not difficult to engage minds. This is particularly true of teaching sixth formers who have opted to study my subject. Everyone knows someone with diabetes, we all hear about GM crops with their potential and issues, sadly we know about the problems with obesity, heart disease and cancer and we're aware of the impact we have on our environment. My job is to equip students with the tools to approach the challenges scientifically and objectively. Biology and science generally is about collecting and using evidence to lead to informed decision-making. Political expedience, media hype and public fear shouldn't be drivers for decision-making. My students are the next generation who will do the experiments, collect and analyse the data and hopefully be listened to. At the moment, they're being young people, hanging out with mates, having fun, and so they should but over the horizon they'll be helping to tackle some pretty tricky issues. I want to help equip them to progress and to be instrumental in shaping our future.

The challenges about teaching biology are really the challenges about teaching generally. Unfortunately, education is constantly being tossed about on an ever-changing political sea and the latest accepted wisdom about 'what makes a good lesson' and 'what makes a good course'.

When I started teaching, an A level student studied three A level subjects (four if you include maths and further maths). They did the exams after two years, what's called a linear course. No coursework. Since then we've seen A and AS levels, modular exams, opportunities for multiple resits and coursework. Now the plans for the future are no coursework, fewer chances for resits and linear courses with terminal exams. My prediction that I'd end my teaching career delivering what I delivered when I started are coming true! It's going full circle. Education shouldn't be down to politicians working to their own agenda nor should it be influenced by the 'flavour of the month' educational theories. Teachers working day-to-day in the classroom know what works and they should have the greatest voice. Rant over!

CSF: Do you think biological sciences are becoming a more popular option for students choosing further education? If so, why do you think this is?

IH: Biology is popular. In my department at Hills Road, there are over 600 students. Many are aspiring medics and vets, others want to be physios, biomedical scientists, geneticists, physiologists, biochemists, microbiologists and lots more. The students recognise employment opportunities but more importantly, they see that these careers are important and that they'll get to use their knowledge and skills in a worthwhile way.

CSF: The gender gap in science and maths education still exists. How do you think this could be addressed going forward?

IH: This is a hard question for me to answer as biology has historically attracted an equal number of males and females. I recall a former physics colleague describing biology as a 'girl's subject'. This revealed two things about him (yes, he was male). He didn't recognise the equal gender balance in biology and, by implication, he saw his own subject as a 'boys subject'. A girl can relate to maths and physics just as much as they can to biology. Boys don't have a 'maths and physics' gene on the Y chromosome. I don't have a solution but somehow we have to dispel myths and I know that my colleagues at Hills Road and the Cambridge science community are working hard on this challenge.

CSF: Do you think schemes which provide professional development for science teachers are having an impact on advancing science teaching?

Continuing Professional Development (CPD) is a lovely concept and it works but there has to be management buy-in and that costs. To release a teacher for a day to attend a very worthwhile course for them and subsequently their students costs in terms of the course fees (if any), costs of a cover teacher for the lessons and travel costs. Having organised conferences for teachers, which in the end didn't happen, how many times have I heard, "I would, if I could but I can't".

There's loads of good stuff out there, we just have to enable teachers to have the opportunity to access it.

CSF: You have been a huge supporter of the Cambridge Science Festival for many years. Why do you think such events are so important?

Being part of the Cambridge Science Festival is hugely important and rewarding for me. The day job is teaching biology to sixth formers but the science festival gives me a chance to engage with a much wider audience, an audience who are looking to engage with science irrespective of age or

experience. I have a lovely photo of a granddad, daughter and granddaughter all joining in to dissect an owl pellet. No one was an expert, all were eager to learn and they shared the experience.

The Science Festival is a special fortnight in my calendar for many reasons. I get to share my enthusiasm for biology with all sorts of people, young and not so young, experts and amateurs. The Festival brings together the whole Cambridge community and beyond. I'm going to stick my neck out and say that in Cambridge we have the most integrated, cohesive science community you can find anywhere. The festival knits together the public, research institutes, universities, schools and colleges and companies. It enables us all to open our doors and say, "Come on in, we want to tell you what we do, why we do it and why it's important". And I go along to lots of the events and I have my eyes opened. I hear nuggets of information one day and the next I pass them on to my students. I don't care about the syllabus at that point; I just want to share my enthusiasm for new stuff because it's exciting.

CSF: What events are you organising at the Festival and are there any particular events you are hoping to attend?

I'll be coordinating the Society of Biology/Hills Road Sixth Form stand at CSF @ Corn Exchange on March 15 and 16. It's a great chance for us to share our enthusiasm for biology and I never fail to be impressed with how brilliant my students are. They're superb ambassadors both for biology and for young people.

What events do I want to attend? So hard to decide. Every year, I go through the programme and tick events and end up double and treble booking myself. I want to hear about stem cells, brains, genes and proteins, cancer in dogs, the science of wine, snowflakes and plants and microbes. And most of all, I love school zone; young scientists showing the public what they've been doing in their science clubs and being the 'experts'. We have a lot to learn from these future scientists and should be doing all we can to encourage them.

Dr John Davey

Dr John Davey is a Herchel Smith Fellow in the Department of Zoology, University of Cambridge. His research focuses on how genomes vary and how this variation influences animal diversity. Dr Davey is addressing these questions using the charismatic *Heliconius* butterflies.

In his Science Festival talk on 15 March, *Why (and how) do butterflies paint their wings?* Dr Davey will talk about the dazzling beauty and diversity of butterfly wings, show what butterflies can tell us about evolution, and explain how genes can work together to paint a butterfly's wings.

The Science Festival caught up with Dr Davey to ask him about his research.

CSF: Why did you choose to focus your research on butterflies?

JD: We work with butterflies because we can use them to study how old species evolve into new ones.

When we think about evolution, we usually work backwards. We start with a present day species and ask how it got that way. We try to explain its features by saying why those features are useful to the species, or we try to specify likely ancestors of present day species by looking at fossils, DNA sequences and morphology.

But we also need to think forwards in evolution – to look at a fossil and ask, why did that fossil species evolve into these particular present day species, rather than some other species? Why did some species become extinct, when others did not? While the millions of species we know about are remarkably diverse, they are a very small fraction of all possible species. Why do we see the particular species we see in the world?

It is very difficult to do experiments to answer these questions, because it can take millions of years for new species to emerge. So, instead, we can look at present day groups with many species at different stages of evolution.

The *Heliconius* butterflies are a group of around fifty species living across the whole of South America, and each species has about five to ten subspecies. Their wing patterns are very diverse, but they also share many pattern elements in many combinations, and distant species mimic each other. Some species split apart 10 million years ago, but some are still in the process of diverging, and still hybridise with each other.

We can take different pairs of butterflies, which might belong to the same species, or belong to different species but live in the same place, or live in different countries altogether, and study how these pairs differ. How do their wing patterns vary? Do they feed on different plants? Do they prefer to mate with their own species? How do their genomes differ? By studying these questions, we can learn a lot about how species form and change over time.

CSF: What can this research tell us about evolution?

JD: One of the major contributions of the theory of evolution is the idea that species are not immutable – that new species emerge from old ones. But how does this happen? What are the steps

that occur? We are trying to document this process for the Heliconius butterflies. Many other researchers are trying to answer the same questions in other groups – in stickleback fish, for example, or snapdragon flowers, or humans. By working on many different types of organism, we hope we will be able to compile a comprehensive picture of how species evolve.

CSF: Why do you think butterflies paint their wings?

JD: The most well-established explanations are about predators. Butterflies can avoid their predators by camouflaging their wings to look like dead leaves, or tree bark, for example. But they also use bright, colourful wing patterns as a warning, or to startle the predators.

Many butterflies are poisonous, and birds get sick if they eat them. If the butterfly has a bright warning pattern, the birds avoid them, which is good for the birds and the butterflies.

Alternatively, the butterflies might have a drab underside, which they show when they are resting, but a bright topside, maybe with eyespots, which they only show when a predator comes near. They flash the bright pattern and startle the predator for long enough to fly away and escape.

A more speculative reason for bright patterns, although evidence is accumulating rapidly, is that the patterns are for mate choice; butterflies use them to recognise each other, and they tend to prefer to mate with their own pattern. This appears to be genetic, although it may be learned in some cases.

CSF: Is there some parallel between what we find beautiful and why butterflies paint their wings?

JD: Beauty is in the eye of the beholder, so we really need to understand the evolution of the eye to answer this question. We know the butterflies see differently to us because they can also see ultraviolet. But most butterfly warning patterns are red, orange, yellow and black, the same as our warning patterns (think of road signs, for example). I find it difficult to believe that this is a coincidence, but we are a long way from understanding how a butterfly's ability to recognise colours and patterns might compare to our own aesthetic abilities.

CSF: Are butterfly wings like thumb prints – all unique?

JD: They are, although we don't know if they could be used for identification, like a thumb print. Within a species, the big features of a wing pattern – a red band, say, or an eye spot – are genetically controlled, but there is small variation in how each feature is made. This variation is mostly environmental – for example, the size of the wing elements might depend on how much, and what, the butterfly ate when it was a caterpillar. But there may be genes that modify the patterns in subtle ways – varying the sharpness of the colour boundaries, or the size of a spot, for example.

CSF: Why is there such diversity in the butterfly world?

JD: The most likely reason is diversity in habitat. For example, around half of all butterfly species are found in the tropics, where the rainforests provide many dense, rich niches for different species to inhabit. A more speculative reason is that the butterflies have evolved a sophisticated toolkit of patterning genes that can be combined to generate a huge range of different patterns – as if they started out being able to make fire and have figured out how to make fireworks.

It may be that every pattern has a good, adaptive reason for existing; perhaps they are optimised to the eyes of predators, or to excite the opposite sex. But it may be that this explosion of diversity is only temporary, and many of the patterns will become extinct, or converge on a smaller number of more optimised patterns.

What is certain is that butterfly diversity is rapidly decreasing. Three quarters of British butterflies decreased in number and distribution in the last 15 years, mostly due to habitat destruction by humans, and also because of climate change, which is also almost certainly due to human behaviour. Similar declines are being seen elsewhere; for example, Monarch butterfly populations in Mexico and the US are collapsing. Conservation efforts are maintaining some of the rarest butterflies, but we can expect the general trend to continue for the foreseeable future.

Speaker spotlight – Professor Kay-Tee Khaw

Kay-Tee Khaw is Professor of Clinical Gerontology at the Department of Public Health and Primary Care at the University of Cambridge.

Her research interests include the maintenance of health in later life and the causes and prevention of chronic diseases including cardiovascular disease, cancer and osteoporosis with a focus on nutrition and hormones. The research is based on longitudinal population studies and clinical trials. Professor Khaw is a principal investigator in the European Prospective Investigation in Cancer (EPIC) in Norfolk, and fellow of the Academy of Medical Sciences UK, and has a National Institute for Health Research Senior Investigator award.

Professor Khaw will be giving a talk, *Healthy for longer: guess how and guess who?* on Wednesday 19 March, 6.30-7.30pm at the Mill Lane Lecture Rooms.

The Science Festival asked Professor Khaw about EPIC, the state of the public's health in the UK, and what advice she would give on how to stay healthier for longer.

CSF: For those who don't know, could you tell us what the EPIC study is all about?

KTK: The European Prospective Investigation into Cancer is a 10 country, half a million participant study that was established to explore reasons for the large variations in cancer throughout Europe. There was a particular focus on potentially modifiable lifestyle factors including diet and physical activity.

The EPIC-Norfolk study is part of this collaboration but from inception was designed to encompass a wide range of conditions and health in addition to cancer. The EPIC Norfolk study recruited 25,000 men and women aged 40-79 years living in Norfolk, UK, between 1993-1997.

CSF: What are you hoping to achieve with this study?

KTK: The overall aim is identify lifestyle and behavioural determinants of health and chronic disease to inform interventions in middle and later life. To enable this, participants are providing us with extensive and detailed information on their diet, physical activity, psychosocial factors and health. They attend health examinations for a range of biological measures, such as lung function and blood pressure, and provide blood and urine samples for biological profiling. Participants are being followed up to the present to monitor changes in health over the years. As the population ages, we are becoming interested not just in preventing diseases such as heart diseases and cancers but maintaining quality of life through maintaining good physical, mental and visual functional health. Last year, we had a 20-year celebration with a meeting held in Norfolk to which participants were invited to attend.

CSF: What have you discovered so far? Has anything surprised you?

KTK: Despite abundant data from laboratory and clinical studies, there is still substantial controversy over the specific dietary components that may affect risk of conditions in human populations. Clinical and laboratory studies are often conducted under very controlled conditions with single nutrients. Though they may give indications as to mechanisms, they cannot replicate the complex

dietary exposures and interactions in real-life human populations or assess long-term relationships with health outcomes. Population based randomised trials of dietary interventions for disease prevention are either not feasible or have been largely inconclusive. Accurate measurement of diet is a challenge in free living communities so a major focus in the EPIC-Norfolk study is to measure diet much more accurately with a combination of dietary instruments including seven-day diet diaries and objective biomarkers such as individual fatty acids and carotenoids or urinary sugars as well as other behaviours that might influence the effects of diet, such as physical activity.

It's clear that the relationship between diet and health is much more complex than simply x or y are good or bad for you. Diet can be explored at the level of individual nutrients, or foods or dietary patterns. For example, there are many different sorts of fats and not only do different fatty acids appear to relate differently to risk of different disease, but the balance between different fatty acids seem to be important. And not only are there interactions between different foods and nutrients: for example, the associations between meat intake and risk of some diseases seems to be modified by intake of other foods such as dietary fibre intake – but dietary patterns such as frequency of eating and time of eating also appear to be important. And of course, other factors such as physical activity are hugely important.

Nevertheless, what is striking from many studies is that relatively modest and feasible differences in some behaviours seem to be related to substantial differences in health. For example, in EPIC-Norfolk, men and women who had four health behaviours: not smoking, not being physically inactive, moderate alcohol intake (more than one and less than 14 units a week) and eating five servings of fruit and vegetables a day had a quarter of the subsequent death rate over the next 15 years with survival equivalent to men and women 14 years younger who did not have any of these behaviours. These behaviours were also associated with good subjective functional health.

CSF: Have things improved since the study began 20 years ago?

KTK: Yes! Not just from our own study but many other surveys that indicate that the health of the general population in the UK is improving.

CSF: What advice can you now give the general public on how to stay healthier for longer?

KTK: The evidence, not just from the EPIC study but from a huge body of evidence worldwide is not to smoke, keep physically active and have a varied diet with more plant foods and less highly processed foods that are high in sodium, sugar and particular fats. There is also much evidence that keeping socially active has health as well as other benefits.

CSF: Do you think the population is becoming healthier or unhealthier and why?

KTK: National statistics on health indicate that the population is becoming healthier in terms of increasing average life expectancy, lower rates of many chronic diseases such as cardiovascular disease and also better functional health. However, many of these statistics are largely driven by post-war improvements with better nutrition, reduction in smoking and reduction in infectious diseases, and there is concern that younger generations may not continue to improve in health. A major public health success but also challenge is population ageing which is unprecedented in human history. This is because of improved health and survival throughout early life, but a challenge must be how we can best maintain good health and quality of life in older people. We are hoping to

contribute to that with continuing follow up in the EPIC-Norfolk study with the help of our participants.

Lord Rees

Sir Martin John Rees, Baron Rees of Ludlow, Kt OM FRS is cosmologist and astrophysicist. He has been Astronomer Royal since 1995 and was Master of Trinity College, Cambridge from 2004 to 2012 and President of the Royal Society between 2005 and 2010. Lord Rees is also a Patron of the Cambridge Science Festival.

As well as popularising his scientific areas from cosmology, including cosmic radiation background and galaxy formation, Lord Rees has written and spoken extensively about the problems and challenges of the 21st century, and the interfaces between science, ethics and politics. He is also one of three founders of the Centre for the Study of Existential Risk.

Lord Rees will be giving a public talk during the Science Festival, *Our Universe and others*, on Monday 17 March.

The Science Festival asked Lord Rees about other universes, extra-terrestrial life and the future of science.

CSF: Do you think parallel or other universes could feasibly exist?

MR: I think they could. Indeed they're a natural consequence of some current theories. There's strong reason to expect that our universe extends far further than we can see with our biggest telescopes. But that's just the aftermath of 'our' big bang. The more interesting (and more speculative) question is whether there are other big bangs, giving rise to other space-times, which might be governed by physical laws quite different from those that prevail here. What astronomers observe could be an infinitesimal part of physical reality. Our Copernican demotion may have much further to go.

CSF: What theories about extra-terrestrial life have you heard that you feel might be plausible?

MR: We've learnt just in the last decade that most stars are orbited by retinues of planets. The night sky is far more interesting than our ancestors thought. Our Galaxy contains literally billions of planets like the Earth. But biology is a harder subject than astronomy. We don't know how life began on Earth. Therefore, we can't tell if it was a rare fluke or whether we'd expect life to emerge on a typical planet. Progress is being made in understanding the origin of life. And within a decade or two we'll have good enough observations of some extra-solar planets to perhaps see evidence for a biosphere. And of course it's good that SETI searches continue - though I'm not holding my breath for signal from ET!

CSF: What do you think existed before the Big Bang? Or is that like asking what's north of the North Pole?

MR: We don't know. Indeed, when the universe was ultra-dense the whole idea of three spatial dimensions, and time ticking away, may have to be jettisoned, so we lose the concept of 'before' and 'after'.

CSF: What scientific breakthroughs do you think we might see over the next decade?

MR: I think we'll understand much better how, over 13.8 billion years, our part of the universe evolved from a hot dense beginning to the complex cosmos we observe, and of which we're part. Progress will depend on better observations, better computer simulations and a deeper understanding of physics.

CSF: As a species, where do you think human beings are headed?

MR: I think within a few centuries groups of pioneers will be living in communities away from the Earth. They will use cyborg techniques, and their knowledge of genetics to ensure that their progeny will be better adapted to alien environments. The post-human era will then have begun. We don't know if it will be dominated by organic or by silicon-based creatures - but there are billions of years ahead, and this evolution will happen on a technological timescale - much faster than the Darwinian selection that led to humans. But there will never be mass emigration of humans - nowhere in space is as comfortable as the South Pole. Problems of global sustainability must be solved here on this Earth.

CSF: What advice would you give to young scientists?

MR: First, choose a subject where new things are happening -- where you can draw on transformative new ideas, better instruments, new techniques, or better computers. You can then do exciting things without needing more talent than the earlier generation - you won't just have to tackle the problems they got stuck on. Second, don't necessarily choose what seems the most important problem. Multiply the importance of the problem by the probability that you'll solve it, and maximize the product. Many great problems have to be tackled obliquely or piecemeal.

Professor Mark Miodownik

Professor Mark Miodownik is a materials scientist at University College London. He is a widely known broadcaster and writer on science and engineering issues. He regularly gives popular talks on engineering and materials science to TV, radio, festival, and school audiences. He gave the 2010 Royal Institution Christmas Lectures, and is a presenter of science and engineering BBC TV programmes, such as *Wonderstuff* on BBC 2, *The How it Works* series on BBC 4 and *The Genius of Invention* on BBC 2. He also appeared as a guest on Dara Ó Briain's *Science Club* on BBC 2 in late 2012.

Mark was recently included in *The Times* list of the top 100 most influential people in UK science. In 2013, he won the Royal Academy of Engineering *Rooke Medal*.

Mark's latest book is called *Stuff Matters*. It's a guide to the materials world, and the science, history, engineering and culture that underpins it. *The Observer* named it as one of the Best Science Books of 2013. *The Financial Times* also named it as one of the Books of the Year.

Mark will be giving two talks at the Science Festival: *Alex Hopkins lecture: strange material* on 14 March, and *Stuff matters* on 15 March. Mark will be talking about bionic people with synthetic organs and even brains, living buildings, and how objects that heal themselves will become the norm – the world is about to become a lot stranger.

The Science Festival caught up with Mark to ask him about some of the weirder 'stuff' he'll talk about in his lectures, what he thinks we might see in the future, and the cultural influences that inspire the development of new materials.

CSF: Can you see a time when 50% or more of the human body will be synthetic? And does this mean that, potentially, we could just carry on living forever, replacing aged organs, skin, brain, etc?

MM: I think what we will see is that disability, due to ageing or accidents will become treatable to a greater and greater extent. Replacement organs will undoubtedly become normal for most people as they get older. We will not necessarily need to become more synthetic, the replacement kidney, livers, hips and knees are likely to be grown from our own cells, a technology made possible by a collaboration between materials scientists and medics. For many technological and economic reasons, living forever is unlikely to be a real prospect, but I think it will be fairly normal to be able to ski and play tennis at the age of 100.

CSF: Is it feasible to imagine a time in the future that we might see cyborgs similar to the liquid metal T-X series Cyborg in the film, *Terminator*?

MM: Give us a chance, we can't even get fusion to work properly yet!

CSF: Obviously, there are some rather strange elements to materials science. What is the most outlandish development you have come across recently that has fired your imagination?

MM: We are moving ever closer to a world where objects will be able to have a sense of touch. Smart phone screens already have one, but when we get to the point where the whole built environment is touchy, well that is going to be a very different kind of world to live in.

CSF: How can a building heal itself?

MM: Self-healing materials like concrete, composites and plastics already exist. Buildings, bridges and even phones made of these materials are going to need less and less help from us to repair themselves.

CSF: Do you think we will ever see the development of the 'space elevator'? (NB: A space elevator is a mode of transport via a cable anchored onto a planetary surface into space).

MM: I think we will need them if space travel is ever going to be available to all but a rich minority – why? Because rockets are expensive and require enormous amounts of fuel.

CSF: What are the current pressing challenges for a materials scientist?

MM: Energy, Health and Un-making (it's my word for recycling, which tends to make people in the UK yawn). We have got to crack solar energy, if we do, it will change everything and make tackling climate change more tractable. The issues with making replacement organs, and doing something about people who are paralysed and disabled are surely some of the biggest issues materials scientists and engineers can tackle. We have got to stop dumping stuff into landfill; it's just not cool.

CSF: In what way do cultural influences affect the development of materials science?

MM: In every way! Materials are expression of people's needs and desires. Thousands of materials scientists work on electronic materials because people love to surf the net. More still work on aerospace materials because people love to go on holiday to far flung places. The clothes we wear, the places we live, the stuff we cook with, everything is made of something, and that something is materials.

CSF: What materials do you think will define our culture in the future?

MM: No idea, and that's the beauty of it: it's a dance, we make materials and materials make us.

Professor Melissa Hines

Professor Melissa Hines specialises in human gender development and is the Director of the Hormones and Behaviour Research Lab at the University of Cambridge. With an educational and professional background in personality and developmental psychology, as well as neuroscience and clinical practice, Professor Hines brings a distinct, multifaceted perspective to her teaching and research.

On 12 March, Professor Hines will be giving a public talk, *What's wrong with pink?* at the Science Festival, during which she will tackle the question, why do girls choose pink dolls, while boys play with vehicles of pretty much any colour, as long as it is not pink? Discussion of this topic will include information about how prenatal testosterone exposure shapes children's toy preferences, as well as how postnatal experience and socialization influence these same behaviours. In addition, Professor Hines will suggest that toy preferences can influence colour preferences, as well as colour preferences influencing toy preferences.

The Science Festival asked Professor Hines about pink and blue gender bias, whether other species have the same colour preferences, and what comes next in this field of research.

CSF: What makes us perceive the colours pink and blue as relating specifically to females and males? Is it just cultural bias or is there some other reason for this collective cultural perception?

MH: Most human behaviour develops in response to a range of influences, and this is generally true for gender-related behaviours too. For instance, we know that the early hormone environment, particularly concentrations of testosterone before and just after birth, as well as postnatal socialisation influence girls and boys to play with somewhat different toys. Gender-related colour preferences may be an exception to this general rule though.

CSF: Do toddlers and babies have the same colour preferences?

MH: Young babies and toddlers do NOT yet show these gender-related colour preferences. Gender-related toy preferences (for dolls versus cars) can be seen in children as young as 12 to 24 months of age, but gender-related preferences for pink versus blue emerge later in development.

CSF: Is it only humans that have sex-typed colour preferences?

MH: There is no evidence that other species show gender-related colour preferences, but there has not been much research on this particular question.

CSF: Aside, from colour, do boys and girls have a preference for playing with particular toys? If so, can you explain why you think this is?

MH: Boys and girls tend to choose somewhat different toys, with dolls and vehicles showing the biggest gender differences. There is good evidence that these gender-related toy preferences arise in part from inborn influences, probably in particular the influence of testosterone during prenatal and neonatal development. For example, similar sex differences have been seen in non-human primates (vervet monkeys and rhesus monkeys), several studies have found that girls exposed to high levels of testosterone before birth show increased preferences for boys' toys and a very recent

study has found that variation in testosterone during the first six months postnatal relates to preferences for gender-typed toys in typically-developing children. In addition to these influences, however, parents, peers, teachers and strangers all encourage children to engage in sex-typed behaviour, including playing with sex-typed toys. Parents rarely discourage activities that their children enjoy, but boys playing with girls' toys is an exception. Parents, teachers and peers all have been found to discourage boys from engaging in girls' activities.

CSF: How far do 'societal pressures' affect human development?

MH: Human psychological and behavioural development is a process that involves biological and social systems interacting over time. We know that a number of different factors are involved in the development of gender-related behaviour, and the next challenge is to determine how they work together.

CSF: The question of why boys prefer blue and girls pink is a perennial one. What has the latest evidence in neuroscience and psychology uncovered?

MH: Both boys and girls prefer pinkish colours as infants, but by the age of about three years, boys avoid pink and girls show a preference for pink. In adulthood, both men and women prefer blue to pink. These changes over time suggest that the social environment may influence the female preference for pink. Also, other research suggests that adults learn to prefer certain colours by having positive experiences with the colours. This suggests that girls may learn to like pink, because their toys, and other items that they like, are coloured pink.

CSF: Are there any new directions for the research?

MH: I'd like to know if other species show gender-related colour preferences similar to those seen in children. Also, do people who live in remote areas, out of contact with manufactured toys, show similar preferences to those shown by boys and girls here in the UK. Other interesting questions relate to the impact of using colours to identify girls' toys and boys' toys. Does this limit the range of experiences available to children?

Professor Michael Green

Michael Green is a theoretical physicist and one of the pioneers of string theory. On 1 November 2009, he succeeded Stephen Hawking as the Lucasian Professor of Mathematics in the Department of Applied Mathematics and Theoretical Physics. He is also a Fellow of Clare Hall. In December 2013, Michael Green was awarded the 2014 Fundamental Physics Prize together with John Schwarz (of Caltech) for 'opening new perspectives on quantum gravity and the unification of forces'.

Professor Green will be delivering the *Andrew Chamblin Memorial Lecture* entitled *The Pointless Universe* on Thursday 13 March.

The Science Festival asked Professor Green about string theory and whether there was any possibility of it ever being proven.

CSF: What first drew you to particle physics?

MG: I became interested in fundamental physics when I was about 14 years old, partly due to the influence of my father, who had a passionate amateur interest in mathematics, and partly due to a charismatic school physics teacher – who also happened to be the author of many well known school physics textbooks.

CSF: Is it possible to explain the basics of string theory in a simple manner?

MG: The basic premise of string theory is disarmingly simple. In conventional theories, the many kinds of sub-atomic particles, such as the electron, the photon and the quarks inside the proton and neutron are described as point-like objects. In string theory there is a single kind of fundamental, string-like particle. A single string can vibrate in a multitude of ways – and, according to the theory, distinct frequencies of vibration, or harmonics, should correspond to the different kinds of sub-atomic particles. Not only might this provide an elegant way of unifying the particles, but it also turns out that string theory describes the forces between the particles in a unified manner. The much deeper problem is we know that any theory that describes the force of gravity in a manner that is consistent with quantum theory, as string theory does, must radically change our notion of space and time at incredibly short distances. Understanding what this might mean is at the heart of present research.

CSF: How did your contributions influence the development of string theory?

MG: String theory was born in the late 1960's, evolving out of attempts to explain experimental data on the strong nuclear force, which is far from the applications currently envisaged for the theory. But string theory was more or less abandoned by the late 1970's as apparent inconsistencies arose and as alternative research areas were developed. Nevertheless, John Schwarz and I were still captivated by the elegance of the theory and in 1979 we started a long collaboration that reformulated it and extended it in a way that clarified its structure and resolved its inconsistencies.

In 1984, we demonstrated that 'superstring' theory consistently embodies the quantum version of general relativity (Einstein's theory of gravity) in a manner that avoids the long-standing problems associated with conventional approaches to uniting gravity and quantum mechanics. This very quickly led to the theory being viewed as the most interesting approach to understanding the

fundamental particles and their forces. Subsequent developments have not only stimulated a wide range of interesting new approaches to particle physics, but also to the cosmology of the early universe and the properties of black holes. A remarkable symbiosis of string theory with pure mathematics is perhaps its most significant achievement, leading to many new mathematical insights.

CSF: Can you see a time when string theory could be proven? Or is that just impossible?

MG: It has become apparent over the past few years that string theory may not simply be a theory of fundamental particles, but it has a mathematical structure that is appropriate for describing a far wider range of physical problems that cannot be tackled by standard theoretical methods. These include important problems in condensed matter physics, low temperature physics, heavy ion collisions and relativistic fluid dynamics. Although one may argue about whether the theory will ever achieve its original goal of giving a detailed account of particle physics, string theory's overarching role as a framework for discussing these disparate phenomena is undoubtedly impressive and involves new mathematics that is here to stay.

CSF: Is string theory likely to have applications?

MG: It is notoriously difficult to predict the eventual impact of fundamental scientific research. The objectives of such research are almost always based on intellectual curiosity rather than the search for applications. None of the great theoretical physicists of the last 200 years, such as Maxwell, Einstein, Heisenberg and Dirac were motivated by possible applications of their research, but their results now account for most of the wealth of modern society. That is a good excuse for avoiding your question!

Professor Molly Stevens

Molly Stevens is currently Professor of Biomedical Materials and Regenerative Medicine and the Research Director for Biomedical Material Sciences in the Institute of Biomedical Engineering at Imperial College.

In 2010, Professor Stevens was recognised by The Times as one of the top 10 scientists under the age of 40 and also received the Polymer International-IUPAC award for creativity in polymer science, the Rosenhain medal and the Norman Heatley Prize for Interdisciplinary research from the Royal Society of Chemistry. She has achieved extraordinary breakthroughs using engineered materials for applications in regenerative medicine, biosensing and tissue engineering by leading a large and extremely multidisciplinary research group of students and postdocs/fellows.

The Science Festival asked Professor Stevens about her research, being recognised as one of the top 10 scientists, and how she balances her academic and home life.

Professor Stevens will be giving a public talk at the Science Festival, *WiSETI lecture: growing organs and other small challenges*, on Wednesday, 12 March.

CSF: Are there are any specific challenges for women in science now?

MS: I think that there are always challenges for men and women in science. It is a work of dedication for both sexes but science is such an exciting place to be that I consider it a real privilege to be a scientist. My own view is that I always focus on doing my research to the best of my ability and try to support my fantastic team in the best way that I can. I have amazing men and women in my lab and it is immensely satisfying to see both of them go on and build up successful groups of their own.

CSF: What was it like being the first woman scientist to appear in Vogue and to be recognised as one of the top 10 scientists under the age of 40 by The Times?

MS: I think both of these are really team efforts; in science we are enabled by how good the people who join our team are and I am very proud of the brilliant people within my team. Vogue did an issue on selected real women from different fields and this time they also chose to highlight someone working in the scientific field. I requested that they focus the article on the research that was going on my lab (rather than on me) and I think that they were able to very successfully convey this to a lay audience. If traditionally non-scientific venues can highlight great science and convey it well, the better for science in general.

CSF: What made you choose to follow a career in tissue engineering?

MS: I saw Professor Robert Langer give a talk on tissue engineering as I was nearing the end of my PhD in single molecule biophysics. I enjoyed my PhD a lot but felt like having the chance to work on technologies where I could directly help people would be something I would really like to do. Luckily for me, I had the fantastic opportunity to join Professor Langer's lab at MIT for my postdoc. My own lab now works on a combination of applied and more fundamental research – it's a lot of fun!

CSF: For those who don't know, can you succinctly explain what your research entails?

MS: Our research spans several different areas from applications in biosensing to applications in regenerative medicine. At the heart of it though we have a strong expertise focussed on designing materials to interface with biology. So, in regenerative medicine we are making materials to act as scaffolds to regenerate tissues as diverse as bone, cartilage and heart; whilst at the same time we have been very successful in the development of new nanomaterials that can enable the early detection of diseases such as cancer. To do this sort of research requires excellent collaborators and a very multidisciplinary team in house – my team has engineers, chemists, biologists, physicist and even surgeons!

CSF: Tissue engineering is emerging as one of the key areas of medical research. What developments do you think we can hope to see in the next 10 years in this pioneering field?

MS: Progress is being made all the time and within the next 10 years we will see more and more lab-based inventions making it through to clinic. The applications that researchers are focusing on are widespread from helping to stop scarring in the heart after heart attacks to preventing degeneration within the nervous system amongst many important goals.

CSF: Do you think tissue engineering / regenerative medicine will evolve and become part of standard medical care much sooner than we think?

MS: Aspects of tissue engineering and cell therapy are already becoming part of medical care. As with all new materials/devices in medicine though these things take time to make sure that the products are both safe and efficacious.

Nick Crumpton

Nick Crumpton recently completed his PhD in the Department of Zoology at the University of Cambridge. In addition to his academic career, he is a science communicator and has worked as a science journalist, appeared as a guest on BBC4's *Secrets of Bones* and will soon be on CBBC's *Naomi's Nightmares of Nature*. Currently, Nick is working at the BBC Natural History Unit.

On Friday 21 March, 8-9pm at the Mill Lane Lecture Rooms, Nick will be leading a talk, *What's the point of palaeontology?* alongside a panel of leading palaeontology experts, including Dr Robert Asher (University of Cambridge), Dr Stephanie Pierce (Royal Veterinary College), Dr Anjali Goswami (University College London) and Jon Tennant (Imperial College London).

The Science Festival caught up with Nick and asked him about his research and his interesting side-line career.

CSF: How did you get into palaeontology, the study of pre-historic life?

NC: Like pretty much every kid growing up, I had some dinosaur toys, but over the years the few models I had in my room turned into a plastic menagerie surrounded by a library of magazines and books on prehistoric beasts. It wasn't that I was only interested in long-dead creatures – I was constantly on the lookout for birds and mammals in my back garden. But it was the concept of terror birds, of entire families of giant South American megafaunas, of hippos in Trafalgar Square, and of whole ecosystems now extinct that really got me excited about palaeontology.

For all the animals I could identify and learn about on Attenborough documentaries, they were only a single snapshot of what had lived on this planet. And what was more, I could find traces of those animals from the past. A pebble in some gravel wasn't just a piece of flint; it was the remains of something that lived hundreds of millions of years ago which humans were using just to decorate their patios. Even now I'm in my late-twenties that sort of thing still makes my head spin.

CSF: Exactly what is the point of it? What place does it have in today's world?

NC: Biology is a hugely interdisciplinary science and to answer a question worth asking it is becoming more common for scientists from different backgrounds to work together, uniting their fields and expertise.

Palaeontology offers so much to disparate corners of biology, from macroecology to conservation science, from filling in the story of how life has evolved, to explaining how individual animals develop as they grow.

My guests appearing at *What's the Point of Paleontology* do completely different sorts of research into vertebrate palaeontology and hopefully by the end of the event people will realise that palaeontology is a massively varied line of research that isn't just about digging up dinosaur bones (although that's pretty cool too!).

CSF: Can you tell us a little bit about your current research?

NC: I have a few projects on the go at the moment but what I'm most excited about working on right now is trying to tease apart just what it is that makes mammals either resilient or vulnerable to extinction.

Although people might pigeonhole this as a conservation question, it is precisely the sort of biological question that I'm going to be highlighting in my talk – questions that need palaeontologists to work with other biologists in order to answer them.

Mammals have a fossil record that stretches back into the hundreds-of-millions of years and we can tie various aspects of their abundance and success in with aspects of their anatomy, or pressures from their environment.

The sixth mass extinction event that's occurring as I type is something that all sorts of scientists can help describe and, ultimately (hopefully), stop. And palaeontology offers us an unprecedented record for us to learn from the past in order to give the animals of today the best chance of not just becoming future fossils.

CSF: What's the most surprising thing you have discovered?

NC: My PhD research was on what we can tell about animal's senses by just looking at their bones – the gaps the soft tissues inside their skulls leave behind. This kind of work was interesting to me as an anatomist, but would also be of interest to palaeontologists trying to reconstruct the behaviour of extinct animals. Although I expected to find a certain amount of convergence in the shapes of the skulls of subterranean mammals, I actually found varying degrees of similarities and differences between animals that live under the ground. This was pretty cool and kind of unexpected as it showed animals that live in very similar environments sometimes depend on quite different sensory inputs in order to live in similar environments.

CSF: Do you focus on a particular mammal? If so, why?

NC: When people think about mammals, it's usually the big, famous ones that first pop into their heads – animals like tigers, giraffes, and bears.

But it's a particular group of small African mammals that I've been obsessed with for a few years. Tenrecs are small insectivorous animals that live in Madagascar and Africa. For most of the 20th century biologists had thought that they were closely related to other small mammals like shrews, moles and hedgehogs, but by studying their DNA and morphology, scientists have recently shown that they are actually more closely related to hyraxes, sea cows and elephants. These animals, along with armadillos, golden moles and sengis, are now grouped together as the Afrotheres and palaeontologists are only just now beginning to unravel their evolutionary history. I just need to book that flight to Madagascar and see some Tenrecs scurrying around in the wild...

CSF: We hear you have an interesting side-line career as a children's activity book writer. Can you tell us a little more about that?

NC: Ha! Well, I'm a massive comic book fan as well as a zoologist and I recently managed to combine the two by working with Flying Eye books and one of their illustrators to write an activity book. It's not about the entire 'Age Of The Dinosaurs', but just the Triassic Period – that peculiar time when

life on Earth was recovering from the worst ever mass extinction event and strange enormous crocodile-like creatures ruled the land. It was a great opportunity to tell the story of animals that people might not know about, like the Pseudosuchians that – if it hadn't been for a bit of luck – could have ruled the Earth instead of the dinosaurs until a certain enormous space ball smashed into the Yucatan peninsula some 65 million years ago. Hopefully, it'll help convince some kids that dinosaurs weren't the only amazing animals to exist some 200 million years ago.

For those interested, here's a link to the book, *Triassic Terrors*:

www.flyingeyebbooks.com/?feb_books=triassic-terrors

Robin Ince

Robin Ince is a stand-up comedian, actor and writer. He is well known for presenting the BBC radio show The Infinite Monkey Cage with physicist Brian Cox.

You can catch Robin in a number of events at the Festival. On Saturday 15 March, he will be curating some lively debates on subjects close to his heart: Science and politics, and Art vs science? On Sunday 16 March, he'll present Robin Ince's show and tell. Later in the evening on the 16th, Robin returns with a look at the last 100 years of psychiatry, psychology and skewiff brain dabbings during Robin Ince is (in and) out of his mind.

We caught up with Robin, a Science Festival regular, and asked him about comedy, science and the relationship between the two.

CSF: Some people have it; some don't. What do you think it takes to be funny?

RI: I am not sure there will ever be an answer to this. It is such a subjective thing. On the same night you can be hilariously funny to one audience, then play to another and they don't like you at all. You are hilarious and you are death, all in three hours. Personally, I like passion and ridiculousness. It is a peculiar thing to be self-conscious, and by dint of that it is odd to be human.

CSF: How did you get into science comedy? And what is the relationship between science and comedy?

RI: All the things in the universe gives you lots to deal with. Why stick to talking about being drunk or going to the supermarket when you can also talk about the idiosyncratic behaviour of particles and the life of a squid? Comedy is often about questioning the world and why we do what we do, with science, it shares the element of curiosity.

CSF: Art or science? Or both? Is there really still a debate?

RI: Good art and good science are both about trying to make sense of the world. In a good society, we should all want to go to the Planetarium and the Tate Britain.

CSF: Should science stay out of politics?

RI: Our society is built on scientific imagination, science can't stay out of politics as politics interferes with science. We need to try and make sure the evidence is out there and people are properly informed before decisions are made. The living world is fragile and far too important to leave the politicians in charge of it.

CSF: What are some of your favourite things from the world of science?

RI: I am currently engrossed in trying to understand the human brain, the way that we view the world and create a picture of it, the impossibility of being truly objective. This does not create an alibi for charlatan balderdash though, science is a method of coming up with the least wrong answers.

CSF: What do you think is the most bonkers thing psychiatry has come up with during the past 100 years?

RI: We are in the early stages of investigating the mind, so much now seems ludicrous. It seems odd to think it has only been in the last 100 years that we have realised rewards increase the chance of good behaviour.

CSF: You seem to have been at the forefront of some major developments in science comedy and now there are other initiatives such as Bright Club and Festival of the Spoken Nerd. Why do you think these kinds of shows have become so popular with the public?

RI: It is possible this is a cynical age, but underneath it, humans are fascinated and curious. Look through a telescope at Saturn and you will experience a feeling of the magnificence of the universe we are part of. Once you come up with one good question, see one bright flame or hear of the smashing of bundles of particles at incredible speed to try and understand why our universe is as it is, you are caught.

CSF: What are the best and worst things about being a stand-up comedian?

RI: It is a platform for self-loathing, to fail in front of strangers is more affecting than when you succeed, but the joy of infecting strangers with your own enthusiasms is a pretty good way to make a living.

Professor Simon Baron-Cohen

Professor Simon Baron-Cohen FBA is Professor of Developmental Psychopathology at the University of Cambridge. He is the Director of the University's Autism Research Centre, and a Fellow of Trinity College. Professor Baron-Cohen is best known for his work on autism, including the theory that autism involves degrees of mind-blindness (or delays in the development of theory of mind) and his later theory that autism is an extreme form of what he calls the 'male brain', which involved a re-conceptualisation of typical psychological sex differences in terms of empathising–systemising theory.

Professor Baron-Cohen has been awarded prizes from the American Psychological Association, the British Association for the Advancement of Science (BA), and the British Psychological Society (BPS) for his research into autism. He has been President of the Psychology Section of the BA, Vice President of the International Society for Autism Research, and the National Autistic Society, and received the 2006 Presidents' Award for Distinguished Contributions to Psychological Knowledge from the BPS. His current research is testing autism at the neural, endocrine and genetic levels.

Professor Baron-Cohen will be giving a lecture at the Science Festival on 15 March – *Do hormones in the womb affect how your brain and mind develops?* – in which he will be discussing the less well-known impacts of testosterone produced by the baby in the womb and the irreversible effects on brain development.

The Science Festival asked Professor Baron-Cohen about the differences between the male and female brain.

CSF: Why did you choose to focus your research on autism?

SBC: Autism represents a puzzle: that social and non-social intelligence 'dissociate' in such individuals. Puzzles call out for answers to the question 'why?'

CSF: Can you explain what the term 'male brain' means?

SBC: More males than females have a 'cognitive style' in which their empathy is lower than their 'systemising' skills, which we summarise as Type S or the 'male brain'. But it's by no means confined to males or seen only in males. Some males have the opposite cognitive profile, where their empathy is higher than their systemising, which we call Type E. And some women have the 'male brain'. Our research is focused on what factors determine whether one ends up with a brain that is typical or atypical for one's sex.

CSF: Can empathy or systemising be attributed to the effects of hormones in the womb, over the influence of culture or 'nurture'?

SBC: There is no question that culture and nurture influence these aspects of the mind, but the Cambridge Longitudinal Child Development Study (where we followed babies whose mothers had an amniocentesis back in 1997, so those babies are now 16 or 17 years old!) has allowed us to test the role of prenatal hormones such as testosterone, finding that this is also a part of the explanation for such individual differences in behaviour.

CSF: So do children who go on to develop autism have elevated levels of prenatal testosterone?

SBC: Well, our research has so far shown that the higher one's prenatal testosterone, the more 'autistic traits' one has post-natally. Our ongoing study is testing if this is also seen in clinical cases of autism.

CSF: How would you go about increasing empathy in conditions such as autism?

SBC: We have shown that some aspects of autism such as emotion recognition can be improved via computer-based teaching, showing children emotions on actors' faces for example, and allowing them to practice in an autism-friendly format (via computers). They seem to prefer learning in highly structured and systematic formats like this.

CSF: Are there individuals who are both extremely empathetic and extremely systematic?

SBC: Yes, there are such individuals, but there is also an intriguing 'trade-off' between these two psychological processes: the better you are at one, the worse you are at the other. We are trying to understand this small but important association.

CSF: In terms of the future, what new treatments for autism do you think might be developed?

SBC: What's important is for treatments to target the areas of disability (such as their social skills) whilst leaving the areas of strength (such as their excellent attention to detail) unaffected so that the child can fulfil their potential. We are currently evaluating the therapeutic potential of a hormone called oxytocin, to see if a nasal spray helps in this way, without side effects. Equally, early detection is vital so that intervention of a psychological kind can begin at the earliest point.

Simon Singh

Simon Singh MBE is a well-known author who specialises in writing about mathematical and scientific topics in an accessible manner. His written works include *Fermat's Last Theorem*, *The Code Book* (about cryptography and its history), *Big Bang* (about the Big Bang theory and the origins of the universe), *Trick or Treatment? Alternative Medicine on Trial* (about complementary and alternative medicine) and *The Simpsons and Their Mathematical Secrets* (about mathematical ideas and theorems hidden in episodes of *The Simpsons* and *Futurama*).

Simon, who completed a PhD degree in particle physics at the University of Cambridge, has also produced a BAFTA award-winning documentary and presented programmes on radio and television. He also co-founded the Undergraduate Ambassadors Scheme. After being sued for libel by the British Chiropractic Association in 2008, he successfully defended his writing and became a campaigner for libel reform. The Libel Reform Campaign successfully lobbied for the Defamation Act 2013.

Simon will be exploring how mathematics has been smuggled into some of our favourite TV shows during his talk at the Science Festival, *The Simpsons and their mathematical secrets*, on Sunday, 16 March.

The Science Festival asked Simon about his latest book, *The Simpsons and Their Mathematical Secrets*,

CSF: Did you always want to go into science?

SS: Like any child, I was curious about the world, so studying and researching science as an adult was simply an extension of this childhood curiosity. My ambition was to be a physicist, but while completing my PhD I could see that others were quicker and smarter than me, so I looked for another career that would keep me close to science. That was science journalism.

CSF: When and how did you first discover the mathematical secrets in *The Simpsons* and *Futurama*?

SS: I was watching *The Simpsons* for about ten years before I realized that one episode (*The Wizard of Evergreen Terrace*) contains a reference to Fermat's Last Theorem. Then, when I looked more closely at other episodes, I began to see that there is vast amount of mathematics in the show.

CSF: By now, you must be quite the expert on *The Simpsons*? Did you have to painstakingly watch all the episodes to write the book?

SS: First, I watched lots of episodes of the show, even though I had seen most of them before. I often watched the shows with DVD commentaries switched on, as the writers sometimes highlight the maths in their commentary. I also talked to others who have been looking at the maths in *The Simpsons*, such as two professors in America who have used examples from the show in their college lectures. Finally, I spent a week with the writers, which was invaluable. Not only did they highlight past references, but they also told me about references in upcoming episodes.

CSF: Do you think the writers deliberately drip feed mathematical references into the minds of the audience? Is it just for fun?

SS: Very few people realize that many of the writers of *The Simpsons* have strong mathematical backgrounds, ranging from degrees to PhDs. In fact, one writer, Jeff Westbrook was a professor at Yale University before he became a comedy writer. They are no longer mathematicians, but they still love mathematics and they express that love by smuggling equations and special numbers into different episodes of *The Simpsons*. The book looks at these mathematical references and explains them, while also looking at the writers and exploring the show. I think readers will be surprised by the quantity and quality of mathematical references, which cover everything from calculus to number theory, from infinitesimals to infinity.

CSF: Do you think mathematics teachers could / will now use *The Simpsons* (if they're not already) as part of their teaching?

SS: I think there is an opportunity for the maths in *The Simpsons* to move into the classroom. In fact, I have already given some *Simpsons*-based lessons in schools, and my plan is to develop some resources that will be freely available later in the year.

CSF: In terms of science journalism, do you think we are about to see a new era as more and more people are switched onto science and understand its connections to the wider world?

SS: To be honest, I am quite depressed about the future. The media seems to be driven by sensationalism and scaremongering, which only confuses the public with respect to science. There are important issues ahead of us, from climate change to nuclear power, from genetically modified food to health policies, and I am not sure that the public (or politicians) are getting the material they need to make properly informed decisions.

Susan Watts

Susan Watts has been a science and technology journalist for nearly 30 years. Following a degree in Physics from Imperial College in London and a Diploma in Journalism from City University, she spent a decade in print journalism at *Nature*, *Computer Weekly*, *New Scientist* and *The Independent* newspaper before accepting a job in broadcasting. She joined *Newsnight* at the BBC in January 1995 when the programme, renowned for its coverage of politics and economics, decided to strengthen its coverage of scientific issues. Since then, she has helped to shape the course of some of the most important national debates in science, technology, engineering, medicine and health, with their many ramifications – political, social and economic.

Susan has won numerous awards for her journalism, including a Bafta for *Newsnight's* coverage of BSE, and became the programme's Science Editor in 2004. However, in November 2013, this post was closed.

In *Talking science: what next?*, at the Senate House on Friday evening, Susan will reflect on echoes today of CP Snow's original concerns over the relationship between scientists and non-scientists, as set out in his 'Two Cultures' lecture of half a century ago. She will also describe some changes in science journalism, and in the way science talks to the world.

Susan will be amongst an illustrious panel, which includes the University of Cambridge Pro Vice Chancellor, Professor Jeremy Sanders, and Professor Sir Walter Bodmer.

The Science Festival asked Susan about her career and her thoughts on what's next for science journalism.

CSF: What drew you to a career in the media?

SW: I was tempted to study for a PhD but, after revising for my final year exams, I was ready to run screaming from academe. I never planned my career, but looked for something that would let me stay in close contact with the science that I had grown to love since watching *Horizon* as a young girl. I wanted to do something creative too, and I thought I was passably good at writing. I was also curious about the world and how it worked, so science journalism seemed a good fit.

CSF: For all the budding science communicators, what do you think are the key attributes needed for a successful career as a science journalist and what advice would you give?

SW: There's a difference, a fundamental difference, between science communication and science journalism. For both, you need to stay curious. You ought to be the kind of person who asks 'why' a lot. You'll need to enjoy coaxing sometimes shy, or reluctant, or just plain difficult scientists to tell you about their work – and then to feel enthused enough to want to tell somebody else, even those who know absolutely nothing about the subject. And if you want to be a journalist, you'll also need to be persistent enough, and brave enough, to find out things that people don't want you to know and often work hard to stop you knowing – and to tell the world those tales too. It's much easier to publish or broadcast stuff that people want to hear; it's another ball game altogether when you're

airing tales that are uncomfortable (and when you need to be completely accurate with your 'i's dotted and 't's crossed).

CSF: In terms of broadcast journalism, what are the major challenges in covering science topics?

The challenges are similar to other media, but exaggerated. You're constantly searching for simplicity. Broadcast journalists are striving for the clearest, least cluttered way to explain a concept, and why it's novel or just interesting. In television, you have visual media to help you, but very few words. It's true that images can be more powerful than words in conveying ideas, but the simpler the message and the fewer the words, the harder it is – and the better you have to understand the science you're working with. The risk, increasingly, is that style dictates and overwhelms content.

CSF: Do you think science reporting has changed over the past 20 years?

Yes. Well certainly my own journalism is less about facts and information, but involves the people and the characters of science and engineering too. Production methods have evolved, so there's far more scope to use imaginative visual effects. There's also been a shift towards live science production, such as the hugely successful Stargazing Live events. Science news reporting has become more sophisticated, less black and white, with more analysis. The public has a clearer idea of what they want from science journalism, but they're looking for it beyond mainstream news, via Internet lectures and web events. There's good reason to be optimistic about the future of science journalism online, with new publications emerging, and online science learning in general, now within reach of individuals.

CSF: What have been the most fascinating stories you have covered on *Newsnight*?

SW: Working in television means you have to go out and meet the people you are reporting on, and talk to them face-to-face, and that has been by far the most rewarding aspect of my work on *Newsnight*. One huge story for me has been the DNA revolution. I've met and interviewed some of its central architects – such as James Watson, for an item looking back at the impact, 50 years on, of the discovery of the structure of DNA. Then John Sulston and Craig Venter on the Human Genome project, and Alec Jeffreys on the huge practical impact of DNA fingerprinting.

CSF: Why do you think events such as the Cambridge Science Festival are important?

SW: Hugely important, because they enable people to really engage, face-to-face, with scientists and engineers. This is always the most rewarding form of human contact, even in a digital world! So I hope such festivals continue to thrive...

Professor Tony Purnell

Tony Purnell is Head of technical development for the Great Britain Cycling Team and Royal Academy of Engineering Visiting Professor at the University of Cambridge.

Professor Purnell, who pursued an academic career at the University of Cambridge after securing his master's from the Massachusetts Institute of Technology, went on to found a company, Pi Research, specialising in race car performance analysis tools and control systems. After selling it to Ford, Purnell continued to manage the business and in 2002 became team principal of the Jaguar Formula 1 team and later spent three years as Technical and Strategic Adviser for the motorsport governing body, the FIA. Tony now leads cycling's so-called 'Secret Squirrel Club' that has supplied Britain's Olympic Team the fruits of a scientific approach to the sport. He also advises rowing, canoeing and a number of other technically dependent Olympic sports.

Professor Purnell will be speaking at the Science Festival on Friday, 14 March, during a talk that tackles the question, *Can science make a cyclist faster?*

The Science Festival caught up with Professor Purnell and asked him about his role at British Cycling, how technology impacts on cycling and the latest breakthroughs.

CSF: You've almost completed your first year as Head of technical development at British Cycling, how has it been?

TP: Utterly fascinating, but so much to learn and all the time I feel a tap dripping on my head reminding me that the Rio Games are getting closer and closer.

CSF: What's been your biggest challenge during the past year?

TP: Getting a new team together and accepting that the budgets to do this sort of work are a fraction of the sort of money Formula One would spend. This actually makes it more fun as one has to be clever to achieve anything, one can't just buy results.

CSF: What are your goals for the coming year?

TP: To make the British Olympic team more competitive in any way I can dream up!

CSF: Can you explain a little about the relationship between technology and cycling?

TP: It's odd just how many engineers one finds who are fanatical cyclists. There's something very easy to understand: to go fastest one simply needs more power from the legs, less weight and less aerodynamic drag from the body. Dig a little deeper and there's an infinite array of interventions that one can think of to achieve this, but each one can be complex and challenging to implement.

CSF: Technology plays a big role in cycling; are you able to give us a sneak preview of the latest breakthroughs in cycling?

TP: Well not really, but the cycling world certainly has woken up to aerodynamics. I don't see any breakthroughs here; just steady evolution towards lower and lower drag. I think the breakthroughs

are and have been in training regimes and understanding that recovery is as important as smashing yourself on the bike.

CSF: Do you think technology will ever turn average performers into medallists? Or is it more a case of giving world-class athletes a competitive edge?

TP: The athletes are god-like beings. It's hard to understand that I'm the same species. I'm an average performer on the bike and believe me if I could turn myself into a medallist I would! We can only hope to give them a little bit of an edge.

CSF: Britain came top of the medallist tables for cycling in 2012. How big a part do you think technology had in the team's huge success?

TP: Now that would be telling! Certainly every little saving in energy helps.

CSF: What do you think it takes to be in a leadership position in sport?

TP: There's no getting away from it, talent helps: Get a Chris Hoy or Chris Froome and life can be relatively easy. This said without the back up the chances of them being able to perform drop considerably. Leadership in sport comes with having a good organisation, well financed, and with real expertise within it, but then you need to add the talent.

Press releases



For immediate release

The 20th Cambridge Science Festival looks ahead to the future of science

What's new in space? Why do coincidences happen? Can science make cyclists go faster? Why do cats make us sneeze? These are just a few of the many intriguing questions being explored at this year's Cambridge Science Festival. Running from Monday 10 to Sunday 23 March and celebrating its 20th appearance this year, the Science Festival hosts over 250 thought-provoking talks and hands-on events for everyone.

The programme is out now on the Cambridge Science Festival website: www.cam.ac.uk/science-festival. With over 250 events, most of which are free, there's surely something for all tastes. Bookings open at 10am on Monday 3 February online and via the Festival phone lines.

Those taking part in this year's Science Festival include University of Cambridge Vice Chancellor, Professor Sir Leszek Borysiewicz; Lord Rees, Astronomer Royal; writer Simon Singh; Professor Michael Green, recent winner of the Fundamental Physics Prize; statistics whizz Professor David Spiegelhalter, neuroscientist Professor Barbara Sahakian; Dame Sally Davies, the Chief Medical Officer for England; Professor Tony Purnell, Head of Technology for British Cycling; Professor Mark Miodownik of the BBC's Science Club; and Professor Molly Stevens, one of The Times top 10 scientists under the age of 40.

The Science Festival welcomes the return of science comedian Robin Ince, who will take a light-hearted look at art vs science; Matt Parker, stand-up mathematician; and the Naked Scientists, who will start an interactive journey through the workings of our nervous system.

The Festival is delighted to include for the first time the Cambridge Biomedical Campus, home of Addenbrooke's Hospital and the Clinical School. Visitors to the campus will be able to explore the latest, ground-breaking medical research being carried out in Cambridge and how this is translated into new treatments and new drugs.

Other events throughout the Festival include:

- Talking science: what next? brings together leading academics Professor Sir Leszek Borysiewicz and Professor Sir Walter Bodmer, with science journalist Susan Watts to discuss what's next for the world of science and society.
- An exploration into what's new in space, following the launch of the Gaia satellite in

2013

- A talk by Professor Barbara Sahakian about overcoming stress and anxiety and why they are on the increase
- A range of talks for all ages and families during Science on Saturday, from exploring the brain by messing with the senses and why rodents rule the world, to the dark world of caves and how the bicycle got its spokes
- The latest in stem cell research, including Professor Robin Franklin talking about his work on central nervous system regeneration
- Discussion focusing on 21st Century families helped by assistive reproduction technologies, same-sex parenting and single parent families, as well as the role of the family in child development

Speaking about this year's bumper Science Festival, Shelley Bolderson, Science Festival Co-ordinator said, "The Science Festival has grown significantly since its modest beginnings 20 years ago and today is recognised as being one of the most exciting Science Festivals in the world. Last year, we welcomed over 30,000 local, national and international visitors and we hope to meet many more newcomers this year. The range and diversity of subjects covered during the two weeks is astonishing and incredibly exciting for anyone who wants to discover the world around them."

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Credit: Stan's Café: *Anatomy of Melancholy*

Theatre and Science merge at Cambridge Science Festival 2014

Innovative theatrical performances headline at the Cambridge Science Festival (10 – 23 March), covering topics such as immortality, computer hacking, melancholy and Albert Einstein.

How To Be Immortal (11 –12 March, Mumford Theatre, Anglia Ruskin University), is based on three true tales that intertwine in this intimate, bold, funny and original new play about love, science, death and immortality. There's live music on cello and squeezebox, 1950s science and animations. A post-show discussion follows the performance on 11 March, with the cast and a scientist from University College London, on the theme 'What your genes say about you'.

Mira Dovreni from Penny Dreadful Productions, the creators of *How To Be Immortal*, said: "Henrietta Lacks died of cervical cancer in West Virginia in 1951. Scientists had been trying to grow human cells outside the body for decades when a routine sample of Henrietta's tissue was sent to the lab. Incredibly, the cells continued to grow and are still growing today. Known as HeLa, they are in constant use in laboratories around the world, they have helped us develop and test most of the medicines in use today – from the polio vaccine to all modern cancer treatments. They are the reason we know we have 46 chromosomes; without them we could never have mapped the genome. Henrietta's daughter Deborah only found out what had happened 30 years later.

“While I was reading about Henrietta's immortal cells, a friend of mine, a cellist, was slowly losing her partner to cancer, and she spent a lot of time looking for ways to keep him alive for their baby daughter. She eventually decided to write a piece of music that represented him in some way – but where to start?

“In *How To Be Immortal* these two stories intertwine, often taking place simultaneously, alongside the thread of a 1950s scientist presenting science hour on TV – whom we discover is the original eccentric genius who grew the immortal cell line from Henrietta’s tissue.

“Working with two UCL clinicians throughout, we have tried to humanise the science involved and allow audiences to 'feel' it through the characters and their stories – and also through a fantastic piece of music. So hopefully audiences will leave understanding a great deal more about what DNA actually means – even if not in a strictly scientific way.”

The Cambridge Science Festival has teamed up with Cambridge Junction to showcase a series of contemporary theatre that has been inspired by science.

On Friday, 21 March, Potential Difference – a new company making contemporary theatre that responds to ideas in science and technology – will present an early showing of the development of *Darknet* at Cambridge Junction, a brand new play that will examine and explore the world of computer hacking and its impact on crime, warfare, sabotage and espionage. This will be an early showing of ideas and material following the initial stage of research and development. It will be accompanied by a short informal panel discussion where academics and specialists will respond to the ideas of the piece.

Darknet is being developed in collaboration with a movement specialist, a game designer and academics including members of the University of Cambridge Computer Labs.

On 12 March, Stan’s Café will perform *Anatomy of Melancholy* at Cambridge Junction. Nearly 400 years ago, shortly after the publication of the King James Bible and Shakespeare’s First Folio, vicar and librarian Robert Burton completed *The Anatomy of Melancholy*, a vast 1,500 page-long attempt to identify the symptoms, causes and cures of kinds of melancholy. Extraordinary, hilarious and profound, it has been described by many as the greatest book ever written. Yet, amidst all the wild stories and suppositions, much of its advice remains as urgent and profound now as it did then.

James Yarker, Stan’s Café’s Artistic Director said: “*The Anatomy of Melancholy* may be ‘the greatest book ever written’ and is full of cutting-edge science from the 17th Century, maids vomiting pebbles, priests defecating in ditches and enormous lists of every melancholy food, location, or occupation. This adaptation is a glorious cure for melancholy revealing how many approaches to life and depression remain unchanged today. We’ve found that whilst Burton gives us insight into a fascinatingly arcane world he often appears to be speaking very directly and with great compassion to us about our lives and scientific ideas now. We are really thrilled to have the opportunity to perform the show to audiences at the Cambridge Science Festival.”

On 19 March, the Science Festival and Cambridge Junction will also present a double bill of theatre made with scientists; *Volcano* and *A Journey Round My Skull* (19 March). *Volcano* is about eruptions and emotions, volcanoes and the Righteous Brothers, tension and release and features an appearance by volcanologist Dr Mike Cassidy. *A Journey Round My Skull* is inspired by the extraordinary medical memoir written by Hungarian satirist Frigyes Karinthy and features audio recordings from live brain surgery.

Olivia Winteringham, Kindie Theatre performer and co-writer of *A Journey Round My Skull*, said: "We have been working with three scientists working in neurosciences and anaesthetics. Professor David McAlpine from UCL Ear Institute, London has been advising us on the creation of the original script and binaural sound recording, which is used in the middle section of the show. He has helped us to find a way to simulate brain surgery from the perspective of a patient, which the audience will experience. In particular, how we can simulate the differing perspective shifts of the sound from the world around the patient, to the physical contact with the head, and how we might imagine the head being drilled and the brain exposed for an awake craniotomy. He even sent us some video and photos of the ornately wooden panelled cafe that FrigyesKarinthy frequented in the 30's, when he made a visit to Budapest to give a presentation on tinnitus."

The final performance to be held at Cambridge Junction as part of the Science Festival will be on 22 March. Tangram Theatre Company will present *Albert Einstein: relativitively speaking*. This promises to be a lecture like no other as the audience join Albert, the genius behind the übercoolest moustache in science. The eccentric theoretical physicist is accompanied by his two wives and mum on the piano, and by guest rapper MC Squared, as he quantum leaps us through two world wars, two theories of relativity, and the deployment of two very big bombs. Warning: features the wurst sausage joke ever.

Speaking about the collaboration with the Science Festival, Cambridge Junction Arts Producer, Daniel Pitt said: "We're very pleased to be partnering with Science Festival, after the success of our first Cambridge Festival of Ideas collaboration last autumn, to bring science-based contemporary theatre into the programme and to Cambridge. Where else can you see a 17th Century depression self-help book brought to life, a show made with audio recordings of live brain surgery, a show featuring a practising volcanologist, a rapping Einstein and comedy about heart attacks and body image?!"

For more information please visit:

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Left: New Art Club: *Feel about your body*, Right: Robin Ince

'An electron and a positron walked into a bar...'

Science comedy tops the bill at this year's Cambridge Science Festival

Visitors will be entertained by a diverse range of stand-up comedy at this year's Science Festival, with comedians tackling the big science issues, including binary numbers, how we feel about our bodies, skewiff brain dabbings, and whether monogamy is dead.

To kick-start the giggles, on 15 March, stand-up mathematician Matt Parker, returning to the Cambridge Science Festival for another year of engaging and entertaining maths, takes a hilarious tour through the world of numbers. From Rubik's Cubes to binary numbers, Matt Parker covers his current favourite bits of maths in a comedy show accessible to everyone. Part stand-up and part maths, this show covers a wide range of maths topics in an engaging fashion as seen in sell-out shows at the Edinburgh Fringe Festival, London's West End, the Melbourne Comedy Festival... and the London Mathematical Society.

Also on 15 March, as part of the Science Festival collaboration with the Cambridge Junction, New Art Club presents: *Feel about your body*. An uplifting, life-affirming and hilarious spectacle about how we feel about our bodies. Tom Roden and Pete Shenton marry stand-up comedy with choreographic minimalism. Expect silliness, see a man talking to his bottom and find out what not to do during a heart attack.

Tom Roden described the show as, “*Feel About Your Body* is a relentlessly entertaining, ground-breaking comedy show that takes as its starting point the recent and historical understanding of the mind and its relationship to the body. It places the debate on the bodies and minds of the two protagonists and on that of the audience.”

The Observer newspaper recently commented, “This is physical comedy with brains and I laughed 'til my face hurt.”

The Science Festival is delighted to welcome back Festival regular, Robin Ince, performing his stand-up show, *Robin Ince is (in and) out of his mind* on 16 March. From Freud and Jung to Laing and Milgram, from rats after rewards to insanity cured by ink spots, Robin looks at the last 100 years of psychiatry, psychology and skewiff brain dabbings. Just how hard is it being a self-conscious being on Planet Earth?

Speaking about his show, Robin said: “This year I have tried to tackle the human mind in my show. Having spent the last six months reading about it, I am now in disarray, discovering possibilities such as ‘free will is an illusion’, many of my personality flaws were formed in the womb, that my inner monologue is still getting used to not being the voice of a god, and that my trepanning equipment may be less use than I imagined. Considering we have the ‘most complex thing in the known universe’ in our head, I am relieved to think that we don't know much of the universe yet and there may be something with a less confusing and confused brain structure and mind out there. I have an inkling that I will be more confused after this show than I was before I started delving into this whole sorry mess of a head of mine.

“I don't think comedy about science is about offering the audience a carefully crafted lesson module on particle physics or epigenetics, but what it can hopefully do is enthuse people to want to know more from people who are far wiser than me.”

On 19 March, disgruntled serial monogamist Rosie Wilby asks an interesting question, *Is monogamy dead?* – which is also the cheeky title of the hilarious sequel to her sell-out show *The Science of Sex*.

Rosie explained the basis for the show: “I've started wondering if in order to be happy, human beings need both the loving security and companionship of a partner and the passion offered up by a lover. These two distinct sets of needs are rarely met by the same person at the same time. If we could ever establish a society where having one of each was the norm, then maybe we could eradicate the need for affairs entirely.”

Finally, Bright Club, the thinking person's variety night, also returns to the Science Festival on 20 March. During the evening, special guests will appear on stage alongside researchers giving stand-up comedy a go for the first time. The audience will join academics from Cambridge and beyond for a light-hearted look at their research.

Bright Club organiser and regular performer, Dr Andrew Holding, said: “Bright Club runs like a standard comedy club, with professional acts. It's a great night for everyone; what makes it different is that alongside the comedians are university researchers. Often they've never done stand-up comedy before, but it works because the strangeness and obscurity of life in the lab varies from the

bizarre to the downright incomprehensible. So not only is it good for a laugh, but it also covers some of the most fascinating (and often obscure) research happening in the UK right at this very moment.”

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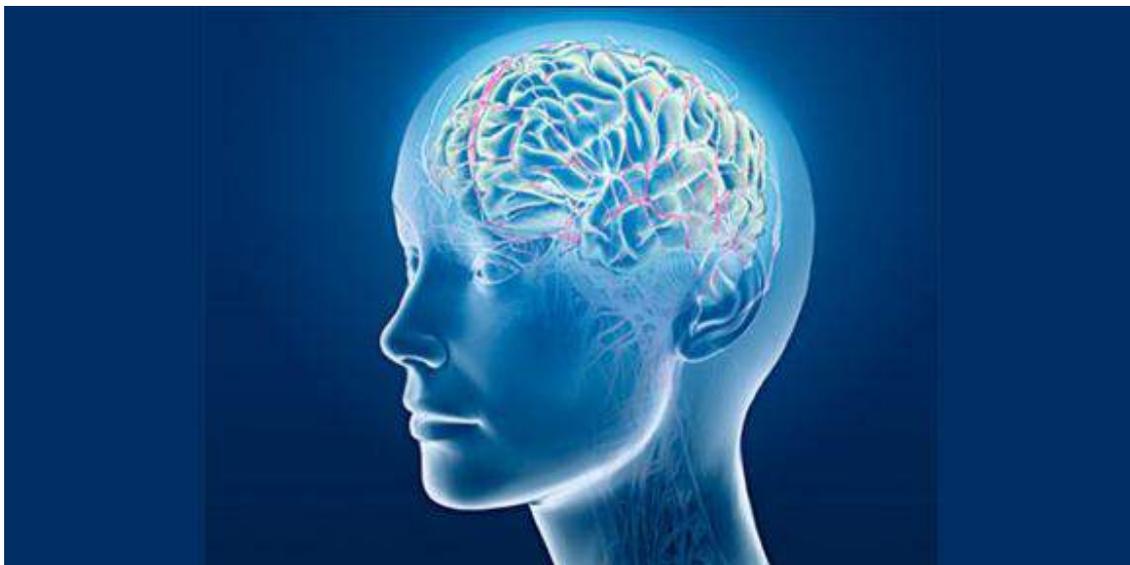
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Credit: digitalbob8

Brightest minds in neuroscience and psychiatry share their research at Cambridge Science Festival

Why is anxiety on the increase? How does the brain generate self-consciousness? How do recent genetic discoveries provide a new direction for neuroscientific research?

This year's Cambridge Science Festival (10-23 March) will feature talks that cover these issues and more from some of the most notable researchers in the fields of neuroscience and psychiatry.

16% of us in Britain have a common mental health disorder of anxiety or depression, according to Professor Barbara Sahakian from the Department of Psychiatry at the University of Cambridge, and these figures are increasing. Why is this? Why do people react to stress differently? How can we develop resilience and wellbeing?

On Tuesday, 11 March Professor Sahakian will discuss these questions with Dr Annette Bruhl, visiting clinical researcher at the Department of Psychiatry, Cambridge and Professor David Baldwin from the University of Southampton. They will discuss how our brains and bodies change when we are stressed and anxious and what pharmacological and psychological treatments are available for people with anxiety disorders. This event is sponsored by the British Association for Psychopharmacology.

"Many of us wake up in the morning, jump on the scales and carefully consider what we are having for breakfast. In fact, given that we are early in 2014, we may be thinking about how we can change our lifestyle to be physically healthier. However, do many of us reflect on the stresses and tensions

that we face, and how we might ensure that we have good brain health? In a global environment, with reduced resources due to austerity, we are increasingly required to multitask and take on additional responsibilities. Fortunately, for many of us, we have resilience and may take on these challenges enthusiastically. However, with increasing day-to-day stress, it is important to reflect on how we might improve our cognition and wellbeing, to ensure we enjoy life as individuals and can contribute to a flourishing society. In our session entitled *Overcoming stress and anxiety: healthy brains for a flourishing society*, we will consider how to maintain good brain health, methods for reducing stress and also what can be done if we succumb to the stresses and pressures of everyday life.

“Anxiety disorders can be debilitating for the individual as they stop people being able to perform their activities of daily living at home or work. These disorders are also expensive for governments since they frequently keep people off work. In our session, we will also discuss pharmacological and psychological treatments for anxiety disorders, including cognitive behavioural and mindfulness therapies.”

During the talk, *The neuroscience of self: how the brain creates ‘me’* on Wednesday 12 March, Dr Jane Aspell from Anglia Ruskin University will discuss how the brain generates self-consciousness, and how it distinguishes between self and world.

Dr Aspell explained the basis of her talk: “What are you? We seem to know our ‘self’ better than anything else in the world but do we really know what a ‘self’ is, what it is made up of? Most people think about personality, identity and character when they hear the word ‘self’ but what lies at their foundation? As babies we first identify with our physical bodies and we must learn to distinguish our own body from the rest of the world.”

Dr Aspell will discuss exciting new evidence from neuroscience that the brain’s model of our own body provides the basis for self-consciousness. She will present some of her recent studies in which something akin to an ‘out of body experience’ was induced in healthy subjects by confusing their senses using virtual reality, alongside the neuroscientific explanation of out-of-body experiences in which the self seems to be located outside of the body. Her research shows that not only is it possible to experience your self located outside of your body, you can also experience a different body as your own.

Developing new therapies for major psychiatric disorders is one of the greatest challenges facing medicine, according to Professor Michael Owen from Cardiff University. On Friday, 14 March, during the Cambridge Neuroscience public lecture, *Genes, brains and psychiatry*, Professor Owen will reveal how advances in neuroscience have given us many new tools to meet this challenge, how recent genetic discoveries provide a new direction for research and also how this work will need to incorporate important conceptual changes to succeed.

Speaking about the challenges facing practitioners, Professor Owen said, “Mental illness can be highly distressing and disabling and is a major economic as well as social burden. Current therapies have many shortcomings and new treatments are urgently required. Progress to date has been hampered by our ignorance of fundamental disease mechanisms and by the fact that our diagnoses

are largely descriptive. These difficulties have resulted in many pharmaceutical companies abandoning drug discovery in psychiatry.

“This comes at a time when scientific and technological advances in neuroscience and genetics have placed us in a strong position to advance our understanding of basic disease mechanisms, which we must do if we are to develop new and more effective treatments.

“Recent genetic findings have highlighted the shortcomings of traditional diagnostic approaches and underscored the complexity of psychiatric disorders. However, in spite of this, they are beginning to converge on specific brain mechanisms that are fundamental to these disorders. Further advances will require a move away from traditional diagnostic approaches towards new ways of relating mechanisms to specific disturbances in psychological function. They will also require more large-scale and collaborative studies.

“However, perhaps the biggest challenge will be to mobilise all those with an interest in developing better psychiatric treatments to make the political case that now is the time for a concerted and coordinated research effort.”

Dr Rachel Perkins will talk about *Creating Mentally Inclusive Communities: Embracing Distress as Part of Everyday Life* at the 11th Annual Disability Lecture on Thursday 20 March. A clinical psychologist, Perkins worked in NHS mental health services for 30 years and is now a senior consultant with the *Implementing Recovery through Organisational Change* programme. She lives and works with a long-term mental health condition. In 2010 she was voted Mind Champion of the Year and awarded an OBE for services to mental health.

Dr Perkins commented: “My major concern from 30 years working in – and as a user of – mental health services is that we tend to believe the answer to mental health challenges is treatment and therapy. While I am not against treatment and therapy, they are only a small part of living with – and moving beyond – mental health problems.”

Instead, she says we should tackle social and interpersonal barriers in the same way as physical barriers. “We accommodate those who have problems navigating the physical world with ramps and hearing loops, and we need the same approach for people with mental health challenges – the mental health equivalent of a ramp,” she said.

At work, this means “lots of boring practicalities” as well as embracing distress as part of everyday life. “It's not rocket science. For managers, lots of it is simple stuff: a buddy, someone to talk to, a bit of extra supervision,” Perkins explained. “We need to embrace distress – in most of our communities we do the stiff upper lip thing like it's going out of style. Tears and anger are human, but they are seen as unusual at work, something to put into the realms of therapy. Our work processes should cope with these fluctuations in people's lives.”

Other events at the Science Festival covering neuroscience and psychiatry include:

- *Do hormones in the womb affect how your brain and mind develops?* On 15 March. Professor Simon Baron-Cohen will discuss how testosterone produced by the baby in the womb has irreversible effects on brain development, and describes a unique experiment

conducted on hundreds of Cambridge children, measuring their testosterone in the womb and following them as they grow up, to see how this remarkable molecule affects their brains and minds.

- *What's wrong with pink?* On 12 March, neuroscientist, Professor Melissa Hines, will discuss why certain toys are embraced by different genders, and why girls choose pink dolls, while boys play with vehicles of pretty much any colour, as long as it is not pink. Professor Hines will illuminate both how humans develop and how societal pressures act upon children.

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Photo credit: Brandon Giesbrecht via flickr

Shedding light on the connections between music and science

A mesmerising orchestral adaptation of *Icarus at the Edge of Time* by Brian Greene with music by Philip Glass and film by Al + Al, and a premiere of the new work by Tim Watts are part of an eclectic range of musical workshops and concerts to be performed at this year's Cambridge Science Festival (10 – 23 March).

What if Icarus travelled not to the sun but to a black hole? On 17 March, Cambridge University Musical Society Symphony Orchestra will perform *Icarus at the edge of time*, an orchestral re-imagining of the Greek myth conducted by Ben Glassberg and featuring Gresham Professor of Astronomy Carolin Crawford.

Patrick Morris of Menagerie Theatre will be narrating the performance. He said: "The piece is a glorious clash of live music, theatrical narration and video, wrapped up in a modern re-telling of a classic tale. I've always loved the Icarus story and the exceptionality of this piece certainly rivals Icarus' own ambition – hopefully without the same consequences! The different layers of the voice, the music and the visuals should make it a real feast for the senses – something like a rollercoaster ride in space."

Professor Crawford commented: "*Icarus* is not only a breath-taking performance that combines live orchestra, narration and a companion film – but it also provides a wonderful vehicle to introduce scientific concepts. The story plays with the ideas of general relativity, and explores how the passage of time is affected by the extreme gravity of a black hole."

The multimedia performance of *Icarus at the Edge of Time* was commissioned and produced by the World Science Festival (New York) with the Alfred P. Sloan Foundation, and Southbank Centre (London) with The Royal Society. Co-Commissioned by Associazione Festival della Scienza, Baltimore Symphony Orchestra and Glasgow's Concert Halls. Executive Producers: Tracy Day, World Science Festival, New York, and Gillian Moore, Southbank Centre, London.

A preview of *Icarus at the Edge of Time* can be seen here: www.cam.ac.uk/science-festival/events-and-booking/icarus-at-the-edge-of-time

On 10 March, Jane Chapman – described as ‘Britain's most progressive harpsichordist’ (The Independent on Sunday) and ‘the hippest harpsichordist around’ (Metro) – juxtaposes Baroque and contemporary works for harpsichord. Jane will explore the creative potential of structures and patterns in these old and new works, shedding light on the connections between them. Of the three world premieres on the programme, works by Alex Cook and Gabriel Chernick engage in musical dialogue with the 400-year old music of Sweelinck, while Tim Watts's new piece takes inspiration from the Natural History Museum's dodo skeleton.

Describing the concert, *Structures and patterns in music*, Jane said: “Be it in the mesmerising extreme velocity of Ligeti's *Continuum*, which ‘hums and jangles like a ghostly vision’, or the beautiful strains of Sweelinck's *Lachrimae*, with its soulful ornamentation and variation, pattern and structure can be central to the creation and appreciation of music. Rameau's depiction of birdsong and the forging of thunder bolts, Kang's relentless evolving jazz rhythms, Kraus's heroic harmonic mountain climb, the motoring twisting patterns in *Toccata* by Chernick, lead us to the world of myth and legend as the Dodo returns. Also new works exploring the vibrant and evocative qualities of the harpsichord by Cook and Watts, and contemplative expressive sounds from Armstrong. This eclectic concert takes the harpsichord from the 16th to the 21st century.”

On the same day, a *Structures and patterns in music*: composition workshop for GCSE students will explore the creative potential of structures and patterns in musical composition encountered in music by Sweelinck and Ligeti. Students will learn about the expressive world and technical possibilities of the harpsichord, including some unexpected extended techniques, working towards a collective composition taking inspiration from elements of variation technique and their connections with the natural world.

The Cambridge Graduate Orchestra (CGO) will perform *Music and Science* on Friday 14 March – a concert of film music featuring Lord of the Rings, Pirates of the Caribbean and Lawrence of Arabia. It will be preceded by a talk given by Ian Cross, Professor of Music and Science in the Faculty of Music.

During the SciBar (science in a bar) event on Thursday 20 March, Dr Satinder P Gill, from the Centre for Music and Science, asks, *Can we live without rhythm?* Our bodies are connected with sound in complex ways, both with the sounds we make and with those that others make. Science paints a fascinating picture of the patterns and structures of human social and cultural rhythm, with research from kinesics, anthropology, music psychology, and neuroscience.

One of the world's biggest little computers, the Raspberry Pi – which has taken the computing world by storm over the last two years – has been used in a multitude of ways and now will be coded to

create music. On 22 March, in a two-hour workshop, *How to make music with Raspberry Pi*, visitors will get the chance to learn some basic coding, allowing them to create music on the Raspberry Pi computer. Supported by Dr Sam Aaron, Research Associate at the University of Cambridge Computer Laboratory and Rachel Drury, Creative Producer.

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Gaia lead investigator, string theory pioneer and Astronomer Royal headline talks on space

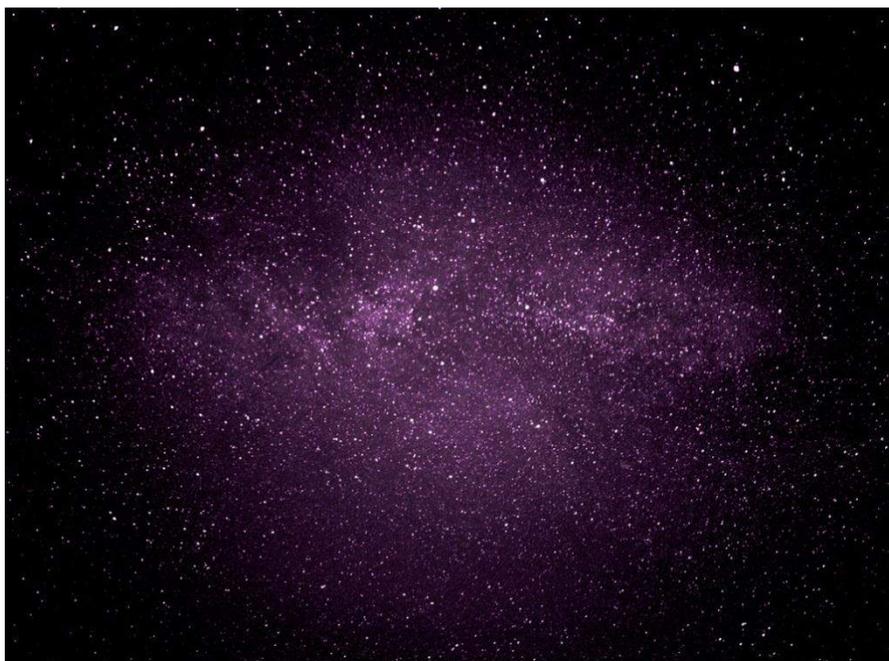


Photo credit: Chris Poole via flickr

Our Copernican demotion may have further to go, according to Lord Rees, Astronomer Royal.

From the structure and history of our Galaxy and how it evolved to the existence of other universes, space-themed talks, showcasing the latest in astrophysics, feature heavily during the Cambridge Science Festival 2014.

The Gaia satellite was launched in December 2013 to determine the structure and history of our Galaxy. The Square Kilometer Array is being built to unravel the role of dark energy and dark matter. Telescopes like these produce unprecedented amounts of data requiring a new supercomputer, the Wilkes, to process them. How do these developments compare to Newton's discoveries and inventions? On Monday 10 March, Dr Patrica Fara, Dr Rosie Bolton and Professor Gerry Gilmore will be discussing this question and more during the event, *What's new in space?* which is organised by Science AAAS.

Professor Gilmore, the UK Gaia satellite principal investigator who recently became a Royal Society Fellow, said: "Gaia, Europe's newest big astrophysics mission, with its goal to provide the first 3D census of the Milky Way, is now in orbit being tested out. Gaia's billion-pixel camera is already in operation. The first images illustrate the challenges and opportunities, technologically and intellectually, to extend our understanding of our Galaxy."

Dr Bolton, an astrophysicist from the Cambridge Cavendish Laboratory who works on designing the world's largest radio telescope, the Square Kilometre Array, commented: "If Gaia is the 'Billion stars' machine, the Square Kilometre Array (SKA) is the 'Billion galaxies' machine."

The SKA project is a 1.5 billion Euro project to build the world's largest and most sensitive radio observatory. Dr Bolton is the project scientist for the Cambridge-based consortium leading the design of the SKA's enormous processing centre. Her part of the talk will highlight the transformational science that will be conducted with the SKA once it comes on-line next decade.

Turning to historical astronomy and Sir Isaac Newton – the second Lucasian Professor of Mathematics at the University of Cambridge – Cambridge historian, Dr Patricia Fara, said: "Isaac Newton is celebrated as the world's greatest scientific genius, the inspired Cambridge scholar who made gravity mathematical and brought order to the heavens. But I will question whether he was indeed a Newtonian scientist: God finds no place in modern physics, but was present throughout space and time in the universe envisaged by Newton."

Modern physics raises questions concerning phenomena on widely different distance scales, from the evolution of the whole Universe to microscopic properties of sub-nuclear particles. On Thursday 13 March, current Lucasian Professor of Mathematics, Michael Green – a theoretical physicist and one of the pioneers of string theory – will present a historical survey of the evolution of theoretical approaches to understanding such problems during the Andrew Chamblin Memorial Lecture: *The pointless Universe*. He will also discuss recent ideas from String Theory that have the potential for unifying areas of physics that have previously appeared to be only remotely connected.

Commenting on his talk, Professor Green, who recently won the Fundamental Physics Prize, said: "According to string theory the different sub-atomic constituents of matter – the electron, the quarks and other elementary particles – are to be thought of as different modes of vibration of an extremely small string. This simple postulate not only unifies the fundamental particles, but leads naturally to a unified description of the physical forces.

"This talk will explain why string theory is so compelling even though it is not yet a complete theory and it has yet to make precise experimental predictions. It will give an overview of the theory, illustrating how it describes physics at ultra-short distances in a manner that is radically different from conventional theories and also describing some possible cosmological implications of the theory.

"The talk will end with an overview of recent ideas, which suggest that the theory may have applications in areas of physics far removed from the ones it was originally intended for."

In a talk on Monday 17 March, Lord Martin Rees, Astronomer Royal, will discuss *Our Universe and others*. We are the outcome of a process taking nearly 14 billion years in which atoms, stars, planets and biospheres emerged from a hot dense big bang. Lord Rees will discuss the key stages in the process. What would our cosmos be like if the key numbers were different? And could a huge variety of other universes exist, each the aftermath of a different big bang?

Lord Rees said: "There's strong reason to expect that our universe extends far further than we can see with our biggest telescopes. But that's just the aftermath of 'our' Big Bang. The more interesting (and more speculative) question is whether there are other big bangs, giving rise to other space-times, which might be governed by physical laws quite different from those that prevail here. What astronomers observe could be an infinitesimal part of physical reality. Our Copernican demotion may have much further to go."

Other space-related events include:

- *Helen Keen's space race*. Join Helen Keen for her new, live, spacetacular show for discerning younger space fans. Arrive in your space costume or whip one up out of free tinfoil before the show starts! See how rockets fly! Learn how they stay in orbit! And find out about the intrepid animals who have travelled into space with science comedian Helen Keen. (15 March)
- *Shortcuts to space: what are the best and worst ways to get into orbit?* With Zephyr Penoyre. This is part of the CHaOS talks. (15 March)
- *Stars, planets and microwave ovens*. Dominic Ford and Dave Ansell (BBC Naked Scientists) use bicycle pumps and kitchen equipment help to find out what a star is made of, how to detect a planet a hundred light years away and how stars ignite. (16 March)
- *Icarus at the edge of time*. What if Icarus travelled not to the sun but to a black hole? This orchestral work is a mesmerising adaptation of Icarus at the Edge of Time by Brian Greene with music by Philip Glass and film by AI + AI. This re-imagining of the Greek myth is performed by Cambridge University Musical Society Symphony Orchestra, conducted by Ben Glassberg and features Gresham Professor of Astronomy Carolin Crawford. (17 March)
- *The early history of the Cavendish Laboratory* (21 March). The opening of the Laboratory in 1874 marked the beginning of a remarkable period of growth in experimental physics in Cambridge. Up to that date, there were no experimental facilities for physics and the subject was not an approved discipline in the Natural Sciences Tripos. The tortuous events which led to the foundation of the Laboratory and the remarkable achievements of the first three Cavendish Professors, Maxwell, Rayleigh and JJ Thomson, will be described by Professor Malcolm Longair.
- *Astronomy road show planetarium*. Sponsored by the East Anglia Branch of the Institute of Physics. Explore the beauty of the night sky. Learn about space, stars and the solar system. The shows are interactive, lively, up-to-date via the internet and scientifically accurate. (22 March)
- *Open afternoon at the Institute of Astronomy*. The Institute of Astronomy opens its doors for our annual open afternoon. We will have talks, displays, demonstrations and hands on activities for everyone to learn more about astronomy, and the kind of research we do. (22 March)
- *Public observing at the Institute of Astronomy*. Stargazing on the Observatory lawns, if weather permits. (22 March)

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Photo credit: Sir Cam

Science of Sport

With the Tour de France coming to the cycling capital of the UK this year and Sport Relief just around the corner, it's no surprise that sport will feature at this year's Cambridge Science Festival.

Head of Technology for British Cycling, Professor Tony Purnell, will be giving a talk on Friday 14 March – *Can science make a cyclist faster?* Cycling leads most Olympic sports in its approach to technology intervention; Professor Purnell will provide an overview of how science and engineering contribute to the raw speed of all Olympic cycling disciplines. He will show that it's not just about incremental gains, but also about avoiding incremental losses.

Speaking about the relationship between technology and cycling, Professor Purnell said: "It's interesting to find just how many engineers one finds who are fanatical cyclists. There's something very easy to understand: to go fastest one simply needs more power from the legs, less weight and less aerodynamic drag from the body. Dig a little deeper and there's a myriad of interventions that one can think of to achieve this, but each one can be complex and challenging to implement."

Visitors to the Science Festival will also have the opportunity to attend a range of sporting talks and demonstrations on 15 March – the first Science on Saturday.

Saturday's sporting events kick off with *How the bicycle got its spokes*. Visitors will be able to explore the fascinating history of the invention of the bicycle and the colourful characters who made it possible. Philip Garsed, Electrical Engineering PhD student at the University of Cambridge, will show

how the contributions of an eclectic mix of inventors came to make the apparently simple machine we know today.

Philip commented: "The bicycle is one of the simplest and most recognisable machines in the world, yet it is the product of the inventiveness of hundreds of people. In *How the bicycle got its spokes*, we'll meet the German baron who first thought to put one wheel in front of the other and the following army of inventors who tinkered with and improved the idea with brilliant ideas of their own. Along the way, we'll discover the frustrations and foresight that drove their inventiveness, the trials and tribulations they experienced and we'll discover how some of these clever ideas actually work."

Other sporting events and hands-on activities taking place on 15 March at the Guildhall in Cambridge include:

- *The mechanics of movement*: Using simple technology visitors will have the chance to record a physical activity such as a jump, kick or throw and compare their recordings to those of elite athletes across a range of sports at exhibition. They will also discover how the angles of the joints change in order to optimise the generation of forces and power.
- *Pumping to boarding success*: Visitors will be able to have a go at one of the tests used with elite sail boarders who will assess capability over a 10-second explosive test. They will then have the chance to compare your scores to those of elite sail-boarders. Pumping is used to generate speed on the board.
- *How we use oxygen*: A chance to explore how we take up oxygen from atmospheric air for the subsequent generation of energy and how this process is related to exercise intensity and duration. Visitors can have their expired air recorded and watch how a range of biological systems integrate in order for them to maximise O₂ extraction and CO₂ expulsion.

On Thursday 20 and Friday 21 March, school children will be able to test their strength, fitness and agility using interactive challenges during *Science of sport for schools* held in the stunning new University of Cambridge Sports Hall. Have they got quicker reaction times than their teacher? Other activities include Batak Wall, target practice, vertical jumps and a speed test.

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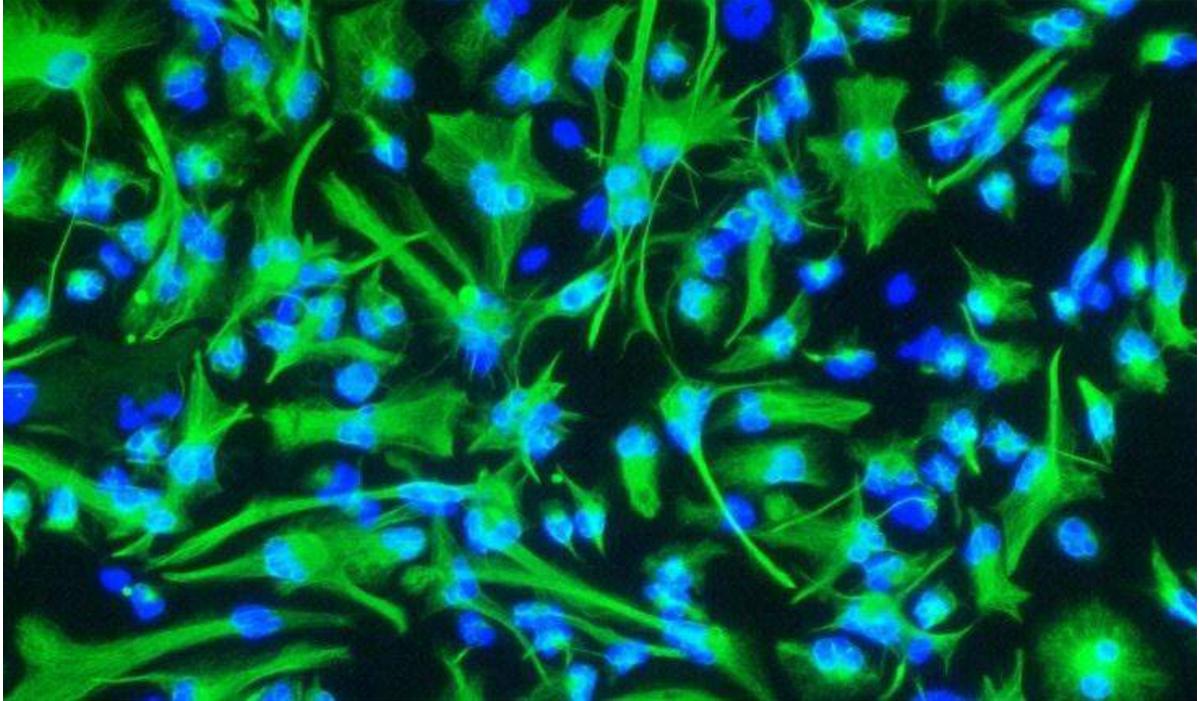


Photo credit: Steven Pollard / Wellcome Images

Stem cells could help in the battle against major brain diseases – scientists reveal latest research

The study of stem cells continues to be a top priority for researchers; given their distinct regenerative abilities, stem cells offer new potential for treating a range of diseases. During the Cambridge Science Festival (10-23 March), researchers reveal how these cells could help with the battle against major diseases of the brain.

On Monday 17 March, the newly appointed Professor of Stem Cell Medicine, Robin Franklin, will be discussing his research into central nervous system regeneration, in particular myelin repair, during his talk *Stem cells and repairing brains*. The potential benefits of myelin repair are to stop nerve cell degeneration and provide a treatment for multiple sclerosis.

Professor Franklin said: “The brain, although capable of unmatched feats of adaptability, is generally considered to be an organ that is very poor at mending itself after injury. However, one particular type of brain cell, called the oligodendrocyte – the cell that makes the myelin wrapping around nerve fibres – can be regenerated when lost in disease by the brain's own stem cells. By studying in the laboratory how brain stem cells generate new oligodendrocytes it has been possible to identify ways in which this important regenerative process might be achieved in the clinic, offering the prospects of regenerative medicine for major neurological diseases.”

On Wednesday 19 March, Professor Roger Barker from the Centre for Brain Repair, Department of Clinical Neuroscience, Cambridge, will be asking, *What can stem cells do for Parkinson's Disease?* Professor Roger Barker's lab studies chronic neurodegenerative disorders of the nervous system, in particular Parkinson's and Huntington's disease. Professor Barker will show how these diseases develop and reveal how, by testing new therapies with specific patient subgroups, the ultimate aim is to find therapies to stop or modify disease processes.

Professor Barker said: "There has been a great deal of excitement about stem cells and how they can be used to study diseases of the brain as well as treat them through implantation. In this talk, I will discuss what we can hope to find out about disease processes by looking at the brain nerve cells we can now make from the skin cells of patients with Parkinson's disease (PD). In addition, I will chart the history of cell transplantation for PD and how the field has moved from periods of huge hope to disappointment before entering this new era of optimism around stem cell therapies. However, is that optimism misplaced or are we really on the threshold of a whole new era of therapies for these incurable diseases of the ageing brain?"

Further talks relating to stem cell research during the Science Festival, include:

- *Stem cell discoveries*, 15, 16 and 23 March. Hands-on activities all about the amazing world of stem cells. Look after your own flask of stem cells in our stem cell pet experiment; race to the finish line in our stem cell board game; view some short stem cell films and talk to researchers working in the field about the latest advances. Adults can also win a tour of the Stem Cell Institute, led by one of our top researchers.
- *Stem cells: using physics and engineering principles in stem cell research*, 18 March. Dr Kevin Chalut's lab focuses on new ways to investigate physical states of a cell during its development using microscopy and microfluidic techniques. The goal is to discover the physical mechanisms, and the importance of those mechanisms, in various areas of stem cell research.
- *Stem cells: reprogramming adult cells back into embryonic stem cells*, 20 March. Dr Jose Silva studies the biology of how to convert a somatic cell back into a pluripotent cell. Somatic cells make up our internal organs, skin, bones, blood and connective tissue. A pluripotent cell refers to a stem cell that has the potential to differentiate into any of the three germ layers. Learn more about this fascinating process.

For more information about the Cambridge Science Festival or to book tickets for any of these events, please visit: www.cam.ac.uk/science-festival

For more information on the Wellcome Trust - Medical Research Council Cambridge Stem Cell Institute, please visit: www.stemcells.cam.ac.uk

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Press Release

25.2.14

Q&A opportunity on peanut allergy research

The Cambridge doctors who discovered the first successful treatment for peanut allergy are due to talk publicly about their work for the first time and to answer questions from the public.

Dr Pamela Ewan, Consultant in Allergy & Clinical Immunology and Consultant in Paediatric Allergy, Dr Andrew Clark will be speaking at a free lecture on the last day of the Cambridge Science Festival.

It will take place at **2pm on 23rd March at the William Harvey Lecture**

Theatre at Addenbrooke's Hospital and members of the public are welcome to come along. To book a ticket, please visit: www.cam.ac.uk/science-festival/events-and-booking/cambridge-university-hospital-chairs-lecture-cracking-the-peanut-allergy

The new therapy for peanut allergy was announced in January and attracted global media interest. The largest single trial of its kind found the treatment to be successful in the majority of the 99 children who took part.

The allergy experts at Cambridge University Hospitals found that 84 and 91 per cent of the two groups of children treated with this new form of immunotherapy could eat at least five peanuts a day.

Peanut allergy affects one in fifty children and is the most common cause of fatal food allergy reactions. People with peanut allergy risk anaphylactic shock or even death if they become accidentally exposed to peanut. The fear of accidental exposure in food reduces their quality of life and severely limits the social habits of allergic individuals, their families and even their friends.

For further information about the development of peanut immunotherapy and when it will become available in clinics, please register your interest at www.cambridgeallergytherapy.com.

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Notes for Editors:

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For further information about this event, contact Louise Gosling:

louise.gosling@addenbrookes.nhs.uk tel: 01223 586 730 Communications Department, Addenbrooke's Hospital, Hills Road, Cambridge CB2 0QQ

For further information about the Cambridge Science Festival, contact Becky Wieczorek, Festivals PR Officer, University of Cambridge: becky.wieczorek@admin.cam.ac.uk tel: 01223 339 670



Children and families spoilt for choice at this year's Cambridge Science Festival

From science story-telling, science busking and a sensory treasure hunt, to solving a fiendish crime or deciding how you would run the planet and, of course, the two Science on Saturdays, children and families are spoilt for choice at this year's Cambridge Science Festival (10-23 March).

Saturday 15 March sees the ever-popular Science on Saturday hosting around 100 events at venues right across the city centre, including the Corn Exchange and the Guildhall. Demonstrations and hands-on activities include everything from virus wars, the wonderful world of blood vessels and discovering the double helix, to stem cell discoveries, bottling your genes and an interactive crime scene. There is simply so much to choose from and the science continues on the Sunday.

Saturday 22 March, the second Science on Saturday, events take place at the West Cambridge Site and focus on mathematics, physics and manufacturing. Once again, the choice is enormous, from laser rocket launching to vacuum bazookas and custard fireballs.

The distinctive gamersbus will also be parked up outside the Hauser Forum on the same day. The gamersbus is a mobile gaming theatre in a unique converted double decker bus, offering access to the latest in gaming through unique partnerships with manufacturers, retailers and games publishers. In addition, the gamersbus will be outside Boots, Sidney Street on Saturday 15 March.

Once upon a time there was a scientist – well, really an explorer – and actually there were lots of them. They wanted to find out about the North and South Poles, how to get there, what ice was made of and what was at the bottom of the ocean... On 15 March, well-known story-teller, Marion Leeper, will be enthralling audiences with a family activity day of science storytelling – *The story of science*.

Prior to this, during a curtain raiser event on Saturday 8 March, shoppers at the Grafton Centre in Cambridge will be amazed and delighted by the science buskers from the British Science Association Cambridgeshire branch performing a variety of hands-on science experiments and demonstrations, including patterns that can trick the mind, the physics of wave patterns, the amazing diversity of natural structures and more.

Over the course of the first weekend (15 – 16 March), the Department of Life Sciences at Anglia Ruskin University, with support from the Institute of Continuing Education, University of Cambridge, will be presenting, *The mystery of the horrible hypothesis* – an exciting and lively activity for all ages. Those taking part must use their scientific detective skills to identify the perpetrators and motives behind a fiendish crime. Working with a team of researchers, they will solve a series of devious scientific puzzles from disciplines including psychology, zoology, genetics and forensics.

Speaking about the event, the organiser, Dr Paul Elliot, Director of Studies in Biology and Scientific Admissions Tutor at Homerton College, Cambridge, and a Senior Lecturer in Animal Behaviour at Anglia Ruskin University, said: “*The mystery of the horrible hypothesis* is an adventure activity that stems from my love of detective stories. Everyone loves a good mystery, and the process of scientific investigation is really a form of mystery solving.

“In this year's activity, participants will be guided through some key aspects of scientific hypothesis testing in the atmospheric surroundings of the Pitt Building or Madingley Hall. They must solve a series of exciting hands-on puzzles, winning prizes along the way. The adventure does not stop after the activity: participants will be able to use their new skills to solve further puzzles in a cryptic diary that they take away. This could lead them to find an ‘ultimate prize’ that is hidden somewhere in Cambridge!”

The ultimate version of this event, will take place at Madingley Hall during the evening of Sunday 16 March, during which participants must solve the devious mystery over a three-course candle-lit meal. Tickets can be booked at: www.ice.cam.ac.uk/murder-mystery-dinner

How would you run the planet? On Saturday 22 March, visitors will be asking themselves this question as they play the *Competition of life game: how would you run the planet?* In a world of finite resources, do they take as much as they can or save for an unpredictable future? This interactive game will let participants try their luck as the CEO of Earth in a range of possible scenarios.

Alison Harvey from the University of Cambridge Conservation Research Institute and one of the organisers of this event, said: “The Competition of Life Game has been set up by the University of Cambridge Conservation Research Institute Graduate Students to engage people in thinking about collective social and environmental issues. With most games you ‘win’ if you get the most – whether points, money, or stuff – with no consequences for taking a lot and leaving others with very little, and without any idea that resources will end.

“UCCRI students have designed an interactive game that sets up a small-scale economy with renewable limited resources where players must decide whether they will compete for supplies to try to ‘win’ for just themselves short-term or work to ‘win’ together by managing their restricted resources in a way that benefits all players and biodiversity in the long-term.

“Basically, this is a fun way to learn about serious conservation issues!”

Throughout the Science Festival (excluding Sunday 16 – Monday 17 March), young explorers will be able to undertake a mission of discovery and forge their own trail through Cambridge, discovering as they go during the event, *Exploring the unknown: a sensory treasure hunt between St John’s College Library and the Polar Museum*. Historic explorers didn’t have maps to help them find their way, so they looked for landmark objects and used their senses to map their surroundings.

Meanwhile, over at the Cambridge Science Centre there will be a host of events to keep any budding Einstein going for days (see www.cambridgesciencecentre.org) including:

- *Perception: get hands on with your senses*. Tuesday 11 – Friday 14, Tuesday 18 – Friday 21 March, 10am – 5pm, Saturday 15 – Sunday 16, Saturday 22 – Sunday 23 March. Is seeing believing? Find out how illusions can fool your brain and reveal how we really perceive the world around us. Visit our hands on exhibition about the senses.
- *Sunday science*. Sunday 16 March. The Cambridge Science Centre goes all out science crazy for the Cambridge Science Festival, with a fun-filled day of hands on non-stop workshops for all the family.
- *Amazing animals: crafty camouflage and communication*. Saturday 22 March. How good are you at spotting a copycat? The University Museum of Zoology will be running workshops and activities at the Cambridge Science Centre, exploring animal senses, camouflage and mimicry.

Other events for children and families during the Science Festival include:

- *The plant pattern hunt*, Botanic Garden (10-23 March). Self-led family trail. Can you discover all of the plant patterns hidden in the Botanic Garden? Pick up an explorer trail from the Garden ticket office and take a trip around the plant kingdom, collecting patterns as you go.
- *Symmetry of science: a walking tour* (15, 17, 19, 21, 22 March). Join Cambridge Science Guides on a walk that will explore the patterns in nature, from crystals to DNA; from code-breakers to rocks, dinosaurs, plants and insects. The afternoon tour on Saturday 22 March will be in Spanish.
- *Meet the little things that run the world* (16 March). In this interactive lecture with Dr Ed Turner, we will put insects under the microscope to learn more about their behaviour, natural history and conservation. The session will include some live insects and specimens from the University Museum of Zoology.
- *Hands-on maths fair* (22 March). Famously, GH Hardy described mathematicians, like poets and painters, as makers of patterns, and mathematics as a creative art. Find out what patterns you can discover, and explore your creative thinking and critical reasoning, with hands-on activities, games and problem solving challenges for all ages from five to adult. From prime number hopscotch to origami, it’s maths, but not as you may know it!

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27.2.2014

Press Release

The Cambridge 'Medical' Science Festival

Cambridge Hospitals (CUH) in partnership with the Cambridge Science Festival is proud to welcome visitors to the Cambridge Biomedical Campus (CBC) to explore some of the life-changing medical research conducted in Cambridge.

This is the first time in the 20-year history of the Festival that CUH has been invited to showcase its expertise alongside the work of the University.

Demonstrations, exhibitions and talks will take place at Cambridge Hospitals from 11am to 4pm on Sunday 23rd March

Visitors, families and journalists are welcome to talk to clinical researchers, take part in hands-on activities and learn about how their work can change lives and shape the future.

Some of the highlights include:

Baby Brain

Take a look inside our brain imaging unit which specialises in studying the newborn brain and see how neuro critical care is making a difference to young lives. The team will be on hand to show how the technology works by demonstrating on willing volunteers how they measure brain oxygen levels.

Cracking the Peanut Allergy

Hear the scientists who developed a treatment for children with peanut allergy, speak publicly for the first time. Ask questions and learn how this immunotherapy works and how it might be used as a treatment for other allergy patients.

Robo Doc

See firsthand how state-of-the-art robotic technology is providing new solutions in prostate cancer treatment. World leading surgeons will demonstrate the four armed Da Vinci robotic system, simulating keyhole surgery and minimally invasive techniques used to remove cancerous prostates.

For more information about what's on offer at CUH and the wider Festival see:
www.cam.ac.uk/science-festival

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NOTES FOR EDITORS

- Cambridge Science Festival aims to provide everyone with opportunities to explore, discover and discuss issues of scientific interest and concern and this year it has over 250 events on offer with something for everyone.
- The newly created **CBC** on the Addenbrooke's site, will be home to one of the largest internationally competitive concentrations of healthcare-related talent and enterprise in Europe. It comprises the Medical Research Council (MRC), the Institute of Metabolic Science (IMS), Cancer Research UK, GlaxoSmithKlein, The British Heart Foundation and the Wellcome Trust and there are plans for AstraZenica and Papworth Hospital to relocate to the site shortly. CBC will provide facilities for local, national and international patients as well as academic, commercial and healthcare facilities for the 17,000 people working on the campus. The Campus is still expanding and in its finished state the CBC will be a 140-acre 'medical city'.

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Tel: 01223 586 730 Communications Department, Addenbrooke's Hospital, Hills Road, Cambridge CB2 0QQ

For further information about the Cambridge Science Festival, contact Becky Wieczorek, Festivals PR Officer, University of Cambridge:
becky.wieczorek@admin.cam.ac.uk tel: 01223 339 670

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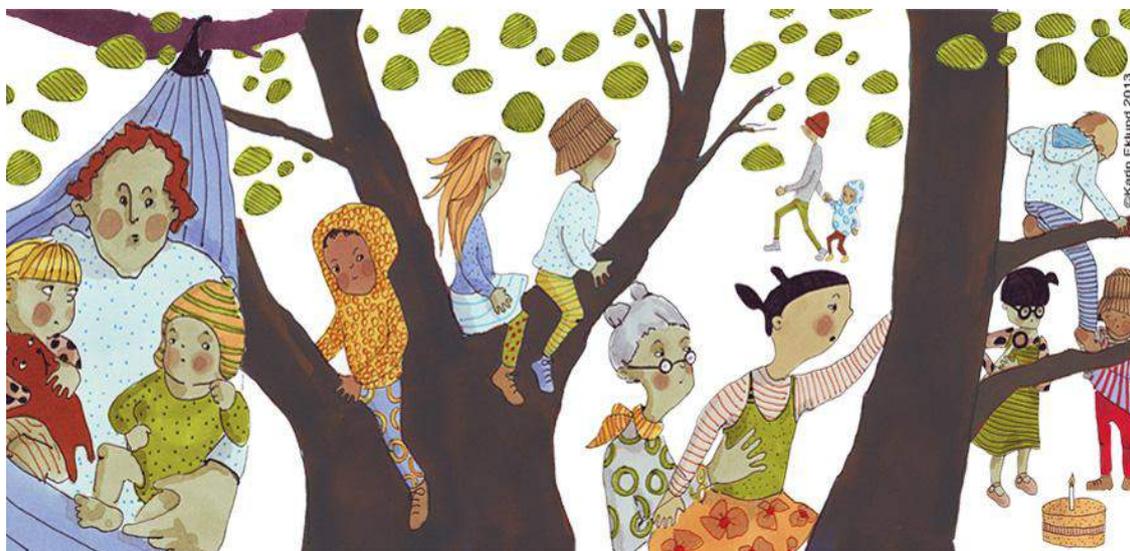
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Can science determine what makes a family?

What makes a family? A team of leading researchers in family development reveal new research that could answer this question on Thursday 20 March at the Cambridge Science Festival.

Families have changed a great deal in recent decades. Just as there are a range of families, there are an equally diverse range of answers to the question, 'what makes a family?'

Who can become a parent and how families are formed has changed in the last 30 years. New research that looks at families helped by assistive reproduction technologies (ARTs), same-sex parenting, single parent families, and the role of the family in child development, allows researchers to uncover insightful facts about the mechanics of modern family life.

This event will explore the questions science asks about how families are formed, how they develop and the role they play in the people we become. The role of siblings, parenting as part of a minority group, same-sex parenting, single parenting, children's contribution to family development and a range of other topics will be explored with the aim of extending our understanding of what makes a family.

Speaking about the research behind this event, Dr Kate Ellis-Davies from the Department of Psychology, University of Cambridge, said: "It's often said that there is no such thing as a baby per se, because there is always baby 'and'... There is a baby *and* those around the baby who nurture and support that baby developing. Traditionally, in society and research, the focus of the 'and' has been on a mother and father, making up what is commonly referred to as a 'nuclear family', with the mother taking on the nurturing role and the father present as provider. There has been a bias towards studying these family types, with much of the research attention placed on the mother. As

time has gone on, research has expanded to consider the role children have in their own development. A child's temperament, gender and age are all areas researchers here at Cambridge consider when seeking to explain family development.

"More recently, there has been an acknowledgement that those who raise a baby may be formed of different people and look very different to the nuclear family stereotype. Single parents, same-sex parents, adoptive and foster parents, or grandparent caregivers are all people who take on the task of forming their family and caring for their baby. These diverse family forms have helped to shift developmental research from describing the family in terms of structure to a description of families by how they function.

"One example of broadening the samples of family research is the on-going work at the Centre for Family Research (CFR), where researchers have worked with same-sex parents and their children. Over the formative years of development, this work has demonstrated that many of the processes we consider important for healthy child development are evident whatever the sexual orientation of parents. Parents and children's well-being in these families has been of interest to recent studies and on-going work at the CFR continues to explore the processes of families in different family structures."

Dr Ellis-Davies described further examples of current work into family development, including recent studies at the University of Cambridge that explore the role of siblings in a child's development. Siblings research aims to explore the role siblings may have on the learning and well-being of children throughout development.

"An on-going study currently running at the CFR looks to track sibling relationships during important milestones, for example starting at primary school and starting at secondary school," said Dr Ellis-Davies.

This event will include talks from some of the leaders in family development research from the University of Cambridge and the Centre for Family Research, activities for children around the theme of 'What makes my family', as well as how families can get involved and play a part in science as it happens.

Other talks and debates relating to development at the Festival include:

- 12 March: neuroscientist and gender development researcher, Professor Melissa Hines asks, *What's wrong with pink?* Professor Hines will reveal why girls choose pink dolls, while boys play with vehicles of pretty much any colour – as long as it is not pink – and how this illuminates both how humans develop and how societal pressures act upon children.
- 14 March: *When babies know so much about the physical world, why is school science so difficult?* Modern research shows that long before their first birthday, babies understand complex relations involving force and motion. Yet precisely the same relations are so challenging when presented in school science that even high performing undergraduates hold significant misconceptions. Professor Christine Howe will shed light on the conundrum, and draw out implications for parents and teachers.

- 15 March: *Do hormones in the womb affect how your brain and mind develops?* Everyone knows that testosterone makes your muscles grow stronger, your voice deepen, and your beard grow. Less well known is that testosterone produced by the baby in the womb has irreversible effects on brain development. This lecture by Professor Simon Baron-Cohen describes an experiment conducted on hundreds of Cambridge children, measuring their testosterone in the womb and following them as they grow up, to see how this remarkable biomolecule affects their brains and minds.
- 15 March: *Mind patterns and brain structures*. Discover how people form memories, what influences gambling behaviour and how the brain develops in adolescence. Learn about research into mental illness or mathematical skills in children. Research groups at the Department of Psychology present their latest research through a series of fun and interactive exhibits and posters.

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University of Cambridge press release

For immediate release: 28 February 2014

Society of Biology, The Babraham Institute, British Association for Psychopharmacology, the Pye Foundation, Walters Kundert Charitable Trust, and Cambridge City Council. Other Festival partners are Cambridge University Hospitals, the Cambridge Science Centre, Hills Road Sixth Form College and National Science and Engineering Week. The Festival's media partner is BBC Radio Cambridgeshire.



Image credit: Simon Halliday

The art of scientific imaging

As part of the 2014 Cambridge Science Festival, the Royal Photographic Society (RPS) has partnered with Dr Stefanie Reichelt, scientist at the University of Cambridge's Cancer Research UK Cambridge Institute, to deliver a range of talks, lectures, demonstrations and exhibitions, dedicated to promoting scientific photography and the science of photography.

On Saturday 15 March, a first-class range of speakers from both within the RPS and those engaged in scientific research will celebrate all that is fascinating within photography and imaging, but with a distinctive scientific slant. There will be a whole day of talks and exhibition showcasing recent advances in imaging science, from biological and high-speed imaging to optical design and holography.

The event includes the Camper Obscura, a camera obscura (an optical device that projects an image of its surroundings on a screen) in a camper van, which offers visual experiences to members of the public that hop aboard. The vehicle is the outreach project for Fotonow and supports a better understanding of photographic and community arts practice. Visitors can find the vehicle parked outside Cancer Research UK building on Saturday and Lady Mitchell Hall on Sunday 16.

Commenting on the art of scientific imaging, Dr Reichelt said: "An image speaks more than a thousand words. In the digital world of today, this is truer than ever; capturing images has never been easier, but also has never been as exciting with new imaging technologies emerging. The

resolution limit in light microscopy as postulated by Abbe, which seemed unbreakable for 200 years, is now a limitation of the past. We image, at an optical resolution of less than 100nm with light, live cells and live molecules. We see what formally a biochemist had to deduce from bands and plots in an indirect way. We are also able to image large samples, whole developing embryos with molecular detail – in real time. This is like looking into a new dimension. Seeing what no one has seen before.”

As part of the celebration, the International Images for Science exhibition 2013 will be on display in the ArtCell Gallery in the Cancer Research UK Cambridge Institute, on the Cambridge Biomedical Campus, which is the same venue where the talks and demonstrations will be given.

In November 2007, Stefanie Reichelt started ArtCell Gallery, which is located in the Cancer Research UK Cambridge Research Institute (CRUK CRI), in the heart of the scientific community of Cambridge.

The institute carries out world-class research to improve our understanding of cancer and find out how to prevent, diagnose and treat different kinds of cancer. The exhibitions at ArtCell aim to bring art into the institute for Stefanie's colleagues, patients at Addenbrookes Hospital as well as the general public.

Since inception in 1853 the Royal Photographic Society (RPS) has had the mission to promote the art and science of photography. Starting in 2011, with the International Images for Science exhibition, the RPS reaffirmed its commitment to Scientific Photography and the Science of Photography. The RPS primarily caters for those with an interest in the science of imaging and scientific imaging through three of its special interest groups, the 3D and Holography group, the Medical Group and the Imaging Science Group. While the combined membership of these groups is small compared to some of the other special interest groups, this does not prevent them holding ambitious events.

This March marks a first, where these three special interest groups have combined forces and have worked with the East Anglian Region to organise a day of Scientific Photography covering a wide gamut of scientific photography and the science of imaging.

The range of talks and lectures has been chosen to ensure that there is something for everybody. They seek to educate, challenge and answer a wide range of questions. The day starts with a talk answering the thorny questions of how many pixels do you need and how many are you getting and ends with a talk about developing the imaging tools of tomorrow, via talks on colour vision, high-speed photography, medical imaging and images, 3D and stereo imaging, imaging nature evolving, and art and science.

Other related events during the Festival include:

- Thursday 13 March. *Life sciences poster and image exhibition*. Sponsored by Linguamatics. Exhibition of work from early career academic researchers in the life sciences at the University of Cambridge. If you've ever wondered what scientists beginning their research at the University actually work on, then come along and meet them. View posters and images from their research, designed for public communication. Topics in the past have ranged from how cuckoos can recognise the patterns on the eggs of other birds, through to the the molecular biology behind ageing.

- Monday 10 – Saturday 22 March, (excluding Sunday 16 March), *Inspiring images: engineering captured on camera*. From rainbow coloured liquid-crystal molecules, to tunnels deep under the ground, this year's entries from the University of Cambridge Department of Engineering photography competition help to bring engineering brightly and vividly to life.
- Friday 14 March – Monday 17 March. *Isaac Newton's camera: dismantling light with Prokudin-Gorskii method photography*. A digital recreation of the earliest known colour photographic technique and an exploration of what happens when you collect the different elements of the colour spectrum separately.

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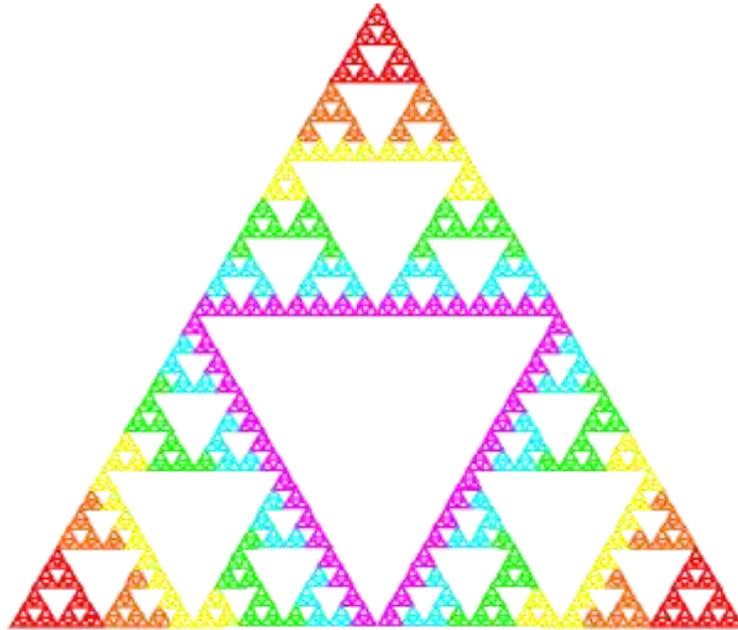


Image: diagram of balloon pyramid courtesy of Bubbly Maths

Guinness World Record attempt at this year's Cambridge Science Festival

A team of 10 balloon artists, Bubbly Maths and the Pyraloons, are attempting to break a mathematical world record by creating the largest balloon pyramid in six short hours at this year's Cambridge Science Festival, which starts on Monday 10 March and runs for two weeks.

The team, who will begin construction at 6am and finish at midday on Saturday 15 March at the Grafton Centre, Cambridge, will endeavour to create the world's largest Sierpinski Pyramid. It will be a giant fractal structure, sized 8 metres long, 7 metres deep and 6.5 metres high and made from spectacular red balloons. A network of 2,048 balloons will be built to create the structure, comprising of 1,024 small pyramids.

The sculpture is being built as a fundraiser event for The African Institute for Mathematical Sciences School Enrichment Centre (AIMSSEC), which helps disadvantaged African children to raise themselves out of poverty through sustainable education. Last year, AIMSSEC, a small organisation that trains over 400 teachers every year, changed the lives of thousands of rural

and township children across South Africa and currently reaches over 100,000 children every year through sustainable education training.

The world's largest Sierpinski Pyramid attempt is educational to the core and will be facilitating lots of mathematical learning for all visitors to the Grafton Centre.

Caroline Ainslie, Founder and CEO of Bubbly Maths, said: "The wonderful thing about our Guinness World Record attempt is that it is based on making maths playful and intriguing to all levels, from a two-year old, fascinated by balloon triangles, to a post-graduate mathematician who can go into deep mathematical concepts over fractals, symmetry, geometry, etc. If you really don't want to consider the maths, simply enjoy the spectacular sculpture and the buzz of attempting the Guinness World Record for a great cause."

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About Bubbly Maths

Bubbly Maths specialises in making maths fun for primary schools that have problems with maths and want their teachers, children and parents to experience excitement whilst doing enjoyable mathematics. Our method is to make maths fun using clowning, soap bubbles and balloons in assemblies and workshops during a Bubbly Maths Day or family learning session. Our resources were developed with mathematical learning experts from NRICH at the University of Cambridge and focus on shape, space and measurement.

About The Pyraloons

The Pyraloons are a collection of entertainment professionals, from balloon modellers to clowns, working together to break world records in novel and innovative ways; all the while raising funds and awareness of the charity AIMSSEC and the good work it does promoting and educating South African pupils and teachers in the wonders of Maths.



Image credit Milosz1

The brave new world of materials science

Bionic people, living buildings, implants that become living bone and artificial muscles... Welcome to the strange world of materials science.

We are about to enter a new materials age, one that challenges the very notion of material itself. Bionic people with synthetic organs and even brains, living buildings and objects that heal themselves will become the norm.

On Friday 14 March, during the *Alex Hopkins lecture: strange material*, Professor Mark Miodownik, materials engineer from University College London and BBC Science Club presenter will review the changes to the material world that are coming our way.

Speaking about the future of synthetic bodies and whether this could mean we live forever, Professor Miodownik said: "I think what we will see is that disability, due to ageing or accidents will become treatable to a greater and greater extent. Replacement organs will undoubtedly become normal for most people as they get older. We will not necessarily need to become more synthetic, as the replacement kidney, livers, hips and knees are likely to be grown from our own cells, a technology made possible by collaborations between materials scientists and medics. For many technological and economic reasons, living forever is unlikely to be a real prospect, but I think it will be fairly normal to be able ski and play tennis at the age of 100."

Professor Miodownik will also be giving a talk on Saturday 15 March entitled *Stuff matters*, during which he will talk about concrete that can heal itself, implants that become living bone and liquids that flow upwards. He will use demonstrations to explain why the world is about to become a lot stranger.

Professor Molly Stevens heads a large multidisciplinary team, from surgeons to engineers, specialising in biomedical materials and regenerative medicine at Imperial College London. She has won multiple prestigious scientific prizes and was one of The Times top ten scientists under the age of 40 in 2010. On Wednesday 12 March, during the *WiSETI lecture: growing organs and other small challenges*, Professor Stevens will be talking about her research on designing materials for biosensing and regenerative medicine; the result of team work between materials scientists, bioengineers, cell biologists, physicists, chemists and surgeons in her group. This is WiSETI's (Women in Science, Engineering and Technology Initiative of the University of Cambridge) flagship annual event, sponsored by Schlumberger Cambridge Research, where a distinguished woman scientist is invited to speak about her life and work.

Describing her team's research, Professor Stevens said: "Our research spans several different areas from applications in biosensing to applications in regenerative medicine. At the heart of it though, we have a strong expertise focussed on designing materials to interface with biology. So, in regenerative medicine, we are making materials to act as scaffolds to regenerate tissues as diverse as bone, cartilage and heart; whilst at the same time we have been very successful in the development of new nanomaterials that can enable the early detection of diseases such as cancer. To do this sort of research requires excellent collaborators and a very multidisciplinary team in house – my team has engineers, chemists, biologists, physicist and even surgeons."

On the subject of tissue engineering emerging as one of the key areas of medical research, Professor Stevens believes that within the next 10 years we will see more and more lab-based inventions making it through to clinic. "The applications that researchers are focusing on are widespread from helping to stop scarring in the heart after heart attacks to preventing degeneration within the nervous system amongst many important goals," she said.

Dr Stoyan Smoukov, Head of the Active and Intelligent Materials Lab, Department of Materials Science and Metallurgy, University of Cambridge will be giving a talk about artificial muscles on Saturday 22 March. His talk will demonstrate various materials that are being used to develop artificial muscles. A wireless microscope will be used to examine these structures. The scattering of light from small soft-lithographic structures will be shown, and how the spacing of light-dots can be used to monitor very sensitively stretching and bending of a material.

Dr Smoukov said: "Materials today can move, change shape and even colour; they do so much more than people often assume. We are trying to do many of those things at the same time and have recently made micro-muscles that move and also have memory. Other muscles we've created can work in the vacuum of space and on command change shape from a European football to an American football (sphere to a long ellipsoid). These kind of intelligent materials, which can both sense and move will be further blurring the lines between living and artificial/'dead' materials."

“The presentation will try to lift some of the magic veil behind some fascinating phenomena from everyday materials, and also perhaps create wonder about some not-so-common ones.”

Other talks, debates and demonstrations relating to materials science, include:

- Thursday 13 March, *SciBar: breaking and building bones. Science in a bar!* What happens when bones break and what materials can we use to repair them? Come and explore the structure of bone tissue and implants from the perspective of materials science and engineering with Dr Rose Spear.
- Sunday 16 March, Dr Erica Bithell, Teaching Officer in Physical Sciences within the Institute of Education and an Affiliated Lecturer in the Department of Materials Science and Metallurgy, University of Cambridge will be giving a talk, *It's simpler with symmetry*. Dr Bithell will be revealing what the palaces of emirs, high-tech materials and broccoli have in common and showing how symmetry and structure bring together stunning works of art, natural forms and cutting-edge technology.
- Saturday 22 March, PhD students, Ed Pickering and Lucy Fielding from the Department of Materials Science & Metallurgy, University of Cambridge will be giving a talk, *Steel: probably the best material in the world*. They will show how steel is probably the most important material ever used – almost every man-made object in the world is either made from steel or has been made using it – and explore what makes steel such a special material, the history of its use, and how it continues to be developed. While it's true that the Iron Age ended centuries ago, we are lucky enough to live in the Steel Age today.

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Spotlight on conservation at the Cambridge Science Festival

From exploring how and why the world's forests are changing to managing freshwater invaders, conservation comes under scrutiny at this year's Cambridge Science Festival.

On Saturday 22 March during the talk, *Planes, lasers and spectral sensors*, Dr David Coomes will discuss his work, which focuses on how and why the world's forests are changing and how he uses his research to inform conservation policy. He will demonstrate how to map the shape of a forest using a remote sensing laser technique and how forests change over time.

Dr Coomes, Head of the Forest Ecology and Conservation Group in the Department of Plant Sciences, University of Cambridge, said: "Everyone knows that biodiverse tropical rain forests are disappearing at an unimaginably high rate, making way for plantations and pastures to meet global demands for food and energy. Less well known is that advances in remote sensing technologies mean that researchers are able to detect illegal logging in the remotest parts of the Brazilian Amazon almost as it happens, allowing authorities to catch the culprits.

"We now have robust tools to calculate how much carbon is stored within a nation's forests, paving the way for rewarding governments who have demonstrably reduced carbon emissions by reforestation. Even more amazing are airborne sensing techniques that produce detailed 3D models of forest canopies and allow the chemistry within individual tree crowns to be analysed. These enable researchers to peer into the leaf and monitor fundamental physiological processes that ultimately determine how trees will respond to climate change.

“My talk will demonstrate how these amazing remote-sensing tools work and discuss their impacts on conservation research.”

Moving on from tropical rainforests, Dr Tony Whitten will investigate what is life like where there is no light. Can anything live in such conditions? Deep in caves, weird animals do live in such conditions, somehow finding prey and dealing with predators. Apart from bats, these animals are not well known and face some unlikely threats. On Saturday 15 March, Dr Tony Whitten, from Fauna & Flora International, will explore the dark world of caves and the life that lives there.

“If ever there was an explored and unappreciated ecosystem it would be caves,” said Dr Tony Whitten. He is the Asia-Pacific Director of Fauna & Flora International, the world’s oldest international conservation organisation – which has its global headquarters in Cambridge – and has recently been appointed as the Chair of a global network for cave invertebrates. “For reasons I will explain in the talk, caves are quite unlike any other ecosystem, and because the animals living within them, often in pitch darkness, they have become adapted to this unusual world. Their body shape, their limbs, their physiology have all changed. Indeed, they are now so finely adapted that they cannot live outside their cave. For this reason, their distributions can be tiny and if a cave is abused by a quarry or by development for a tourist cave, these animals do not just become a bit rarer, they become globally extinct. Who is going to yell ‘Stop!!’?”

Other talks, debates and demonstrations relating to conservation, include:

- Saturday 15 March, *Managing Britain’s freshwater invaders*. Dr David Aldridge, lecturer in Aquatic Ecology from The Department of Zoology, University of Cambridge, will be running an interactive table showcasing a selection of invasive species.
- Saturday 15 March, *Wildlife animal sounds quiz*. Sarah Luke, from the Insect Ecology Group in Zoology, will be running an interactive, fun wildlife animal sounds quiz.
- Saturday 15 March, *The life of a dragonfly*. The jaws of the extraterrestrial creature in the film *Alien* were based on those of a dragon fly larvae? Take a look at the dragon fly and other insects under a microscope and learn about their behaviour and function in ecosystems.
- Sunday 16 March, *Meet the little things that run the world*. In this interactive lecture with Dr Ed Turner, we will put insects under the microscope to learn more about their behaviour, natural history and conservation. The session will include some live insects and specimens from the University Museum of Zoology.
- Saturday 22 March, *Minerals, fossils and meteorites are more fragile than you think*. A geological conservation event which combines a 30-minute workshop with a 30-minute tour of the geological store facility. Although most minerals, fossils and meteorites are rock-hard, their preparation and conservation for the purposes of research and museum display requires careful handling and considerable skill. Find out from the experts the do’s and don’t’s of specimen preparation and conservation.

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Credit: Sir Cam

Cambridge Science Festival celebrates women

Tomorrow, Saturday 8 March, is International Women's Day, a global celebration of women with events held throughout the world to inspire and celebrate the rich and diverse achievements of women in every aspect of daily life – from politics and business, to art and science.

The Cambridge Science Festival is grateful to the many excellent women who are taking part in this year's Festival and have made significant contributions to science.

Look out for talks and events featuring Dame Sally Davies, Susan Watts, Professors Gillian Griffiths, Barbara Sahakian, Clare Bryant, Melissa Hines, Molly Stevens, Christine Howe, Nicky Clayton, Sharon Peacock and Maria Grazia Spillantini, Dr Rosie Bolton, Sophie Scott, Helen Czerski and Heather Williams and all the other hundreds of female staff and students at the University of Cambridge.

Events recognising women's achievements taking place during the Festival include the following:

Wednesday 12 March, 5-6pm. *WiSETI lecture: growing organs and other small challenges*. This is WiSETI's (Women in Science, Engineering and Technology Initiative) flagship annual event, Sponsored by Schlumberger Cambridge Research, where a distinguished woman scientist is invited to speak about her life and work. This year the speaker is Professor Molly Stevens.

One of the aims of the lecture is to highlight issues that particularly affect women in science research and contribute to relatively low numbers of female scientists in senior positions. The annual lecture speakers explore how these issues manifest on them personally and discuss

approaches to managing obstacles and overcoming them. This popular and well-attended event is hosted by the Vice-Chancellor and provides an opportunity for networking both before and after the lecture.

Wednesday 12 March, 8-9pm. *What's wrong with pink?* Neuroscientist, Professor Melissa Hines will discuss her area of research that focuses on why certain toys are embraced by different genders. Why do girls choose pink dolls, while boys play with vehicles of any colour, as long as it is not pink? Find out the answers to these questions and how they illuminate both how humans develop and how societal pressures act upon children.

Saturday 15 March, 10am-3pm. *Meet the women who do the science, technology, engineering and maths.* This is an opportunity to talk to Cambridge AWiSE (Association for Women in Science and Engineering) about careers in these fields.

Also on Saturday 15 March, Gia Milinovich, TV presenter of programmes such as Channel 4's Demolition Day, Sky Sports, Nickelodeon and BBC Radio 5 Live shows, will chair a panel session on women in science featuring: Sophie Scott, Helen Czerski and Heather Williams.

Dr Lucinda Spokes, Cambridge Science Festival Co-ordinator, said: "We feel very privileged to be able to share the research of so many eminent female scientists during the Cambridge Science Festival and be part of this international celebration of women."

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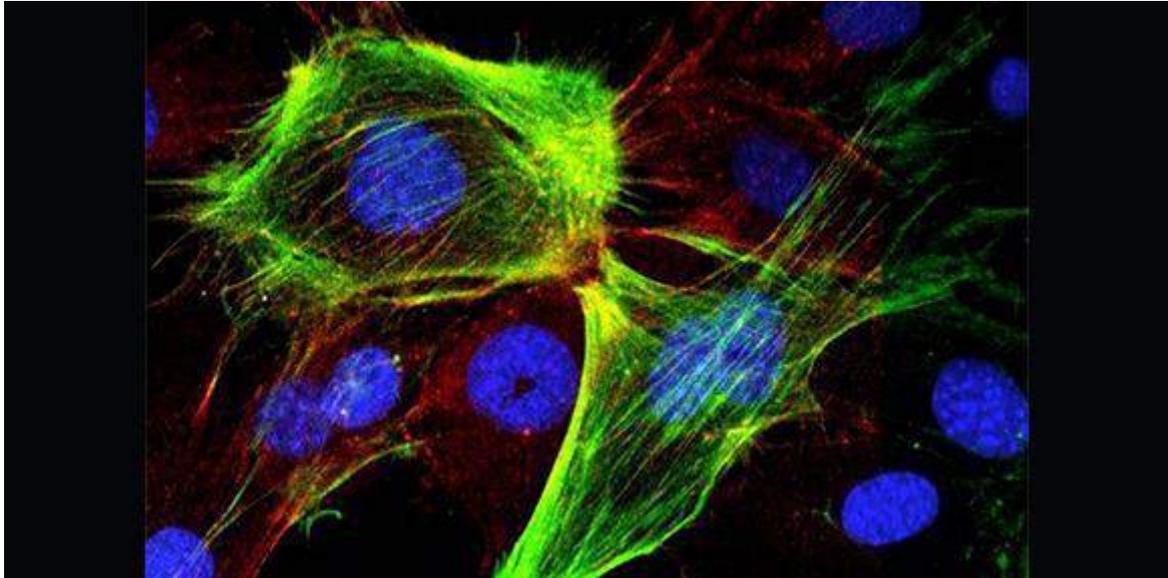
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About AWiSE

Cambridge AWiSE is a regional network for women in science, technology, engineering and mathematics (STEM) in both industry and academia and for women who wish to return to a STEM career after a break. We bring together women with common interests and act as a source of support, information and inspiration; aim to help women stay in STEM and make the most of their careers; and provide regular talks, workshops, networking opportunities and information through our website and newsletter.



Behind the scenes of cancer research

Cancer will affect one in three of us at some point in our lives, so research into this disease is vital. Most cancer patients will see their doctor when the disease is already advanced and harder to treat, according to Professor Ashok Venkitaraman, Director of the Medical Research Council (MRC) Cancer Unit in Cambridge.

Professor Venkitaraman's Unit will be opening its doors on Sunday 23 March for the event *Behind the scenes of cancer* research. Visitors will be able to join scientists from the MRC Cancer Unit and the Hutchison/MRC Research Centre to find out more about how they are trying to improve the detection and treatment of cancer. They will also be able to take a look at DNA mutations and unusual chromosomes, and have a go at some of the experiments the researchers do in the lab every day.

Professor Venkitaraman said: "Research at the MRC Cancer Unit focuses on understanding the earliest stages in the development of cancer, and using this new knowledge to find better ways of detecting and treating the disease before it advances. My colleagues and I believe that research on early cancer progression, detection and treatment has tremendous potential to improve the survival rates of cancer patients.

"The Cambridge Science Festival is an excellent opportunity for us to speak to the public about our science, and our hopes for the future of cancer detection, treatment and prevention. We also hope our event will give visitors a small insight into what goes on in some of our labs, and perhaps even inspire the next generation of cancer researchers."

Speaking about some of the latest research, Dr Ireena Dutta, Scientific Communications Manager at the MRC Cancer Unit said: “One area in which we're making significant strides is the screening and monitoring of patients at risk of developing oesophageal cancer (cancer in the gullet). Research undertaken by Professor Rebecca Fitzgerald has developed a new device called the Cytosponge, which can be used to collect cell samples from patients, and is much less invasive (and cheaper) than traditional monitoring methods such as endoscopies. This makes it suitable for use in a screening programme, and it is currently being assessed in a large-scale clinical trial. Visitors can find out more about this and other research we are currently doing on the day.”

On the same day, there will be another similar event, *Be a cancer research scientist for a day*, which is being run by the Cancer Research UK (CRUK) Cambridge Institute. They are inviting visitors to don a lab coat and be a scientist for a day. Visitors will be able to enter their mini science lab, run a DNA gel, stain tissue sections and look at them down a microscope, and try out virtual reality radiotherapy with CRUK's clinical cancer colleagues.

Drug development is a major part of cancer research and visitors to the Cambridge Biomedical Campus will be able to discover more about this aspect of medical research with two further events also being held on Sunday 23 March.

During the first event, *Making medicines from A to Z*, visitors will be able to learn how AstraZeneca scientists discover and develop new medicines. In this interactive experience, they will be able to explore how chemistry and 3D modelling are used in the design and build of new drugs and then explore how these drugs, alone or in combination, are tested in humans to treat diseases such as cancer. This event will also take place on Sunday 16 March at the Cambridge Corn Exchange.

The second event is *Developing new drugs: have a go at pharmacokinetic sampling!* The National Institute for Health Research (NIHR) Clinical Investigation Ward is involved in many research studies working towards the development of new treatments for cancer. During the development of new drugs detailed studies are undertaken to establish how quickly the body absorbs the drug and how long it stays in the body. Visitors will be able to find out more about this aspect of medical research and have a go at 'pharmacokinetic' sampling.

Other talks, debates and demonstrations relating to cancer research include:

- Saturday 15 March, as part of ThinkCon 2014, Kat Arney will be talking about the *Evolution of Cancer*.
- Tuesday 18 March, *Transmissible cancers in dogs and Tasmanian devils*. Andrea Strakova will reveal unexpected findings about two unique cancers that have adapted to transfer by the means of living cancer cells between their hosts – Tasmanian devils and domestic dogs. We will explore how a cancer can become transmissible, despite the fact that it is usually considered to be a malignant transformation of cells of your own body.

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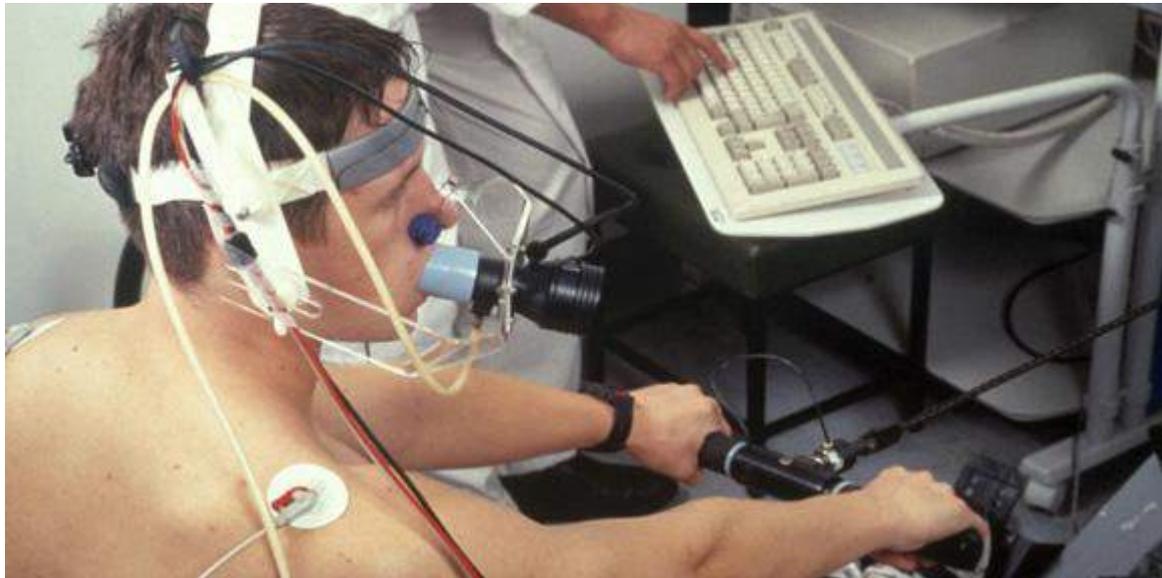
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Fat, fitness and food... The latest research brought to light

What effects if any do our diets have on health? How can we find health patterns in the population? What's the truth about fat? What keeps people fit and healthy as they get older? These questions and more will be explored at this year's Cambridge Science Festival.

On Saturday 15 March and Sunday 23 March, the event, *From EPIC Patterns to better health*, will reveal how looking at patterns in the population allows us to understand the links between diet, lifestyle and health. Visitors to this event will be able to see patterns in the Science Festival 2014 population, explore balanced diets, and experience for themselves the eye conditions being studied in the EPIC project in the Department of Public Health and Primary Care.

The European Prospective Investigation into Cancer and Nutrition (EPIC) was designed to investigate the relationships between diet, nutritional status, lifestyle and environmental factors and the incidence of cancer and other chronic diseases. EPIC is a large study of diet and health having recruited over half a million (520,000) people in 10 European countries: Denmark, France, Germany, Greece, Italy, The Netherlands, Norway, Spain, Sweden and the United Kingdom.

Stephanie Moore, Senior Research Assistant on the EPIC Study, said: "You might not believe you have ever thought about epidemiology before, but there are often health stories in the newspapers and you have probably asked yourself questions like: What effects if any do our diets have on health? How can we find health patterns in the population? What do they mean? What keeps people fit and healthy as they get older? How much difference does eating my five a day make? Is my body shape linked to staying well? The EPIC study looks at all these things and many more.

“For 20 years we have been asking people about their lifestyle and diet, making measurements and recording disease if people get ill and over 25,000 people have come to see us and filled in questionnaires, most of them more than once. Our participants have contributed to over 400 research publications.”

Professor Kay-Tee Khaw, one of EPIC’s Principal Investigators will also be presenting an interactive talk on a publication that hit the news, *Healthy for longer: guess how and guess who?* on Wednesday 19th March. Visitors will be able to join colleagues from the Department of Public Health and Primary Care for a life-size game of guess who? to understand epidemiological concepts and how, by discovering patterns in populations, we can advise the people on how to stay healthy for longer.

An event on Thursday 20 March – *Why we know very little about the effect of diet on health, And why so much is written about it* – will see David Colquhoun, Professor of Pharmacology and author of the award-winning Improbable Science Blog (<http://www.dscience.net/>) debunk some of the many myths involving diet and ill health, with which we are endlessly bombarded.

Speaking about the topic of his talk, Professor Colquhoun said: “We are perpetually bombarded with advice about what to eat, and quite often each new report contradicts earlier ones. It follows that some of the advice is wrong. The main reason for this sad state of affairs is that it’s hard to allocate people at random to eat one diet or another. We have to rely on observing what people eat and how they die. Since healthy and wealthy people tend to eat differently from poor unhealthy people, it’s impossible to tell what’s a consequence of wealth and what’s a consequence of diet. That’s why ‘Almost every single nutrient imaginable has peer reviewed publications associating it with almost any outcome’. In fact, no single food has a dramatic effect, good or bad, on health. About all one can say is don’t eat too much and don’t eat all the same thing. But there isn’t much money in such simple advice.”

Other talks and exhibitions related to fitness, health and metabolism include:

- Saturday 15 March, *Marvellous metabolism*. Every time you swallow a sandwich or bite a banana, your body converts the food you've eaten into the energy you need to do everything – from moving to thinking to keeping warm to growing. Scientists from the University of Cambridge Metabolic Research Laboratories will provide hands on activities and games to help explain why we eat what we do and how we use the energy it provides.
- Saturday 15 March, *Fat, fitness and metabolism...how you can take part in clinical research*. Clinical research comes in many forms from cancer drug trials to a simple blood test. At the NIHR/Wellcome Trust Clinical Research Facility within Addenbrooke’s Hospital we do exactly this, but we also need healthy adults and children to help us find out about normal body fat, fitness and metabolism. This helps us to understand, recognise and treat metabolic disorders such as diabetes and obesity.
- Sunday 23 March, *Fascinating fat*. Have you ever wondered what fat does? We all know that if we eat too much we get fat, but having too little fat is just as unhealthy as having too much. Join the University of Cambridge Metabolic Research Laboratories and MRC Metabolic Diseases Unit in hands-on activities and games that show you some fascinating facts about fat and why it is so important for everyday life.

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Dementia: what's needed now?

A remarkable new project that looks at brain donor's involvement in brain research and the search for cures for dementia will be presented at this year's Cambridge Science Festival on Friday 21 March.

Mind over matter showcases 12 of Britain's oldest brain donors who agreed to be photographed and interviewed. Presented by artist Ania Dabrowska and Professor Bronwyn Parry, King's College London, the event also includes a panel discussion chaired by Carol Brayne, Professor of Public Health Medicine in the Department of Public Health and Primary Care at the University of Cambridge.

Speaking about her involvement in this event, artist Ania Dabrowska said: "The *Mind over matter* project came out of my longstanding artistic interest in questions of memory, Professor Bronwyn Parry's research on brain banks and body organ donation, and our mutual desire to create work that not only demystifies what happens behind the doors of brain banks to the audiences but also celebrates the role that brain donors play in the search for the cure for dementia.

"The project, funded by Wellcome Trust People Award, proved to be ground-breaking because of the ethical issues it raises about creating art work about people who might be affected by dementia, access to brain banks and unveiling of brain donors' identity, something that was apparently unprecedented. It offered me as an artist rare access to private lives and archives of the donors we worked with as well as an opportunity to learn about the incredible research that goes on in brain banks around the world.

“I believe that the relationship between art and science can be beneficial for both disciplines and for the public, but it is a challenging one as they are rooted in disparate traditions, come with sets of conflicting expectations and are governed by different rules of conduct.

“Thanks to the trust between Professor Parry, the donors, their families and myself, our collaborators at Cambridge University Hospital’s Brain Bank and Wellcome Trust support, we succeeded in overcoming these challenges, producing a book and a multi-sensory exhibition that gave due space to both of these worlds in an emotionally charged, curatorially experimental, intellectually challenging and scientifically accurate outputs. All of this was only possible because of the willingness of all parties to cross the boundaries of their usual practice and our shared belief in the importance of bringing the subject of dementia to the forefront of public awareness.”

A further event covering the subject of dementia will be held on Sunday 23 March. *Dementia: what’s needed now?* will investigate the state of research into dementia and the commitment of G8 countries to trying to find a cure by 2025. This will be discussed by leading dementia researcher, Professor Carol Brayne with the agency responsible for dementia policy in the UK, Public Health England.

Professor Brayne said: “Dementia continues to hit the press almost if not every day. It is one of the major topics of our time and has attracted policy makers’ attention round the world. The announcement of a Dementia Envoy for the recent G8 is a completely new development to assist the international efforts to meet the aspirations set up at this highly successful international forum in December last year. These two events, focused on this topic, cover very different angles of science. The first is an arts and science collaboration to celebrate brain donation, which was built upon long standing studies in Cambridge and participants and their families. The second will be a reflection on the G8, its outcomes and the way in which our institutional structures are responding to policy developments and how science informs this process.”

The event, *Become a Dementia Friend*, which is also on Sunday 23 March, will highlight the need for a helping hand for those suffering with dementia to go about their daily lives and feel included in their local community. Dementia Friends gives people an idea of the small things they can do to make a difference to people living with dementia.

Lucy Lloyd from the Institute of Public Health, University of Cambridge, said: “670,000 people across England are living with dementia. Many people (one in four) with dementia say that shopping and going out can be very stressful and many have given up since being diagnosed. Drop in to one of our *Become a Dementia Friend* information sessions to learn how to offer a helping hand. By becoming a Dementia Friend you will be able to support people in your community, help shift misconceptions, and help make your local area a more dementia aware community.”

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Cambridge Science Festival prepares for another huge weekend

Cambridge Science Festival is preparing for another jam-packed two days this coming weekend (22-23 March) as it once again presents hundreds of scientific events hosted across the West Cambridge Site on Saturday and the Biomedical Campus at Addenbrookes Hospital on Sunday.

Last weekend, saw a world record set with the largest balloon pyramid being built at the Grafton Centre and thousands of people attending the hundreds of talks, debates, exhibitions and hands-on demonstrations held at venues throughout the city centre, including the Corn Exchange and the Guildhall. This weekend promises much the same.

The second Saturday shifts its focus to the West Cambridge site, where visitors will be able to enjoy a day bursting with events, including magnificent manufacturing, phenomenal physics, marvellous maths and more.

If the weather is as good as it was last weekend, the Institute of Astronomy will be opening its doors for a spot of evening star gazing between 7-9pm. They will also be hosting their annual open afternoon, from 2.30-6.30pm, with talks, displays, demonstrations and hands-on activities for everyone to learn more about astronomy and the kind of research they do. Visitors might also be lucky enough to spot an alien or two.

Over at the Hauser Forum, the ever-popular *Schools Zone* returns. Teams of students from schools and sixth form colleges from across the region will be the experts as they showcase what is happening in schools either as part of their curriculum or in after-school clubs. These are always exciting demonstrations from the next generation of scientists, engineers and mathematicians as they bring interactive fun to the Festival.

At the Centre for Mathematical Sciences, visitors will be able to get hands-on at the maths fair. Famously, GH Hardy described mathematicians, like poets and painters, as makers of patterns, and mathematics as a creative art. Visitors to the maths fair will be able to explore their creative thinking and critical reasoning, with hands-on activities, games and problem solving challenges for all ages. From prime number hopscotch to origami, it's maths but not as you may know it.

For anyone who missed CHaOS (Cambridge Hands-On Science) – the student group based in Cambridge – last weekend, they will once again bring their wide range of hands-on physics experiments to the Cavendish Laboratory, revealing the beauty and surprise of scientific understanding and relevance to everyday life. There will also be a series of talks, *Physics IS fun*; Dr Lisa Jardine-Wright will be revealing the physics in toys and Dave Ansell will be tripping the light fantastic in his talk of the same name and again in his demonstration featuring vacuum bazookas and custard fireballs.

The Institute for Manufacturing will be offering up an array of highly interactive activities, including laser bunny hop, laser rocket racing and visitors will have the opportunity to try out some of the latest science based products from local companies and win a prize for thinking of the best ways to use them.

For science enthusiasts wishing to remain closer to the city centre, there will be a range of tours and talks taking place. The Botanic Garden will be holding a chemical trail around the Cambridge University Botanic Garden, and the University Museums will be showcasing a range of science-based events and tours. At the Mill Lane Lecture Rooms, Dr David Coomes will be revealing how and why the world's forests are changing and how he uses his research to inform conservation policy.

In the evening at the Cambridge Junction, Tangram Theatre Company will be performing *Albert Einstein: relativitively speaking*, a lecture like none most people will have ever attended. The eccentric theoretical physicist is accompanied by his two wives and mum on the piano, and by guest rapper MC Squared, as he quantum leaps us through two world wars, two theories of relativity, and the deployment of two very big bombs. Warning: features the wurst sausage joke ever.

The second Science on Sunday, held at the Cambridge Biomedical Campus at Addenbrookes, will offer visitors the opportunity to explore some of the life-changing medical research conducted here in Cambridge. Alongside a range of demonstrations, exhibitions and workshops, highlights include a talk by Professor Dame Sally Davies, Chief Medical Officer, who will discuss the consequences of our long-term abuse of antibiotics, and the team who cracked the often life-threatening problem of peanut allergy, which was in the news recently, will be giving the first public talk about their work.

There will also be a wide range of exhibitions and hands-on activities, including the opportunity to be a cancer researcher for the day, discover better ways to be healthy, and a heart surgery theatre simulation.

Dr Lucinda Spokes, Science Festival Co-ordinator and Co-ordinator of the events at the Cambridge Biomedical Campus, said: "Last weekend we had 1,500 visitors during the first two hours at the Corn Exchange on Sunday morning, and we're expecting it to be as busy this weekend. Every year, the Science Festival just gets bigger and better.

“This year, we are absolutely delighted to be partnering with the Cambridge Biomedical Campus to demystify much of what goes on in terms of health research. The events have been planned to offer an opportunity for everyone to learn more about the many health issues that somehow affect us all.”

For more information about the Cambridge Science Festival or to book tickets for any of these events, please visit: www.cam.ac.uk/science-festival

Further news stories about the Cambridge Science Festival can be viewed here: www.cam.ac.uk/science-festival/news

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Ends

About Cambridge Science Festival

Now in its 20th year, the Cambridge Science Festival gives the public the opportunity to explore Cambridge science. Thanks to the support of the University, our sponsors and partners, most of the events are free.

The Science Festival aims to provide the public with opportunities to explore and discuss issues of scientific interest and concern and to raise aspirations and career awareness in the areas of science, technology, engineering or mathematics.

Patrons of the Science Festival are: Professor Simon Baron-Cohen, Professor John Barrow, Dr Claire Cockcroft, Dr Henry Gee, Lord Rees of Ludlow, Professor Malcolm Longair, Mr Tim Radford, Professor Barbara Sahakian, Professor Jeremy Sanders, Dr Andrew Sugden, Ms Carol Vorderman, Professor Jim Secord, Mr Ian Harvey, Professor Andrea Brand, Professor Ron Laskey, Professor Bill Sutherland, Professor John Naughton, Professor Alan Barrell.

The Cambridge Science Festival is sponsored by Cambridge University Press, the Medical Research Council, Anglia Ruskin University, AstraZeneca, MedImmune, Royal Society of Chemistry, AAAS Science International Inc., TTP Group plc., BlueBridgeEducation, Linguamatics, Abcam plc., RAND Europe, Society of Biology, The Babraham Institute, British Association for Psychopharmacology, the Pye Foundation, Walters Kundert Charitable Trust, and Cambridge City Council. Other Festival partners are Cambridge University Hospitals, the Cambridge Science Centre, Hills Road Sixth Form College and National Science and Engineering Week. The Festival's media partner is BBC Radio Cambridgeshire.



Photo credit: Sir Cam

Professor Chris Bishop (Microsoft Research Ltd, Cambridge) during the event *It's rocket science!*

Cambridge Science Festival 2014 breaks records

Science has dominated Cambridge over the past two weeks and it was hard to miss the palpable buzz that infiltrated the city.

With well over 250 events ranging from stem cell and medical research, to comedy, theatre and scientific photography – there was even an event on the science of sweets from the ever-engaging Stefan Gates – it was no surprise that the number of visits this year reached over 35,000. During the first weekend alone, visits were estimated to reach a staggering 20,000; the first hour on Sunday at the Corn Exchange saw 1,500 visits.

It was also a year of record breakers with Bubbly Maths breaking the world record for building the world's largest balloon pyramid at the Grafton Centre on Saturday 15 March.

Professor David Spiegelhalter, who was the official Judge for the balloon record-breaking attempt and also delivered a talk on coincidences, said: "For me the Festival was the usual slightly bizarre combination of events: talking to 400 people about their experiences of coincidences, judging an eight-metre high, world-record-beating Sierpinski pyramid of balloons in the Grafton Shopping Centre, then racing off to be on a panel with Robin Ince on whether scientists should get involved in politics. Exhausting but fun!"

And it was a year of firsts... The Science Festival joined forces with the Cambridge University Hospitals NHS Foundation Trust to organise and host a clinical Science Festival at the Cambridge Biomedical Campus on the Addenbrookes' site last Sunday.

Head of Communications at Cambridge University Hospitals, Jo Timson said: "I'm absolutely thrilled that our part in the Cambridge Science Festival was such a success! It was wonderful to see so many families visiting the stalls and exhibits, and talking directly to the doctors and nurses about the work they do. This is precisely why we wanted to get involved – so that people could see first-hand the amazing medical innovations that go on here at Addenbrooke's and the Rosie, and the difference this important work makes to all our lives. Organising such a large event was certainly a challenge but it was very exciting, especially working with our colleagues at the University. It's definitely something we'd like to get involved in next year."

Additionally, the Science Festival teamed up with BlueBridge Education for the first time to bring an international dimension to the Schools Zone last Saturday, during which a Japanese team joined teams of students from 12 regional schools and sixth form colleges to offer a range of exciting demonstrations from the next generation of scientists, engineers and mathematicians. More than 500 people visited the Schools Zone during the four-hour event, outstripping last year's visits.

There were also 45 School Roadshow visits the week prior to the start of the Festival, and 300 pupils took part in the Schools Hub at Sawston Village College on 27 February. These programmes and activities, exclusively for schools, are all designed to enrich the curriculum and inspire pupils into further study of science and to think about the world they live in, with topics from Astronomy and Zoology to plant science and medicine. Speakers come from local industry, research institutes and from University of Cambridge departments.

Visitors to this year's Science Festival also had the opportunity to attend talks by some of the UK's most iconic scientists, including Lord Rees, the Astronomer Royal, Professor Michael Green, one of the pioneers of string theory, Dame Sally Davies, Chief Medical Officer for England, and Professor Molly Stevens, recognised by The Times as one of the top 10 scientists under the age of 40, alongside countless others. And those lucky enough to have attended the talk by Simon Singh, *The Simpsons and their mathematical secrets* could have been sitting next to Professor Stephen Hawking, who also attended the event.

Susan Watts, Science Editor for BBC Newsnight, said: "Getting involved with this year's Cambridge Science Festival was a real treat. I was asked to take part in the Friday keynote discussion, *Talking Science: Where Next?* in the University's historic Senate House. Having the opportunity to speak in the very venue where CP Snow delivered his 'Two Cultures' lecture gave the evening an added resonance.

"The audience, happily, ranged across all age groups; from teenagers to emeritus professors. It was a lively event, and we could have spent more time on questions... so room for debate next year!

"Afterwards, I had the chance to meet inspiring innovators working in technology companies around Cambridge, and bumped into some of the festival performers. One highlight was chatting with stand-up mathematician Matt Parker, after he'd tried his hand at playing the Theremin – the

electronic instrument that makes a mean ‘woo-woo’ sound (as per the Dr Who theme tune – <https://www.youtube.com/watch?v=EwdaGW-5f5I>). Each year, the Festival programme gets bigger and better, and for performers like Matt, it seems to be a perfect way to capture the imagination of young people, and show them that grappling with even the most difficult concepts in maths and science can be fun. “

Other highlights included the events hosted at the Corn Exchange in the city centre for the first time during the weekend of 15-16 March, which saw nearly 7,000 visits over the two days; events that focussed on cycling to link in with the Tour de France coming to Cambridge; and of course there was the (fake) snot – 300 bags of it were made during the event *Why snot?*

It is very fair to say that all these events would not be possible without the year-on-year support the Festival receives from its dedicated volunteers. This year, in addition to the hundreds of speakers and demonstrators, 130 people gave up their free time during the two-week period to support the smooth running of events. Volunteers came from across the region and as far afield as Malaysia, Slovenia, and Belgium, some making trips to learn about science communication events at first hand. One couple from Scotland actually travel down every year to volunteer at the Festival.

Speaking about the experience of the Science Festival on BBC Radio Cambridgeshire on Monday, Nicola Buckley, Head of Public Engagement at the University of Cambridge, said: “The Science Festival has built considerably over the years and we now have great support from local audiences and those from further afield. Lots of people have come to expect a range of really interesting events and a genuine diversity that can appeal to everyone.

“I think many people have developed a greater understanding and realisation of what an important role science has in 21st century culture and, therefore, they also have a deeper curiosity about what’s going on in science and technology. The University and partners have created more ways than ever before for people to find out about these subjects. We know that science and technology take a bit of opening up and these fields needs good communicators to bring them to life.

“The special thing about the Science Festival is that active scientists are involved who help explain science and they really put a lot of their voluntary time into explaining and inviting questions on what they’re doing on a day-to-day basis for everyone. It also gives people the opportunity to hear about scientific research at greater length and in more depth than they might, say, through news media.”

This year’s Cambridge Science Festival was sponsored by Cambridge University Press, the Medical Research Council, Anglia Ruskin University, AstraZeneca, MedImmune, Royal Society of Chemistry, AAAS Science International Inc., TTP Group plc., BlueBridgeEducation, Linguamatics, Abcam plc., RAND Europe, Society of Biology, The Babraham Institute, British Association for Psychopharmacology, the Pye Foundation, Walters Kundert Charitable Trust, Virgin Media, and Cambridge City Council. Other Festival partners were Cambridge University Hospitals, the Cambridge Science Centre, Hills Road Sixth Form College and National Science and Engineering Week. The Festival’s media partner was BBC Radio Cambridgeshire.

University of Cambridge press release

For immediate release: 26 March 2014

To leave feedback about your experience of the Cambridge Science Festival 2014, please visit:
www.cam.ac.uk/science-festival/feedback

Press coverage

BBC Radio Cambridgeshire interviews

Speaker	Event name & date	Interview date & time	Programme	Broadcast date
Dane Comerford		24.1.14	Breakfast	27.1.2014
David Spiegelhalter	What a coincidence! 13/3	7.2.14	Drivetime	7.2.14
Ian Harvey		18.2.14	Breakfast	18.2.14 (8.45am)
Paul Elliott	The mystery of the horrible hypothesis		Naked Scientists (Ginny Smith)	
Rosie Wilby	Is monogamy dead? 19 March	5.3.14	Sue Dougan in the afternoon	2pm
Gerry Gilmore	What's new in space? 10 March	7.3.14	Drivetime	7.3.14, 5.45pm
Shelley Bolderson	Co-ordinator	7.3.14 (2pm pre-rec)	Drivetime	10.3.14, 5.37pm
Simon Singh	Simpsons and their mathematical secrets, 16 March	10.3.14	Breakfast	10.3.14
Anthony Purnell	Can science make a cyclist faster? 14 March	11.3.14	Drivetime	11.3.14, 5.45pm
Clare Bryant	Why cats make you sneeze, 12 March	12.3.14, 4.15pm	Drivetime	12.3.14, 5.50pm
Susan Watts	Talking science: what next? 14 March	13.3.14, 3.30pm	Drivetime	13.3.14, 5.45pm
Anna Hughes	CHaOS		Breakfast (interviewed by Ginny Smith)	14.3.14, 7.45am
Lord Rees	Our universe and others 17 March	14.3.14, (2pm pre-rec at Trinity)	Drivetime	14.3.14, 5.45pm
Linden Smith	Our immune system decides + other events	14.3.14 (4pm pre-rec)	Drivetime	14.3.14
Paul Elliott	The mystery of the horrible hypothesis	14.3.14	Jane Smith Breakfast show	15.3.14

Stephanie Brown	Engineers without borders	15.3.14	Saturday morning breakfast	16.3.14
Ratnaghosha	Science and Buddhism, 16/3	16.3.14	Faith show	16.3.14
Phil Hawkins	Cambridge Stars 2, 18/3	17.3.14	Drivetime	17.3.14, 5.45pm
Kate Ellis-Davies	What makes a family, 20/3	18.3.14	Drivetime	18.3.14, 5.45pm
Olivia Winteringham	Volcano / A journey around my skull	19.3.14	Drivetime	19.3.14, 5.45pm
Nick Crumpton	What's the point of paleontology	20.3.14	Drivetime	20.3.14, 5.45pm
Ashok Venkitaraman	CSF@CBC 23/3	21.3.14	Drivetime	21.3.14
Nicky Buckley	To talk about the rise of science festivals	24.3.14	Drivetime	24.3.14
Other radio/ TV interviews				
Shelley Bolderson	Co-ordinator	7.3.14 (1pm pre-rec)	Star Radio	
Dane Comerford	PE Manager	7.3.14 (2.30pm pre-rec)	Heart Radio	
Anthony Purnell	Can science make a cyclist faster? 14 March	11.3.14, 6.45pm	BBC Look East	
Paul Elliott	The mystery of the horrible hypothesis	14.3.14, (1.30pm pre- rec)	Star Radio	
Robin Franklin	Stem cells and repairing brains	18.3.14	BBC Radio 4, You and Yours	
Karen Pearce	Science of sport	21.3.14	ITV Anglia	
Mark Miodownik	Alex Hopkins lecture: strange materials	14.3.14	BBC Radio 4, Inside Science	



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IAN HARVEY

Thursday 20 February 2014

New study shows one in four Americans don't know the Earth orbits the Sun. Are we better educated on science in the UK?

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As a science teacher, I'd like to think so. Test yourself with our 'basic science' quiz



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Once upon a time people believed the Earth was flat, barnacle geese “are produced from fir timber tossed along the sea, and are at first like gum” and mental illness was demon possession. These beliefs were

lly understandable at the time, there was little or no evidence to the contrary. But we’ve come a long way since then thanks to scientific investigation.

Darwin didn’t just wake up one morning after a cheese-induced dream and think “What a brilliant idea...natural selection”. His theory was based on painstaking investigations and

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experiments, amassing evidence to test the theory.

Any idea in science is tested with rigour and the evidence and conclusions have to stand up to scrutiny. Nothing is published in scientific journals until it's been peer reviewed and peers are great critics! And accepted wisdom is challenged as new evidence appears. Science never stands still. New techniques test old hypotheses and sometime overturn them. In the last century there was the central dogma, DNA makes RNA makes protein.

It fitted all the then available evidence but along came knowledge of how retroviruses such as HIV work. Now we know that RNA can make DNA and that knowledge has been put to great use.

The findings of the survey by the National Science Foundation in America are let's say "interesting" - or would it be better to say a tad worrying. It showed one in four Americans don't know that the Earth orbits the Sun and only half believe in evolution.

THINK YOU CAN DO BETTER? TAKE THE QUIZ BELOW

Copernicus put forward the heliocentric model in the 16th century in opposition to geocentrism. In the centuries since, the heliocentric model has stood up to scrutiny, no evidence has contradicted it or favoured geocentrism. Humans may like to feel that their Earth is the centre of the universe and may choose to ignore all evidence. I'd like to believe that I'm a talented musician but as a scientist I have to confront the reality of evidence, I'm not! There is nothing wrong with belief, it's just not science and it's often not evidence-based.

So where do we get our knowledge from? Home, school, media, etc. Parents do their best but they may not be the best informed and have their own prejudices. The media like a good story even if it doesn't always quite fit the facts. So that makes formal education critical. In the UK what's taught in science is science but the survey makes me wonder about science education in some parts of America. Are students taught to understand and value evidence-based reasoning and argument? Are they challenged to question their beliefs and where they come from? The survey suggests not always.

But most of the population are out of school so how do we educate these people? Again I think the UK does well. Having taken a dig at the media, by-and-large they do a great job because they too are under scrutiny. A BBC science programme would be slammed if it presented factually incorrect information. Is this the norm in America?

The survey has glimmers of hope for our friends across the pond. 90 per cent do think science has benefits outweighing the dangers and have an interest in learning more about medical discoveries. 30 per cent want more funding for science.

As I write this, I'm preparing for the Cambridge Science Festival in March of which I'm a patron. We'll have 30000 visitors engaging with science, people from five to 95. We'll engage our audience in lots of aspects of science and hopefully educate and enthuse. They're welcome to challenge us and that debate between scientists and the public is healthy.

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Public engagement with science in the UK is good and is growing. I'd like to see the same survey conducted over here, fingers crossed we'd do better!



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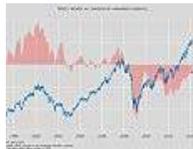
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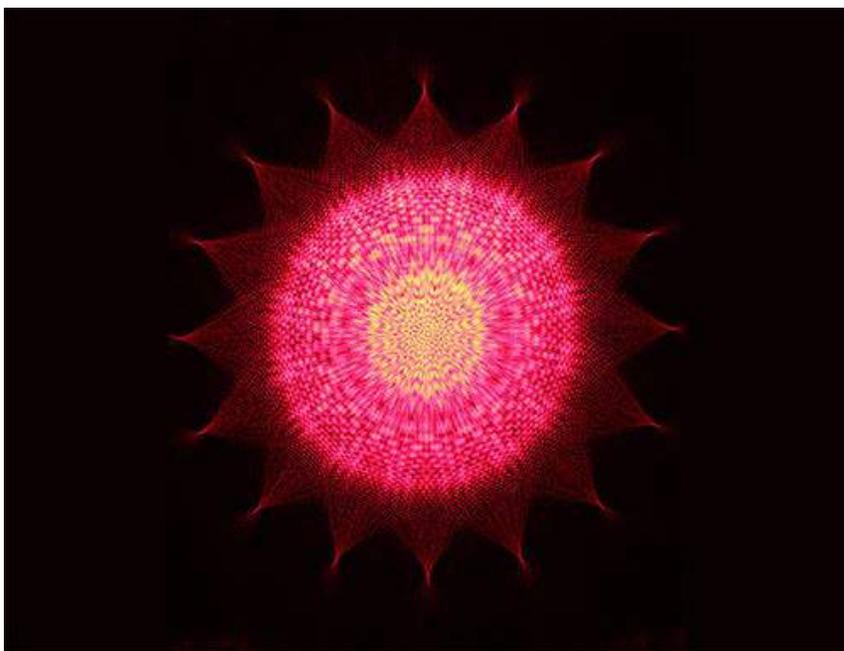
Engineering art: Researchers capture science on camera

10:26 05 March 2014

There is science in this beauty. All the entries in this annual photography competition were taken by engineers from the University of Cambridge as they worked. The winning photo, which looks like a disco sun, captures laser light diffraction. A selection of entries will be on display [from 10 March](#) as part of the [Cambridge Science Festival](#).

Sandrine Ceurstemont

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Winner: Diffraction sun

First prize went to this image of a laser shining on a [liquid crystal spatial light modulator](#). The diffraction of the light creates this psychedelic pattern. PhD student Ananta Palani uses a similar set-up in his research designing a microscope that can magnify tiny, fast-moving objects. This could allow us to see a [virus infecting a cell](#), which is difficult to observe using existing technology.

(Image: Ananta Palani/Department of Engineering, University of Cambridge)

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Sharing is caring: how brotherly bonds influence future friendships

Children who share more readily with their brothers and sisters will find it easier to form friendships at school, Cambridge University has found



How well brothers and sisters get on has a large bearing on how well they make friends at school, Cambridge University has found Photo: Alamy

By Sarah Knapton, Science Correspondent

7:00AM GMT 09 Mar 2014

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As any parent knows, teaching children to share with their brothers and sisters can feel like an ongoing battle.

Squabbling siblings arguing over toys or the remote control is likely to be a familiar occurrence in most households.

But mothers and fathers should take comfort in the knowledge that instilling an ability to share into their children could help them make friends later in life.

Cambridge University found that youngsters who were more prepared to share with their siblings at a young age were more social when they got



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to school.

Researchers believe that brothers and sisters provide a practice ground for testing out social interactions that they will use later. And it could mean that only children will struggle in comparison.

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"Parents who despair when repeatedly called in as a referee in sibling disputes should take heart from this finding because it suggests that leaning to share with a sibling can indeed help children acquire the pro-social skills needed to form positive relationships with their peers," said the report authors.

"Children's behaviour toward unfamiliar peers may be an important indicator of their ability to develop new friendships.

"Parents who encourage their young children to act pro-socially toward their sibling may foster the development of skills that children can apply in interactions with new acquaintances later in childhood."

The research is part of the 'Toddlers Up!' study which has been tracking the social development of 140 children for 10 years.

Dr Kate Ellis-Davies of the Department of Psychology at Cambridge University will be talking about the findings at the Cambridge Science Festival which begins tomorrow.

"The sharing that you do with your siblings when you're very young really predicts the pro-social behaviours you exhibit when you get to school.

"Siblings are basically your peers for your early years and are helpful for developing social skills and understanding what others are thinking.

"We can predict that children who do not share with their siblings are more likely to be anti-social when they get to school."

Dr Ellis-Davis warns that families where siblings are separated in childcare because a parent is working may struggle to catch up.

"More parents are working full-time and children are around their peers rather than their siblings, so there is much less sibling contact and much more peer contact earlier through childcare.

"We are currently looking at whether these children will struggle to catch up, and be less social, and we're also looking at what impact this might have on only children."

The study, published in the online journal Early Education and Development looked at whether children were willing to share aged three and compared it to how they interacted with peers aged six.

They found that older children were more likely to share with their younger siblings and therefore more social when they got to school.

Overall, the most a child was seen to spontaneously share with their brothers or sisters, the more they were able to make new acquaintances.

"This finding suggests that the presence of a young sibling may provide a fertile context for developing prosocial behaviours," the report found.

"Relationships with siblings provide many children with their first sustained opportunities to engage with individuals who are less capable than themselves and so may foster behaviours such as helping and

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Iain Aitch, Colette Bernhardt & Abi Bliss
The Guardian, Saturday 8 March 2014

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Figs In Wigs

International Women's Day, Nationwide

Both activism and celebration are in abundance at this year's International women's day (Sat). The Million Women Rise march in central London protests against male violence, while events around the UK include Sheffield's commemorations of the "Women of Steel". At Liverpool's Bluecoat, discussions range across poverty, the arts and women's status as outsiders, while Brighton's LGBT promoters Pink Fringe and Traumfrau team up for a spectacular with Bird la Bird and Figs In Wigs at Wagner Hall.

AB

Falmouth Spring Festival

Blooms and brooms abound at this eclectic community festival, with events ranging from a century-old flower show to an all-hands-on-deck spring clean of Falmouth's beach and streets. Much of the merriment takes place outside: try Nordic walking, foraging, wildlife trails, Zumba, giant Connect Four, "sumo-suit wrestling" or even a half-marathon. If it

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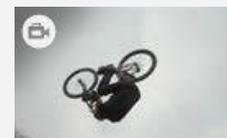
1 Apr 2014
Broken Twin (No 1,732)

Today's best video



The week in TV

Telly addict **Andrew Collins** casts his critical eye over New Worlds (above), Klondike, The Trip to Italy, Endeavour and Monkey Planet
22 comments



Mountain bikers show jaw-dropping skills

Riders from around the world compete in Vienna



'Get your arse out, mate'

Leah Green turns the tables on everyday sexism
2851 comments



Paris tightrope walker crosses Seine

French acrobat Denis Josselin crosses river on 150m steel cable

rains – or the healthy, outdoor vibe gets too much – you can take refuge at photo exhibitions, shops transformed by daffodil-wielding schoolkids, or that trusty staple of many a south-west town: the cider and folk fayre.

Various venues, Thu to 30 Mar

CB

Cambridge Science Festival

Boffins and buffoons come together for this annual celebration of the entertainment value offered by science. "Stand-up mathematician" Matt Parker looks at the numbers behind the Rubik's Cube, Robin Ince feels the bumps of psychiatry and psychology, and Rosie Wilby ponders the death of monogamy. How To Be Immortal considers love, science and death, with Darknet at the Junction looking at hacking, espionage and sabotage. There are lectures, too, with the maths of Star Trek and a historical anatomy of melancholy providing the giggles that discussions on climate change can't.

Various venues, Mon to 23 Mar

IA

Out & about

Cryptic Nights: Mirror Lands, Glasgow, Sat & Sun

Film and sound installation about the Black Isle with contributions from locals.

CCA

Faulty Towers: The Dining Experience, London, Sat & Sun

Prepared to be "served" by Sybil, Basil and Manuel in this site-specific piece of comedy theatre.

Charing Cross Hotel, WC2

Camellia Festival 2014, London, Sat to 30 Mar

One for the green-fingered hordes as the humble flower is celebrated.

Chiswick House, W4

Curry And Coding, Manchester, Mon

Aimed at women (but men are welcome too), this lunchtime session marries curry with computers.

Longsight Library

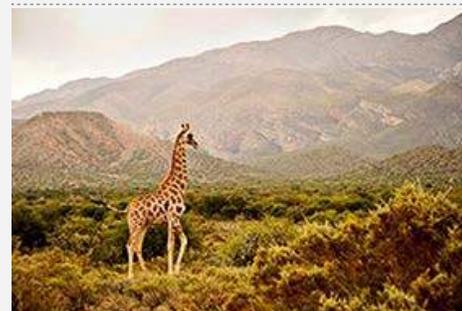
St Patrick's Festival, Glasgow, to 17 Mar

Glasgow celebrates the Irish patron saint with a programme of celebrations that look at the links between Scotland and Ireland.

Various venues

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Revealed: Eight exciting scientific advances which could change ALL of our lives

Mar 10, 2014 00:16 | By **Anthony Bond**

From 3D printers to BitCoin, we list some of the most fascinating developments in science

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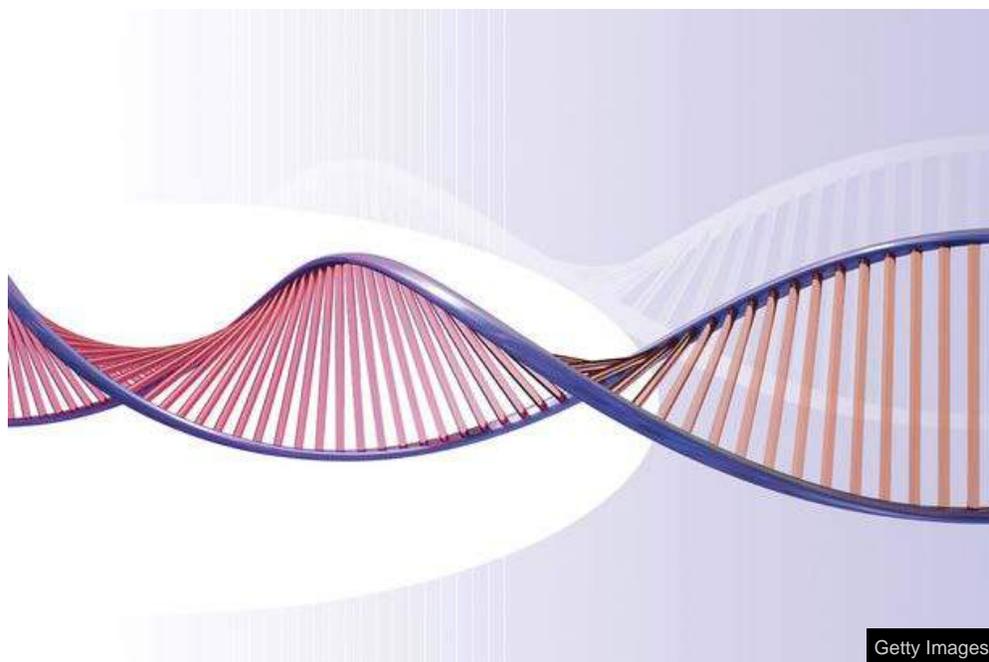


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It is a subject which can often confuse and bamboozle many people.

The complex intricacies of science require a sharp mind and can easily confuse the vast majority of us.

But scientific advances benefit each and everyone of us through health, entertainment and our environment.

Starting today, some of the world's brightest minds will gather at the Cambridge Science Festival to discuss the future of science.

Here Mirror Online looks at eight key subjects due for discussion at the two-week extravaganza which could help change all of our lives.

1) 3D printers

3D printers have the power to radically change the world. Through it, people can make a three-dimensional solid object of almost any shape from a digital model.

Incredibly, people are already uploading designs for prosthetic limbs to the internet, for free, which can then be printed for just £150.

Some firms are also 3D printing parts for houses. The opportunities are endless and it is something which could revolutionise all of our lives in the future.

2) Genome sequencing

The title may sound complicated but recent advances in this area could have implications for all of us.

Scientists say we may soon be in a position where members of the public can pay to look at their genetic code. This will allow us to understand which illnesses we could be predisposed to.

Dr Phillip Hawkins, who will speak at the festival, said: 'The pace at which genome sequencing technology has developed in recent years is truly astonishing and we are very close to an individual being able to read his or her genetic code as a 'consumer product'

'Our increasing ability to understand and predict an individual's biological predispositions will inevitably bring with it moral and ethical challenges to our existing framework for understanding human behaviour, motivation and responsibility'.

3) BitCoin

BitCoin is an internet currency that is created using an increasingly complex mathematics formula.

Recently, the US Senate described virtual currencies as a "legitimate financial service".



Video: 'F*** the poor' goes viral as UK charity unveils controversial shock campaign



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MISSING MALAYSIAN AIRLINES FLIGHT

Missing Malaysia Airlines flight live: Malaysian Government accused of hiding information on vanished jet

FLIGHT MH370

One area which will be discussed at the festival is how BitCoin could cut out the need for governments to mint money.

Increasingly, BitCoins could be used more by charities and non-government organisations working in countries where government corruption is rife.

It could help avoid strict financial laws which are designed to prevent their work and allow NGOs to work directly with the population.



Getty Images

Milky Way

4) Remote sensing technologies and forests

It is no secret that tropical rain forests are disappearing at a rapid rate. If this continues, it could have disastrous implications for generations to come.

However, new remote sensing laser technologies could well help prevent further destruction and catch people illegally chopping down vast areas of forest.

Dr David Coomes, from the Department of Plant Sciences, University of Cambridge, said "Advances in remote sensing technologies mean that researchers are able to detect illegal logging in the remotest parts of the Brazilian Amazon almost as it happens, allowing authorities to catch the culprits.

"We now have robust tools to calculate how much carbon is stored within a nation's forests, paving the way for rewarding governments who have demonstrably reduced carbon emissions by reforestation."

Astrophysics - improving knowledge of Dark Matter

Gaia, the unmanned space observatory of the European Space Agency, is currently operating in orbit.

It will vastly improve our understanding of the distribution of Dark Matter, which



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could lead to answers on the biggest questions of our existence.

This includes 'why does time go only in one direction' and 'why did the universe begin?'

Professor Gerry Gilmore, from the University's Institute of Astronomy, said: :

'The future of astrophysics is to answer the biggest questions of our existence through precision weighing.'



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MRI and model of human brain

6) Battle against Parkinson's and other brain diseases

The study of stem cells is a top priority and could offer new potential for treating a range of major brain diseases in years to come.

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MISSING MALAYSIAN AIRLINES FLIGHT

Missing Malaysia Airlines flight live: Malaysian Government

Professor Roger Barker said: "There has been a great deal of excitement about stem cells and how they can be used to study diseases of the brain as well as treat them through implantation."

7) Cloud computing and law

Many of us now store some of our most treasured possessions on our laptops and tablets.

So security concerns are becoming increasingly important.

One area which is being developed is cloud computing and law.

In the near future it is hoped we can have software systems that provably provide privacy and also accept liability for failures, leading to payouts from insurance companies.

8) Bionic people and the future of disability

Materials science could lead to all kinds of fascinating developments in the future - particularly for disabled and elderly people.

Scientists believe that replacement organs will become normal for most people as they get older, which could lead to many OAPs still enjoying sports even as they reach 100.

Professor Mark Miodownik, from University College London, said: "I think what we will see is that disability, due to ageing or accidents will become treatable to a greater and greater extent.

"Replacement organs will undoubtedly become normal for most people as they get older. For many technological and economic reasons, living forever is unlikely to be a real prospect, but I think it will be fairly normal to be able ski and play tennis at the age of 100."

accused of hiding information on vanished jet



FLIGHT MH370

Missing flight MH370 live: "Confusion" in search for jet 'may have set rescue efforts back by three days'



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'I heard

Science in all its psychedelic glory: Beautiful images taken in the name of research celebrate the work of young British scientists

- The pictures are part of an exhibition at the Cambridge Science Festival and are on show to open up the world of scientific study to the general public
- They have been compiled by researchers from the life sciences subjects at the University of Cambridge
- Images include microscopic views of brains and hair follicles as well as images of proteins and brain surfaces

By SARAH GRIFFITHS

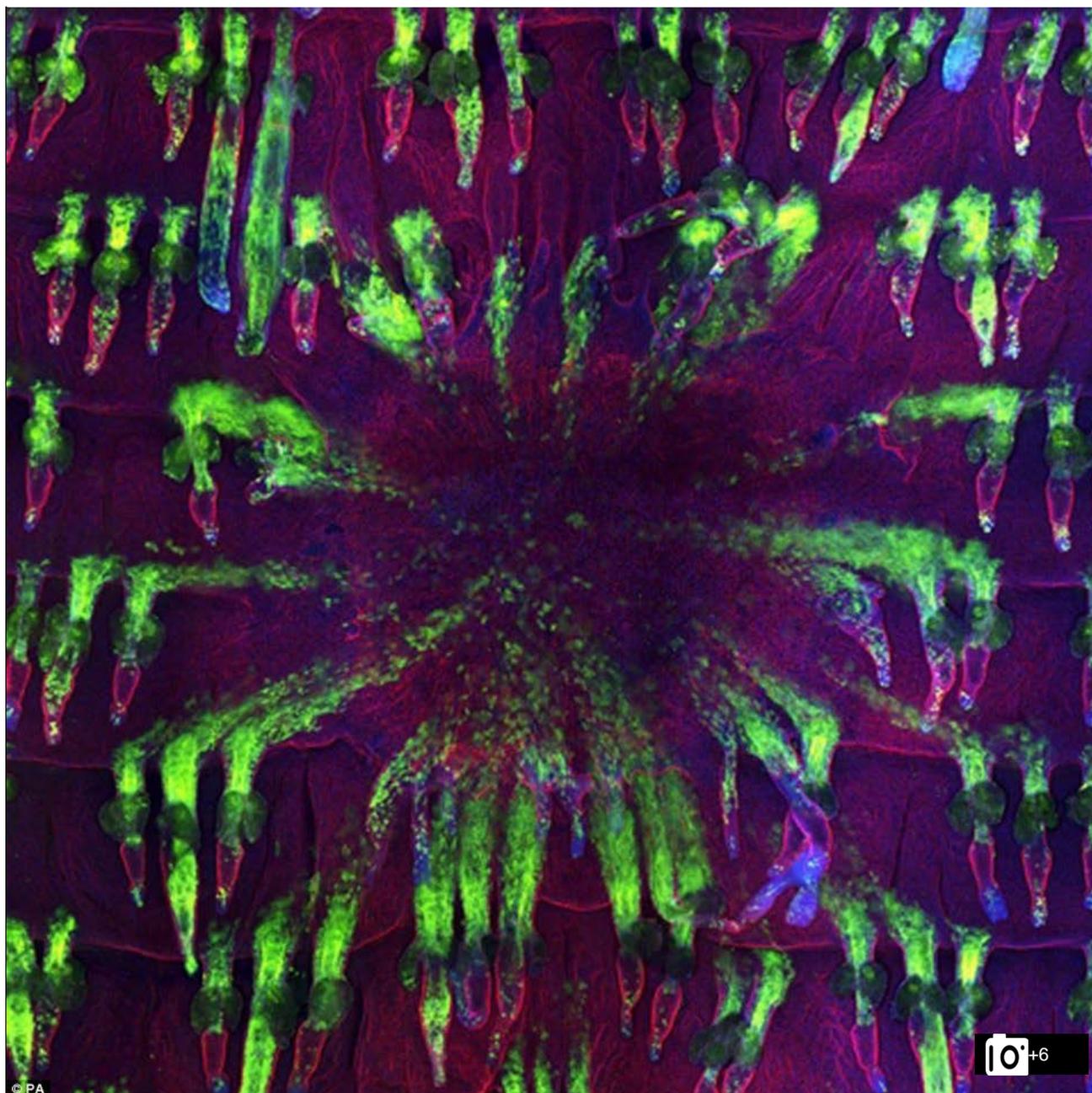
PUBLISHED: 13:54, 12 March 2014 | UPDATED: 14:54, 12 March 2014

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From a rainbow on the surface of a fruit fly's brain to the last tree to be felled in a once great forest, a series of intriguing photographs showcasing the work of young researchers have gone on show.

The pictures are part of an exhibition at the Cambridge Science Festival, which aims to open up the world of scientific study to the general public. They have been compiled by researchers from the life sciences subjects at the University of Cambridge.



Beautiful firework? An ultra-magnified image by Mahalia Page, which captures how hair follicles help heal wounds by supplying new cells, is one of a series of images by researchers from the life sciences subjects at the University of Cambridge. The pictures are part of an exhibition at the Cambridge Science Festival, which aims to open up the world of scientific study to the general public

Alexander Hackman is studying the bio-mechanics of how insects clean themselves for his PhD.

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His picture might look like an abstract piece of modern art, but it is actually an ultra-magnified image showing a polystyrene particle that is five times smaller than the diameter of a human hair attached to a cleaning hair removed from an ant's antenna.

He created the first of its kind image using a special microscope in a bid to show how insects keep healthy using specialised cleaning devices.

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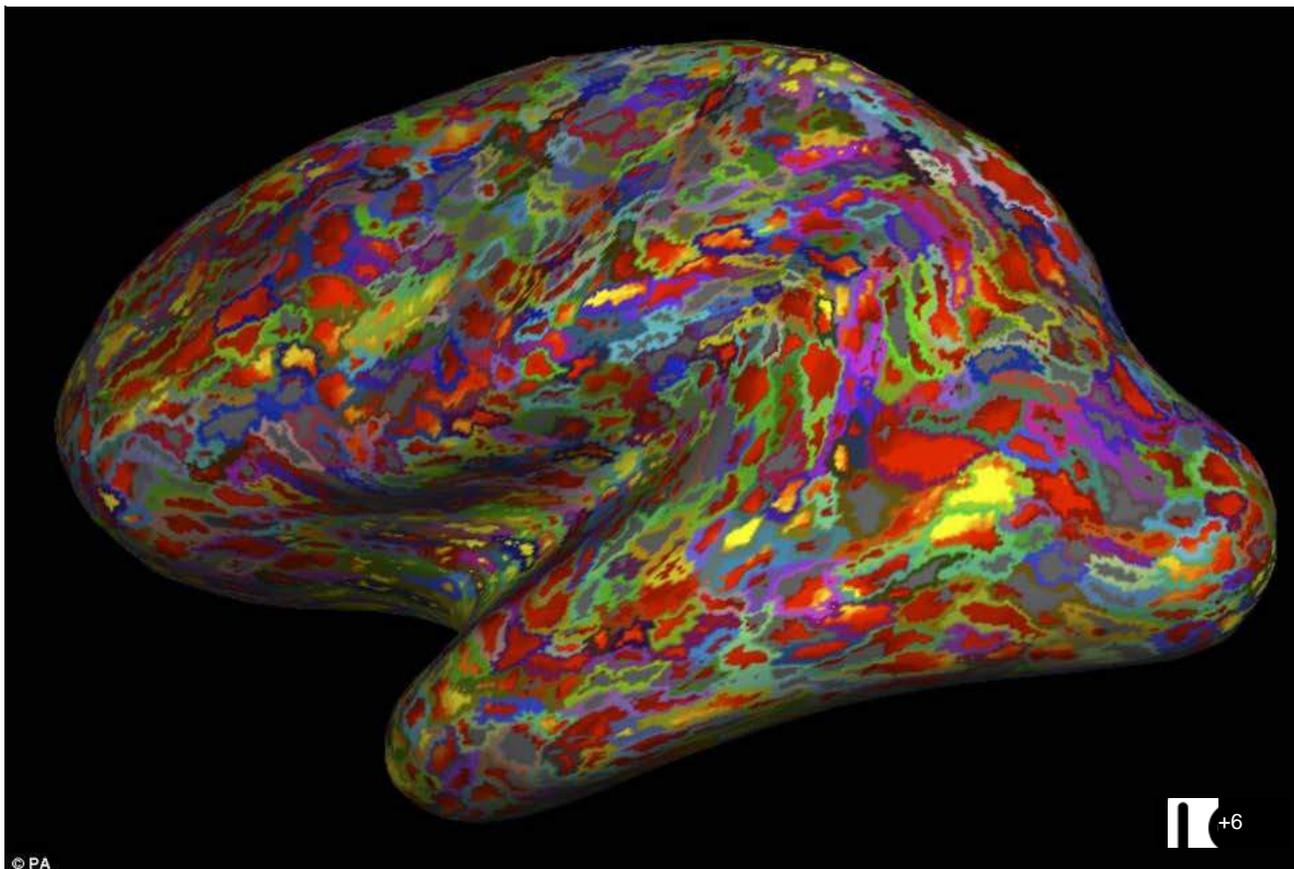
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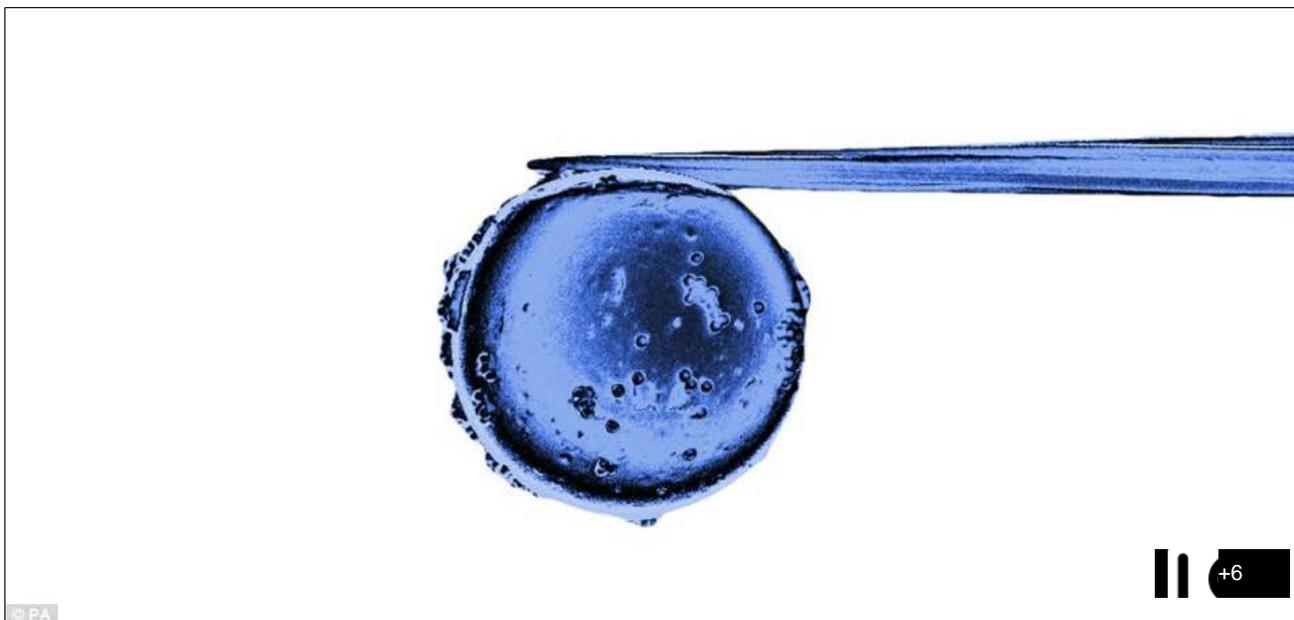
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Konrad Wagstyl used a new method to look at the cerebral cortex. The result is The Jigsaw Brain (pictured), which is a colourful image showing how the brain is randomly split into a thousand pieces, to highlight how researchers identify the same areas of different brains



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Alexander Hackman's picture might look like an abstract piece of modern art, but it is actually an ultra-magnified image showing a polystyrene particle that is five times smaller than the diameter of a human hair attached to a cleaning hair removed from an ant's antenna

Another picture, taken by Sarah Luke, shows a mighty Belian iron-wood trunk lying on a forest floor in the state of Sabah in Malaysian Borneo, which is all that is left of a site that has been cleared to make way for an oil palm plantation.

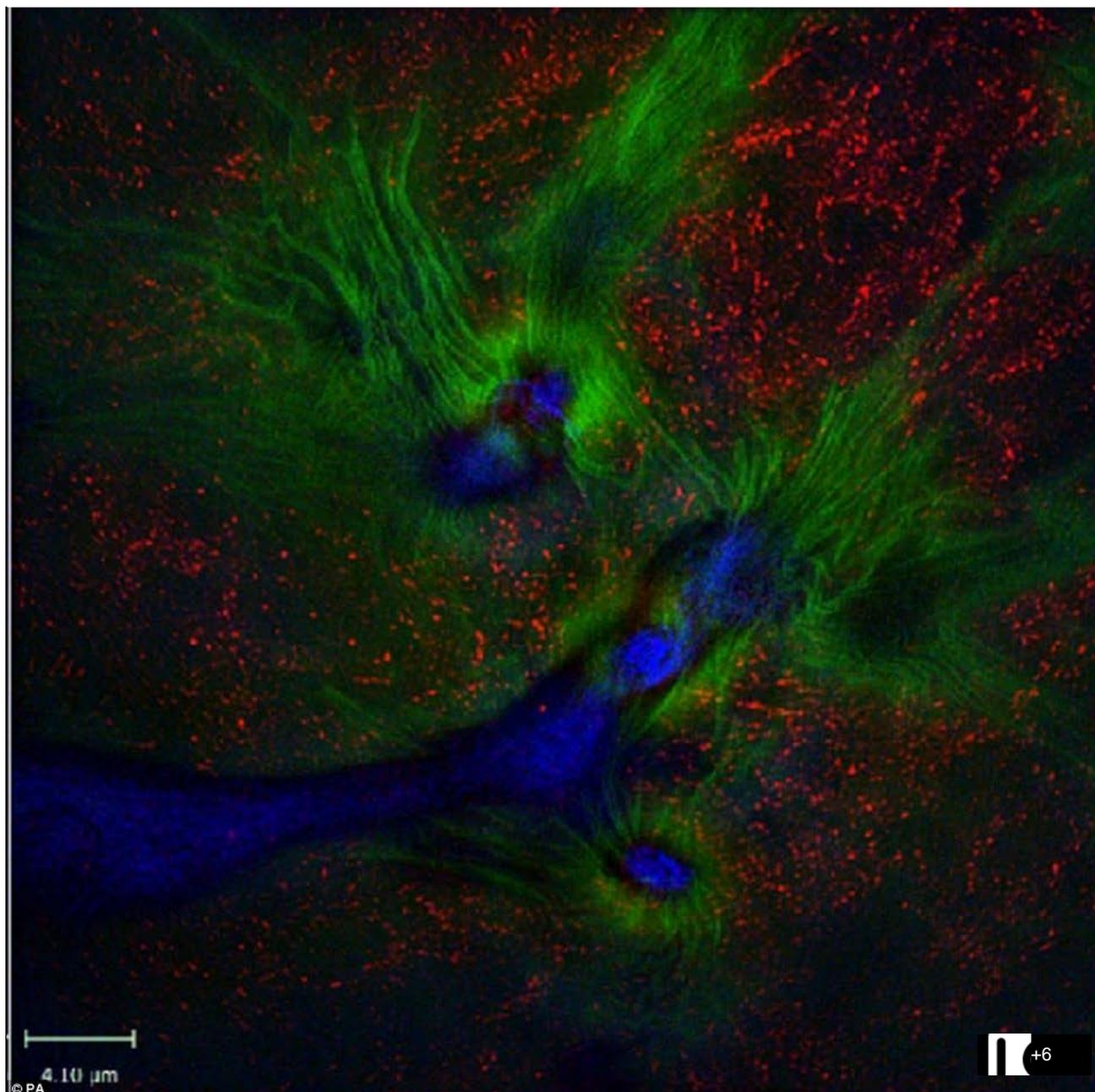
'Malaysia is a leading producer of palm oil and the industry has provided a hugely valuable boost to the economy and many jobs,' she explained.

'However, vast areas of forest have been lost, posing major threats to biodiversity.'

'It is unusual to see such a large trunk left abandoned in a plantation, and this offers a particularly poignant reminder of the forest that has been lost.'



Sarah Luke's image (pictured) shows a mighty Belian iron-wood trunk lying on a forest floor in the state of Sabah in Malaysian Borneo, which is all that is left of a site that has been cleared to make way for an oil palm plantation



Jun Liu's image (pictured) is described as a rainbow 'Milky Way at the brain surface' and shows the blood brain barrier of a fruit fly rendered at super resolution

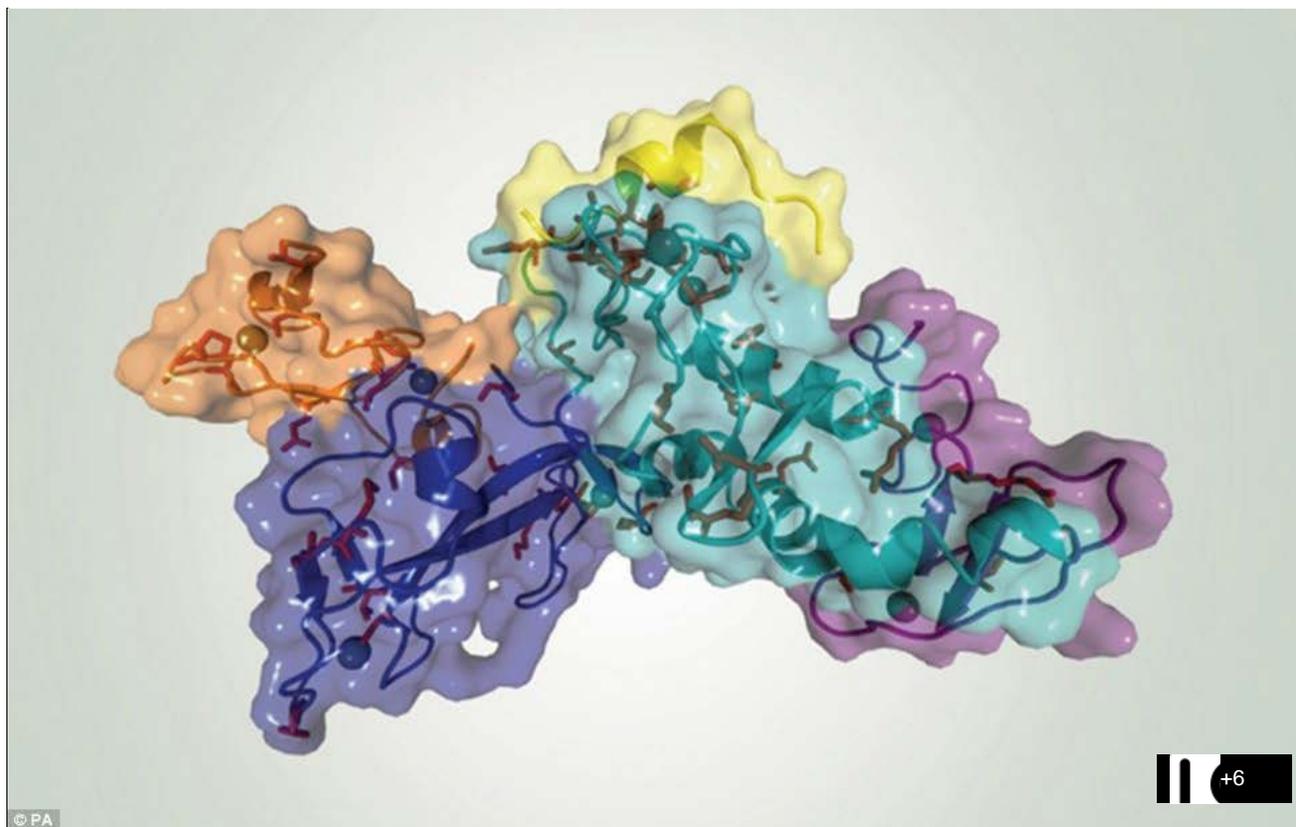
Jun Liu's image is described as a rainbow 'Milky Way' at the brain surface and shows the blood brain barrier of a fruit fly rendered at super resolution.

To create another technicolour image of a brain, Konrad Wagstyl used a new method to look at the cerebral cortex.

The result is The Jigsaw Brain, which is a colourful image showing how the brain is randomly split into a thousand pieces, to highlight how researchers identify the same areas of different brains.

Another image by Mahalia Page shows how hair follicles help heal wounds by supplying new cells and Tobias Waeur produced an image showing the molecular structure of the protein Parkin, which has been shown to cause Parkinson's disease.

The images will be shown at the Cormack Room University Centre in Cambridge between 12.30pm and 3pm tomorrow and entry is free.



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Tobias Wauer produced an image showing the molecular structure of the protein Parkin, (pictured) which has been shown to cause Parkinson's disease

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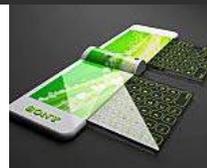
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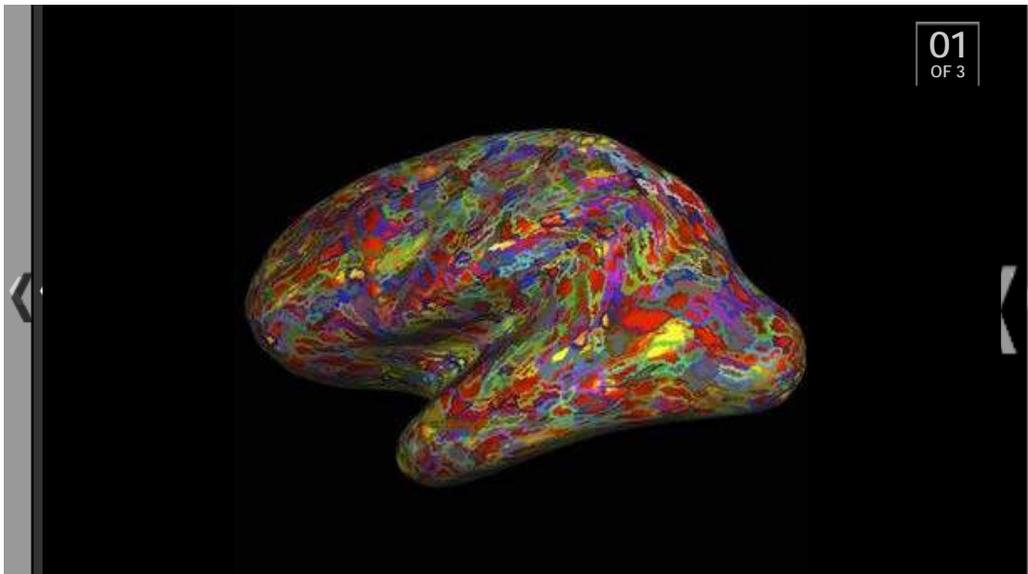
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Pictures reveal work of scientists

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Konrad Wagstyl used a new method of looking at the cerebral cortex to produce *The Jigsaw Brain* (Konrad Wagstyl/University of Cambridge/PA)

12 MARCH 2014

From a rainbow on the surface of a tree felled in a once great forest, a series of images which showcase the work published for the first time.

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Taken using a special microscope, it is the first time such an image has been captured and it helps understand how insects keep healthy using specialised cleaning devices.

Another picture, taken by Sarah Luke, shows a mighty Belian iron-

wood trunk laying on a forest floor in the state of [Sabah](#) in Malaysian Borneo - all that is left of a site that has been cleared to make way for an oil palm plantation.

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Mahalia Page captured how hair follicles help heal wounds by supplying new cells and Tobias Waeur produced an image showing the molecular structure of the protein Parkin which has been shown to cause Parkinson's disease.

The exhibition takes place at the Cormack Room University Centre in Cambridge between 12.30pm and 3pm tomorrow. Entry is free.



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7:00AM, THU 13 MAR 2014

Images from science in new exhibition

Last updated Thu 13 Mar 2014

UK - Cambridge



Science pictures are going on display. Credit: University of Cambridge

A series of unique and surreal images created by scientists at the University of Cambridge, have gone on display.

The exhibition is part of Cambridge Science Festival, and aims to open up the world of scientific study to the public. The images include a fruit fly's brain and the last tree felled in a forest in Malaysia.

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EDITORIAL

Festival Lessons

 Leszek Borysiewicz¹, Nicola Buckley²

» ¹Sir Leszek Borysiewicz FRS is Vice-Chancellor of the University of Cambridge and a professor in the Department of Medicine at the University of Cambridge, Cambridge, UK.

» ²Nicola Buckley is Head of Public Engagement at the University of Cambridge, Cambridge, UK.
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CREDIT: PHILIP MYNOTT

Cambridge Science Festival was attended by several hundred people, with a less ambitious scope and more dependence on straightforward public lectures. Since then, there has been growing recognition of the benefits of public engagement for researchers, and finding effective ways to showcase science and technology is now a priority. Research funders and universities in many nations are increasingly embedding requirements for public engagement within their funding programs and career advancement schemes, acknowledging the importance of making visible the processes of and outputs from research. The creative scaffold of most science festivals reflects this push to engage.

Today, there are several hundred festivals every year that enable millions of people worldwide to interact with those working in science. As part of the many science-in-society activities now taking place, festivals aim to nurture scientific literacy among attendees of all ages, to enthuse them with the wonder and excitement that scientists feel, and to help students and researchers appreciate how public engagement can help them view their own work in both interdisciplinary and social contexts. The core content of the Cambridge Festival is science and technology, but perspectives are drawn in from other fields too, and the presentation is influenced by the world of the arts. This weaving together of science and culture to communicate the relevance of science to everyday life seems to lie behind the growing international popularity of such festivals.

The Cambridge Festival has the advantage of pulling perspectives from the

For a university that is over 800 years old, 20th anniversaries are rather modest. Yet in March, the University of Cambridge will reflect on 20 years of organizing the Cambridge Science Festival in the United Kingdom. During this year's event, topics ranging from string theory to sustainability will be examined through talks, demonstrations, debates, theatre, music, exhibitions, and more. Hundreds of researchers and students will participate, and around 30,000 people are expected to attend. Over the past two decades, the festival has imparted many general lessons about how to successfully make science "public" and why this endeavor is important not only for the audience but for the research enterprise itself.

In 1994, the idea of a festival to communicate science to the public was still in its infancy in the United Kingdom. The modern concept of such a program had come about only a few years earlier in Edinburgh, with the idea that science could be packaged in a format from the arts. The first



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university's own researchers in social sciences, arts, and humanities together with those in the sciences and technology. The involvement of a university can also help to attract the participation of many partners beyond its own campus. In turn, a festival can make a university's research world less mysterious. The Cambridge Festival enables attendees to come into intimate contact with the people and setting of science at the University of Cambridge and to become part of discussions that have personal and global dimensions—from climate change and health to technologies that are part of their everyday lives.

Our experience has been that participants in science festivals are as diverse as the efforts that go into reaching out to them. Certainly, online dissemination is providing the University of Cambridge and the Festival with opportunities to reach an even wider audience. But successful outreach requires nurturing relationships with local communities, not only to support a yearly festival but also to maintain year-round public engagement activities. As such, science festivals such as the one in Cambridge have become central to many networks for informal science learning in the United Kingdom; this is perhaps the greatest lesson learned from organizing the Cambridge Festival. An honest dialogue between science and society comes through real experiences of engagement, and more than just once a year.

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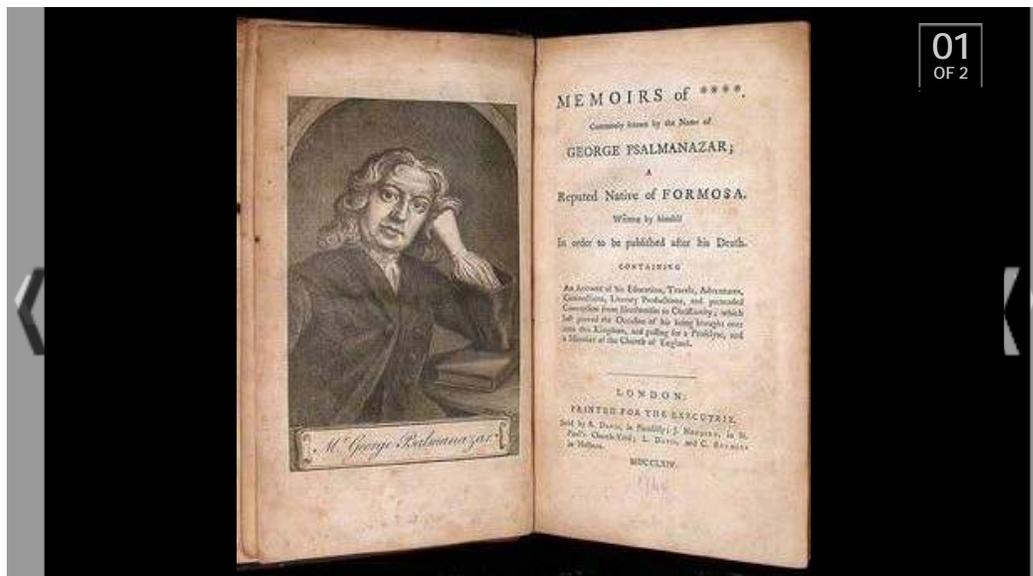
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Literary hoax on show

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The History of Formosa has gone on display at St John's College in Cambridge

13 MARCH 2014

With its tales of underground palaces and a diet of vipers' blood for breakfast, it was one of the great literary hoaxes of the 18th century - now a work of travel fantasy which fooled high society is to go on public display.

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monsters and alien, exotic peoples, images that enthralled audiences who had never left their home country."

The book was phenomenally successful with the first edition selling out rapidly and French and German editions achieving similar success.

In a posthumously -published autobiography , Psalmanazar describes himself as a child genius with a gift for languages.

He set about creating false identities and crafting fantastic tales - even eating raw meat and speaking a language of his own creation in a bid to convince others of his authenticity.

Psalmanazar explained away his pale skin by telling doubters he had lived underground with Formosa's upper classes and never saw the sun.

It was not until British explorers began to travel to Formosa - sometimes equipped with a copy of his made-up dictionary of Formosan language in a bid to communicate with confused locals - that the con was uncovered.

Psalmanazar eventually grew tired of his forged life and spent his later years living a quiet existence as a clerk in London and writing theological pamphlets.

His will included instructions for a confession to be published after his death in 1763.

Dr Nicholls added: "Psalmanazar's fraudulent description of Formosa was so successful because it first appeared at a time when interest in exploration and strange new lands was at its height across European society.

"Other items on display represent the adventures and work of real-life explorers such as James Cook, Marco Polo and [James Clark Ross](#). These intrepid travellers increased the sum of human knowledge immensely."

The exhibition, World Of Wonders, is being held at the Old Library at St John's on Saturday as part of the Cambridge Science Festival.



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society.

There was only one catch: it was completely made up and author George Psalmanazar was actually a white, blond-haired Frenchman who had never left [Europe](#) and whose real name is still unknown.

St John's College in Cambridge has put its first edition of the 1704 book on display for the first time, in a rare opportunity for the public to assess the work of the Enlightenment-era Walty Mitty for themselves.

Mark Nicholls, the college's librarian, said: "His tales, imaginative as they are, fit into a wider genre alongside travellers' accounts and maps featuring grotesque creatures, sea



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JOIN FIGHT Vs CANCER

By CHRISTINA EARLE

MORE than 900 Brits a day are diagnosed with cancer – and now scientists are opening their lab doors to show YOU what they are doing to defeat the disease.

You can be a cancer research scientist for the day at the Hutchison/MRC Research Centre in Cambridge this Sunday. Experts at Cambridge University and Cancer Research UK are giving their time as part of this week's Cambridge Science Festival.

Visitors will be able to take a look at DNA mutations and unusual chromosomes and try their hand at experiments.

Dr Will Howat, of Cancer Research UK, said: "We're moving closer to beating cancer. But every cancer is different – and that's the problem."

"Our main focus is to improve detection – something that has improved massively."

"We now hear less bad news than ten years ago when it comes to detection and survival rates. Cancer is not necessarily something to fear, thanks to developments in science."

● For further festival details, see cam.ac.uk/science-festival.





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18 March 2014, 6.06am GMT

What theatre and science can learn from one another

AUTHOR



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'A Journey Round my Skull'. Jonathan Blackford, Kindie Theatre

C.P. Snow's pessimistic view of “**two cultures**” – the arts and the sciences at war with each other, glowering across no man's land, entrenched in their embattled fortress of true expression (as each saw it) was a nihilistic prospect indeed. Fortunately, this view couldn't be more wrong – wrong then, in 1956, and even further from the truth today.

Never have the arts and the sciences had so much cause to celebrate what they have in common and never has the opportunity for theatre particularly to engage with scientists, and with the scientific process itself, been higher.

Cambridge Science Festival, for example, **are hosting** a number of theatrical performances that cover topics such as immortality, computer hacking, melancholy and Albert Einstein.

In my opinion (I speak as a scientist), a critical reason for this

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bridging of the “void” is that academic scientists in particular are increasingly speaking directly to an audience beyond their peers.

Although “popular” scientists have always been with us, the scientific lecture as “performance” has become the norm in the age of university expansion. Audiences for a typical undergraduate lecture can top several hundred, enough to fill a medium-sized theatre, and many scientists, having honed their skills before 300 biology majors, have graduated from the lecture theatre to the theatre proper, trying their hand at stand-up comedy, or in directing or writing for the stage, as [Jonathan Miller](#) has done.

With this requirement to perform (student assessment of lecturers’ abilities is now standard), comes an increasing readiness to engage with audiences who might have little understanding of the process of science, but a lot of interest in the message of science. But theatre can engage with science in more ways than simply the technical. The key thing here is that they share a common term and a common tool – that of “interpretation”.

There’s one play in particular that I think emphasises this. Michael Frayn’s [Copenhagen](#) is about the meeting of physicists Niels Bohr and Werner Heisenberg. It could never have been about the technical science – no audience could have understood it, but then again neither could (or can still) most scientists. In fact, much of academic science lies beyond the comprehension of a relatively small cohort of similarly trained individuals. It is because of this that vehicles such as the stage can work so well at promoting discussion of the concepts involved.

In the play (and in life) Bohr’s and Heisenberg’s disagreement, the uncertainty, if you will, centred on the feasibility of nuclear weaponry at a critical juncture, early in World War II. The importance of their argument extended beyond who was right to what the enormous consequences would be if either one of them were proved to be so.

The lack of certainty as to whether nuclear weapons could be realised was also mirrored in the lack of certainty as to who said what to whom – Bohr and Heisenberg subsequently



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disagreed vehemently over what precisely they disagreed on in the first place. Interpretation was key, and each interpreted differently the scientific data and the recollection of their meeting.

Frayn's play, which is concerned with this uncertainty, speaks to a common misconception concerning science: namely, that science "has the answers" and all that remains is that these answers be uncovered and applied to global problems. This is patently untrue, although it often resides strongly in popular imagination.

This is not to say that science does not contain truth or certainty, but that it is not the answers that science produces (which are always, or at least should be, couched in terms of probability) that are certain but, rather, the methodology by which questions are asked in the first place. Observing, hypothesising, and then testing.

At its core, science tries to gradually direct away from error and towards truth – getting it slightly less wrong in a good cause, if you will. Science is uncertain, and it is at the boundaries of what is known and what is unknown, that creativity flourishes. Interpretation of raw data leads to creativity – the most creative science is often the most uncertain (and often the most personal).

These are all ideas that ring particularly well with the stage. "Interpretation" is of course key to theatre. Texts are interpreted by a director for the stage, books are translated into plays, plays into films, films back into musical theatre.

So perhaps the lesson that each needs to teach the other is that they actually share a common ground – that of uncertainty, interpretation and the application of method, and that by realising this common ground they can engender more creativity in their own sphere.

I've been working with Kindle Theatre in developing their play at the Cambridge Science festival, **A Journey Round my Skull**. The play is inspired by an extraordinary medical memoir written by Hungarian satirist **Frigyes Karinthy**. It explores brain surgery from the perspective of a patient, and features audio recordings from brain surgery.

I was struck by the common fascination in which I, the scientist, and Olivia Winteringham, the director and actor, held Karinthy's darkly humorous report of his benign (although no

less serious for it) brain tumour. It induced auditory hallucinations in him. The creativity our interaction engendered drove both of us to understand more of what Karinthy experienced during the particularly gruesome surgical procedure to remove the tumour (he was awake throughout).

This interaction of science and theatre permitted the expression of a desire to explore more deeply each other's domain, and to do so without the fear of looking foolish. Each could explore the other's, previously uncharted, territory, observing the landscape and bringing back to their own discipline insights and motives potentially useful to our own spheres.

This speaks to a simple truth – science and theatre can learn from each other through their common goals of interpreting knowledge and ideas in new ways. A successful outcome will be that the audiences leave the (lecture) theatre with more questions than answers. It doesn't get more scientific than that.

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Cambridge Science Festival gets funny

By: [Julian Hall](#)

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Robin Ince

For two weeks this month comedy and science have been getting along famously, with the [Cambridge Science Festival](#) diversifying their 'curriculum' to include funny men and women with as much a grasp of protons as punchlines.

The mix of disciplines has a broader range of acts upon which to draw these days, of course, and the sexiness of the melange has been fortified by the success of QI, The Infinite Monkey Cage and Dara O'Briain's The School of Hard Sums.

Among the acts at the Cambridge Science Festival (which finishes on Sunday) are Robin Ince, Matt Parker, Rosie Wilby and New Art Club, each with their own take on the burgeoning popularity of science-based comedy.

"It's all the best bits of learning without the down-sides of being at school."

Published
12:09pm
Friday, March 21, 2014

Filed under
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That's how mathematician and stand up, Matt Parker, explains the sci-comedy phenomena, adding: "Lay nerds can now go to comedy nights which celebrate the fascinating aspects of maths and science with no test or exam to worry about."

When not flying solo, Parker is one third of Festival of the Spoken Nerd (along with Helen Arney and Steve Mould) who are adept at making experiments into entertainment and have appeared in Robin Ince's Nine Lessons for Godless People and Uncaged Monkeys, the stage version of The Infinite Monkey Cage with Professor Brian Cox.

Ince, whose Cambridge Science Festival show is about the human mind, agrees that the no-pressure approach can pay-off: "I don't think comedy about science is about offering the audience a carefully crafted lesson module on particle physics or epigenetics, but what it can hopefully do is enthuse people to want to know more from people who are far wiser than me."

Physical comedy duo New Art Club will performing a piece about body image. Pete Shenton, one half of the outfit, feels that comedy has always been about "mining ideas for meaning and laughter."

"There is a rigour to creating a world of logic out of the chaos of everything, and still making it bloomingly funny.'

Finally, Rosie Wilby, whose show explores monogamy and looser adherence to it, thinks that cerebral comedy comes out of a cyclical development of the circuit:

"Perhaps it's a little bit like the original 'alternative comedy circuit' that sprang up in the 80s as an antidote to the very old school mainstream comedy (that had more than a faint whiff of prejudice). Now 'mainstream' UK comedy isn't so un-PC by any stretch of the imagination but is, by nature, fairly unthreatening and unchallenging. So this time, the 'alternative' that has sprung up is a more cerebral circuit of comics and audiences that want to think a bit more."

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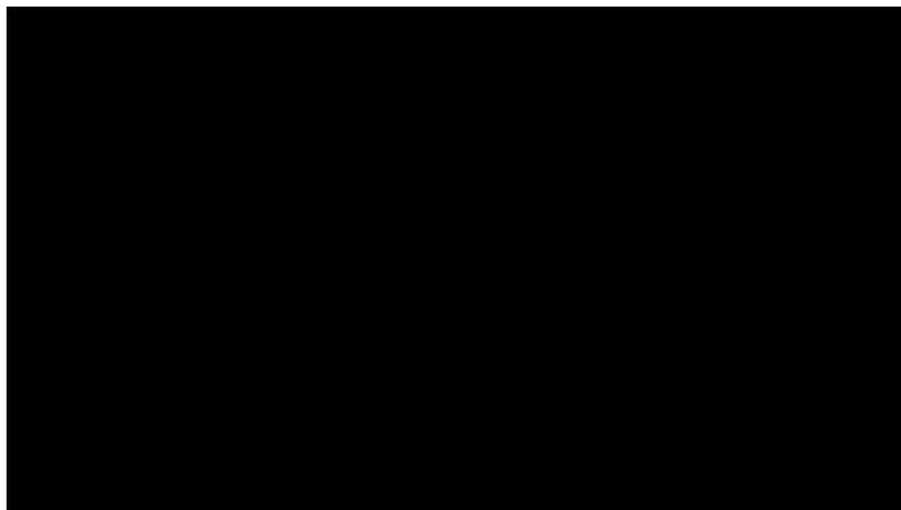
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3:19PM, SAT 22 MAR 2014

Thousands turn out for Science Festival

Last updated Sat 22 Mar 2014

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Thousands of youngsters in Cambridge have been finding out how they can use science in their everyday lives as part of a drive to get more of them interested in the subject. The annual University of Cambridge Science Festival allows children to take part in a range of activities.

Last weekend alone more than 20,000 people attended events around the City and it's hoped that figure will be beaten this weekend.

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97 years old and STILL as undead as a zombie...

ZOMBIES, I must confess, have not occupied my thoughts a great deal, let alone given me sleepless nights, but that was before I attended a lecture at the Cambridge Science Festival a week ago.

Published: Mon, March 24, 2014

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The festival, now in its 20th year, is a wondrous celebration of all things scientific, with hundreds of talks and events to suit all ages and tastes, and last Saturday my own taste for the bizarre was fully satisfied by a young fellow called Matt Parker who describes himself as a "stand-up mathematician".

His talk was hugely amusing and almost equally informative, but the high point for me was his reference to a 2009 paper on zombies.

I cannot imagine how I have been unaware of this paper for five years, but Parker's talk sent me immediately on a hunt for the paper, written by four Canadians and entitled: When Zombies Attack!: Mathematical Modelling Of An Outbreak Of Zombie Infection.

They start with a basic model that consists of three classes: Susceptible (S), Zombie (Z) and Removed (R).

The numbers of S, Z and R will change as time progresses, particularly through encounters

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between Zombies and Susceptibles.

The number of such encounters will be proportional to SZ, and the encounter may send an S or a Z to the R category.

Evidence suggests that the only way to reclassify a Z as R is to decapitate it or remove its brain.

An S, however, may become an R either by being bitten, when it will eventually turn into a Z, or be eaten by the Z and removed entirely from the system.

Evidence suggests that the only way to reclassify a Z as R is to decapitate it or remove its brain

In the long term, natural causes may also reduce S through non-zombie-related death.

Since the period of Zombie Attacks is relatively short, however, the effect of natural death and births on the size of S is negligible.

Essentially, a Zombie Attack is not very different from any other epidemic and the mathematics of epidemiology may be adapted to determine what happens.

After some calculations, the authors of the paper conclude: "Since all the eigenvalues of the doomsday equilibrium are negative, it is asymptotically stable.

It follows that, in a short outbreak, zombies will likely infect everyone."

This also turns out to be the case when their model includes a "latency period" between being bitten and turning into a zombie.

The time it takes for everyone to become zombified is then increased, but they still get us all in the end.

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Putting some of the Zombies in quarantine also does not help in the long run, but introducing a "treatment" parameter, whereby zombies may become de-zombified, does lead to another equilibrium between susceptibles and zombies, albeit with a small population of uninfected people.

The only hope, the maths tell us, is to hit the zombies hard and quick at the start, "or else we are all in a great deal of trouble". Worst of all, however, they find that "the disease-free equilibrium is always unstable".

That means, I fear, than even if we think we have wiped them out, the zombies will always return.

And that, I suspect, is why there are so many zombie film sequels and remakes.

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Family doctors told to stop doling out antibiotics: Chief medical officer accuses GPs of prescribing drugs to patients who are suffering minor illnesses

- Professor Dame Sally Davies said doctors are fuelling spread of superbugs
- Country's top medical adviser also warned of a postcode lottery
- Said it is twice as easy to get a prescription in Newcastle than London
- Called for a 24-hour delay in prescriptions to stop people taking drugs if they don't need them

By [BEN SPENCER](#)

PUBLISHED: 23:18, 24 March 2014 | UPDATED: 23:58, 24 March 2014

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Family doctors are fuelling the spread of superbugs by needlessly 'dishing out' antibiotics, the country's top medical adviser has said.

Professor Dame Sally Davies accused GPs of prescribing powerful drugs to patients who are reluctant to take time off work with minor illnesses.

She also called for sick animals to be slaughtered rather than treated to prevent a looming crisis in antibiotic resistance.

Dame Sally, the Chief Medical Officer for England, warned of a growing postcode lottery in which it is twice as easy to get an antibiotics prescription from a GP in Newcastle than in parts of London.

And she called for a 24-hour delay in prescriptions to stop people taking the drugs if they don't need them.

Speaking at the Cambridge Science Festival, she said: 'There is evidence that some GPs are dishing out more than they need to for medical clinical disease.

'We've clearly got it wrong, and I would argue that GPs do need more training. If we don't take action, deaths will go up and up and modern medicine as we know it will be lost.'

Antibiotics are designed to fight bacteria, but are

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Out of control: Professor Dame Sally Davies said the willingness of GPs to give out drugs was causing the spread of superbugs

routinely given for viral infections.

Experts are worried that high usage of antibiotics increases the chances of bacteria becoming resistant to them – fuelling a breed of superbugs such as MRSA and making illness more difficult to treat in the long term.

Last year Dame Sally asked the Government to put antibiotic resistance on the national risk register – ranking it alongside a large-scale terrorist attack or flu pandemic.

She warned that without action we may return to a '19th-century environment' within 20 years, in which routine operations such as transplants carry a deadly risk because of the risk of untreatable infections.

About 35million antibiotic prescriptions are given out by doctors in England every year. The biggest prescribers are in western Newcastle, where one in 12 patients were given the medication in 2012.

That is twice as many as the lowest, in Camden, north London, where one in 25 received a prescription the same year.

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Dame Sally said: 'You can't tell me that in Newcastle West they've got more sick people, more than double, than in Camden.'

'So there's something about prescribing practice.' Statistics reveal a pronounced north-south divide in prescribing rates, with 69 per cent of northern areas prescribing more than the national average, compared with 39 per cent of those in the south.

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Over the counter: Experts are worried that high usage of antibiotics increases the chances of bacteria becoming resistant to them (file picture)

'Dame Sally said patients often pressure GPs to dish out prescriptions, and called for more training. Doctors' guidelines have advised against giving antibiotics for coughs and colds since 1998.]#

'But the Government's own research has shown antibiotics are prescribed for up to 80 per cent of such minor ailments – despite being more likely to be caused by a virus than a bacteria.

Dame Sally said: 'It is very difficult for GPs. They get patients coming and saying, "I've got an ear infection", or more often "my child has an infection". They say, "Give me an antibiotic so I can go to work".

'I don't beat GPs up because I think it's very difficult when you're faced with a mother who is very anxious with a sick child with a high temperature.'

She also called for a cut in the use of antibiotics in farm animals, one of the biggest causes of resistance to the drugs.

Controversially, she urged vets to slaughter sick animals rather than give them antibiotics to help them recover.

She said: 'I had a bit of a problem with some vets recently because I said, "Why don't you just slaughter animals when they're badly infected?" It seems to me much better because then they can't transmit them [antibiotics].

'At the moment, if you eat a farmed salmon in America it has probably eaten its own weight in antibiotics.'

Dame Sally called for the adoption of a delayed prescription system for patients, to drive down use of drugs.

She said: 'The doctor writes the prescription and hands it to the parents and says, "If your child is still sick in 24 hours and hasn't improved, go and get your prescription."'

She also accused drugs companies of failing to invest in developing new antibiotics, because 'they don't make a profit'.

No new class of antibiotic has been discovered since 1987. In contrast, a new infection emerges on an almost yearly basis.

She added: 'I'm really worried about this. This is like climate change. We are doing it to ourselves and we could die of it if we don't do something now.'



Mass: Around one in 16 people in Britain are prescribed antibiotics each year

THE FACTS - AND CONCERNS - ABOUT ANTIBIOTICS

Around one in 16 people in Britain are prescribed antibiotics each year.

Doctors have been advised not to give patients antibiotics for minor illnesses since 1998, but Government research suggests the drugs are prescribed for up to 80 per cent of coughs, colds and sore throats.

Antibiotic resistance occurs when bacteria adapt to survive the medicines intended to destroy them.

Standard treatments become ineffective and infections persist, increasing risk of spreading to others.

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With sisters Poppy and Chloe



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End of an era



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Gave birth a week ago



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Previously claimed she



High doses of the drugs – whether for humans or animals – increase the problem by accelerating the speed at which bacteria adapt.

Resistance to the drugs has led to the rise of superbugs against which there is no treatment, such as MRSA and clostridium difficile.

Dame Sally warns that within 20 years it may be impossible to fight common infections, making routine operations dangerous.

But critics claim that so-called 'antibiotic prohibitionists' such as Dame Sally are making it harder for patients to get the drugs they need.

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The 20th Cambridge Science Festival looks to the future of science

What's new in space? Why do coincidences happen? Can science make cyclists go faster? Why do cats make us sneeze? These are just a few of the many intriguing questions being explored at this year's Cambridge Science Festival. Running from Monday 10 to Sunday 23 March and celebrating its 20th appearance this year, the Science Festival hosts over 250 thought-provoking talks and hands-on events for everyone.

The programme is out now on the Cambridge Science Festival website. With over 250 events, most of which are free, there's surely something for all tastes. Bookings open at 10am on Monday 3 February online and via the Festival phone lines.

Those taking part in this year's Science Festival include University of Cambridge Vice Chancellor, Professor Sir Leszek Borysiewicz; Lord Rees, Astronomer Royal; writer Simon Singh; Professor Michael Green, recent winner of the Fundamental Physics Prize; statistics whizz Professor David Spiegelhalter, neuroscientist Professor Barbara Sahakian; Dame Sally Davies, the Chief Medical Officer for England; Professor Tony Purnell, Head of Technology for British Cycling; Professor Mark Miodownik of the BBC's Science Club; and Professor Molly Stevens, one of The Times top 10 scientists under the age of 40.

The Science Festival welcomes the return of science comedian Robin Ince, who will take a light-hearted look at art vs science; Matt Parker, stand-up mathematician; and the Naked Scientists, who will start an interactive journey through the workings of our nervous system.

The Festival is delighted to include for the first time the Cambridge Biomedical Campus, home of Addenbrooke's Hospital and the Clinical School. Visitors to the campus will be able to explore the latest, ground-breaking medical research being carried out in Cambridge and how this is translated into new treatments and new drugs.

Other events throughout the Festival include:

- Talking science: what next? brings together leading academics Professor Sir Leszek Borysiewicz and Professor Sir Walter Bodmer, with science journalist Susan Watts to discuss what's next for the word of science and society.
- An exploration into what's new in space, following the launch of the Gaia satellite in 2013
- A talk by Professor Barbara Sahakian about overcoming stress and anxiety and why they are on the increase
- A range of talks for all ages and families during Science on Saturday, from exploring the brain by messing with the senses and why rodents rule the world, to the dark world of caves and how the bicycle got it spokes
- The latest in stem cell research, including Professor Robin Franklin talking about his work on central nervous system regeneration
- Discussion focusing on 21st Century families helped by assistive reproduction technologies, same-sex parenting and single parent families, as well as the role of the family in child development

Speaking about this year's bumper Science Festival, Shelley Bolderson, Science Festival Co-ordinator said, "The Science Festival has grown significantly since its modest beginnings 20 years ago and today is recognised as being one of the most exciting Science Festivals in the world. Last year, we welcomed over 30,000 local, national and international visitors and we hope to meet many more newcomers this year. The range and diversity of subjects covered during the two weeks is astonishing and incredibly exciting for anyone who wants to discover the world around them."

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Astronomer Royal speaks at Cambridge Science Festival

no comment richard wilson 27th January 2014

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Cambridge Science Festival will take place on 10-23 March and the showcase of UK science will include presentations by Lord Rees, Astronomer Royal and Professor Molly Stevens, one of *The Times* top 10 scientists under the age of 40.



Lord Rees

Topics for discussion this year include:

- Talking science: what next? brings together leading academics Professor Sir Leszek Borysiewicz and Professor Sir Walter Bodmer, with science journalist Susan Watts to discuss what's next for the world of science and society.
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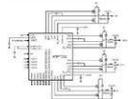
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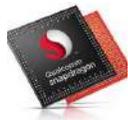
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Cambridge Science Festival

Mar 10th 2014 - Mar 23rd 2014, Cambridge University, Cambridge



The 20th Cambridge Science Festival looks ahead to the future of science.

What's new in space? Why do coincidences happen? Can science make cyclists go faster? Why do cats make us sneeze? These are just a few of the many intriguing questions being explored at this year's Cambridge Science Festival. Running from Monday 10 to Sunday 23 March and celebrating its 20th appearance this year, the Science Festival hosts over 250 thought-provoking talks and hands-on events for everyone.

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[festival](#). With over 250 events, most of which are free, there's surely something for all tastes. Bookings open at 10am on Monday 3 February online and via the Festival phone lines.

Cambridge Science Festival gives the public the opportunity to explore Cambridge science. Thanks to the generosity of the University, our sponsors and partners, most of the events are free.

The Science Festival aims to provide the public with opportunities to explore and discuss issues of scientific interest and concern and to raise aspirations and career awareness in the areas of science, technology, engineering or mathematics.

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Cambridge Science Festival programme: Discover the science of cycling, The Simpsons, Star Trek and sweets

Written by GARETH MCPHERSON

Want to know how you could shave time off your cycle into work? Or why you're always sneezing around cats?

Cambridge Science Festival may be able to help.

The university's 20th annual science extravaganza, which has released its 2014 programme, launches in March and features a stellar list of speakers including its Vice Chancellor Professor Sir Leszek Borysiewicz and the country's chief medical officer Dame Sally Davies.

It allows members of the public to hear from world-beating scientists and take a hands-on approach in famous institutions that have hosted some of man's greatest discoveries.

For the first time at the festival, the Cambridge Biomedical Campus is among the venues and members of the public will be able enter a lab at Cancer Research UK Cambridge Institute to replicate what scientists are doing on the front line of the fight against cancer.

You will also be able to learn about the solar system at the Cavendish Laboratory, test your reaction times at the University of Cambridge Sports Centre and question whether monogamy is still alive at CB2 bistro.

Some Cambridge academics will even be having a go at stand-up for the first time at The Portland Arms pub alongside more seasoned performers.

A "bizarre" journey into the science of sweets will be trodden at the Sidgwick Site, where in another talk a professor uses the theory of probability to examine how surprising our stories of coincidence are.

The festival, which runs from March 10 to March 23, includes more than 250 talks and hands-on events. Most of the events are free and some do not require booking.

Bookings open on Monday (February 6) at cam.ac.uk/science-festival.

SOME OF OUR HIGHLIGHTS

Can science make a cyclist faster?

6-7pm, Friday, March 14

Mill Lane Lecture Rooms, Mill Lane,



Cambridge Science Festival features 250 events

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Susan Boyle

ART

The vastness of nature at Byard Art

CB2 1RW

In the year the Tour de France comes to Cambridge, Prof Tony Purnell, head of technology for British Cycling, on how science and engineering helps boost speed.

Pre-book

What's wrong with pink?

8-9pm, Wednesday, March 12

Mill Lane Lecture Rooms, Mill Lane.

CB2 1RW

Prof Melissa Hines, a neuroscientist, asks why certain toys are embraced by different genders and what that tells us about human development and the pressures society puts on children.

Pre-book

The Simpsons and their mathematical secrets

1-2pm, Sunday, March 16

Cambridge Union, Bridge Street, CB2 1UB

Simon Singh, author of Fermat's Last Theorem, will talk about how complex mathematical theory has reared its head in episodes of The Simpsons and Futurama.

Pre-book

Star Trek: the math of Khan

6-9pm, Monday, March 17

Arts Picturehouse, St Andrew's Street.

CB2 3AR

Mathematician James Grime asks what we can learn about maths in the Star Trek films.

Pre-book

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SLIDESHOW: Cambridge Junction new season launch

Written by ELLA WALKER



Dickle Beau - Blackouts

7 Images

Open Slideshow 

Cambridge Junction has announced its full spring arts season and is celebrating with a launch party this Thursday (February 6).

The season is set to include 30 pieces of contemporary performance covering theatre, dance, cabaret, circus - packed with the quirkiness, skill and talent you can't help but expect from the Junction.

They've also teamed up with the Cambridge Science Festival (including a double bill of shows made with scientists) and EAT Cambridge for two one-day festivals.

Theatre highlights include: new works from international companies Gob Squad and post, alongside Cambridge favourites NIE and Night Light Theatre. The venue is also proud to be presenting six performances of Frozen Light's Tunnels - a multi-sensory production for teenagers with profound and multiple learning disabilities (PMLD).

Dance fans can spot Jean Abreu Dance and Igor and Moreno as well as acrobatics from Square Peg Contemporary Circus.

Workshops this season include a masterclass by award winning Cambridge-based comedy/dance pioneers New Art Club and another chance to learn how to create music using Raspberry Pi.

The free (yes, we said FREE) Season Launch Night on Thursday is hosted by the hilarious New Art Club and will feature an appearance by drag fabulist Dickle Beau, live music, and food from cool Cambridge burger van Steak and Honour (plus a free drink if you sign up in advance too!).

Daniel Pitt, Cambridge Junction's arts producer said:

"This is our third season since we rebranded as Cambridge Junction and

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Campaign for cycle route between Saffron Walden and Cambridge takes step forward

REVIEWS

Susan Boyle

relaunched the arts programme, and the numbers show that there's real interest in what we're presenting and developing over here across the railway tracks. If you haven't had a chance to see what we've got on yet, why not check out the website? There are renowned local (Night Light Theatre, NIE, New Art Club, Hunt and Darton), regional (Jean Arbreu Dance, GETINTHEBACKOFTHEVAN), national (Stan's Cafe, Made in China) and international (Gob Squad, Post) companies to choose from.

"Following a successful collaboration with Cambridge University Festival of Ideas in the autumn, we have a strand in March of contemporary theatre that has been inspired by science, as part of the Cambridge Science Festival. Then in May, we're teaming up with the return of EAT Cambridge to present a few projects at the point where theatre, food and community meet. Interwoven through those are shows that are saying something important about the world we're living in, and some we just think are great things to see.

"We've said it before, but why not try something different?"

Visit junction.co.uk or call (01223) 511511 for more details or to book tickets.

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Cambridge Science Festival celebrates 20th year

no comment Alun Williams 28th January 2014

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The [Cambridge Science Festival](#), supported by Cambridge University, is running from Monday 10 to Sunday 23 March and celebrating its 20th appearance.



Those taking part include University of Cambridge Vice

Chancellor, Professor Sir Leszek Borysiewicz; Lord Rees, Astronomer Royal; writer Simon Singh; Professor Michael Green, recent winner of the Fundamental Physics Prize; statistics whizz Professor David Spiegelhalter, neuroscientist Professor Barbara Sahakian; Dame Sally Davies, the Chief Medical Officer for England; Professor Tony Purnell, Head of Technology for British Cycling; Professor Mark Miodownik of the BBC's Science Club; and Professor Molly Stevens, one of The Times top 10 scientists under the age of 40.

With more than 250 science-related events, it will explore questions such as What's new in space? Why do coincidences happen? and Can science make cyclists go faster?

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For more information, visit www.cam.ac.uk/science-festival



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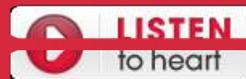
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Cambridge Science Festival

30th January 2014, 16:24

Cambridge Science Festival gives you the chance to explore the mysteries of science.



About the event...

The Science Festival aims to provide the public with opportunities to explore and discuss issues of scientific interest and concern and to raise aspirations by encouraging young people to consider a career in science, technology, engineering or mathematics.

When?

Get ready to explore structures and patterns with more than 250 inspiring talks, films, debates and hands-on activities, all taking place from 10th – 23rd March 2014.

Most of the festival's events are free to attend.

The Schedule

[See the programme of activities and talks here](#)

Comments



ON RADIO

Matt Wilkinson

1pm - 4pm

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ON TV



NOW Gnarlz Barkley
Crazy

13:31 Pharrell Williams
Happy (Who's On Heart
Power Intro)

13:28 Toni Braxton
Unbreak My Heart

13:20 The Script
Hall of Fame

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SLIDESHOW: Cambridge Junction new season launch

Written by ELLA WALKER



Dickie Beau - Blackouts

7 Images [Open Slideshow](#)

Cambridge Junction has announced its full spring arts season and is celebrating with a launch party this Thursday (February 6).

The season is set to include 30 pieces of contemporary performance covering theatre, dance, cabaret, circus - packed with the quirkiness, skill and talent you can't help but expect from the Junction.

They've also teamed up with the Cambridge Science Festival (including a double bill of shows made with scientists) and EAT Cambridge for two one-day festivals.

Theatre highlights include: new works from international companies Gob Squad and post, alongside Cambridge favourites NIE and Night Light Theatre. The venue is also proud to be presenting six performances of Frozen Light's Tunnels – a multi-sensory production for teenagers with profound and multiple learning disabilities (PMLD).

Dance fans can spot Jean Abreu Dance and Igor and Moreno as well as acrobatics from Square Peg Contemporary Circus.

Workshops this season include a masterclass by award winning Cambridge-based comedy/dance pioneers New Art Club and another chance to learn how to create music using Raspberry Pi.

The free (yes, we said FREE) Season Launch Night on Thursday is hosted by the hilarious New Art Club and will feature an appearance by drag fabulist Dickie Beau, live music, and food from cool Cambridge burger van Steak and Honour (plus a free drink if you sign up in advance too!).

Daniel Pitt, Cambridge Junction's arts producer said:

"This is our third season since we rebranded as Cambridge Junction and relaunched the arts programme, and the numbers show that there's real interest in what we're presenting and developing over here across the railway tracks. If you haven't had a chance to see what we've got on yet, why not check out the website? There are renowned local (Night Light Theatre, NIE, New Art Club, Hunt and Darton), regional (Jean Abreu Dance, GETINTHEBACKOFTHEVAN), national (Stan's Cafe, Made in China) and international (Gob Squad, Post) companies to choose from.

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“Following a successful collaboration with Cambridge University Festival of Ideas in the autumn, we have a strand in March of contemporary theatre that has been inspired by science, as part of the Cambridge Science Festival. Then in May, we’re teaming up with the return of EAT Cambridge to present a few projects at the point where theatre, food and community meet. Interwoven through those are shows that are saying something important about the world we’re living in, and some we just think are great things to see.

“We’ve said it before, but why not try something different?”

Visit junction.co.uk or call (01223) 511511 for more details or to book tickets.

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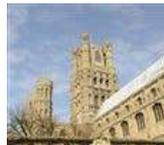
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Sonic Shocks

CAMBRIDGE SCIENCE FESTIVAL announces comedy line up including ROBIN INCE



Visitors will be entertained by a diverse range of stand-up comedy at this year's Science Festival, with comedians tackling the big science issues, including binary numbers, how we feel about our bodies, skewiff brain dabbings, and whether monogamy is dead.

To kick-start the giggles, on 15 March, stand-up mathematician Matt Parker, returning to the Cambridge Science Festival for another year of engaging and entertaining maths, takes a hilarious tour through the world of numbers. From Rubik's Cubes to binary numbers, Matt Parker covers his current favourite bits of maths in a comedy show accessible to everyone. Part stand-up and part maths, this show covers a wide range of maths topics in an engaging fashion as seen in sell-out shows at the Edinburgh Fringe Festival, London's West End, the Melbourne Comedy Festival... and the London Mathematical Society.

Also on 15 March, as part of the Science Festival collaboration with the Cambridge Junction, New Art Club presents: Feel about your body. An uplifting, life-affirming and hilarious spectacle about how we feel about our bodies. Tom Roden and Pete Shenton marry stand-up comedy with choreographic minimalism. Expect silliness, see a man talking to his bottom and find out what not to do during a heart attack.

Tom Roden described the show as, "Feel About Your Body is a relentlessly entertaining, ground-breaking comedy show that takes as its starting point the recent and historical understanding of the mind and its relationship to the body. It places the debate on the bodies and minds of the two protagonists and on that of the audience."

The Science Festival is delighted to welcome back Festival regular, Robin Ince, performing his stand-up show, Robin Ince is (in and) out of his mind on 16 March. From Freud and Jung to Laing and Milgram, from rats after rewards to insanity cured by ink spots, Robin looks at the last 100 years of psychiatry, psychology and

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skewiff brain dabbings. Just how hard is it being a self-conscious being on Planet Earth?

Speaking about his show, Robin said: "This year I have tried to tackle the human mind in my show. Having spent the last six months reading about it, I am now in disarray, discovering possibilities such as 'free will is an illusion', many of my personality flaws were formed in the womb, that my inner monologue is still getting used to not being the voice of a god, and that my trepanning equipment may be less use than I imagined.

Considering we have the 'most complex thing in the known universe' in our head, I am relieved to think that we don't know much of the universe yet and there may be something with a less confusing and confused brain structure and mind out there. I have an inkling that I will be more confused after this show than I was before I started delving into this whole sorry mess of a head of mine.

"I don't think comedy about science is about offering the audience a carefully crafted lesson module on particle physics or epigenetics, but what it can hopefully do is enthuse people to want to know more from people who are far wiser than me."

On 19 March, disgruntled serial monogamist Rosie Wilby asks an interesting question, Is monogamy dead? – which is also the cheeky title of the hilarious sequel to her sell-out show The Science of Sex.

Rosie explained the basis for the show: "I've started wondering if in order to be happy, human beings need both the loving security and companionship of a partner and the passion offered up by a lover.

These two distinct sets of needs are rarely met by the same person at the same time. If we could ever establish a society where having one of each was the norm, then maybe we could eradicate the need for affairs entirely."

Finally, Bright Club, the thinking person's variety night, also returns to the Science Festival on 20 March. During the evening, special guests will appear on stage alongside researchers giving stand-up comedy a go for the first time. The audience will join academics from Cambridge and beyond for a light-hearted look at their research.

Bright Club organiser and regular performer, Dr Andrew Holding, said: "Bright Club runs like a standard comedy club, with professional acts. It's a great night for everyone; what makes it different is that alongside the comedians are university researchers.

Often they've never done stand-up comedy before, but it works because the strangeness and obscurity of life in the lab varies from the bizarre to the downright incomprehensible. So not only is it good for a laugh, but it also covers some of the most fascinating (and often obscure) research happening in the UK right at this very moment."

For more information about the Cambridge Science Festival or to book tickets for events, please visit: www.cam.ac.uk/science-festival

#news #Cambridge Science Festival #Comedy #Robin Ince #Matt Parker #New Art Club #Rosie Wilby #Bright Club

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Sex, maths, monogamy and a laugh from the labs at the Cambridge Science Festival

By Culture24 Reporter | 11 February 2014
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The comedy bill alone should stimulate a few cells at this year's Cambridge Science Festival

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Tom Roden and Pete Shenton present comedy show Feel About your Body under their New Art Club act as part of this year's Cambridge Science Festival
© Chris Nash

Comedy about science, as suggested by the opening punchline from Cambridge Science Festival - an electron and a positron walk into a bar - can be painful. Tom Roden and Pete Shenton's mix of stand-up and choreography, for example, features renal introspection as part of the highly-rated show.

Mathematician Matt Parker, meanwhile, uses Rubik's Cubes and binary numbers in a hybrid which has sold out the Edinburgh Fringe Festival, the Melbourne Comedy Festival and performances in the West End.

"I don't think comedy about science is about offering the audience a carefully-crafted lesson module on particle physics or epigenetics," ponders Robin Ince, a regular at the festival who's bringing his new cerebral circumnavigation, Robin Ince is (in and) out of his Mind, to the bill.

"But what it can hopefully do is enthuse people to want to know more from people who are far wiser than me.

"This year I have tried to



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tackle the human mind in my show. Having spent the last six months reading about it, I am now in disarray, discovering possibilities such as 'free will is an illusion', that many of my personality flaws were formed in the womb, that my inner monologue is still getting used to not being the voice of a god, and that my trepanning equipment may be less use than I imagined.

"Considering we have the most complex thing in the known universe in our head, I am relieved to think that we don't know much of the universe yet and there may be something with a less confusing and confused brain structure and mind out there.



Robin Ince goes inside his head on March 16

© Steve Ullathorne

"I have an inkling that I will be more confused after this show than I was before I started delving into this whole sorry mess of a head of mine."

While Ince sets his sights on the last century of psychiatry and psychology, Rosie Wilby – a "disgruntled serial monogamist" whose sequel to her sell-out *The Science of Sex Show* is called *Is Monogamy Dead?* – seeks a solution to a relationship conundrum.

"I've started wondering if in order to be happy, human beings need both the loving security and companionship of a partner and the passion offered up by a lover," asks the comedian whose previous show was a memento of a failed Britpop band.

"These two distinct sets of needs are rarely met by the same person at the same time.

"If we could ever establish a society where having one of each was the norm, then maybe we could eradicate the need for affairs entirely."

There are, as usual, hundreds of events to choose from for committed and less faithful lovers at the festival this year. Of the comedy nights, Bright Club also features academics talking jovially about their careers.

"Often they've never done stand-up comedy before," warns organiser Dr Andrew Holding.

"But it works because the strangeness and obscurity of life in the lab varies from the bizarre to the downright incomprehensible.

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“So not only is it good for a laugh, but it also covers some of the most fascinating, and often obscure, research happening in the UK right at this very moment.” His conclusion could be a neat summary of the festival as a whole.

- **Cambridge Science Festival runs March 10-23 2014. Visit cam.ac.uk/science-festival for the full programme and to book.**

What do you think? Leave a comment below.

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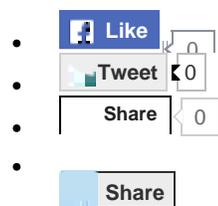
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The 20th Cambridge Science Festival looks ahead to the future of science

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28th January 2014

News Release from: [University of Cambridge](#)



Held from Monday 10 to Sunday 23 March at the University of Cambridge UK, the 20th annual Cambridge Science Festival will attempt to answer many intriguing questions: What's new in space? Why do coincidences happen? Can science make cyclists go faster? Why do cats make us sneeze? The Science Festival hosts over 250 thought-provoking talks and hands-on events for everyone.

This year's Science Festival participants include: University of Cambridge Vice Chancellor, Professor Sir Leszek Borysiewicz; Lord Rees, Astronomer Royal; writer Simon Singh; Professor Michael Green, recent winner of the Fundamental Physics Prize; statistics whizz Professor David Spiegelhalter, neuroscientist Professor Barbara Sahakian; Dame Sally

Davies, the Chief Medical Officer for England; Professor Tony Purnell, Head of Technology for British Cycling; Professor Mark Miodownik of the BBC's Science Club; and Professor Molly Stevens, one of The Times top 10 scientists under the age of 40.

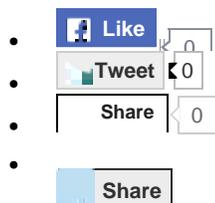
The 20th science festival welcomes the return of science comedian Robin Ince, who will take a light-hearted look at art vs science. Stand-up mathematician, Matt Parker and the Naked Scientists, who will start an interactive journey through the workings of our nervous system, will also be present this year. For the first time, the Cambridge Science Festival will include the Cambridge Biomedical Campus, home of Addenbrooke's Hospital and the Clinical School. Visitors to the campus will be able to explore the latest, ground-breaking medical research being carried out in Cambridge and how this is translated into new treatments and new drugs. With over 250 events, most of which are free, there's surely something for everyone.

Other events throughout the Festival include: an exploration into what's new in space, following the launch of the Gaia satellite in 2013; a talk by Professor Barbara Sahakian about overcoming stress and anxiety and why they are on the increase; a range of talks for all ages and families during Science on Saturday, exploring the brain by messing with the senses, why rodents rule the world, the dark world of caves and how the bicycle got its spokes; the latest in stem cell research, including Professor Robin Franklin talking about his work on central nervous system regeneration; and a discussion focusing on 21st Century families helped by assistive reproduction technologies, same-sex parenting and single parent families, as well as the role of the family in child development.

Shelley Bolderson, Science Festival Coordinator, commented: "The Science Festival has grown significantly since its modest beginnings 20 years ago and today is recognised as being one of the most exciting Science Festivals in the world. Last year, we welcomed over 30,000 local, national and international visitors and we hope to meet many more newcomers this year. The

range and diversity of subjects covered during the two weeks is astonishing and incredibly exciting for anyone who wants to discover the world around them."

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Why is anxiety on the increase? How does the brain generate self-consciousness? How do recent genetic discoveries provide a new direction for neuroscientific research?

This year's Cambridge Science Festival (10-23 March) will feature talks that cover these issues and more from some of the most notable researchers in the fields of neuroscience and psychiatry.

16% of us in Britain have a common mental health disorder of anxiety or depression, according to Professor Barbara Sahakian from the Department of Psychiatry at the University of Cambridge, and these figures are increasing. Why is this? Why do people react to stress differently? How can we develop resilience and wellbeing?



On Tuesday, 11 March Professor Sahakian (pictured) will discuss these questions with Dr Annette Bruhl, visiting clinical researcher at the Department of Psychiatry, Cambridge and Professor David Baldwin from the University of Southampton. They will discuss how our brains and bodies change when we are stressed and anxious and what pharmacological and psychological treatments are available for people with anxiety disorders. This event is sponsored by the British Association for Psychopharmacology.

"Many of us wake up in the morning, jump on the scales and carefully consider what we are having for breakfast. In fact, given that we are early in 2014, we may be thinking about how we can change our lifestyle to be physically healthier. However, do many of us reflect on the stresses and tensions that we face, and how we might ensure that we have good brain health? In a global environment, with reduced resources due to austerity, we are increasingly required to multitask and take on additional responsibilities. Fortunately, for many of us, we have resilience and may take on these challenges enthusiastically. However, with increasing day-to-day stress, it is important to reflect on how we might improve our cognition and wellbeing, to ensure we enjoy life as individuals and can contribute to a flourishing society. In our session entitled *Overcoming stress and anxiety: healthy brains for a flourishing society*, we will consider how to maintain good brain health, methods for reducing stress and also what can be done if we succumb to the stresses and pressures of everyday life.

"Anxiety disorders can be debilitating for the individual as they stop people being able to perform their activities of daily living at home or work. These disorders are also expensive for governments since they frequently keep people off work. In our session, we will also discuss pharmacological and psychological treatments for anxiety disorders, including cognitive behavioural and mindfulness therapies."



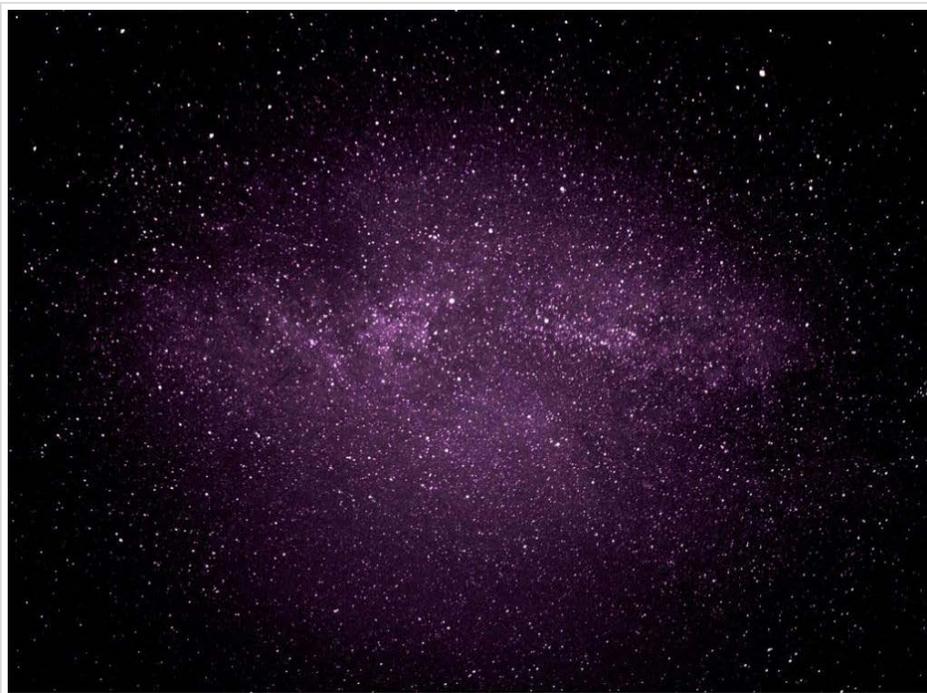
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Space at the UK Cambridge Science Festival

Posted on 17 February 2014. Tags: [cambridge](#), [science](#), [Space](#)

Gaia lead investigator, string theory pioneer and Astronomer Royal headline talks on space



Our Copernican demotion may have further to go, according to Lord Rees, Astronomer Royal.

From the structure and history of our Galaxy and how it evolved to the existence of other universes, space-themed talks, showcasing the latest in astrophysics, feature heavily during the Cambridge Science Festival 2014.

The Gaia satellite was launched in December 2013 to determine the structure and history of our Galaxy. The Square Kilometer Array is being built to unravel the role of dark energy and dark matter. Telescopes like these produce unprecedented amounts of data requiring a new supercomputer, the Wilkes, to process them. How do these developments compare to Newton's discoveries and inventions? On Monday 10 March, Dr Patrica Fara,



About BARSC

The British Association of Remote Sensing Companies (BARSC) was established in 1985, and represents the interests of all those involved in remote sensing activities, from major companies to SMEs and independent consultants. The Association Objectives are:

-

To conserve, promote and protect the interests of, and encourage co-operation between, all UK companies, partnerships and individuals offering and undertaking consulting and contracting services in the field of remote sensing.

-

To ensure that the interests of the Members of the Association are fully represented in all national, international and government committees which may exist and exert influence on the spheres of interest of Members.

-

To liaise with Government departments, academic institutions and other similar bodies when undertaking contractual remote sensing activities in the operation of the professional and commercial services provided by Members.

-

To encourage international funding and executing Agencies or organisations instigating remote sensing projects overseas to co-operate with BARSC and its Members.

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To provide a forum for representations to government and other appropriate bodies in connection with overseas trade visits and exhibitions.

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Do all such other things as may be conducive to the attainment of the above objectives

Dr Rosie Bolton and Professor Gerry Gilmore will be discussing this question and more during the event, What's new in space? which is organised by Science AAAS.

Professor Gilmore, the UK Gaia satellite principal investigator who recently became a Royal Society Fellow, said:

"Gaia, Europe's newest big astrophysics mission, with its goal to provide the first 3D census of the Milky Way, is now in orbit being tested out. Gaia's billion-pixel camera is already in operation. The first images illustrate the challenges and opportunities, technologically and intellectually, to extend our understanding of our Galaxy."

Dr Bolton, an astrophysicist from the Cambridge Cavendish Laboratory who works on designing the world's largest radio telescope, the Square Kilometre Array, commented: *"If Gaia is the 'Billion stars' machine, the Square Kilometre Array (SKA) is the 'Billion galaxies' machine."* The SKA project is a 1.5 billion Euro project to build the world's largest and most sensitive radio observatory. Dr Bolton is the project scientist for the Cambridge-based consortium leading the design of the SKA's enormous processing centre. Her part of the talk will highlight the transformational science that will be conducted with the SKA once it comes on-line next decade.

Turning to historical astronomy and Sir Isaac Newton – the second Lucasian Professor of Mathematics at the University of Cambridge – Cambridge historian, Dr Patricia Fara, said:

"Isaac Newton is celebrated as the world's greatest scientific genius, the inspired Cambridge scholar who made gravity mathematical and brought order to the heavens. But I will question whether he was indeed a Newtonian scientist: God finds no place in modern physics, but was present throughout space and time in the universe envisaged by Newton."

Modern physics raises questions concerning phenomena on widely different distance scales, from the evolution of the whole Universe to microscopic properties of sub-nuclear particles. On Thursday 13 March, current Lucasian Professor of Mathematics, Michael Green – a theoretical physicist and one of the pioneers of string theory – will present a historical survey of the evolution of theoretical approaches to understanding such problems during the Andrew Chamblin Memorial Lecture: The pointless Universe. He will also discuss recent ideas from String Theory that have the potential for unifying areas of physics that have previously appeared to be only remotely connected.

Commenting on his talk, Professor Green, who recently won the Fundamental Physics Prize, said: *"According to string theory the different sub-atomic constituents of matter –the electron, the quarks and other elementary particles – are to be thought of as different modes of vibration of an extremely small string. This simple postulate not only unifies the fundamental particles, but leads naturally to a unified description of the physical forces."*

"This talk will explain why string theory is so compelling even though it is not yet a complete theory and it has yet to make precise experimental predictions. It will give an overview of the theory, illustrating how it describes physics at ultra-short distances in a manner that is radically different from conventional theories and also describing some possible cosmological implications of the theory."

"The talk will end with an overview of recent ideas, which suggest that the theory may have applications in areas of physics far removed from the ones it was originally intended for."

In a talk on Monday 17 March, Lord Martin Rees, Astronomer Royal, will discuss Our Universe and others. We

are the outcome of a process taking nearly 14 billion years in which atoms, stars, planets and biospheres emerged from a hot dense big bang. Lord Rees will discuss the key stages in the process. What would our cosmos be like if the key numbers were different? And could a huge variety of other universes exist, each the aftermath of a different big bang?

Lord Rees said:

"There's strong reason to expect that our universe extends far further than we can see with our biggest telescopes. But that's just the aftermath of 'our' Big Bang. The more interesting (and more speculative) question is whether there are other big bangs, giving rise to other space-times, which might be governed by physical laws quite different from those that prevail here. What astronomers observe could be an infinitesimal part of physical reality. Our Copernican demotion may have much further to go."

Other space-related events include:

- Helen Keen's space race. Join Helen Keen for her new, live, spacetacular show for discerning younger space fans. Arrive in your space costume or whip one up out of free tinfoil before the show starts! See how rockets fly! Learn how they stay in orbit! And find out about the intrepid animals who have travelled into space with science comedian Helen Keen. (15 March)
- Shortcuts to space: what are the best and worst ways to get into orbit? With Zephyr Penoyre. This is part of the CHaOS talks. (15 March)
- Stars, planets and microwave ovens. Dominic Ford and Dave Ansell (BBC Naked Scientists) use bicycle pumps and kitchen equipment help to find out what a star is made of, how to detect a planet a hundred light years away and how stars ignite. (16 March)
- Icarus at the edge of time. What if Icarus travelled not to the sun but to a black hole? This orchestral work is a mesmerising adaptation of Icarus at the Edge of Time by Brian Greene with music by Philip Glass and film by AI + AI. This re-imagining of the Greek myth is performed by Cambridge University Musical Society Symphony Orchestra, conducted by Ben Glassberg and features Gresham Professor of Astronomy Carolin Crawford. (17 March)
- The early history of the Cavendish Laboratory (21 March). The opening of the Laboratory in 1874 marked the beginning of a remarkable period of growth in experimental physics in Cambridge. Up to that date, there were no experimental facilities for physics and the subject was not an approved discipline in the Natural Sciences Tripos. The tortuous events which led to the foundation of the Laboratory and the remarkable achievements of the first three Cavendish Professors, Maxwell, Rayleigh and JJ Thomson, will be described by Professor Malcolm Longair.
- Astronomy road show planetarium. Sponsored by the East Anglia Branch of the Institute of Physics. Explore the beauty of the night sky. Learn about space, stars and the solar system. The shows are interactive, lively, up-to-date via the internet and scientifically accurate. (22 March)
- Open afternoon at the Institute of Astronomy. The Institute of Astronomy opens its doors for our annual open afternoon. We will have talks, displays, demonstrations and hands on activities for everyone to learn more about astronomy, and the kind of research we do. (22 March)
- Public observing at the Institute of Astronomy. Stargazing on the Observatory lawns, if weather permits. (22 March)

For more information about the Cambridge Science Festival or to book tickets for any of the events above, please visit: www.cam.ac.uk/science-festival

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STEM CELLS COULD HELP IN THE BATTLE AGAINST MAJOR BRAIN DISEASES – SCIENTISTS REVEAL LATEST RESEARCH

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 19 February 2014
 Cambridge, UK


Press release

The study of stem cells continues to be a top priority for researchers; given their distinct regenerative abilities, stem cells offer new potential for treating a range of diseases. During the Cambridge Science Festival, researchers reveal how these cells could help with the battle against major diseases of the brain.

On Monday 17 March, the newly appointed Professor of Stem Cell Medicine, Robin Franklin, will be discussing his research into central nervous system regeneration, in particular myelin repair, during his talk *Stem cells and repairing brains*. The potential benefits of myelin repair are to stop nerve cell degeneration and provide a treatment for multiple sclerosis.

Professor Franklin said: "The brain, although capable of unmatched feats of adaptability, is generally considered to be an organ that is very poor at mending itself after injury. However, one particular type of brain cell, called the oligodendrocyte – the cell that makes the myelin wrapping around nerve fibres – can be regenerated when lost in disease by the brain's own stem cells. By studying in the laboratory how brain stem cells generate new oligodendrocytes it has been possible to identify ways in which this important regenerative process might be achieved in the clinic, offering the prospects of regenerative medicine for major neurological diseases."

"I will chart the history of cell transplantation for PD and how the field has moved from periods of huge hope to disappointment before entering this new era of optimism around stem cell therapies."

Professor Roger Barker, Centre for Brain Repair, Department of Clinical Neuroscience, Cambridge

On Wednesday 19 March, Professor Roger Barker from the Centre for Brain Repair, Department of Clinical Neuroscience, Cambridge, will be asking, *What can stem cells do for Parkinson's Disease?* Professor Roger Barker's lab studies chronic neurodegenerative disorders of the nervous system, in particular Parkinson's and Huntington's disease. Professor Barker will show how these diseases develop and reveal how, by testing new therapies with specific patient subgroups, the ultimate aim is to find therapies to stop or modify disease processes.

Professor Barker said: "There has been a great deal of excitement about stem cells and how they can be used to study diseases of the brain as well as treat them through implantation. In this talk, I will discuss what we can hope to find out about disease processes by looking at the brain nerve cells we can now make from the skin cells of patients with Parkinson's disease (PD). In addition, I will chart the history of cell transplantation for PD and how the field has moved from periods of huge hope to disappointment before entering this new era of optimism around stem cell therapies. However, is that optimism misplaced or are we really on the threshold of a whole new era of therapies for these incurable diseases of the ageing brain?"

Further talks relating to stem cell research during the Science Festival, include:

- *Stem cell discoveries*, 15, 16 and 23 March. Hands-on activities all about the amazing world of stem cells. Look after your own flask of stem cells in our stem cell pet experiment; race to the finish line in our stem cell board game; view some short stem cell films and talk to researchers working in the field about the latest advances. Adults can also win a tour of the Stem Cell Institute, led by one of our top researchers.
- *Stem cells: using physics and engineering principles in stem cell research*, 18 March. Dr Kevin Chalut's lab focuses on new ways to investigate physical states of a cell during its development using microscopy and microfluidic techniques. The goal is to discover the physical mechanisms, and the importance of those mechanisms, in various areas of stem cell research.
- *Stem cells: reprogramming adult cells back into embryonic stem cells*, 20 March. Dr Jose Silva studies the biology of how to convert a somatic cell back into a pluripotent cell. Somatic cells make up our internal organs, skin, bones, blood and connective tissue. A pluripotent cell refers to a stem cell that has the potential to differentiate into any of the three germ layers. Learn more about this fascinating process.

Background information

About Cambridge Science Festival

Now in its 20th year, the Cambridge Science Festival gives the public the opportunity to explore Cambridge science. Thanks to the generosity of the University, our sponsors and partners, most of the events are free.

The Science Festival aims to provide the public with opportunities to explore and discuss issues of scientific interest and concern and to raise aspirations and career awareness in the areas of science, technology, engineering or mathematics.

Patrons of the Science Festival are: Professor Simon Baron-Cohen, Professor John Barrow, Dr Claire Cockcroft, Dr Henry Gee, Lord Rees of Ludlow, Professor Malcolm Longair, Mr Tim Radford, Professor Barbara Sahakian, Professor Jeremy Sanders, Dr Andrew Sugden, Ms Carol Vorderman, Professor Jim Secord, Mr Ian Harvey, Professor Andrea Brand, Professor Ron Laskey, Professor Bill Sutherland, Professor John Naughton, Professor Alan Barrell.

The Cambridge Science Festival is sponsored by Cambridge University Press, the Medical Research Council, Anglia Ruskin University, MedImmune, Royal Society of Chemistry, AAAS Science International Inc., TTP Group plc., BlueBridgeEducation, Linguamatics, Abcam plc., RAND Europe, Society of Biology, The Babraham Institute, British Association for Psychopharmacology, the Pye Foundation, Walters Kundert Charitable Trust, and Cambridge City Council. Other Festival partners are Cambridge University Hospitals, the Cambridge Science Centre, Hills Road Sixth Form College and National Science and Engineering Week. The Festival's media partner is BBC Radio Cambridgeshire.

Further information

For more information about the Cambridge Science Festival or to book tickets for any of these events, please visit: www.cam.ac.uk/science-festival 

For more information on the Wellcome Trust - Medical Research Council Cambridge Stem Cell Institute, please visit: www.stemcells.cam.ac.uk 

Further news stories about the Cambridge Science Festival can be viewed here: www.cam.ac.uk/science-festival/news 

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Stem cells to fight brain diseases say Cambridge scientists

Written by ELEANOR DICKINSON

Sufferers of serious brain diseases could one day be helped by stem cell treatments, according to scientists at Cambridge University.

Scientists at the University hope to be able to use the regenerative power of stem cells to treat major brain conditions such as Parkinson's and Huntington's disease.

Their findings are expected to be revealed at the Cambridge Festival of Science next month.

Robin Franklin, the newly appointed Professor of Stem Cell Medicine, will be discussing his research into central nervous system regeneration and the possibility of treating multiple sclerosis.



Stem cell discoveries, Cambridge Science Festival

He said: "The brain, although capable of unmatched feats of adaptability, is generally considered to be an organ that is very poor at mending itself after injury.

"However, one particular type of brain cell, called the oligodendrocyte – the cell that makes the myelin wrapping around nerve fibres – can be regenerated when lost in disease by the brain's own stem cells.

"By studying in the laboratory how brain stem cells generate new oligodendrocytes it has been possible to identify ways in which this important regenerative process might be achieved in the clinic, offering the

prospects of regenerative medicine for major neurological diseases."

Another speaker at the festival will be Professor Roger Barker from the Department of Clinical Neuroscience, who will discuss the possibilities of using stem cell therapy to treat Parkinson's and Huntington's disease.

Professor Barker will show how these diseases develop and reveal how, by testing new therapies with specific patient subgroups, the ultimate aim will be to find therapies to stop or modify disease processes.

He said: "There has been a great deal of excitement about stem cells and how they can be used to study diseases of the brain as well as treat them through implantation.

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"In this talk, I will discuss what we can hope to find out about disease processes by looking at the brain nerve cells we can now make from the skin cells of patients with Parkinson's disease.

"In addition, I will chart the history of cell transplantation for Parkinson's disease and how the field has moved from periods of huge hope to disappointment before entering this new era of optimism around stem cell therapies.

He added: "However, is that optimism misplaced or are we really on the threshold of a whole new era of therapies for these incurable diseases of the ageing brain?"

During the festival, biology enthusiasts and people with interests in stem cells will be able to take part in a number of hands-on activities, including being able to look after your own stem cells, play a board game with them and watch a number of films on the subject.

There will also be a talk by Dr Jose Silva on turning adult stem cells back into embryonic stem cells.

For more information about the Cambridge Science Festival or to book tickets for any of these events, please visit: www.cem.ac.uk/science-festival

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Berenice Mann

localsecrets.com Thursday, 27 Feb 2014

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Problem?

Can science make a cyclist faster? How to be immortal? How would you run the planet?



Scientists will explore these thought-provoking questions and many more at the 20th annual [Cambridge Science Festival](#)—the largest ever. With 255 events planned including talks by leading scientists, kids' storytelling and workshops, plus discussions and exhibitions, this year's 10-23 March festival will help raise awareness of some of the achievements, discoveries and aspirations of home-

grown science, maths and engineering champions.

'We've got talks, hands-on activities, films and discussions running throughout the festival fortnight,' says Dr Lucinda Spokes, Festivals and Training Coordinator for Cambridge Science Festival. 'Everyone is invited, so come along and explore science with us!'

Six Royal Society Fellows are attending the festival which is expected to attract 30,000 visitors. With renowned scientists taking part including Lord Rees, the Astronomer Royal, statistics whizz Professor David Spiegelhalter, neuroscientist Professor Barbara Sahakian and Professor Tony Purnell, Head of Technology for British Cycling, there is no shortage of attractions. If that isn't enough to tempt you, there are science-related art exhibitions and music concerts, science comedian Robin Ince and the Naked Scientists, who regularly debunk, demystify and inform on the radio.

With the Tour de France heading to Cambridge, the popularity of cycling here and the trend for consumer fitness products, there is a fitting focus on sports, with events including *How the bicycle*



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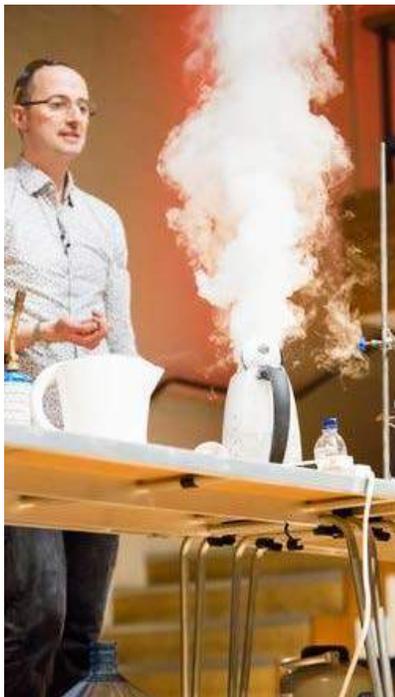


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got its spokes. Sporting events will start on 15 March and feature special children's interactive challenges during *Science of sport for schools* on 20 and 21 March.

Children will be further spoilt for choice, with special activities including a gamer bus, day of science storytelling, science buskers at the Grafton Centre, murder mystery, plant hunts, running the world and a maths fair among many others. [Click here for more details.](#)

On the 5 March there is a special launch event celebrating International Women's Day. *The meaning of success: insights from women at Cambridge* is a book and website celebrating women from across the University, their stories and achievements. On 12 March the WiSETI (Women in Science, Engineering and Technology) lecture is *Growing organs and other small challenges* by Professor Molly Stevens.

As the festival covers the full range of science endeavours, from astronomy to zoology, here are a few titles from a vast array to whet the appetite as scientists ask *What's new in space? What is matter? What's wrong with pink?*, discuss *Why cats make you sneeze* and finally admit, yes, *It is rocket science!*

The University of Cambridge and many sponsors open their doors to the public for the festival, held across 85 venues. There will be brand new venues to visit, as the new Biomedical campus at Addenbrooke's opens its doors, as well as the Corn Exchange, Guildhall, West Road Concert Hall and University departments. There is even a [free festival app](#) to help you: and at first glance it looks very helpful with a booking tool, maps to help you find venues and easy to find listings. Although searching by subject would be useful!

Cambridge Science Festival Berenice Mann

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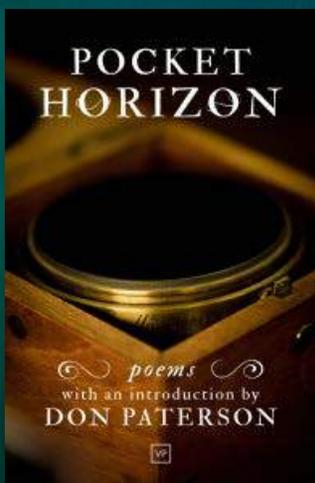
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'Science as the Spark' at Cambridge Science Festival

Filed under: [Readings](#) — [Leave a comment](#)

February 28, 2014



Pocket Horizon, Valley Press.

Join us at the Cambridge Science Festival on [Thursday, 20 March](#) for a lively panel discussion with authors whose work involves equal portions of art and science.

How has scientific inquiry lead to literary works? Why is the literary presentation of science relevant to scientists and society?

A panel including Chris Beckett, Dave Clements, Laura Dietz, and Kelley Swain will skirt the 'inspiring science!' cliché to ask illuminating questions, including why scientists and historians who can communicate in any genre, and artists who can draw on any inspiration, choose to structure their work at the intersection of these fields.

The panel will be led by Dr. John Holmes, Chair of the [British Society for Literature and Science](#).

The organisers thank the British Society for Literature and Science for its generous grant in support of the event.

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Cambridge doctors to answer questions from the public of their life-changing peanut discovery

Written by ADAMLUKE

The Cambridge doctors who discovered the first successful treatment for peanut allergy are to talk publicly on the subject for the first time and answer questions.

Dr Pamela Ewan, consultant in allergy and clinical immunology, and Dr Andrew Clark, consultant in paediatric allergy, will give a free lecture on the last day of the Cambridge Science Festival.

The William Harvey lecture theatre at Addenbrooke's will host the event at 2pm on March 23 with everyone welcome.

To book a place, visit cam.ac.uk/science-festival/events-and-booking/cambridge-university-hospital-chairs-lecture-cracking-the-peanut-allergy.

The new therapy was announced in January and attracted global media interest after finding the treatment was successful in the majority of the children who took part.



Lena Barden and Dr Andy Clark

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Cambridge Science Festival

Dates: 10-23 March

The Cambridge Science Festival kicks off on the 10th March and we think it would make for a fab weekend away.

From science story-telling, science busking and a sensory treasure hunt, to solving a fiendish crime or deciding how you would run the planet, children and families are spoilt for choice.

Events will be taking place at the university, as well as in the city centre and there are so many to choose from. Here are a few of our favourites:

The plant pattern hunt, Botanic Garden (10-23 March). Self-led family trail. Can you discover all of the plant patterns hidden in the Botanic Garden? Pick up an explorer trail from the Garden ticket office and take a trip around the plant kingdom, collecting patterns as you go.

Meet the little things that run the world (16 March). In this interactive lecture with Dr Ed Turner, insects will be put under the microscope to learn more about their behaviour, natural history and conservation. The session will include some live insects and specimens from the University Museum of Zoology.

Hands-on maths fair (22 March). Famously, GH Hardy described mathematicians, like poets and painters, as makers of patterns, and mathematics as a creative art. Find out what patterns you can discover, and explore your creative thinking and critical reasoning, with hands-on activities, games and problem solving challenges for all ages from five to adult. From prime number hopscotch to origami, it's maths, but not as you may know it

For more information about the Cambridge Science Festival or to book tickets for any of these events, please visit: cam.ac.uk

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Secondary school transition: everything a Y6 parent needs to know

It might seem only the blink of an ago that you were waving your child off on their first day in Reception, but if you've got a child in Year 6 you'll already be starting to think about the [transition to secondary school](#).

We've got lots of information to help you with **school applications** (and **appeals** if you didn't get your first choice), plus tips to help you **prepare your child for the move**, get everything ready for the first day (including the **5 things you must do before starting secondary school!**) and help your child find their feet during those first daunting weeks.

- [School admissions appeals forms](#): a step-by-step guide
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Can you spot the connectives in each of the sentences below and write it next to it?

CONNECTIVES or conjunctions are joining words. We use them to -
 - link sentences together
 - to extend a sentence

I can't go to bed **because** I've brushed my teeth.
 We walk to school **because** school is close.
 I'd like to go to the park to play **and** see my friends.
 Mum said I could have cake **if** I ate my fish.
 My brother and I went to the shop **but** to the school play.
 Star Wars is my favourite film **so** I've seen it six times.

George felt the teacher was better with a good class **but** I was going to have packed lunch. I'd forgotten my lunch box.

www.theschoolrun.com

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Mixed numbers on a number line

Put all these fraction cards on the number line. Can you work out where they should go on the number line below?

1 3/4 4 1/2
 1/2 4 3/4
 2 3/4 1 1/2
 2 1/2 3 1/2

0 1 2 3 4 5

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[Mixed numbers on a number line](#)

Washing line patterns; cursive patterning practice 1

Use the washing line pattern to create your own cursive pattern. Write the letters of your name in cursive on the washing line.

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Explaining probability

Probability is when we make judgements on whether something is likely to happen or not.

Probability can be described in words, or made according to lots of fractions and percentages.

Repeat: Heads Tails 1 2 3 4 5 6

Where would you put these statements on the probability line above?

A coin will always land on heads.
The more I roll the die the more I will get a 6.
Water will boil when I boil it.
It is impossible to get a 7 on a die roll.
There will be a snow day next week.
There will be a snow day next week.

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[Explaining probability](#)

Irregular plurals wordsearch

What does it mean to be a noun? Can you find the nouns in the sentence below?

When I was a boy I had a dog. He was a golden retriever. He was very friendly. He was very smart. He was very happy. He was very healthy. He was very beautiful. He was very brave. He was very kind. He was very generous. He was very helpful. He was very honest. He was very hardworking. He was very intelligent. He was very talented. He was very funny. He was very cute. He was very lovable. He was very loyal. He was very devoted. He was very obedient. He was very obedient. He was very obedient.

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[Irregular plurals wordsearch](#)

FREE science activities for kids



Bounce across the surface of Mars, build bridges out of chocolate, dive into the human body and more at these amazing science events for families.

The [Big Bang Fair](#) at the NEC Birmingham, is FREE for families to attend on 15 and 16 March. Register now!

The [Cambridge Science Festival](#) family events (some free) take place on 15-16 and 22-23 March.

Maths homework worries sorted!

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From area to word problems, our [primary-school numeracy glossary](#) offers a complete guide to all the **maths concepts** taught in EYFS, KS1 and KS2.

Brush up on your own mathematical skills, clear up homework confusion and **understand exactly what your child is learning at school** by reading our basic definitions (with links to more detailed explanations, teachers' tips and examples).

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Can science determine what makes a family?

What makes a family? A team of leading researchers in family development reveal new research that could answer this question on Thursday 20 March at the Cambridge Science Festival.

By Editor Cambridgeshire 04/03/2014 11:20 am
Published by: Families Cambridgeshire

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What makes a family? A team of leading researchers in family development reveal new research that could answer this question on Thursday 20 March at the Cambridge Science Festival.

Families have changed a great deal in recent decades. Just as there are a range of families, there are an equally diverse range of answers to the question, 'what makes a family?'

Who can become a parent and how families are formed has changed in the last 30 years. New research that looks

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at families helped by assistive reproduction technologies (ARTs), same-sex parenting, single parent families, and the role of the family in child development, allows researchers to uncover insightful facts about the mechanics of modern family life.

This event will explore the questions science asks about how families are formed, how they develop and the role they play in the people we become. The role of siblings, parenting as part of a minority group, same-sex parenting, single parenting, children's contribution to family development and a range of other topics will be explored with the aim of extending our understanding of what makes a family.

Speaking about the research behind this event, Dr Kate Ellis-Davies from the Department of Psychology, University of Cambridge, said: "It's often said that there is no such thing as a baby per se, because there is always baby 'and'... There is a baby and those around the baby who nurture and support that baby developing. Traditionally, in society and research, the focus of the 'and' has been on a mother and father, making up what is commonly referred to as a 'nuclear family', with the mother taking on the nurturing role and the father present as provider. There has been a bias towards studying these family types, with much of the research attention placed on the mother. As time has gone on, research has expanded to consider the role children have in their own development. A child's temperament, gender and age are all areas researchers here at Cambridge consider when seeking to explain family development.

"More recently, there has been an acknowledgement that those who raise a baby may be formed of different people and look very different to the nuclear family stereotype. Single parents, same-sex parents, adoptive and foster parents, or grandparent caregivers are all people who take on the task of forming their family and caring for their baby. These diverse family forms have helped to shift developmental research from describing the family in terms of structure to a description of families by how they function.

"One example of broadening the samples of family research is the on-going work at the Centre for Family Research (CFR), where researchers have worked with same-sex parents and their children. Over the formative years of development, this work has demonstrated that many of the processes we consider important for healthy child development are evident whatever the sexual orientation of parents. Parents and children's well-being in these families has been of interest to recent studies and on-going work at the CFR continues to explore the



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processes of families in different family structures.”

Dr Ellis-Davies described further examples of current work into family development, including recent studies at the University of Cambridge that explore the role of siblings in a child’s development. Siblings research aims to explore the role siblings may have on the learning and well-being of children throughout development.

“An on-going study currently running at the CFR looks to track sibling relationships during important milestones, for example starting at primary school and starting at secondary school,” said Dr Ellis-Davies.

This event will include talks from some of the leaders in family development research from the University of Cambridge and the Centre for Family Research, activities for children around the theme of ‘What makes my family’, as well as how families can get involved and play a part in science as it happens.

Other talks and debates relating to development at the Festival include:

12 March: neuroscientist and gender development researcher, Professor Melissa Hines asks, What’s wrong with pink? Professor Hines will reveal why girls choose pink dolls, while boys play with vehicles of pretty much any colour – as long as it is not pink – and how this illuminates both how humans develop and how societal pressures act upon children.

14 March: When babies know so much about the physical world, why is school science so difficult? Modern research shows that long before their first birthday, babies understand complex relations involving force and motion. Yet precisely the same relations are so challenging when presented in school science that even high performing undergraduates hold significant misconceptions. Professor Christine Howe will shed light on the conundrum, and draw out implications for parents and teachers. University of Cambridge press release

For immediate release: 28 February 2014

15 March: Do hormones in the womb affect how your brain and mind develops? Everyone knows that testosterone makes your muscles grow stronger, your voice deepen, and your beard grow. Less well known is that testosterone produced by the baby in the womb has irreversible effects on brain development. This lecture by Professor Simon Baron-Cohen describes an experiment conducted on hundreds of Cambridge children, measuring their testosterone in the womb and following them as they grow up, to see how this remarkable biomolecule affects their brains and minds.

15 March: Mind patterns and brain structures. Discover how people form memories, what influences gambling behaviour and how the brain develops in adolescence. Learn about research into mental illness or mathematical

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skills in children. Research groups at the Department of Psychology present their latest research through a series of fun and interactive exhibits and posters. For more information about the Cambridge Science Festival or to book tickets for any of these events, please visit: www.cam.ac.uk/science-festival

Further news stories about the Cambridge Science Festival can be viewed here:

www.cam.ac.uk/science-festival/news

To see a range of Q&As with key speakers, please visit: www.cam.ac.uk/science-festival/speaker-spotlights

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About Cambridge Science Festival

Now in its 20th year, the Cambridge Science Festival gives the public the opportunity to explore Cambridge science. Thanks to the support of the University, our sponsors and partners, most of the events are free.

The Science Festival aims to provide the public with opportunities to explore and discuss issues of scientific interest and concern and to raise aspirations and career awareness in the areas of science, technology, engineering or mathematics.

Patrons of the Science Festival are: Professor Simon Baron-Cohen, Professor John Barrow, Dr Claire Cockcroft, Dr Henry Gee, Lord Rees of Ludlow, Professor Malcolm Longair, Mr Tim Radford, Professor Barbara Sahakian, Professor Jeremy Sanders, Dr Andrew Sugden, Ms Carol Vorderman, Professor Jim Secord, Mr Ian Harvey, Professor Andrea Brand, Professor Ron Laskey, Professor Bill Sutherland, Professor John Naughton, Professor Alan Barrell.

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Society of Biology, The Babraham Institute, British Association for Psychopharmacology, the Pye Foundation, Walters Kundert Charitable Trust, and Cambridge City Council. Other Festival partners are Cambridge University Hospitals, the Cambridge Science Centre, Hills Road Sixth Form College and National Science and Engineering Week. The Festival's media partner is BBC Radio Cambridgeshire.

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Cambridge Science Festival celebrates its 20th anniversary

4/03/2014



The Cambridge Science Festival, which starts on Monday (10th March), celebrates its 20th anniversary this year. The Festival - which runs until 23 March - offers a huge range of talks and hands-on activities. And thanks to the generosity of the University, Festival sponsors and partners, most of the events are free.

The Science Festival aims to provide the public with opportunities to explore and discuss issues of scientific interest and concern and to raise aspirations by encouraging young people to consider a career in science, technology, engineering or mathematics.

Last year, the Festival welcomed more than 30,000 visitors to over 200 events and received extensive national and local media coverage. Over 170 event coordinators organised talks, interactive demonstrations, hands-on activities, film showings and debates with the assistance of around 1,000 staff and students from departments and organisations across the University and research institutions, charities and industry in the eastern region. In addition, over 140 people volunteered their time to act as stewards to ensure visitors had a safe and enjoyable Festival experience.

Bookings are now open for this year's event, which includes more than 250 inspiring talks, films, debates and hands-on activities.

[Visit the Festival website.](#)

[Download the programme here.](#)

The official app for the 2014 Cambridge Science Festival is available for iPhone and Android. Search, book and organise your events, access videos, photo galleries and competitions, and be the first to hear Festival news. Features include a personal Festival planner with reminder options and maps to help plan your perfect Festival.

[Download the free Science Festival app](#)



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CAMBRIDGE SCIENCE FESTIVAL

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Written by Nicola Foley on 24 February 2014.

What's new in space? Why do coincidences happen? Why do cats make us sneeze? These are just a few of the questions being explored at this year's Cambridge Science Festival, taking place at venues across the city, 10-23 March.

Over 250 inspiring discussions, hands-on activities, tours and talks are planned on every subject under the sun, from genes and the universe to snot, brains and the science of cycling.

"The Science Festival has grown significantly since its modest beginnings 20 years ago and today is recognised as one of the most exciting science festivals in the world," says event co-ordinator Shelley Bolderson.

This year's festival, which explores themes of 'structures and patterns', is bursting with fascinating events, kicking off with a variety of pre-festival special shows. For starters, there's *The Meaning of Success* on Wednesday 5 March – an event celebrating International Women's Day 2014, featuring insights from the women of Cambridge University, their stories and achievements.

The main Science Festival begins on Monday 10 March, with a flurry of fantastic events to get stuck into. Discover *What's New in Space* at St Catharine's College, go behind the scenes at the *World's Oldest Start-Up* (Cambridge University Press), or attend a talk on science and faith, presented by Dr Conor Cunningham. Another highlight for opening day is sure to be the *Science Festival Ceilidh*, which features special science-themed dances including the 'Nuclear Fusion', 'Wave-Particle Duality in 6/8 Time' and 'Mr Schrödinger's Maggot.'

Other highlights include *How To Be Immortal* - a play about science, love and living forever; a hands-on session about sensory perception (is seeing believing? How can illusions fool our brain?); a concert of film music by the Cambridge Graduate Orchestra and a talk on whether science can make you cycle faster, with Professor Tony Purnell, head of



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technology for British Cycling.

Or, join comic and science champ Robin Ince at the Cambridge Union as he talks art and science on 15 March, then learn the mathematical secrets behind The Simpsons the following day.

Find the full festival programme with prices, times and locations at www.cam.ac.uk/science-festival

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The art of scientific photography at the Cambridge Science Festival

Posted on Tuesday 4 March, 2014 by [Daniela Bowker](#) in [Events](#), [News](#) | [No Comments](#)

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The Cambridge Science Festival opens on Monday and as part of its incredibly diverse and packed programme, it has teamed up with the Royal Photographic Society (RPS) and Dr Stefanie Reichelt, a scientist at the University of Cambridge's [Cancer Research UK](#) Cambridge Institute, to focus on the science of photography and the promotion of scientific photography. They're providing a range of talks, lectures, demonstrations and exhibitions, with something that should appeal to everyone.



Saturday 15 March will be devoted to the subject of imaging and imagery. It starts with a talk asking just how many megapixels you really need and precisely how many do you really get and ends with a talk about developing the imaging tools of tomorrow. This goes via talks on colour vision, high-speed photography, medical imaging and images, 3D and stereo imaging, and whole lot more. The Camper Obscura will also be on-site that weekend. Yes, as its name suggests, its a [camera obscura](#) in a [camper van](#).

As well that day devoted to photography, there are other events related to images taking place over the course of the festival: the life sciences poster and image exhibition, the Inspiring images: engineering captured on camera exhibition, and a digital recreation of the earliest known colour photographic technique and an exploration of what happens when you collect the different elements of the colour spectrum separately.

All of the details of all of the events are available on the [Cambridge Science](#)

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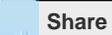
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Festival website. Specific details about the photography-oriented events is [here](#). You don't need to book and the talks are free, but it is requested that you register for the morning or the afternoon session.

Maybe I'll see you there?

Did you enjoy The art of scientific photography at the Cambridge Science Festival? Share it with your friends:

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About Daniela

This post was written by Daniela Bowker, who has written [1255 articles for Photocritic](#)

Daniela has written three books on photography, contributed to several others, and acted as the editorial consultant on many more.

Her newest book, *Social Photography*, is currently available as a [digital download](#) and will be coming to bookstores in the US and UK in spring 2014.



You might also want to check out her exploration of other-worldly photographic creations, *Surreal Photography: Creating the Impossible*, and *Photo School Fundamentals*, for which she contributed the section on composition.

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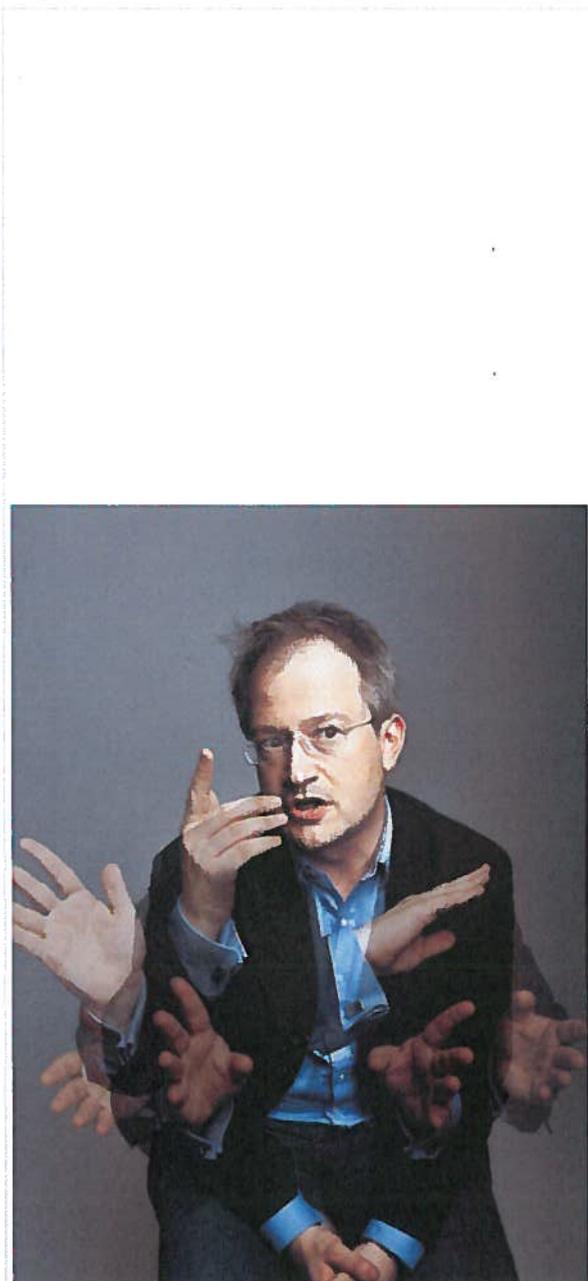
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Our top Cambridge Science Festival picks

Written by: ELLA WALKER



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The 20th annual Cambridge Science Festival kicks off this week, here are our quick fire top picks:

Delve into Robin Ince's mind

The comic, science geek and BBC Radio 4 presenter will be (in and) out of his mind in an "unhinged" but rather funny lecture. (March 16)

Trick your senses

Cambridge Science Centre shows you how to fool your brain and misdirect your senses. Everything is an illusion after all... (daily)

Discover imaginary islands

It turns out quite a few explorers imagined whole islands, find out about the phantom locations at The Polar Museum. (March 13)

What a coincidence!

Professor David Spiegelhalter studies risk and coincidences. He'll be taking the surprising, applying probability and seeing what happens – go get involved. (March 13)

Newton's camera

Discover Isaac Newton's camera, how light can be dismantled and the earliest uses of colour photography at Grand Arcade. (March 14-17)

Bottle your genes

Extract DNA from you own cheek cells and then see what it looks like – don't worry, there'll be trained scientists from ARU on hand to help! (March 15)

Delve into a crime scene

Fingerprinting, evidence collecting and painstaking crime solving – come over all CSI at The Guildhall. (March 15)

Be a rocket scientist

Cambridge University's Department of Chemistry is going rocket crazy with a family talk. Expect bangs, whooshes and facts on how we sent men to the moon. (March 15-17)

How do you feel about your body?

This is what theatre duo New Art Club is questioning in a "sexy and entertaining" show all about being in a human body at Cambridge Junction. (March 15)

What is a star made of?

Using bicycle pumps and bits of microwaves, Dominic Ford and Dave Ansell are going to show you how to detect a planet a hundred light years away, and what a star is made of. (March 16)

Star Trek mathematics

The Arts Picturehouse is holding a Star Trek session on the math of Khan. Science and sci-fi collide... (March 17)

Download a full programme at cam.ac.uk/science-festival.

∴ Cambridge Science Festival, in and around Cambridge, Monday, March 10 – Sunday, March 23. For tickets, locations and details, visit cam.ac.uk/science-festival



Catch the amazing British Sea Power at Cambridge Junction



FAMILY SLIDESHOW: Amazing harness enables St Neots 4-year-old Bella Lockett, who has cerebral palsy, to walk down aisle as flower girl



RUN BLOG: Running Mad, week five of Haver10 training

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Robin Ince

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FAMILY

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FEBRUARY 23, 2014 Posted by ADMIN in UNCATEGORIZED



Live orchestra and theatrical film blend in a 'black hole' adaptation of *Icarus at the Edge of Time*, part of this year's Cambridge Science Festival. **Sam Hetti (24 Feb'14)**

Icarus at the Edge of Time by **Brian Greene** features music by **Philip Glass** and film by **AI + AI**, in a premiere of the work by **Tim Watts**. The work posits the question: what if Icarus travelled not to the sun but to a black hole?

The answer appears on 17 March when Cambridge University Musical Society Symphony Orchestra will perform *Icarus* in an orchestral reworking of the Greek myth conducted by **Ben Glassberg** and featuring Gresham professor of astronomy **Carolin Crawford**.

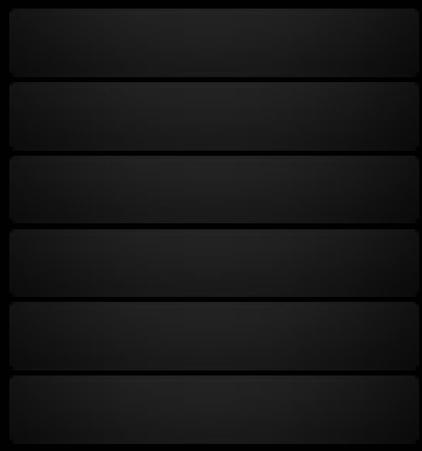
Performance narrator **Patrick Morris** of Menagerie Theatre said: "The piece is a glorious clash of live music, theatrical narration and video, wrapped up in a modern retelling of a classic tale. I've always loved the Icarus story and the exceptionality of this piece certainly rivals Icarus' own ambition – hopefully without the same consequences! The different layers of the voice, the music and the visuals should make it a real feast for the senses – something like a rollercoaster ride in space."

Professor Crawford commented: "*Icarus* is not only a breath-taking performance that combines live orchestra, narration and a companion film – but it also provides a wonderful vehicle to introduce scientific concepts. The story plays with the ideas of general relativity, and explores how the passage of time is

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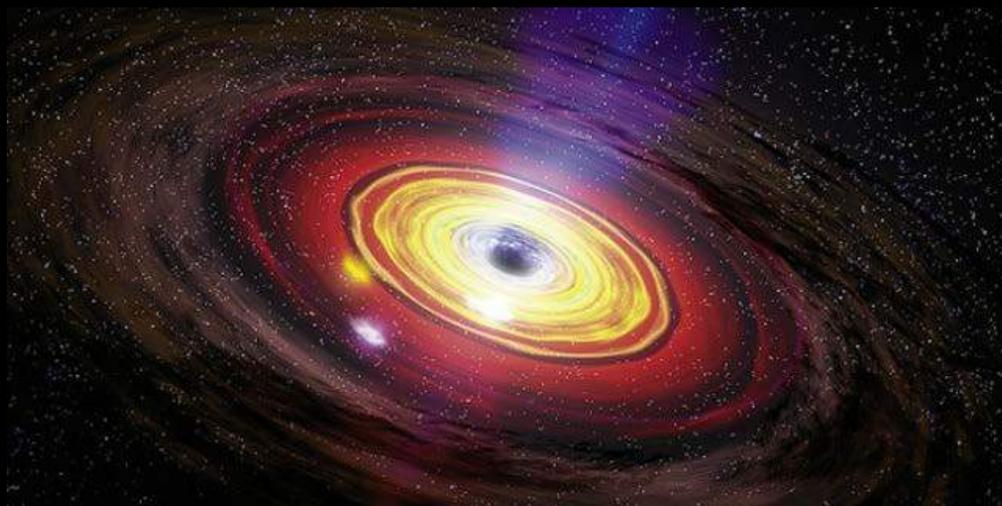
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affected by the extreme gravity of a black hole.”

Elsewhere, on 10 March, **Jane Chapman** (pictured above) ‘Britain’s most progressive harpsichordist’ will explore the creative potential of structures and patterns in old and new works. Of the three world premieres on the programme, works by **Alex Cook** and **Gabriel Chernick** engage in musical dialogue with the 400-year old music of **Sweelinck**, while Tim Watts’s new piece takes inspiration from the Natural History Museum’s dodo skeleton.



Icarus on course (Phil Plait)

Jane Chapman said of the concert, *Structures and patterns in music*: “Be it in the mesmerising extreme velocity of Ligeti’s *Continuum*, which ‘hums and jangles like a ghostly vision’, or the beautiful strains of Sweelinck’s *Lachrimae*, with its soulful ornamentation and variation, pattern and structure can be central to the creation and appreciation of music. Rameau’s depiction of birdsong and the forging of thunder bolts, Kang’s relentless evolving jazz rhythms, Kraus’s heroic harmonic mountain climb, the motoring twisting patterns in Toccata by Chernick, lead us to the world of myth and legend as the dodo returns. Also new works exploring the vibrant and evocative qualities of the harpsichord by Cook and Watts, and contemplative expressive sounds from Armstrong. This eclectic concert takes the harpsichord from the 16th to the 21st century.”

On the same day, a *Structures and patterns in music*: composition workshop for GCSE students will explore the creative potential of structures and patterns in musical composition encountered in music by Sweelinck and Ligeti. Students will learn about the expressive world and technical possibilities of the harpsichord, including some unexpected extended techniques, working towards a collective composition taking inspiration from elements of variation technique and their connections with the natural world.

Other events:

The Cambridge Graduate Orchestra (CGO) performs *Music and Science*, Friday 14 March.

SciBar (science in a bar) event, Thursday 20 March when Dr Satinder P Gill, from the Centre for Music and Science, asks, ‘*Can we live without rhythm?*’

On 22 March, *How to make music with Raspberry Pi* allows visitors will the chance to learn some basic coding, allowing them to create music on the Raspberry Pi computer.

Last year, the Cambridge Science Festival welcomed over 30,000 visitors to over 200 events which included organised talks, interactive demonstrations, hands-on activities, film showings and debates.

Icarus at the Edge of Time, commissioned and produced by the World Science Festival (New York) with the Alfred P. Sloan Foundation, and Southbank Centre (London) with The Royal Society. Co-commissioned by Associazione Festival della Scienza, Baltimore Symphony Orchestra and Glasgow’s Concert Halls.

Executive producers: Tracy Day, World Science Festival, New York and Gillian Moore, Southbank Centre, London.

See preview of *Icarus* at:

www.cam.ac.uk/science-festival/events-and-booking/icarus-at-the-edge-of-time

Patrons of the Science Festival: Professor Simon Baron-Cohen, Professor John Barrow, Dr Claire Cockcroft, Dr Henry Gee, Lord Rees of Ludlow, Professor Malcolm Longair, Mr Tim Radford, Professor Barbara Sahakian,

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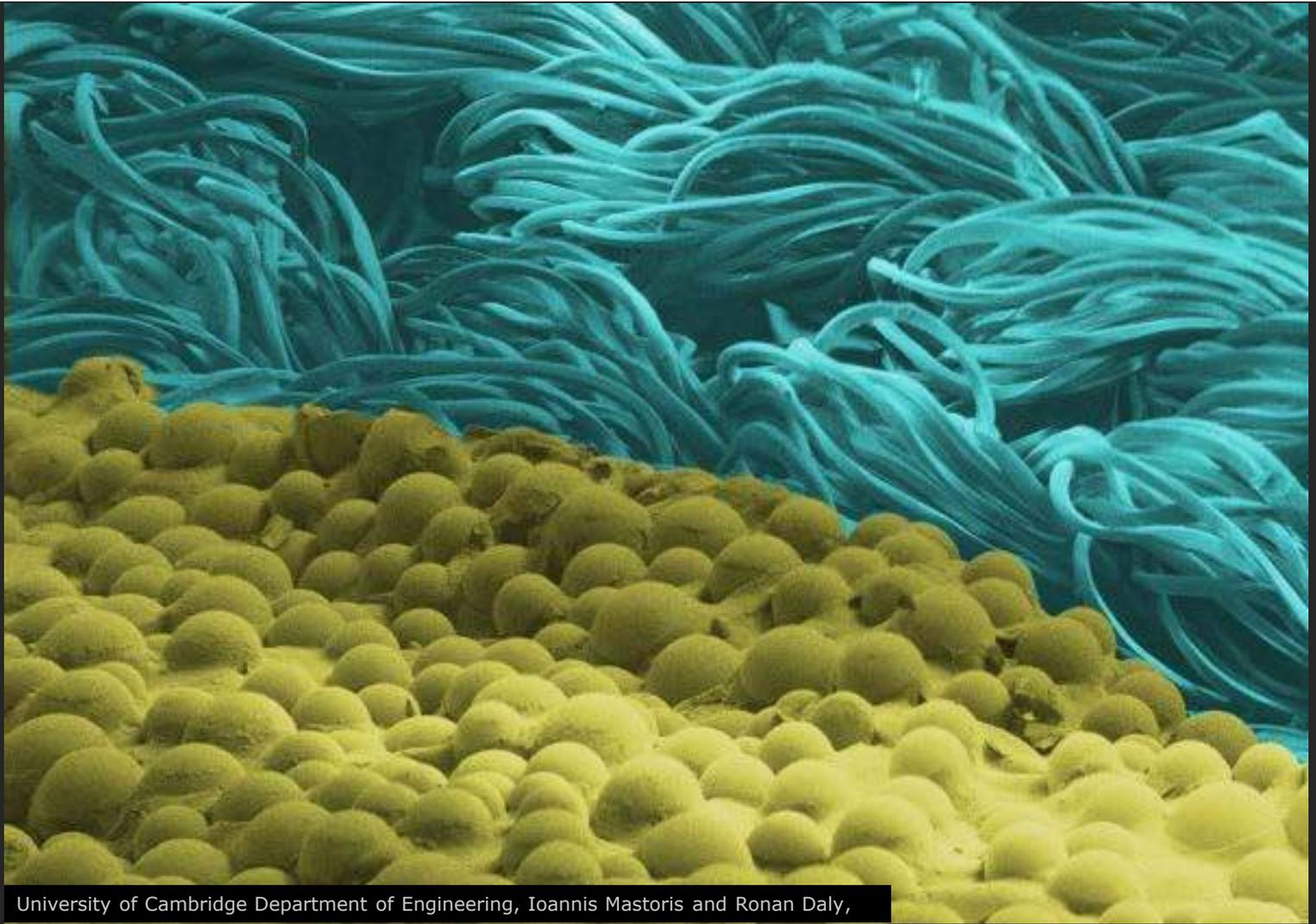
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Mon 03 Mar 2014

CAMBRIDGE SCIENCE FESTIVAL - INSPIRING IMAGES: ENGINEERING CAPTURED ON CAMERA



University of Cambridge Department of Engineering, Ioannis Mistoris and Ronan Daly,

From rainbow coloured liquid-crystal molecules, to tunnels deep under the ground, this year's images from the University of Cambridge Department of Engineering photo competition help to bring engineering brightly and vividly to life.

Laser light diffracted by a hologram, microscopic details from a man-made fabric and photos from the deepest tunnels of the London Underground are among an array of stunning images on display as part of the Cambridge Science Week.

The annual photography competition aims to show that engineering is not only about fixing machines and building bridges, but involves everything from studying objects and processes in microscopic detail, to building towering structures. Whether a professor, student, or member of support staff.

Philip Guildford, Director of Research, said that entries for the competition had once again impressed the judging panel. "The winning images are diverse, beautiful and meaningful," Guildford said. "They all tell wonderful stories of engineering students, researchers and academics seeking to discover new scientific truths and advance technology. The winners give an eye-catching glimpse of work in the Department of Engineering, but there were over 150 other entrants this year, each communicating their unique message of how engineering is advancing and helping the World. The breadth and quality of work is quite staggering."

The first place prize was awarded to Ananta Palani's entry entitled "Diffraction Sun". The PhD student

shone a laser light onto a small liquid crystal device, causing the light to interfere with itself and become diffracted. Palani's sun-like image is the result of this diffraction. The research behind this image could potentially help create a microscope that would allow people to see very fast and very small objects, such as a virus infecting a cell, which at the moment can only be observed with great difficulty.

Ioannis Mastoris and Ronan Daly were the joint winners of the second prize with their electron microscopy image of the reflective coating and fibrous cloth of a man-made fabric. This photograph was taken as part of a research project focusing on the lifecycle of these fabrics, from which the findings could be utilised to help decrease the environmental impact of the fibre-dyeing process. Phil Catton, who works in the Department's Centre for Smart Infrastructure and Construction (CSIC), won third prize for his image entitled "Mirror Finish". In this photograph researchers are using a 3D laser scanner to measure deformations in the London Underground Northern Line station at Euston. The information collected will then be fed into CSIC-developed models for analysis, in order to predict the behaviour of future complex tunnel geometries; these predictions will be a valuable tool in the future as new underground tunnels are built.

Inspiring Images: engineering captured on camera

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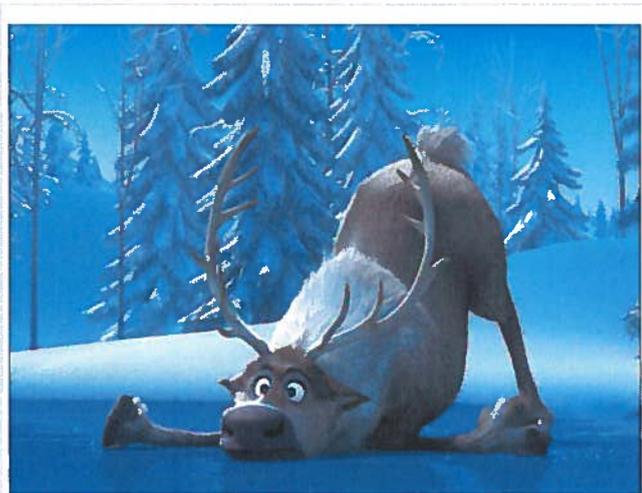
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10 things to do with the family (March 6 - 13)

Written by ELLA WALKER



3 images

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1. Get ready for Cambridge Science Festival

WHIZZ! Bang! Crackle! The British Science Association is bringing a host of exciting experiments to the Grafton Shopping Centre on Saturday for you to get stuck into. From 10am until 4pm the Science Busking sessions is a chance for all ages to be hands on with a range of scientific marvels – and it's free to take part! The full festival starts on March 10, visit cam.ac.uk/science-festival for more details.

2. Go to a show

SING, dance and don a leather jacket for Sing-a-long Grease at Cambridge Corn Exchange! You'll get to watch Danny and Sandy fall in love and race around kicking up their heels, while you sing-a-long with all the summer lovin' tunes – plus, dressing up is very much encouraged. The show is on Friday and you get a free goodie-bag too! What's not to love? Suitable for all the family, tickets are £13.50 for children and £15 for adults. Call (01223) 357851 to book your seats.

3. Watch a film

DISNEY is back on form with its latest enchanting and sparkling animation Frozen,

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Susan Boyle

loosely based on The Snow Queen. Grab your popcorn and settle down to see independent, self-assured heroines (and sisters) Anne and Elsie battle the elements and their own fears as they fight for the throne. Pecked with laughter, fun, music and snowflakes that appear to be falling on you, it's showing at the Arts Picturehouse on Saturday at 10.30am (autism friendly screening) or 11am (Kid's Club screening). It costs £1.50 per kid's club member or £3.50 per non-members. Book on 08719025720.

4. Tramp round the park

THE crocuses are popping up which means it's practically spring! Wreap up and head outside for a run around the park. We'd head to Priory Park in St Neots for the zip line, Huntingdon Country Park for making dens in the woods or Jesus Green for the pirate ship playground. A-ha me hearties! Don't forget to pack some snacks!

5. Meet a meercat

TAKE a peek at the meercats that live at Shepreth Wildlife Park. You can watch them poking their heads up daily, but at 4pm you can find out all about the adorable little creatures from the park rangers during a talk. Usual admission applies, but to actually get up close and personal with the meercats for an hour, tickets cost £75 per person. Call (01763) 262226 for more information.

6. Get arty

FEELING arty? Head to Kettle's Yard on Castle Hill for an afternoon of drawing and exploring this Sunday. From 1pm to 4pm the gallery will host its twice-monthly Studio Sundays sessions, where you can be inspired by the gallery's exhibition (currently a lot of turquoise seascapes dotted with boats and brightly coloured flowers in Art & Life: 1920 - 1931) and create artworks of your own. There's also a crafty prop-box to rummage through packed with family-friendly activities. Best of all, it's completely free - just drop-in. Visit www.kettlesyard.co.uk or call (01223) 748100 to find out more.

7. Be a mucky pup

UNDER 5s can chuck on their wellies and head outside to be mucky pups at Wicken Fen on Wednesday. The 'Springtime Adventure' themed session is a chance to get stuck into some seasonal crafting and outdoorsy adventuring. The daffodils might even be out! Don't forget scarves, hats and gloves! Places cost £4 and the morning runs from 10.15am until 11.45am. Call (01353) 720274 to book your child's place.

8. Go for a dip

WHY not go for a splash about at the pool? On Saturdays, Parkside Pools in Cambridge host a fun swim session in the main and diving pools from 2pm until 4pm. Perfect for 0 - 15-year-olds, grab your cozzie and leap right in, then front crawl your way home... Call (01223) 446100 for prices and press information.

9. Have a sing-song

MUSICAL mums and babies can put their vocal chords to the test at Rhymetime at Cambridge Central Library. Suitable for 0 to 18-month-olds and their grown-ups, you can happily clap, squawk, cry, rhyme and hum along as you wish and make similarly vocal friends while you're at it. It's on every Thursday (2.30pm - 3pm) and Saturday (10.30am - 11am) and is completely free. Call 03450455225 for more details.

10. Go to the zoo

IS the cold weather getting you down? Imagine how the kangaroos at Linton Zoo must feel, braving the chilly drizzle. Instead of hopping about the outback (it's summer in Australia at the moment don't you know!), cheer them - and yourselves - up with a visit. The centre (which also has lions, snow leopards, parrots and a lot more colourful creatures), is open from 10.30am until 4pm on the weekends. Entry is £9 for adults and £6.50 for children. Call (01223) 891308 for more details.

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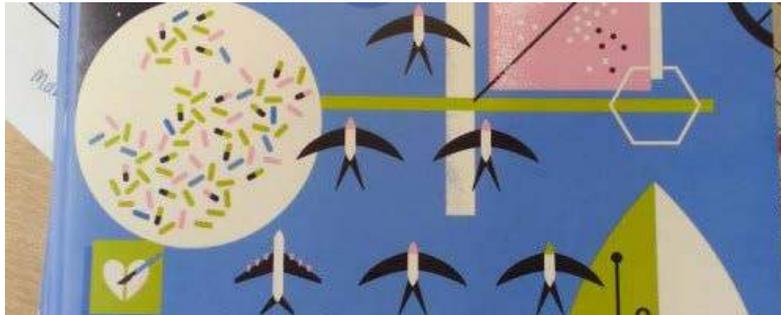
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Girls prefer pink - but only because they've learned to, says a Cambridge psychologist

Written by EMMA HIGGINBOTHAM



2 Images

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We modern parents are a liberal lot, aren't we? If our toddler daughter wants to dress up as a cowboy and play with toy trains – great! If our little boy wants to wear a tutu and push a pink pram – fantastic!

Actually no. Not according to Cambridge University's Professor Melissa Hines, anyway.

As a psychologist specialising in gender development, Melissa spends an awful lot of time watching how parents interact with their kids – and our behaviour isn't necessarily as liberal as you'd assume.

"Parents rarely discourage their children from doing things, unless it's aggressive things, but just in terms of activities, parents typically like to find out what interests their child and then facilitate that. But Boys playing with girls' things is an exception," says Melissa with a chuckle.

"If you watch parents playing with their children, you'll find that they don't mind if girls play with boys' toys. The only thing they discourage is boys playing with girls' toys."

But why? "We don't know for sure, but I would speculate that it has to do with the lower status of women," she says. "You don't want your children to do something that is typical of a lower-status group." Yikes! Isn't that a bit controversial? "I don't think so," shrugs Melissa.

Most aspects of our gender-related behaviour develop as a result of our biological make-up, she says, "so part of the reason that girls gravitate towards dolls, and boys towards cars and trucks, has to do with their hormone environment,

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prenatally and just after birth.

"But it's also heavily socialised," she adds. "Not just parents but peers, teachers, even strangers encourage children to play with sex-type toys."

These days it's easier than ever to see what toys are 'for girls' rather than boys, thanks (or not) to the colour pink, which Melissa will explore as part of this year's Cambridge Science Festival. The event, next Wednesday night, is called What's Wrong With Pink? - and I get the feeling she'd quite like to remove that question mark.

"Pink is special," says Melissa with a smile. "Pink, I think, is probably pretty much socialised. We could make any colour 'the girl colour'. It could be yellow! And why do I think this is the case? Well one thing is if you look at very young children, say 12 to 24 months old, they already show these toy preferences. They aren't as dramatic as when children are a bit older, but they are emerging.

"But," she says firmly, "the preference for pink for girls isn't there yet. ALL young babies - boys and girls - like reddish-pinkish colours better than other colours. And then at about age 3, girls start to preferentially like pink, and boys to avoid pink."

Why? "It's probably a marketing tool. So if pink is for girls, then you can't have your brother's old tricycle, can you? You're going to have to get a new one for your daughter, because she's going to want a pink one.

"Girls like dolls, and they get dolls that are pink. They probably get clothes that are pink, and they like those clothes and other items that are pink. And so they learn to like pink."

Yet interestingly, pink isn't historically associated with girliness: "It became much more dramatic post-war," says Melissa. "Before that you would see pink for boys: I have a picture of a Victorian doll that's a boy all dressed in pink; Churchill's racing colours were pink and brown, my son went to a school in London where the boys all had to wear pink football costumes historically. So there was a time when pink wasn't so off-limits. But now it is."

Is that necessarily a bad thing? "Well it channels people into a limited range of behaviours, so I think it's potentially not a good thing," says Melissa. "If you think that only things that are pink are for you - and none of the blocks, or cars, or things that are generally for boys are pink - then you won't have those experiences.

"And similarly for boys, if they can't have pink things. Maybe they would like to play with dolls, some of them, and why should it be kind of labelled as 'not for them'?" So she's a fan of the Pinkstinks campaign to destroy the (potentially stifling) 'pinkification' of girlhood, then? "Yeah, I like Pinkstinks," she grins.

It's a fascinating subject, and one that Melissa has been studying for many years. Her research has centred extensively on toy choices: back in the 1990s, she and her colleagues famously tested whether male and female vervet monkeys preferred traditionally male or female human toys.

"We gave them sex-typical toys - cars are for boys and dolls are for girls, and sex-neutral toys - like a picture book and a stuffed animal toy. And so our question was, would they show sex differences in their preference for these toys?"

"We do a similar thing with children: we bring them into a playroom and we record what they play with; that's how we empirically show that boys play with cars and trucks more than girls do, and girls play with dolls more than boys do. And we found a similar thing in these vervet monkeys."

It's perhaps not surprising that the female monkeys preferred dolls, given their nurturing role ("The girl monkeys do spend a lot of time with the baby animals, and this doll had a round pink face, kind of like a baby monkey"). But what is surprising is that the male monkeys preferred human boys' toys. Where they expecting that? "Well we were testing that idea, but we were surprised, actually," admits Melissa.

"Another research group has done a similar study in Atlanta, and they've found that male monkeys like wheeled toys." But surely a monkey has no experience of wheels? "Exactly! So it's made us rethink what these toys are about. So we've been looking at things like: is it the shape? Are the girls' toys more rounded and the boys' toys more angular? It doesn't seem to be that.

"So we went back to people, and thought, well let's see if we make the toys in the 'wrong' colours, will that influence whether children are interested in them?" It didn't. "And that's how we found out that young girls don't already prefer pink.

"So it might be motion. Males may like to watch things move."

Originally from Washington DC, Melissa originally intended to study aggression: "I grew up in an era of a lot of violent behaviour: people assassinating presidents, mess murderers... and I thought why are people doing these things? And then I discovered it's very hard to study aggression, so I got interested in gender development more broadly."

She had her very own case study in her (now grown-up) son, of course, who typically loved to play with vehicles and toy soldiers. Did she try giving him girly



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things? "He would ignore them," she shrugs.

So will people learn anything new at the event? "I think they're going to be surprised that the things that make girls like a doll are different from the things that make a girl like pink," says Melissa.

And should we be training our children to play with the toys of the opposite gender? "Parents generally encourage their children to do the things their children enjoy, and that's probably a good practice. Although breadth of experience is a good thing too, so they might try introducing them to other things. But," she adds, smiling again, "as with my son, they might ignore those other things." And parents of boys can feel free to (secretly) sigh with relief.

What's Wrong With Pink? is at the Mill Lane Lecture Rooms, Mill Lane, Cambridge, on Wednesday (March 12) from 8pm to 9pm. Pre-book by visiting cam.ac.uk/science-festival or calling (01223) 766766.

The Cambridge Science Festival runs from March 10 to 23; see cam.ac.uk/science-festival for the full line-up.

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"The athletes are god-like beings": Rio, British Olympics and the science of cycling

By Becky Wiczorek | 19 February 2014
Tags: Cambridge | Cambridgeshire | Passions | genetics | All tags

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Tony Purnell is a former principal of the Jaguar Formula 1 team and the new Head of Technical Development for the Great Britain Cycling Team. A key member of the Olympic effort, he appears at Cambridge Science Festival



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"My first year at British Cycling has been utterly fascinating – so much to learn, and all the time I feel a tap dripping on my head reminding me that the Rio Games are getting closer and closer.

Getting a new team together and accepting that the budgets to do this sort of work are a fraction of the sort of money Formula 1 would spend is the biggest challenge. This actually makes it more fun as one has to be clever to achieve anything: one can't just buy results.

My goal is to make the British Olympic team more competitive in any way I can dream up.

It's odd just how many engineers one finds who are fanatical cyclists. There's something very easy to understand: to go fastest, one simply needs more power from the legs, less weight and less aerodynamic drag from the body.

Dig a little deeper and there's an infinite array of interventions that one can think of to achieve this, but each one can be complex and challenging to implement.

The cycling world certainly has woken up to aerodynamics. I don't see any breakthroughs here, just steady evolution towards lower and lower drag.

I think the breakthroughs are and have been in training regimes and understanding that recovery is as important as smashing yourself on the bike.

The athletes are god-like beings. It's hard to understand that I'm the same species.

I'm an average performer on the bike and believe me, if I could turn myself into a medallist I would. We can only hope to give them a little bit of an edge. Every little saving in energy helps.

There's no getting away from it, talent helps. Get a Chris Hoy or Chris Froome and life can be relatively easy.

This said, without the backup the chances of them being able to perform drop considerably. Leadership in sport comes with having a good organisation, well financed, and with real expertise within it. But then you need to add the talent."

- **Tony's talk, [Can Science make a Cyclist Faster?](#), is at [Cambridge Science Festival](#) on March 14. [Book online](#).**

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Two exciting decades of scientific fun and games

Written by CHRIS ELLIOTT



15/03/03 Cambridge Science Festival. Children watching experiments with Liquid Nitrogen. Picture by Richard Patterson.

6 Images

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Space travel, evolution, medical breakthroughs, mobile technology – all these subjects, and many, many more, will feature in this year's Cambridge Science Festival, which begins on Monday.

This year it is 20 years since the event that inspired the Cambridge festival, National Science Week, first came into being.

Back in 1994, many scientists, including senior figures at Cambridge University, wanted to do more to enthuse people to pursue careers in science and engineering, and the idea was to catch them young.

The emphasis was on staging exciting events to capture children's imagination. In 2001, for example, pupils all over our region took part in an attempt to create a world record for the number of people jumping into the air at the same time.

As a result, the Cambridge Science Festival, pioneered by Cambridge University and backed by local businesses – including the News – was launched, and it has now become a much-anticipated highlight of the city's annual events calendar.

Our photographs today include pupils at Kedington primary school taking part in 2001's world record attempt – by landing all at once, they hoped to make the water on the table in front of them move – and two pictures from 1995, showing a young man posing for a skeleton photo, and families enjoying a simple experiment on

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Susan Boyle

the New Museums site in Downing Street: university students are pumping a drinks bottle with air, to try to make it fly.

In 2003, children are watching experiments with liquid nitrogen, and in 2007, pupils at Swavesey primary school are being shown how to make bread by staff from the university's Department for Plant Sciences – and two young science fans are finding out how big a dinosaur's foot was.

Prof Jeremy Sanders, the university's Pro-Vice-Chancellor for Institutional Affairs, told Memories: "We're delighted that the festival has proved so popular over the years with people of all ages from the city and far beyond. The festival is valuable for the university's researchers and students, just as it is for the festival attendees, as university members take the opportunity to share their enthusiasm, make use of their communication skills and discuss topics from astronomy to zoology with visitors.

"We have seen local school pupils who have attended the festival for years then enter the university as science students and take part in the festival themselves as inspiring demonstrators."

Details of festival events can be found at www.cam.ac.uk/science-festival.

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International Women's Day 2014: Ten of the best places in Britain to be inspired

07 March 2014
Tags: women's history | suffrage | women's suffrage | Passions | All tags

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Special festivals, the World War I centenary programme and dancing feet play their part in this year's International Women's Day



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Women of the World Festival 2014 at the Southbank Centre

Saturday and Sunday passes have sold out, but limited tickets are available for individual events and much of the programme is free at the Southbank's broadminded weekend of events and exhibitions. It ranges from a debate on Page 3 in the company of Katie Price and a talk with adored actress Maxine Peake to club nights and two exhibitions: JD 'Okhai Ojeikere's Hairstyles and Headdresses is the first UK exhibition of work by the renowned Nigerian photographer who recently passed away, while Iraqi-born artist Jananne Al-Ani portrays the landscapes of the Middle East through films and photographs at the Hayward Gallery.

The Georgian House which became a First World War military hospital at Dunham Massey

National Trust-owned and set within a deer park, this Cheshire site was turned from a country estate into a temporary hospital by three women during the war. Discover their story in the recently-opened exhibition, Sanctuary from the Trenches – A Country House at War.

Victor Tardieu's paintings of wartime nursing at the Florence Nightingale Museum

A French painter who served in World War I, Tardieu made oil depictions of the volunteer field hospital at Bourbourg, near Dunkirk, in 1915. Nearly a century on, they provide the museum – which has recently acquired them – with beautiful focal points for an examination of the history of nursing during the Great War and the role of female volunteers on the battlefields of France and Belgium. The Hospital in the Oatfield - The Art of Nursing in the First World War runs from March 13 – October 26 2014.

Tales of jewel trading at the Museum of the Jewellery Quarter

Birmingham Museums and Art Gallery's exhibition, An Adaptable Trade: The Jewellery Quarter at War (from June 14), considers the effect of World War I on the jewellery trade, revealing the role of women in an industry which adapted swiftly to the challenges of the time.

Downton Abbey style at Bath's Fashion Museum

The status, class and position of women altered dramatically during World War I, as well as society's views on what women were allowed to wear. Uniforms, civilian dress, memorabilia, propaganda and, glamorously, numerous costumes from the series Downton Abbey feature in The Great War in Costume: Family and Fashion on the Home Front (July 19 – September 5), the Fashion Museum's take on an era of change.

A forgotten philanthropist and badge-making in Liverpool

9 April 2014

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Southwark Local History Library and Archive



Find out about Emma Georgina Holt, a key figure behind the University of Liverpool halls of residence, in a talk at the city's **Sudley House** (March 8, 1pm). Then join a special workshop at the **International Slavery Museum**, inspired by the women on the Black Achievers Wall. This badge-making session is called Girls are Great (1pm-4pm).

Poetry and song in Yorkshire

Huddersfield's **WomenCentre** returns with an evening of singer-songwriters for a second year – this time featuring Iranian folk song, blues and a new piece of poetry created by Alison Lock and based on the thoughts of local women.

Comedy, performance and theatre with Bridport's feminists

Top comedian Shappi Khorsandi is at **Bridport Arts Centre** on Sunday, but the weekend begins with a pop-up play about the Brontës on Friday and performers and stalls in Bucky Doo Square on Saturday. "This will be a very social gathering," says Margie Savory, of hosts Bridfem, promising a midday surprise. Visit their **Facebook page** for full details.

The pull of pink and professorial insights at Cambridge Science Festival

Hundreds of female scientists are at this year's festival – Wednesday sees the flagship event for the Women in Science, Engineering and Technology Initiative, followed by a talk, What's Wrong with Pink?, in which neuroscientist Professor Melissa Hines discusses her research on girls' preference for pink childhood toys (boys, conversely, have a reluctance to play with pink vehicles). The Association for Women in Science and Engineering also lays on an inspiring open day, and TV presenter Gia Milinovich chairs a panel session.

Three weeks of inspiration and performance in Dundee

Dance classes, choreographed performances, relaxation techniques for the mind and forensic science sessions all feature during **Dundee Women's Festival**, running alongside the Women in Science Festival 2014 until March 24.

- Visit internationalwomensday.com.

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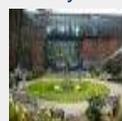
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Bubbly Maths wizards attempt largest Balloon Pyramid to raise funds for African learners

By Shane Tyas | 07 March 2014
Tags: Cambridgeshire | Cambridge | Science Art | Objects | festival | All tags

- News
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A Guinness World Record attempt will boost African learners and make mathematics more fun



Big-scale balloon building in Cambridge
© Bubbly Maths

An enthusiastic team of Mathematicians and balloon artists are planning to take the mathematical world by storm next week by creating the world's largest balloon pyramid.

The two groups, Bubbly Maths and the Pylaloons, will make their Guinness World Record attempt in six short hours at this year's **Cambridge Science Festival**.

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The Sierpinski Pyramid will be eight metres long, seven metres deep and 6.5 metres high, made of 2,048 red balloons and 1,024 small pyramids.

As well as attempting to break a new record, the structure is being built to help raise money for the African Institute Sciences Schools Enrichment Centre, a small organisation which changes the lives of thousands of children in South Africa each year by providing disadvantaged youngsters with the substantial education they need.

On top of raising money for the Centre, the team of maths whizzes are hoping to make their subject more enjoyable and entertaining for children who struggle with it.

“The wonderful thing about our Guinness World Record attempt is that it is based on making maths playful and intriguing to all levels,” says Caroline Ainslie, the founder of Bubbly Maths.

The Pyraloons – a collection of professional entertainers ranging from balloon modellers to clowns – regularly help raise funds for the Centre in inventive, fun ways.

The festival, which will run for a fortnight, begins on March 10 2014.

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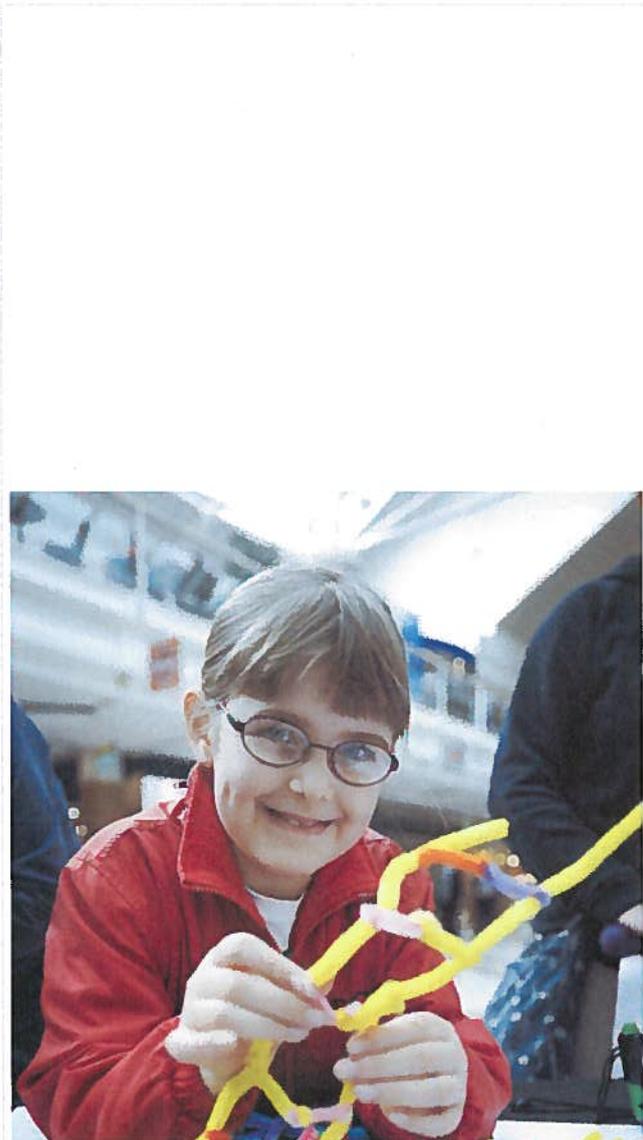
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SLIDESHOW: Young scientists go bananas at Cambridge shopping centre - to extract DNA from the bendy fruit

Written by RAYMOND BROWN



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08/03/14 Science buskers from the British Science Association Cambridgeshire branch with hands on science experiments and demonstrations for all ages in the Grafton Centre. Pictured is Katie Marshall 7 constructing DNA. Picture: Keith Happell

5 Images

Budding young scientists went bananas at a Cambridge shopping centre – to extract DNA from the bendy fruit.

Science buskers brought hands-on experiments and demonstrations for all ages to The Grafton.

Excited youngsters were given the chance to extract DNA from bananas and looked at insects through a microscope.

They were also baffled and amazed by patterns that can trick the mind, the physics of wave patterns, optical illusions, 'secret art' and the diversity of natural structures.

Gary Barrett, 45, of Cambridge, brought his three young children to the stall.

He said: "We just came out of the cinema and saw the stall. It's great the children can get a bit of education in a shopping centre. They have loved it and have learned something about science at the same time. It is a fantastic idea."

The stall was set up by the British Science Association Cambridgeshire branch on Saturday as a precursor to the Cambridge Science Festival.

Connie Ockman, a scientist who helped on the stall, said: "We've had a really great response. It's been busy all morning and the children have really enjoyed it."

"They can just experiment and see that they can all be scientists and don't have to have a lab to do it."

"We want to talk to children and encourage them to look at science and we have had a few teachers too who want ideas of what experiments they can easily do in the classroom."

Based in Cambridge, the county branch of the association was founded in 2010 and runs a series of events in and around the city.

Rose Spear, chairman of the branch, said: "We try to show experiments that people can do at home."

"It's about thinking in a logical way. We are also here to promote and support the Cambridge Science Festival."

The festival, which kicks off today and runs for two weeks, will feature evolution, space travel, medical breakthroughs and mobile technology.

It is 20 years since the event that inspired the Cambridge festival, National Science Week, first came into being.

Details of festival events can be found at cam.ac.uk/science-festival.

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Cambridge University professor Tony Purnell is aiming to make Great Britain's all-conquering cyclists even stronger

Written by AARON MASON

Imagine being asked to build on the success of Team GB's cyclists at the London Olympics when the likes of Sirs Bradley Wiggins and Chris Hoy, Victoria Pendleton et al enjoyed a literal gold rush of medals.

It is a daunting prospect and mixed results at the recent world track championships show just how tough it will be to repeat those triumphs in Rio in 2016.



Tony Purnell

Well, Cambridge-based Tony Purnell is the man charged with keeping things on track after being appointed British Cycling's head of technical development last May and he freely admits wondering what he had let himself in for the time after taking over from previous incumbent Chris Boardman.

Purnell, 55, who has kept on his role as a professor of engineering at Cambridge University, said: "Chris and I joke about it being a complete poisoned chalice in that in the 10 years before I came in, they've gone from virgin territory where the application of a good engineering eye could spot a lot of areas for gain, but all of those have been elected upon.

"I did think 'crkey, this is pretty hopeless' because they've done everything and won everything.

"Certainly, there was the idee that London just can't be repeated because it was so fantastic and then I started to think the press are going to be at our throats if we don't equal the success of the past, but then I've looked at it again and thought it's a fantastic job for an engineer.

"It's very exciting and it meshes with my position at the university just perfectly.

"Of course, I come from a completely different background and started to think 'they haven't thought about this or that' and I'm beginning to get a little bit more confident that we're going to find some worthwhile little tips and tricks."

The 'background' Purnell talks of is his decade in the Formula One paddock, initially as principal of the Jaguar team before going on to become technical consultant for the FIA, motorsport's governing body.

Purnell left the post in 2010 and said while he enjoyed his time in the sport, he did not miss it.

He said: "The travelling was horrendous and frankly you won't find that many people in F1 who aren't divorced, sometimes several times over.

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Susan Boyle

"It really is a lifestyle choice and it's a circus which is great fun for five to 10 years."

He added that while there were elements of motorsport which could cross over and benefit cycling, there were huge differences as well.

"My job wouldn't be anything like as effective if I hadn't had those years in motor racing," he said.

"I can look at mistakes in the approaches that were made in motor racing and try to avoid them or piggyback on good things.

"In motorsport, it's very much about the car and needing an adequate driver, but this is very much about the athlete riding an adequate bike, so because it's all about the athlete a lot of my focus has actually been in helping coaches," he said.

"I imagine people think I'm going to come up with faster wheels or frames!

"The budget we have is also a pittance compared to F1. When you think Jaguar or other F1 teams would have aerodynamics departments with over 100 people and we've got half a person, that sums it up.

"At Jaguar we had our own wind tunnel and most teams have two whereas we get the occasional day at Southampton, so it's a complete and utterly different world.

"That's been a challenge because you're used to vast resources and suddenly you have to get much smarter about the way you approach things."

Purnell will be giving a talk entitled Can Science Make a Cyclist Faster? as well as unveiling Cambridge University's new road racing team as part of Cambridge Science Festival on Friday - an event which has already sold out.

But while he is loathe to give too much away about the work being done by his "Secret Squirrel Club", Purnell said the emphasis was as much on the rider as the bike.

"The mantra is the accumulation of incremental gains," said Purnell, a keen amateur racer, who has ironically been forced to hang up his wheels due to the demands of his role.

"We try to look at absolutely all aspects and look for anything where science in terms of equipment of training can contribute.

"We're pretty secretive about what we do, but before I had the job, I always thought British Cycling must have some demon tricks up their sleeve, but since I've been in the post, I've found it's not that way at all.

"It's like anything, it's all pretty obvious when you see something being implemented, but not so obvious before that.

"Because aerodynamics is so obvious, people imagine that to be our entire focus when it's not.

"It's everything, it's how the riders eat, how they sleep, how they go about training, how they recover from training and it all adds up to going into the competition with the right frame of mind.

"It's not about anything in particular, but everything in particular."

And Purnell is positive cycling will continue to thrive as a sporting success story in this country.

He said: "It's been tainted over the years, but what I see at the moment is fantastic and a new dawn for the sport and I think it will grow and grow.

"People like Bradley Wiggins and Chris Froome are familiar athletes and there's a trickle down effect on the whole population.

"British Cycling subscriptions have gone up four or fivefold and it's brilliant the Tour de France is coming to Cambridge, it's a dream come true."

For more information on Cambridge Science Festival, visit www.cam.ac.uk/science-festival

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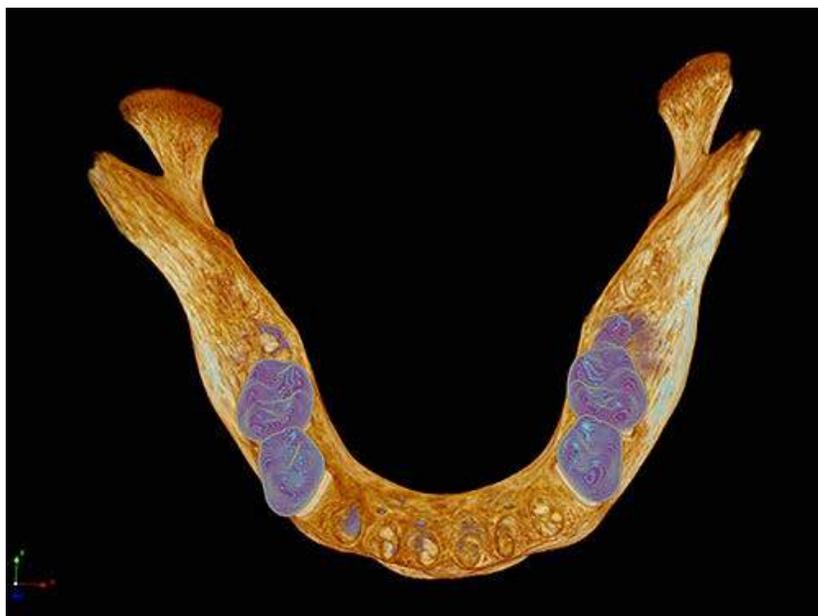
NewScientist

Crystals and lice: Best of the Wellcome Image Awards

13:28 11 March 2014

The overall winner of the [2014 Wellcome Image Awards](#) will be announced later today. This year all 18 winning images will go on show simultaneously at five major science venues in the UK – the Wellcome Trust's headquarters in London, [Glasgow Science Centre](#), the [Museum of Science and Industry \(MOSI\)](#) in Manchester, [Techniquest](#) in Cardiff and [W5](#) in Belfast – as well as at the [Koch Institute for Integrative Cancer Research](#) at the Massachusetts Institute of Technology. There will also be a display at Anglia Ruskin University in Cambridge, UK, during the [Cambridge Science Festival](#). Here's a selection of our favourites. **Caroline Morley**

Next [Image 1 of 6](#)

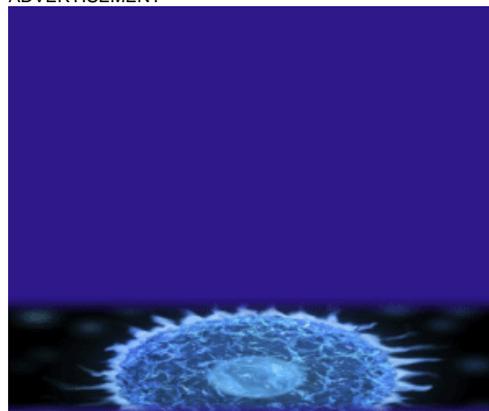


This is a micro-computed tomography (micro-CT) scan of a jawbone that belonged to a child buried in an 8th- to 10th-century cemetery at Raunds in the English Midlands. Kevin Mackenzie at the University of Aberdeen, UK, used X-rays to create 4800 digital slices of the jaw (brown) and teeth (blue). The digital model allows researchers to examine internal features without damaging the original.

(Image: Kevin Mackenzie, University of Aberdeen)

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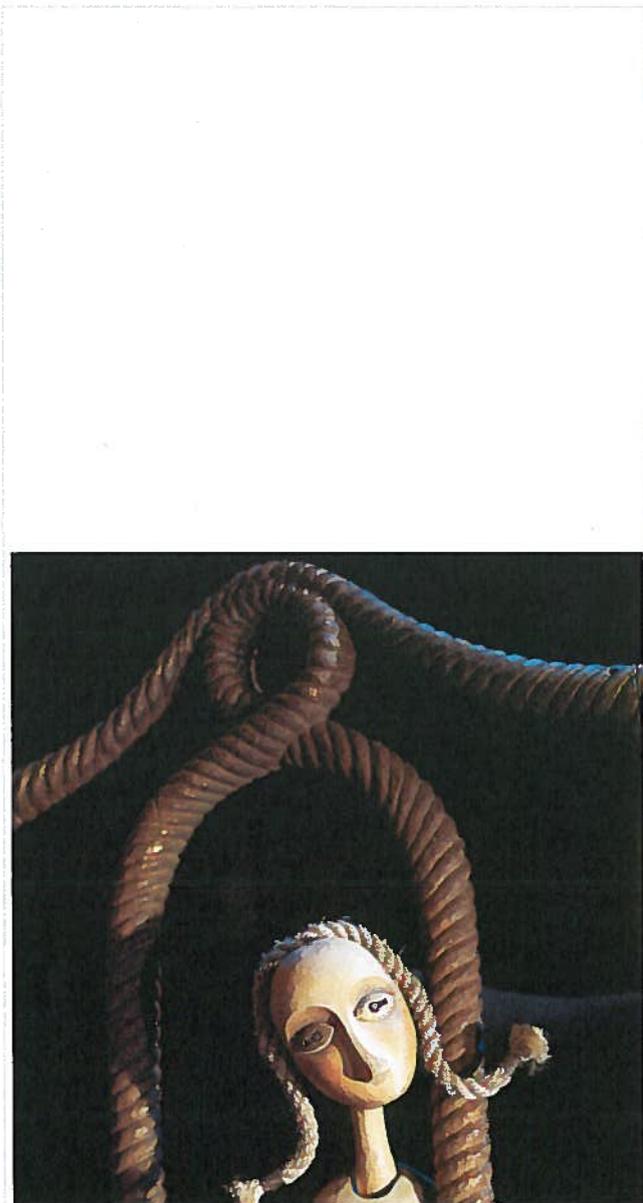
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10 things to do with the family (March 13 - 20)

Written by ELLA WALKER



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cerebral palsy, to walk down aisle as flower girl

This week we've picked five Cambridge Science Festival activities and five non science activities to keep you occupied. Here goes...

For science lovers (all free):

1. Head to the zoo

TAKING this year's Cambridge Science Festival theme, 'structure and patterns', Shepreth Wildlife Park has got its animals involved. On Saturday and Sunday, see which different patterns, colours and designs you can spot at a drawing and photography class using live animals and creepy crawlies insect models (11.30am – 12.30pm). There'll also be a presentation on basic animal anatomy and camouflage (2.30pm – 3.30pm), plus arts, crafts and the centre's Round the Park quiz for 7 – 14 year olds. Call (01763) 262226 to book!

2. Be an archeologist

EVER dreamed of being Indiana Jones? Now's your chance. You'll get to act like a forensic scientist and learn what secrets bones, stones, teeth, hair, shells, pots and even fossilized poo can tell us about the past! There'll be hands on experiments to get stuck into as you pick up tricks for identifying bones and plant remains. Just pop along to the ground floor of the McDonald Institute for Archaeological Research on Downing Street on Saturday between 10.30am and 4pm. There's no need to book!

3. Bottle your genes

DID you know, the secret to who you are can be found in your cheeks? Crazy, right? On Saturday between 11am and 3pm, if you drop into Cambridge Corn Exchange, students from Long Road Sixth Form College will be on hand to help you extract DNA from your own cheek cells! Don't worry, it's not some madcap experiment! You'll be able to see your own DNA under a microscope and take it home with you!

4. Fill your head with knowledge

CheOS – a group of science obsessed students – are hosting a day of exciting talks and demonstrations on Saturday. From 9.45am until 4.30pm, they'll be taking over the Department of Zoology so you can: learn how to send and make secret signals, find out all about crystals, discover how to make fire, investigate vacuum bazookas and custard fireballs, see which plants grow the fastest and largest, and get to grips with the best and worst ways to get into space. Visit chaossience.org.uk or call (01223) 766766 for more details and to book tickets.

5. Investigate a crime scene

FANCY being a crime scene investigator? Collect the evidence, take finger prints and tot up what might have happened at an interactive crime scene at The Guildhall on Saturday. From 10am until 4pm the site will be home to an unexplained crime and it's up to you to solve it! Just drop in and get your hands dirty.

For once you've had your fill of science:

1. Go to a show

A WORLD of palaces and forests, ogres and fairies is coming to Cambridge Junction in Little Theatre's Sleeping Beauty in The Woods. Princess Rose is victim to wicked spell that means, on her 16th birthday, she will prick her finger and the kingdom will fall asleep for 100 years... obviously, only true love's kiss will solve the situation. Expect quirky puppets, video and live music to boot. Catch the show on Sunday at 11.30am or 2.30pm. Tickets are £9 per grown up and £5 per child from (01223) 511511.

2. Watch a film

YOU know what happens if you tell little white lies, don't you? Pinocchio certainly does. The wooden toy with an ever growing nose gets out and about in this classic Disney film at Cambridge Arts Picturehouse this Saturday. Will he get his wish and

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become a real boy though? On at 10.30am (autism friendly screening) or 11am (Kid's Club screening), it costs £1.50 per kid's club member or £3.50 per non-members. Book on 08719025720.

3. Be a muckypup

UNDER 5s can chuck on their wellies and head outside to be mucky pups at Wicken Fen on Wednesday. The 'Springtime Adventure' themed session is a chance to get stuck into some seasonal crafting and outdoorsy adventuring. The daffodils might even be out! Don't forget scarves, hats and gloves! Places cost £4 and the morning runs from 10.15am until 11.45am. Call (01353) 720274 to book your child's place.

4. Take a night-time ramble

GO on a walk round Wandlebury Country Park by moonlight. The rangers are leading a ramble on Sunday from 9pm until 10pm around the parkland so you can take a peek at the stars and spot the nocturnal creatures pottering about in the dark. Suitable for over 7s, you're allowed to bring a torch if you want! Booking essential, call (01223) 243830 and feel free to donate £3 per adult and £2 per child to take part.

5. Go bird watching

TAKE a trip to Wicken Fen and see which birds call the reserve home. Look out for colourful ones in the trees, watery ones and speedy ones skimming over ground and so many more. After the session - suitable for the whole family - you can get crafty making a bird box of your own to take home. The session costs £4.75 per child and runs on Sunday from 2pm until 4pm. Call (01353) 720274 to book.

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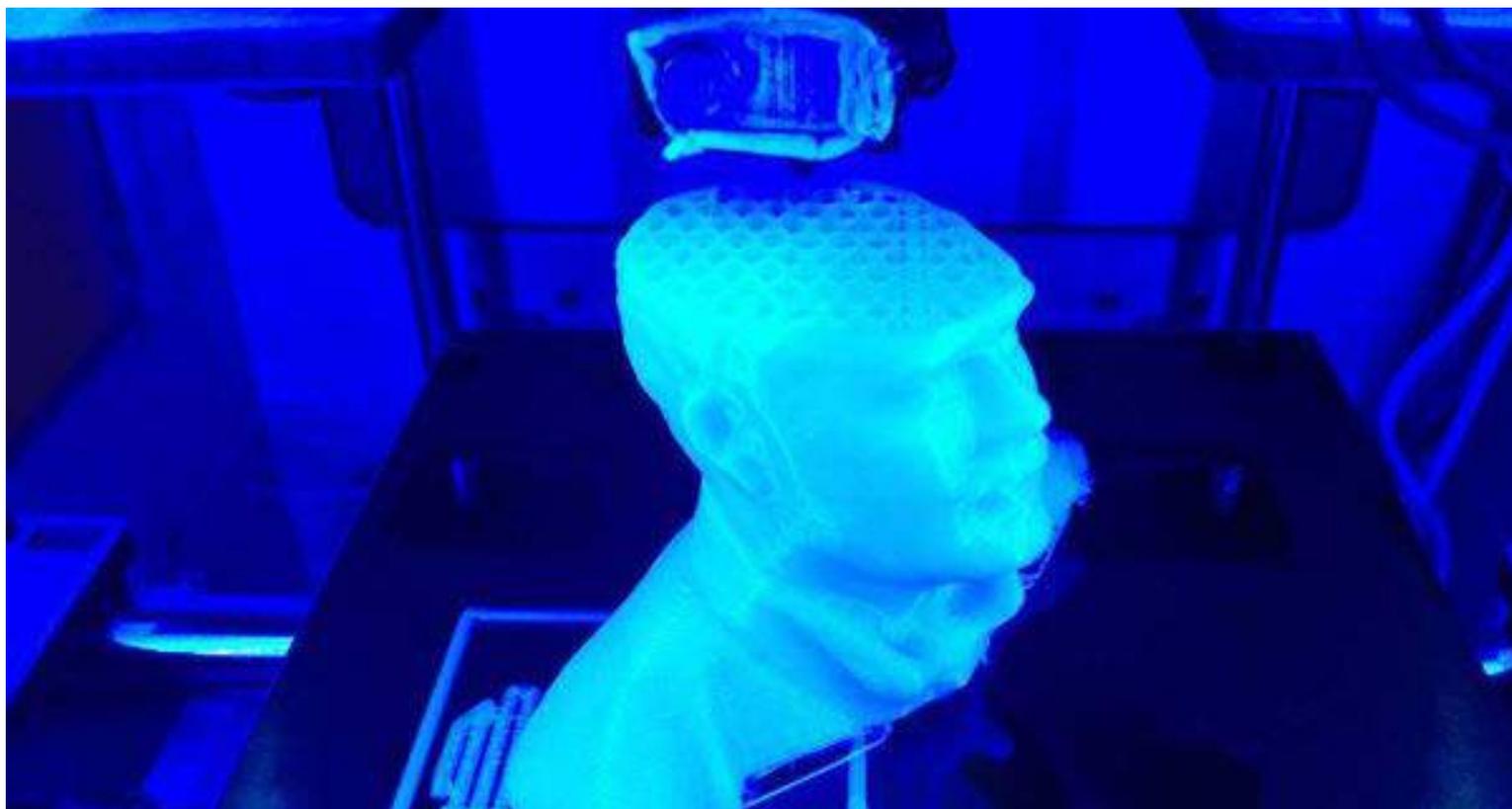
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QUIRKY WORLD ... 3D printed parts help surgeons to rebuild injured motorcyclist's face



Thursday, March 13, 2014



A survivor of a serious motorcycle accident has had pioneering surgery to reconstruct his face using a series of 3D printed parts.

Stephen Power is thought to be one of the first trauma patients in the world to have 3D printing used at every stage of the procedure.

Doctors at Morriston Hospital in Swansea had to break his cheekbones again before rebuilding his face.

Mr Power, 29, from Roath in Cardiff, suffered two broken arms and had his right leg so badly damaged it required a bone graft after the horrific bike crash which happened as he returned from a night out with friends in Porthcawl in September 2012.

FURY BITES



USA:

A row over a parking space at a shopping centre in the US got out of hand when one driver almost bit off another motorist's finger.

Tonya Knight-Joseph, 42, claims she argued with two women who accused her of stealing their parking space at the Cherry Hill Mall in southern New Jersey, and suffered verbal and physical abuse before one of them bit down on her finger and almost severed it.

Police said they are still hunting the attackers.

Ms Knight-Joseph said hospital staff were shocked to discover such a serious bite had been caused by a human.

DRIVER-FREE PLANNING



USA:

Officials in California have been looking to the future as they bid to legislate for the arrival of hi-tech driver-less cars.

A law passed in 2012 set a deadline of the end of this year for the state's Department of Motor Vehicles to decide how to legally integrate the so-called autonomous vehicles — which were once the stuff of science fiction but could be commercially available by the end of the decade.

The latest talks on the matter among roads officials focused on how the vehicles will record actions so the data can be

used to reconstruct an accident in an effort to apportion blame.

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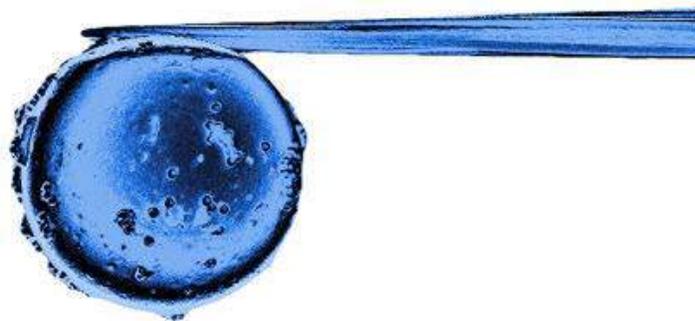
USA:

Concerns over a drought could see salmon migrating to the ocean in an unusual manner — by lorry.

Wildlife officials are planning to move hatchery-raised salmon across California by tanker trucks next month if water levels in the Sacramento River and its tributaries prove too low and inhospitable for the fish.

Officials fear the rivers could become too shallow and warm to sustain migrating salmon, and will keep an eye on conditions while crossing their fingers for heavy rain.

WONDERS REVEALED



ENGLAND:

From a rainbow on the surface of a fruit fly's brain to the last tree to be felled in a once great forest, a series of unique and sometimes surreal images which showcase the work of top young researchers has been published for the first time.

Compiled by researchers from the life sciences subjects at the University of Cambridge, the pictures are part of an exhibition which aims to open up the world of scientific study to the general public.

Produced by PhD, post-doctoral and Master of Philosophy researchers, they feature in an exhibition organised as part of the current Cambridge Science Festival.

Alexander Hackman is studying the bio-mechanics of how insects clean themselves for his PhD. His ultra-magnified image shows a polystyrene particle which is five times smaller than the diameter of a human hair attached to a cleaning hair removed from an ant's antenna.

PIRATE PARROT



ENGLAND:

Bosses at a major tourist attraction are attracting swashbuckling visitors to a pirate camp — by enlisting a pet parrot.

Charlie, a 32-year-old blue and gold macaw, saw off competition from three other birds to land the role at Legoland in Windsor in the Castaway Camp, which is part of a new pirate adventure play area.

Charlie's owner, Peter Bloom, 55, from Pickering, North Yorkshire, has had the bird for 30 years since he bought her in Scotland where she was hatched.

He said that he believed the macaw was chosen for the role because she can roll over and play dead.

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What's New in Space?

Science Festival kicks off with big questions



Berenice Mann
localsecrets.com Wednesday, 12 Mar 2014
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Answering the question, 'What's new in space?' an impressive line-up of scientists at a Cambridge Science Festival event on 10 March reviewed the progress from Isaac Newton's physics and Albert Einstein's relativity to the 3000 radio-strong SKA project testing extreme gravity and the Gaia satellite making multi-dimensional measurements of a billion stars.

They touched on Newton struggling to fit facts to his theories, the stretching of space and time, a historic method of mapping stars and new developments in astrophysics including the Gaia project which hopes to answer questions such as 'How old are the stars?' and 'How big was the Big Bang?'



The event at St Catherine's College, one of the first in [Cambridge Science Festival's](#) 10-23 March programme, began with a background into space history. Dr Patricia Fara, academic and author of several books on general science history and Isaac Newton in particular, spoke about 'Isaac Newton and Space', and some lesser known information about Newton, whose laws of physics are still the foundation of our science teaching. Newton gave us the theory of gravity, the concept of matter being active and many mathematical techniques, as well as the legendary apple-tree story - but who knew that he 'fudged' some of his facts to fit his theories?

Astrophysicist Dr Rosie Bolton discussed how Newton's Theory of Gravity had lasted around three centuries before discrepancies began to appear, which led to Einstein's General Theory of Relativity, combining Newtonian gravity with Special Relativity. She went on to explain some of the principles such as the stretching of space and time, and how pulsar signals from space can help scientists to observe objects bending time and space. To make a small improvement in our knowledge, Bolton explained how the [Square Kilometre Array \(SKA\) project](#), being built over the next 10 years, will provide 3000 radio dishes to make observations in the ~20cm wavelength region of the spectrum and will be situated in two



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deserts in the Southern hemisphere, searching for pulsar signals throughout the galaxy, and creating another 'Big Data' problem for the mathematicians and number crunchers to solve.

Professor Gerry Gilmore spoke captivantly about the [Gaia project](#)- the European Space Agency's mission to take the first reliable census of the Milky Way. He explained very succinctly how we think in 12 dimensions (who knew!), the historic way Herschel mapped out the stars of the Milky Way and explained how difficult it is for us to know where everything is in space and how it moves. The vast distances involved make it extremely hard to measure. Gaia is planning to make precision 3D measurements for 1 billion stars, using a 1 billion pixel camera (compare to a normal camera with 14 million pixels). The measurements will be taken in space and the audience watched an inspirational video of the launch which took place last year.

The talks were followed by a panel discussion, chaired ably by Tim Radford, science journalist at The Guardian, taking interesting audience questions including 'Where does the universe come from?' and 'Does Newtonian theory still work?'



[What's New in Space? Berenice Mann](#)

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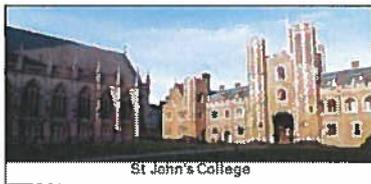
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One of the greatest literary hoaxes of all time will get its first ever public outing in Cambridge this weekend

Written by ADAMLUKE

Full of tales of underground palaces and a diet of vipers' blood for breakfast, it was one of the great literary hoaxes of the 18th century, fooling high society.



St John's College

And now the work of travel fantasy called *The History Of Formosa*, which gives a fantastical account of life on the island now known as Taiwan, is to go on public display in Cambridge.

Supposedly written by a native, its accounts of criminals being killed and eaten and priests sacrificing thousands of children to bloodthirsty horned gods captivated readers.

There was only one catch – it was completely made up and author George Psalmanazar was actually a white, blond-haired Frenchman who had never left Europe and whose real name is still unknown.

St John's College is putting its first edition of the 1704 book on display for the first time this Saturday, as part of its World Of Wonders exhibition which also features other items representing the adventures and work of real-life explorers such as James Cook, Marco Polo and James Clark Ross.

Dr Mark Nicholas, the college's librarian, said: "Psalmanazar's tales, imaginative as they are, fit into a wider genre alongside travellers' accounts and maps featuring grotesque creatures, sea monsters and alien, exotic peoples, images that enthralled audiences who had never left their home country."

The book was a huge success, with the first edition selling out rapidly and French and German editions achieving similar success.

In a posthumously-published autobiography, Psalmanazar describes himself as a child genius with a gift for languages.

He set about creating false identities and crafting fantastic tales - even eating raw meat and speaking a language of his own creation in a bid to convince others of his authenticity.

Psalmanazar explained away his pale skin by telling doubters he had lived underground with Formosa's upper classes and never saw the sun.

It was not until British explorers began to travel to Formosa – sometimes equipped with a copy of his made-up dictionary of Formosan language in a bid to communicate with confused locals – that the con was uncovered.

Psalmanazar eventually grew tired of his forged life and spent his later years living a quiet existence as a clerk in London and writing theological pamphlets.

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Susan Boyle

His will included instructions for a confession to be published after his death in 1763.

Dr Nicholls added: "Psalmazar's fraudulent description of Formosa was so successful because it first appeared at a time when interest in exploration and strange new lands was at its height across European society."

The exhibition, which is part of the Cambridge Science Festival, is being held at the Old Library at St John's from 10am to 4pm.

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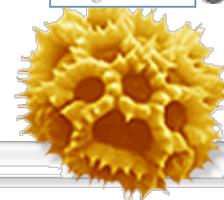
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Ode to a dodo: new music and research released

13 March 2014



Composer Tim Watts with the dodo in the Treasures Gallery. His new piece for the harpsichord, *Dodo Suite*, is part of a joint project that uses natural history specimens to inspire classical music composition.

Specially commissioned music and stories of a dodo in Japan perpetuate the myth of probably the most famous bird in the world.

A research paper by **artist and Museum fossil bird specialist Julian Pender Hume** and a new experimental **composition for the harpsichord by Tim Watts** have raised the status of the already legendary dodo.

Endemic to Mauritius and **extinct for around 350 years**, the giant flightless pigeon continues to capture people's imagination, partly because it was wiped out by human carelessness.

Dr Hume, who recently contributed to the re-imaging of the dodo in [Sir David Attenborough's *Natural History Museum Alive* film](#), studied the seventeenth century journals of the commander of a Dutch factory in Deshima, an island off Nagasaki, Japan.

Survival of the fittest

The journals suggest that, not only was a live dodo transported to Japan from Mauritius by boat, but also that the birds were still surviving on Mauritius in 1647, a few years after scientists estimate the species went extinct.

Part of the reason no one knows exactly what the dodo, *Raphus cucullatus*, looked like is because only a few of them were ever exported to Europe, possibly as few as two, **one of which lived at the back of a shop in London.**

The Dutch settled on Mauritius in 1598 and used it as a refreshment station for ships en route to east Asia. Deshima was particularly important because the Dutch were the only Europeans allowed to trade with Japan, but could only do so through the island.

Dr Hume now suggests that a dodo and a white deer were sent by the Dutch to Deshima in 1647 as rare gifts for the governor of the island or one of his superiors, to maintain good trading relations.

Unknown fate

But the mystery of the dodo continues. While the destination of its travelling companion,

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the white deer, was recorded, the fate of the dodo upon arrival in Deshima is unknown.

'Unless documentary evidence survives that records its presence in Japan, the fate of the last recorded captive dodo will never be known,' said Dr Hume.

'That live dodos survived the arduous and lengthy voyages both east and west, however, is certainly testament to their endurance and adaptability.'

Within a century of the Dutch settlement on Mauritius, the dodo had been wiped out due to the **decimation of the ebony forests and the introduction of non-native animals** such as rats and monkeys that preyed on the bird and its eggs. Sailors also ate dodo meat.

Music and natural sciences

In a collaboration between the Royal College of Music and the Centre for Arts and Humanities Research at the Museum, Tim Watts chose the dodo skeleton housed at the Museum to inspire his new classical composition for the harpsichord, Dodo Suite.

Dodo muse

'Despite being a composite, the dodo skeleton seems full of personality, as if it is trying urgently to communicate through the glass that now confines it,' Watts said.

'My Dodo Suite seeks to animate this sense of personality, through allusions to the dance forms and contrapuntal style of the time of the dodo's discovery. The harpsichord, which not so long ago also came quite close to extinction, inhabits an "imaginary space", created using **sounds recorded in different parts of the Museum**, as well as "replicas" of harpsichord sonorities created with plucked piano strings.'

Dodo Suite is part of an ongoing project exploring the potential of using natural history specimens to inspire classical music. It premiered on Monday as part of the Cambridge Science Festival, in partnership with St John's College, Cambridge.



[Listen to Flightless Fugue, harpsichord played by Jane Chapman.](#)

Dodo re-image

Because dodos are so rare, the specimen on display at the Museum is a composite made up from bones from different animals. New research suggests the dodo was leaner and more upright than traditionally portrayed.

Further information

- [The dodo skeleton](#)
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Gold pants, science and silliness galore with New Art Club at Cambridge Junction

Written by ELLA WALKER



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New Art Club

2 images

Open Slideshow

Who doesn't want to spend an evening with two guys prancing around in spangly gold pants? Especially when it's all in the name of science – how could you resist?

New Art Club, aka curators and art directors Tom Roden and Pete Shenton, are presenting their latest show, *Feel About Your Body*, as part of Cambridge Science Festival (see our top festival picks at cambridge-news.co.uk/whats-on)

Dubbed "sexy AND intellectual" the talented duo, who indulge equally in brilliance and pure lunacy, will be chaffing, dancing and singing their way through their Cambridge Junction set, exploring how we feel about the skin we're sewn into.

But be warned, it's not for the faint hearted: there will be nudity, a man talking to his bottom and strict instructions on what not to do if you're having a heart attack.

And, if you feel like whipping on some gold pants of your own in solidarity, do feel free.

Also, take a look at another Science Festival double bill: *Volcano* and *A Journey Round My Skull*, two theatre shows made with scientists. They're "part performance, part lecture, part school science experiment," apparently, and yes, the volcano is papier-mache! See both on Wednesday, March 19 at 7.30pm and 9pm. Tickets £14.

:: New Art Club: *Feel About Your Body*, Cambridge Junction, Saturday, March 15 at 7.30pm. Tickets £12 from (01223) 511511 / cornex.co.uk



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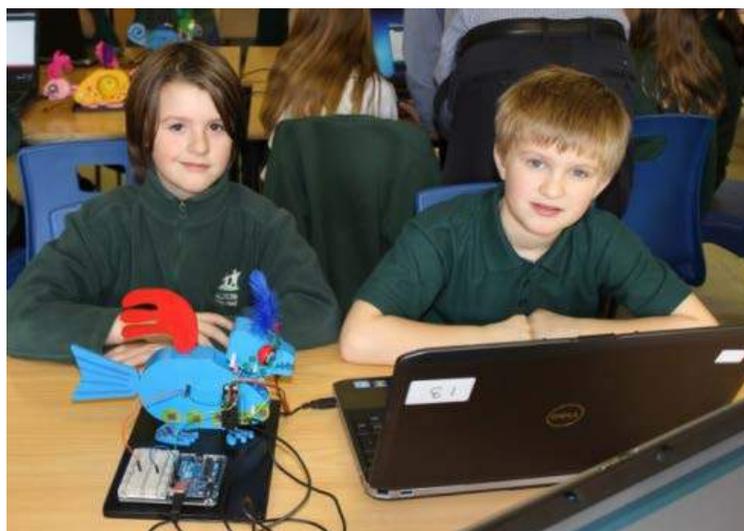


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Meldreth pupils take part in University of Cambridge science festival



Arduino Programming

By **Matthew Gooding**
Saturday, March 15, 2014
2:57 PM

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Pupils at a village school embarked on a scientific voyage of discovery as part of the University of Cambridge's science festival.

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Meldreth Primary School held it's annual science week to coincide with the start of the festival, which began on Monday.

Sally Willian, from Meldreth Primary School, explained: "From Monday to Friday all learning at the school was based wholly around elements of science on a voyage of discovery that took in space, microbiology, forces, forensic science, rocks and geology, care and safety of the human body, computer programming, mobile phone technology, the animal kingdom and savage chemical reactions.

"The children have been able to experience many areas of science outside the boundaries of the usual school curriculum and this will have a hugely beneficial impact on their scientific knowledge and understanding. We are certain that our budding young scientists of the future will continue their learning during the Cambridge Science Festival."

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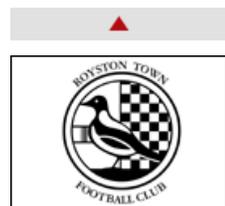
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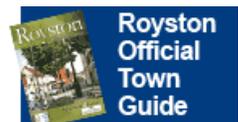
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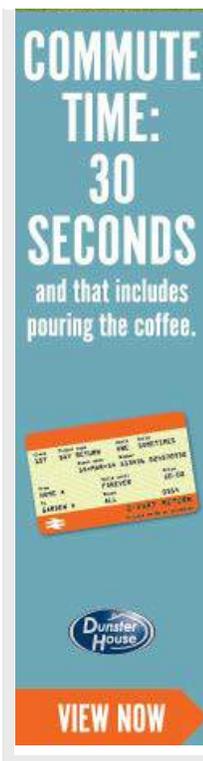
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On Friday local businesses including STEM Ambassadors, Shepreth Wildlife Park, BlackBerry and Airbus Defence and Space visited the school for a series of talks and workshops.

Pupils also visited the Cambridge Science Centre and took part in use of forensic science techniques to solve a 'crime' around the school.

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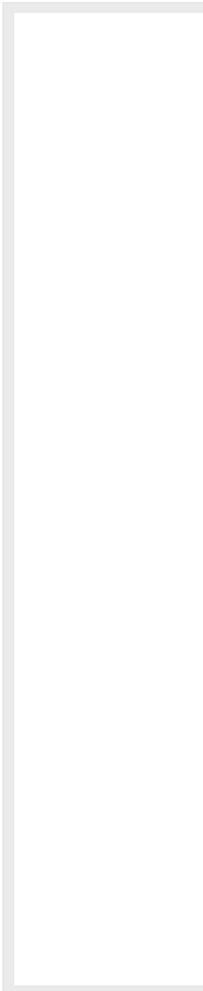
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Breathhtaking science images go on show



by Jack Tappin
jack.tappin@haverhillecho.com (mailto:jack.tappin@haverhillecho.com)

The winning pictures from this year's Wellcome Image Awards, which offer an up-close and personal look at the world of science, are on show at Anglia Ruskin University in Cambridge until March 29,

The Wellcome Image Awards 2014 celebrates the best in science imaging talent and techniques, and this year marks the first time that the winning entries will be displayed outside London.

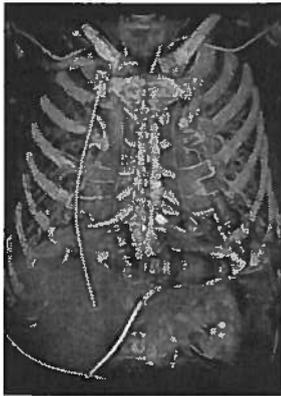
The images, which include a CT scan of a seal skull, a head louse egg attached to a strand of hair and an x-ray of a brown long-eared bat, showcase some of the wonders of the natural world in breathtaking detail.

The exhibition of the 18 winning images, held at the Ruskin Gallery on Anglia Ruskin's Cambridge campus, includes the overall winner – an image of a mechanical heart pump inside the chest of a patient by Professor Anders Persson of Linköping University in Sweden – which was announced at an awards ceremony recently.

BBC medical correspondent Fergus Walsh, who was a member of the judging panel, said: "As always, this year's entries are both technically brilliant, and visually striking.

"Never before have I thought of a kidney stone or a nit as beautiful, but the Wellcome Image Awards show time and again that there can always be a different way of looking at things."

Commenting on the overall winner, Walsh added: "Anders Persson's 3D Image of a mechanical heart fitted inside a human chest is truly stunning.



"The juxtaposition of delicate human anatomy with the robust mechanical plumbing parts is dramatic, and the image is rendered so vividly in 3D that it appears to jump out at the viewer."

The winning images will also be made available on the Wellcome Image Awards website and will go on show in a window display at the Wellcome Trust's headquarters in London.

Catherine Draycott, head of Wellcome Images and a member of the judging panel, said: "Every year, the Wellcome Image Awards bring to life the vibrancy of the world of science, as well as championing the incredible cutting-edge techniques in scientific imaging."

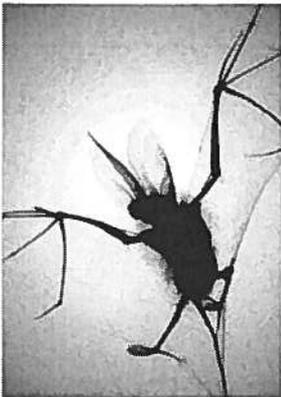
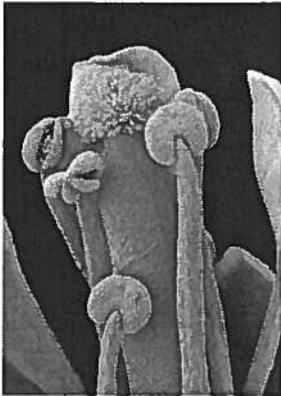
"This year, we are particularly delighted to be exhibiting the winners across the UK allowing many more people to come closer to these exceptional images."

The exhibition at the Ruskin Gallery is free of charge to attend, and is being held to coincide with the Cambridge Science Festival.

The Ruskin Gallery is open from 10am-4.30pm Monday to Saturday, and until 8pm between March 17 and 20.

There will also be a talk by the Wellcome Trust on Thursday (March 20, 7pm).

For all the latest news see Thursday's (March 20) Echo.



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VIDEO AND SLIDESHOW: Crowds cheer on balloon artists as they break a Guinness World Record by building a giant inflatable pyramid in Cambridge shopping centre

Written by ADAMLUKE



Attempt to build the worlds largest balloon Sierpinski tetrahedron at the Grafton Centre. The End result

9 images

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An enormous balloon pyramid constructed in a Cambridge shopping centre has

set a new Guinness World Record.

A team of balloon artists and volunteers joined forces at The Grafton on Saturday and successfully twisted and tied their way to the gigantic achievement.

The world's largest balloon Sierpinski tetrahedron was made out of 2,048 balloons, in 1,024 pyramids of different sizes, by representatives of Bubbly Maths and the Pyraloons – measuring just over 7m tall and taking six hours to put together.

But it almost failed to hit its target when balloons, pumped up with nitrogen, mysteriously started popping at one stage causing a shortage in supply.

Caroline Ainslie, aka Bubbles the Mathematical Clown, explained: "It did get hairy. We had brought 3,000 red balloons which we thought would be more than enough but it wasn't.

"Luckily some of the artists had brought their own supplies along so we were able to add a colourful top to the construction.

"The biggest challenge during the record attempt was keeping the morale up. It is so hard blowing up so many balloons and our hands were raw by the end.

"The public really helped by cheering us on the whole time and there was a big crowd when the final pyramid was completed.

The Sierpinski triangle is named after Polish mathematician Wacław Sierpiński, who described it in 1915. It features numerous smaller triangles within its large triangular outer frame.

Expert witness to the achievement was Cambridge University's mathematics professor David Spiegelhalter, who will feed back the news to Guinness World Records team in the hope of official recognition that the design surpassed the previous 4m tall record.

Lance Stanbury, manager of The Grafton, said: "This was an event not to be missed. The construction of the balloon pyramid was fantastic to see and we achieved a new Guinness World Record right here in the Grafton Centre."

The event, which was linked to Cambridge University's Science Festival, also raised money for AIMSSEC – a schools mathematics enrichment programme offering free resources and courses to teachers in the developing world – through workshops and collections held during the day.

For more information, visit pyraloons.com or bubblymaths.com.

Guinness World Record attempt with balloons in ...



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SLIDESHOW: From the animal kingdom, art and photography to heart surgery, Cambridge University Science Festival proves a big hit with families

Written by ADAMLUKE



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15/03/14 Workshops for Cambridge Science Festival - Shepreth 15/03/14 ART and photography workshops on the pattern and structure of the animal kingdom at Shepreth Wildlife Park as part of the Cambridge Science Festival. Amber Merry -11 and Lisa Dawson -24

11 Images

Open Slideshow

The first weekend of the Cambridge University Science Festival was marked with art, photography, heart surgery – and a murder mystery.

Thousands of visitors flocked to a range of venues in and around the city, with many of the events free of charge.

At Shepreth Wildlife Park, the focus was on the pattern and structure of the animal kingdom with presentations on the attraction's new Animal Encounter sessions held in the Discovery Centre, alongside art and photography workshops.

Lainie Bazzoni, head of education, said: "It was a really nice way of introducing kids to form and structure, and they got the chance to draw live animals."

"We looked at perspective, light and shadow, and vanishing points. It was important to show that art forms have a basis in the world on science."

Meanwhile, Madingley Hall hosted a series of murder mystery workshops yesterday afternoon in which participants of all ages had to use their scientific detective skills to identify the perpetrators and motives behind a fiendish crime.

Working with a team of researchers, sleuths solved a series of scientific puzzles from disciplines including psychology, genetics and forensics, and then presented their findings in the hope of earning a prize.

The event was run by the Department of Life Sciences at Anglia Ruskin University, with the help of undergraduates.

Elsewhere, exhibitors at Cambridge's Corn Exchange included Papworth Hospital, the Wellcome Trust Sanger Institute, the Babraham Institute and the Medical Research Council.

At the biology-themed venue, visitors were able to observe demonstrations of heart surgery, discover how cells use antibodies to detect and destroy viruses, learn about blood vessels and metabolism, and explore the structure of DNA.

Daniel Saxon, marketing manager for Papworth Hospital, which created its own mini operating theatre for the occasion, said: "We were delighted to see so many people looking to learn about their hearts and lungs and about what we do at Papworth Hospital."

"Children and adults alike loved learning how to 'save a life' with CPR training and looking down the microscope to see how we diagnose heart and lung disease."

The festival runs until next Sunday. For more information, visit cam.ac.uk/science-festival.

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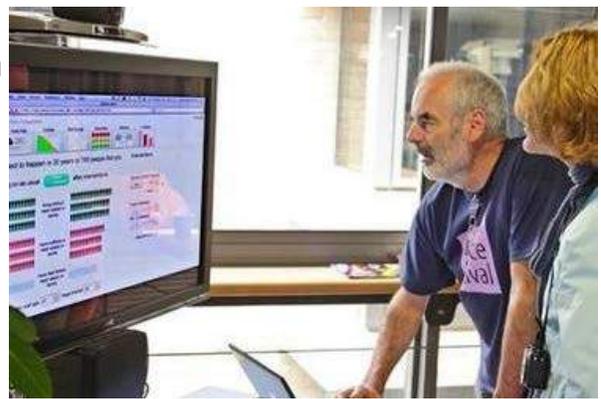
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Mike Levy
localsecrets.com Monday, 17 Mar 2014

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Have you ever bumped into a neighbour on the far side of the world or thought of a word just as it is said on the radio? The whole nature of coincidences seems very abnormal, if not paranormal, but can coincidence be explained?

Most if not all can be – even seemingly bizarre occurrences such as several members of one family being born on the same day and really rare repetition such as winning the lottery twice -- proposes Professor David Spiegelhalter, the Winton Professor for the Public Understanding of Risk and Professor of Biostatistics at the University of Cambridge. A 'coincidence', he says, is a surprising series of events seen as meaningfully related but in fact with no apparent causal connection. Coincidences seem to occur without explanation – a good challenge for any scientist—but Spiegelhalter says it all comes down to probabilities.



Spiegelhalter and his team are researching the whole strange subject and have been collecting odd and seemingly inexplicable coincidences garnered from the general public, posting them on his website. As one of the star turns the Cambridge Science Festival, the affable and self-denigrating chap presented himself more as the interesting man in the pub than the distinguished professor. Speaking to a near full house in the huge Lady Mitchell Hall he began by apologising to his audience for not having given this talk before and that it was all a bit off the cuff. That seemed hard to believe as his 60 or so minutes were packed with fascinating insights not to mention a fully planned PowerPoint slideshow.

The charming Spiegelhalter brimming with quips and comical asides, went on to categorise the commonest forms of coincidence. He said that categories of coincidences can include: finding a link with someone you meet; surprising repetitions: for instance when you've had no contact with someone for ages, then find two connections to them very close together in time,

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and he showed press cuttings of a family whose three children were each born on exactly the same day. Then there's the repetition of a really rare event – for example your life being saved twice by the same person.

There are the spooky coincidences of simultaneous events: for example when two people phone each other at exactly the same time and parallel lives when two people in a small group find they share a birthday or an unusual name, or when two people discover their lives match each other in bizarre details. Then there are unlikely chains of events such as losing your false teeth overboard and finding them inside a fish you caught 20 years later.

Spiegelhalter went on to look at various theories behind coincidence – often like that of Jung there is a mystical even rather magical element lying behind these strange conjunctions of events. But the Cambridge don is no mystic. He prefers cold logic and argues that coincidence can be explained away by maths and probability theory. 'There are in the world large numbers of opportunities for things to happen,' he told his audience adding that, 'people who notice things, notice things.' He reminded us all that most of us are only two steps away from knowing thousands if not hundreds of thousands of people and so what seems like a strange coincidence, is in fact a conjoining of events that is sometime bound to happen. The good professor went on to carry out some audience research. Each row was asked to write down his or her birth date (not year) and pass it down the line. He then asked how many shared the same birthday exactly, or within two days or a week. An astonishingly large number of people found that their birthdays matched (or almost did). It all comes down to probability and with the right facts (neatly supplied on a slide) one can pretty accurately assess the probabilities of sharing the same birthday with others.

He amusingly told the story, recently in the press, of a shopper who found six double yolk eggs in her purchase. Though the odds seem to be several hundreds of millions to one, Spiegelhalter showed how he could reduce them to a certainty – by buying half a dozen double-yolk eggs from Waitrose. Coincidence, is not always what it seems.

If you have an amazing coincidence to report, email the details to the [professor's website](#).

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Science of coincidences Mike Levy

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'Come closer' science image winners displayed across four nations

Winners of the Wellcome Image Awards 2014 showing the wonders of life under the microscope are being exhibited in Manchester, Belfast, Cardiff and Glasgow at the same time in different ways



Following the announcement of the winners of the annual [Wellcome Image Awards](#) on March 11th, 'Come Closer' exhibitions of the 18 stunning winning images opened simultaneously in four science museums in England, Northern Ireland, Scotland and Wales, bringing these images up-close for a nationwide audience, but each in their own way.

For the first time since the launch of the awards in 1997, the winning entries celebrate the best in close-up science imaging technique and talent. The images, many created by medical professionals and scientists, show in minute detail



the wonders that can be found around and inside us, ranging from an electron micrograph of a kidney stone and a head louse egg, to an x-ray of a bat, and from a 3D computed tomography image of a seal's skull to a cross-section of a flower bud.

The four venues have also chosen different ways to display the beautiful images:

At [MOSI](#), Manchester's Museum of Science and Industry, the images are being displayed in light boxes inside the first-class waiting room of the oldest surviving passenger railway station in the world.

[Glasgow Science Centre](#) is projecting the 18 images in its Science Mall and visitors can also 'come closer' through a touch screen which lets them zoom into the images to see more detail.

At [Techniquet](#) in Cardiff, the winning images are being displayed on both sides of a glass balustrade, enabling visitors to see them on two floors.

And at [W5](#) in Belfast, the images are mounted in light boxes around the walls of the science centre's main concourse.

The fascinating images will also be displayed in the windows of the [Wellcome Trust's](#) headquarters in London as well as at the [Ruskin Gallery at Anglia Ruskin University](#) in Cambridge during the Cambridge Science Festival.



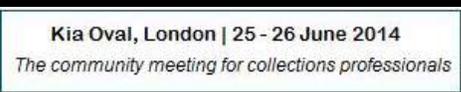
The Wellcome Image Awards was established to raise the profile of contemporary biomedical image collections and to celebrate the world of research scientists, photographers and illustrators working in this field. The winning images were selected by seven judges from all the thousands acquired by the Wellcome Images picture library since the 2012 Awards.

BBC Medical Correspondent Fergus Walsh, who was a member of the judging panel, said: "As always, this year's entries are both technically brilliant, and visually striking. Never before have I thought of a kidney stone or a nit as beautiful, but the Wellcome Image Awards show time and again that there can always be a different way of looking at things."

The images are also available on the [Wellcome Image Awards](#) website and already feature in Wellcome Images collections, where they can be accessed and used along with more than 40,000 other contemporary biomedical and clinical images.

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David L Clements, science and science fiction



Cambridge Science Festival: Science as the Spark

March 18, 2014 by [davecl](#) | [Leave a comment](#)

I'll be on a panel at the Cambridge Science Festival this Thursday:

Science as the Spark – literature inspired by science

How has scientific inquiry lead to literary works? Why is the literary presentation of science relevant to scientists and to society?

This panel, chaired by Dr John Holmes, will skirt the cliches to ask illuminating questions, investigating why a number of talented scientists, historians and artists structure their work at the intersection of these worlds.

Panel members:

Chris Beckett, novelist and short story writer, 2013 Arthur C. Clarke best novel award for Dark Eden, Edge Hill award for The Turing Test.

Dave Clements, novelist and short story writer, 2013 Sir Arthur Clarke award, astrophysicist at Imperial.

Laura Dietz, novelist, convenor of the MA in Creative Writing at Anglia Ruskin.

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*Kelley Swain. poet and novelist, lecturer in Humanities in Global Health for
BSc, past Writer in Residence at the Whipple Museum of the History of Science*

**Thursday 20 March, 7pm-8.30pm, Anglia Ruskin University, East Road,
Building, LAB005**

It's free, but seats are going quickly, so [book now!](#)

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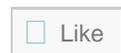
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15:25 Tuesday 18 March 2014

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SLIDESHOW: Melbourn Village College and Meldreth Primary School students enter 'voyage of discovery', from space to the human body

Written by LUCY ROSS-MILLAR



17/03/14 Mad Science roadshow - Melbourn17/03/14 Mad Science visit Melbourn Village College to do science workshops and experiments with year 8 students, as part of the National Science and Engineering week . Nick Clohesy aka Nitro Nick . Picture: David

9 images

[Open Slideshow](#)

Pupils have been blowing up balloons with chemical reactions as part of National Science and Engineering Week (NSEW).

'Mad Science' paid a visit to Melbourn Village College on Monday to run a series of workshops with year 8 students, allowing them to get hands on experience.

Trocey Mayhead, science teacher at the school, said: "The students had a fantastic morning doing lots of different experiments: blowing up balloons with chemical reactions, looking at the science involved in burning paper and learning about non-Newtonian fluids, it has been a science lesson they will always remember."

NSEW is a ten-day national programme of science, technology, engineering and maths events and activities across the UK aimed at people of all ages.

Four budding year 7 scientists, from the school's lunchtime 'Club experimental' (STEM Club), represented Melbourn Village College at the Sellers Festival of Science at Cambridge University's Chemistry department yesterday.

And a selection of year 10 students are currently involved in the National Biology challenge through the Royal Society for Biology.

Mrs Mayhead added: "The school's lunchtime club is thriving.

"We recently had a guest speaker, Katy Symons who talked to students about her career in structural engineering and shortly Matt Haslet from the Welding Institute is coming in to give another careers talk on the welding industry."

At Meldreth Primary School last week, learning was based wholly around elements of science on a voyage of discovery that covered space, microbiology, forces, forensic science, rocks and geology, care and safety of the human body, mobile phone technology, the animal kingdom and chemical reactions.

Pupils also visited the Cambridge Science Centre, enjoyed talks by Melbourn Village College, STEM ambassadors, Shepreth Wildlife Park and BlackBerry, as

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 Living With Dogs family workshops at Wood Green



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FAMILY
 'Our two little miracles' - Cambridge mum tells how IVF has given her the family she'd always dreamed of



CHOICE
 SLIDESHOW: Fantastic - The Museum of Cambridge exhibition looks back

to the days when wedding rings were made of eel skin

well as using forensic science techniques to solve a "crime" around the school.

Sally Willan, teacher and science coordinator, said: "The children have been able to experience many areas of science outside the boundaries of the usual school curriculum and this will have a hugely beneficial impact on their scientific knowledge and understanding.

"We are certain that our budding young scientists of the future will continue their learning during the Cambridge Science Festival which runs until Sunday."

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Cambridge: Hidden city

Why we live in a Tardis



Mike Levy
localsecrets.com Monday, 17 Mar 2014
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There is something of the Tardis in Cambridge. How does such a small city pack so much in?

A few days ago I took a guided walk, part of the Cambridge Science Festival. Called, 'Symmetry of Science', the knowledgeable Blue Badge guide took us first on a familiar route – DNA at The Eagle pub, the beautiful symmetry of the Gate of Honour in Senate House Passage. Then we were off piste and for me, into Terra Nova.



First we delved into the yard of old Cavendish Labs. We glimpsed the bust of Rutherford and admired the distinctive 1930s building designed to withstand a chemical blast (but not the splitting of the atom one suspects). All this was new to me – as was our subsequent jaunt into the depths of Pembroke College to admire the astonishing 'botanical' windows in the library. These are normally off limits to non-college mortals but their sheer exuberance took the breath away. The same can also be said of the college's lovely gardens with their long vistas of Wren's chapel – a brave new world for this writer.

What else is hidden in this Russian Doll of a city?

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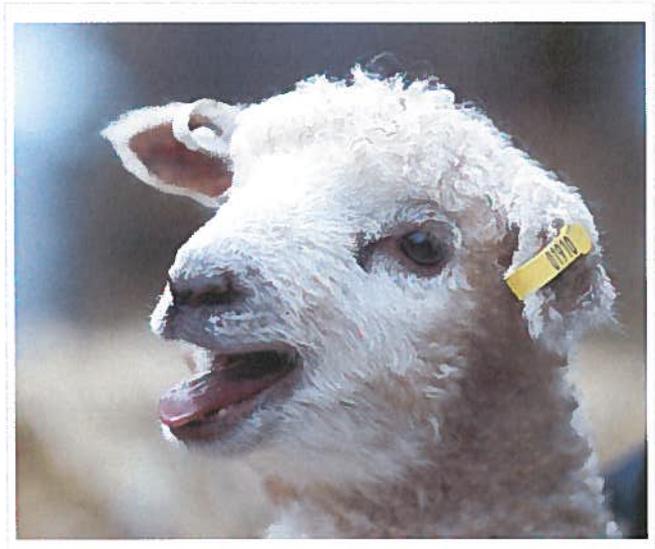
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06:00 Thursday 20 March 2014

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10 things to do with the family (March 20-27)

Written by ELLA WALKER



A lamb soaks up the early spring sunshine at Wimpole Hall farm in Cambridgeshire. PRESS ASSOCIATION Photo. Picture date: Thursday March 6, 2014. Photo credit should read: Chris Radburn/PA Wire

3 images [Open Slideshow](#)

1. See a show

RAPPERS, break dancers, MCs and singers will be strutting their stuff at this spring's Bling Ya Ting urban talent show final. Taking place at Cambridge Corn Exchange next Thursday (March 27), you'll be able to spot up and coming Cambridgeshire talent and have fun while you're at it. The show will kick off at 7.30pm and tickets are £7.50 from (01223) 357851.

2. Go to a gig

IF (mums and dads) you're sick of singing along to "The wheels on the bus go round and round," Megson can help. The husband and wife duo (Stu and Debbie Hanna), are the darlings of the British folk scene. Hailing from Teeside, the pair are three time BBC Radio 2 Folk Award nominees, and are coming to Cambridge toting guitars, mandolins and a fresh approach to nursery rhyme time. The Family Folk Show with Megson is at Cambridge Junction on Sunday at 11.30am and 2.30pm. Tickets are £9 (£5 concessions) from (01223) 511511.

3. Watch a film

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Campaign for cycle route between Saffron Walden and Cambridge takes step forward

REVIEWS
Susan Boyle

KERMFF the Frog, Miss Piggy and the rest of the goggle-eyed gang are starring in **The Muppets** at Cambridge Arts Picturehouse this Saturday! Packed with songs, dancing and laughs galore, the Muppets join forces with fans to save their old theatre from a greedy oil tycoon. It's showing at 10.30am (autism friendly screening) or 11am (Kid's Club screening). It costs £1.50 per kid's club member or £3.50 per non-members. Book on 08719025720.



4. Meet the lambs

DON your 'awww' face, lambing season has hit Wimpole Hall – so it must be spring! From Saturday, the farm will be throwing open its doors so you can meet its newest, fluffy, gangly legged additions. You'll be able to see newborn lambs frolicking about and learn how the average sheep lives its life. Usual admission applies and you can pop by daily between 10.30am – 5pm. You're going to want to take one home with you!



ART
The vastness of nature at Byard Art

5. Climb a tree

EVER dreamed of being Tarzan? Now's your chance! Wimpole Hall is running a whole day of tree climbing workshops on Monday. You'll be able to swing through the tree canopy using ropes, knots and karabiners (don't worry, it's safe!), and then zip line back down to earth, just try not to look down! The hour long sessions are running throughout the day and are suitable for all ages, costing £18 per person. Call 08442491895 to book your slot.



TRIED AND TESTED
Tried and tested: 6D lashes

6. Get arty

DISCOVER your inner artist at a magical workshop on Tuesday. The Fitzwilliam Museum's It's Magic! session is a chance to explore the gallery's collections and get messy in the studio creating and designing your own artworks to take home, and presumably lick on the fridge. It's on from 10am until 11.30am and is suitable for 2-5-year-olds. The session costs £3 per child. Call (01223) 332904 to find out more.



CHOICE
Catch the amazing British Sea Power at Cambridge Junction

7. Get even more arty

FEELING arty? Head to Kettle's Yard on Castle Hill for an afternoon of drawing and exploring this Sunday. From 1pm to 4pm the gallery will host its twice-monthly Studio Sundays sessions, where you can be inspired by the gallery's exhibition (currently a lot of turquoise seas capes dotted with boats and brightly coloured flowers in *Art & Life: 1920 - 1931*), and create artworks of your own. There's also a crafty prop-box to rummage through packed with family-friendly activities. Best of all, it's completely free – just drop-in. Call (01223) 748100 to find out more.



FAMILY SLIDESHOW: Amazing harness enables St Neots 4-year-old Bella Lockett, who has cerebral palsy, to walk down aisle as flower girl

8. Spot a copycat

AS part of Cambridge Science Festival, the Zoology Museum is hosting workshops all about animals and how they camouflage themselves. The 'Amazing animals: craftycamouflage and communication' sessions are a chance to find out how good you are at spotting the difference, and you can find out all about how animals try to blend in with their surroundings to avoid pesky predators. Visit the Cambridge Science Centre on Jesus Lane between 10am and 5pm on Saturday to take part. Normal admission applies, call (01223) 967965 to book your place.

9. Get to grips with Raspberry Pi

TECHNICALLY minded whizz-kids can put their brains to the test at Cambridge Junction with a Raspberry Pi workshop. Impress your friends by learning some basic coding and make your own music on the Raspberry Pi computer, with help from expert Dr Sam Aaron from the University of Cambridge Computer Laboratory. There are two sessions running on Saturday: 10.30am-12.30pm, and 1.30pm-3.30pm. Suitable for all ages, places cost £3, book on (01223) 511511.

10. Go on a treasure hunt

HAVE an adventure this weekend by venturing out on a sensory treasure hunt between St John's College Library and the Polar Museum. On the 'exploring the unknown trail' you'll need to spot landmark objects and use your senses to discover a different side to Cambridge. Good luck! Get involved daily (until Sunday), between 10am and 4pm. It's completely free and suitable for over 5s – the trail starts at either venue!

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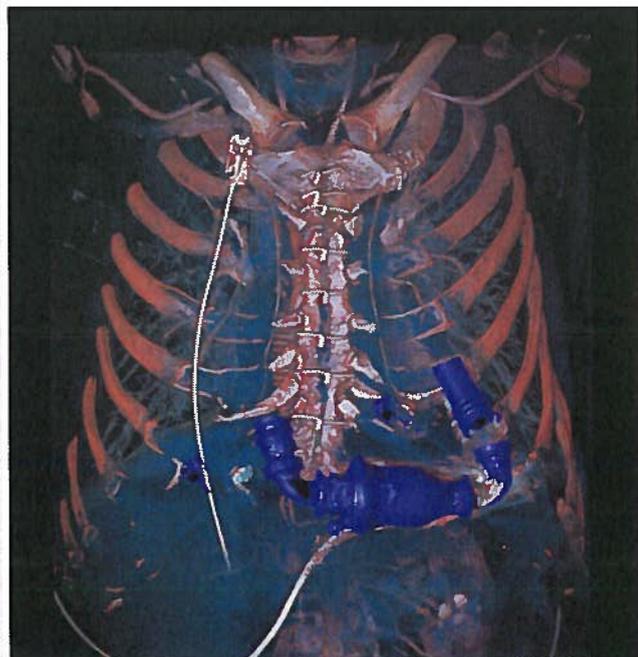
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SLIDESHOW: A mechanical heart pumping and bug burrowing into human skin on show in stunning Wellcome Trust photography exhibition in Cambridge

Written by GARETH MCPHERSON



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Susan Boyle



Credit: Anders Persson, Wellcome ImagesARU Mechanical heart pump in the thorax, DECT (credit Anders Persson)

8 images

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A mechanical heart pumping inside a rib cage, a bug burrowing into human skin and the "suicide" of breast cancer cells.

These are some of the wonders from the science world that have been captured in breathtaking detail and put on display in Cambridge.

Winning entries of the Wellcome Image Awards 2014, run by the trust that funds life-saving genome research at the Sanger Institute in Hinxton, are being exhibited outside of London for the first time.

They can be viewed for free at Anglia Ruskin University in East Road until Saturday, March 29, to coincide with the Cambridge Science Festival.

Fergus Walsh, one of the judges and BBC medical correspondent, said all 18 entries are "both technically brilliant and visually striking".

He added: "Never before have I thought of a kidney stone or a nit as beautiful, but the Wellcome image Awards show time and again that there can always be a different way of looking at things."

Commenting on the overall winner, he added: "Anders Persson's 3D image of a mechanical heart fitted inside a human chest is truly stunning."

"The juxtaposition of delicate human anatomy with the robust mechanical plumbing parts is dramatic, and the image is rendered so vividly in 3D that it appears to jump out at the viewer."

The Ruskin Gallery is open from 10am to 4.30pm Monday to Saturday.

A talk by the Wellcome Trust takes place at the gallery at 7pm tonight.

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Cambridge Science Festival set for gripping climax with events at city's West Cambridge site and Biomedical Campus at Addenbrooke's

Written by CHRIS ELLIOTT

Science fans will be flocking to Cambridge this weekend - as the city's hugely-popular Science Festival comes to an exciting finish.

Cambridge University is spearheading another jam-packed two days of events, with hundreds of talks, debates, exhibitions and hands-on demonstrations planned.

On Saturday, the university's giant West Cambridge site will host many of the happenings, and on the two-week festival's final day on Sunday, the Biomedical Campus at Addenbrooke's will be the main venue.

Last weekend, a world record was set with the biggest-ever balloon pyramid being built at the Grafton Centre, and thousands of people attended free events in the city centre, including the Corn Exchange and the Guildhall.

A spokeswoman for the festival said: "This weekend promises much the same. On the West Cambridge site, visitors will be able to enjoy a day bursting with events, focusing on manufacturing, physics, maths and more.

"If the weather is as good as it was last weekend, the Institute of Astronomy will be opening its doors for evening star gazing between 7-9pm. They will also be hosting their annual open afternoon, from 2.30 to 6.30pm."

Events are also planned at the Hauser Forum and the Institute of Manufacturing, and there will be a hands-on Maths Fair at the Centre for Mathematical Sciences - and in the city centre, museums and other venues will taking part.

On Sunday at the Cambridge Biomedical Campus people will get the opportunity to explore some of the life-changing medical research going on there, in a range of demonstrations, exhibitions and workshops.

Tomorrow at 8pm, TV science journalist Nick Crumpton will give a talk about palaeontology at the Mill Lane Lecture Rooms.

Science Festival co-ordinator Dr Lucinda Spokes said: "Last weekend we had 1,500 visitors during the first two hours at the Corn Exchange on Sunday morning, and we're expecting it to be as busy this weekend. Every year, the Science Festival just gets bigger and better."

More information, including how to book tickets, is available at www.cam.ac.uk/science-festival.

chris.elliott@cambridge-news.co.uk

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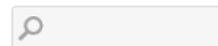
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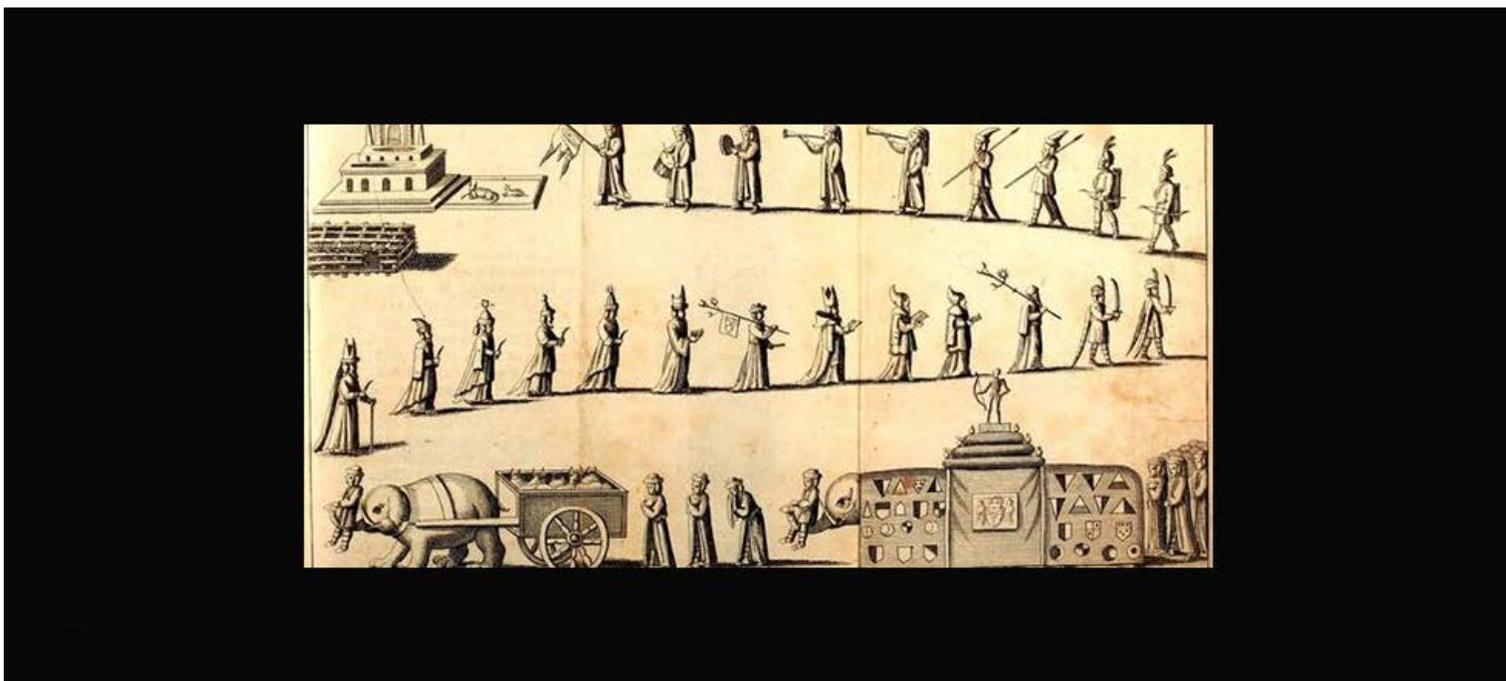
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Engraving showing George Psalmanazar's imaginary account of a Formosan funeral. Credit: Reproduced by permission of the Master and Fellows of St John's College, Cambridge

FANTASY ADVENTURES OF EARLY-MODERN WALTER MITTY GO ON SHOW

Article created on Thursday, March 20, 2014



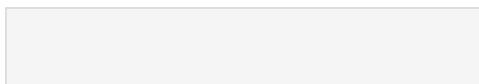
The fictitious adventures of a 17th century con artist, who fooled London society for years with his made-up travellers' tales, are being put on public display at St John's College, Cambridge for the first time as part of the Cambridge Science Festival.

The 1704 work, *The History of Formosa*, describes in great detail the culture, language and customs of the island nation of Formosa, modern-day Taiwan. The book was supposedly written by a native of Formosa who was brought to Europe by Jesuit missionaries, but all is not as it seems.

An early Walter Mitty

The catch is that the author, who called himself 'George Psalmanazar', was actually a white, blond-haired Frenchman who had never left Europe. Every detail of Formosan life that the book describes is completely made up. Psalmanazar was a fantasist who, like an early Walter Mitty, spent his life in a world of his own imagination. His hoax was so successful that to this day, we still don't know his real name.

The exhibition – much of which can also be seen [online](#) – places Psalmanazar's fantasies in the context of the real history of exploration, map-making and travel; not because anything he



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wrote was true, but because he provides an insight into the early modern European craze for discovering new places, people and cultures.

Even today, we still know very little about who Psalmanazar really was, because his posthumously-published autobiography deliberately obscures the details. He was probably born in Languedoc or Provence somewhere between 1679 and 1684 and educated in a Jesuit academy. Psalmanazar describes himself as a child genius with a gift for languages, who had no need of formal education.

Forging identities and crafting fantastic tales

His career of forging identities and crafting fantastic tales began when he was a young man. With the aid of a pilgrim's staff and cloak stolen from the reliquary of a local church, he set off on a walking tour of Europe, claiming to be an Irish Catholic pilgrim. This story soon fell apart as many people he met knew Ireland well and could easily see through his lies. Psalmanazar then shifted his imaginary origins to somewhere more remote: first Japan and then Formosa.

To give his story more credibility, he began to follow a 'pagan' calendar, eat raw meat and even speak a language of his own creation. His suspiciously French accent, he explained, was simply due to the way he had been taught to speak French and English by the Jesuit missionaries who had brought him to Europe.

History of Formosa

When Psalmanazar reached England, news of this strange foreign traveller spread quickly and he soon became a favourite of London society. It was at this time he wrote his completely fictitious History of Formosa. Psalmanazar's version of Formosa is a sensationalist fantasy where the nobility live in underground palaces and dine on vipers' blood for breakfast, while criminals are killed and eaten, and priests sacrifice thousands of children a year to bloodthirsty horned gods.

To modern readers, Psalmanazar's stories seem far-fetched but they successfully fooled an English audience with little or no experience of other cultures and a view of the world that saw foreign people as primitive and savage. Psalmanazar's book was an unqualified success. It was published in two English editions, the first of which will be on show at St John's College. French and German editions also swiftly followed. After its publication, Psalmanazar was invited to lecture upon Formosan culture before several learned societies, and it was even proposed that he teach his invented language to students at Oxford University.

Psalmanazar was frequently challenged by sceptics, but for the most part he managed to deflect criticism of his main claims. He explained, for instance, that his pale skin was due to the upper classes of Formosa living underground and never seeing the sun. Jesuit missionaries who had actually been to Formosa and who contradicted Psalmanazar's claims were not believed due to the general anti-Jesuit attitudes prevalent at the time.

Discredited by British explorers

Psalmanazar's Walter Mitty-style fantasies became increasingly unbelievable and were ultimately discredited as British explorers actually began to travel to Formosa (sometimes equipped with a dictionary of Psalmanazar's 'Formosan' language) and found it was not as he described at all. Jonathan Swift, author of his own fantastic tale Gulliver's Travels, satirised



George Psalmanazar whose 1704 work, The History of Formosa, describes in great detail the culture, language and customs of the island nation of Formosa, modern-day Taiwan. Image: Wikimedia Commons

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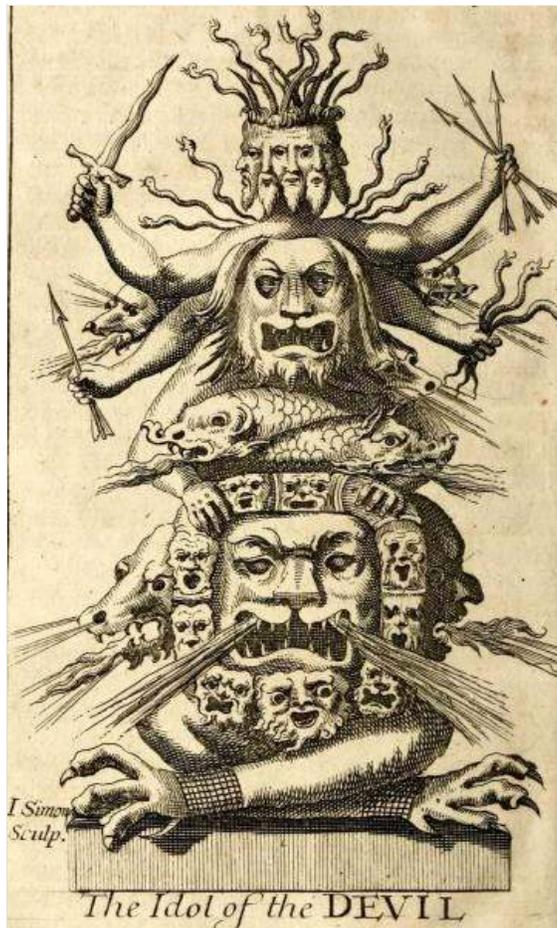


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Psalmanazar's fantasies of Formosa depicted a shocking and salacious society where nobles drank vipers' blood, criminals were killed and eaten, and priests would sacrifice thousands of children each year to their bloodthirsty gods before idols.

Psalmanazar's graphic descriptions of cannibalism in his Modest Proposal of 1729.

Psalmanazar eventually grew tired of his forged life, and assumed a quiet existence in London as a clerk and writer of theological pamphlets. In his final years, he wrote a frank confession with instructions in his will for it to be published after his death in 1763. This account, entitled Memoirs of XXX, Commonly known by the name of George Psalmanazar, a reputed native of Formosa, is also amongst the items on display in the St John's exhibition.

Dr Mark Nicholls, Librarian at St John's College, said:

"Psalmanazar's fraudulent description of Formosa was so successful because it first appeared at a time when interest in exploration and strange new lands was at its height across European society. His tales, imaginative as they are, fit into a wider genre alongside travellers' accounts and maps featuring grotesque creatures, sea monsters and alien, exotic peoples, images that enthralled audiences who had never left their home country."

"Other items on display represent the adventures and work of real-life explorers such as James Cook, Marco Polo and James Clark Ross. These intrepid travellers increased the sum of human knowledge immensely, and the College is delighted that such items will be on display for all to see as part of the Cambridge Science Festival."

Source: [University of Cambridge](http://www.cam.ac.uk)

More Information

The exhibition, World of Wonders, is to be held in the 17th century Old Library at St John's College, Cambridge and will be open to the public on Saturday 15 March from 10:00-16:00. Entry is free and there is no need to pre-book. There will also be a digital gallery on the College website featuring images of the exhibition, available here: <http://www.joh.cam.ac.uk/science-festival-exhibition-2014> Visit the College website www.joh.cam.ac.uk or the Science Festival website www.cam.ac.uk/sciencefestival for more details.

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Cambridge Science Festival 2014: A smorgasbord of science

Posted by [Jennifer](#) on Fri 21 Mar 2014Categories: [Uncategorized](#) | [\[9\] Comments](#)

Mid-March is one of my favourite times of the year: the days are getting longer, I can start hanging my washing outside and Cambridge is buzzing from its [annual science festival](#).

With over 250 events across the two weeks, it was difficult to decide what to attend but I tried to squeeze in as much as I could. Here are some of my highlights from the first week:

On Monday, [Tim Radford](#) chaired a discussion between [Patrica Fara](#), Rosie Bolton and [Gerry Gilmore](#) asking 'What's new in space?' The answer? A 1 billion pixel camera aboard the [Gaia satellite](#), which was launched at the end of last year. Back on the ground, there's the Square Kilometre Array, a project that is set to start building thousands of 15m wide radio dishes across two sites in the southern hemisphere from 2018. So we'll be obtaining a lot of data – big data – but rather than answering questions, the panel said that scientists first need to figure out the right questions to ask.

Wednesday saw [Molly Stevens](#), of Imperial College London, deliver the annual [WiSETI](#) lecture. She combined a fascinating account of her unusual career path, which she described as a series of lucky events and accidents, with an overview of the exciting research going on in her group. Rather than a general call for science to improve the way it approaches women with

children, Stevens explained the practicalities of how she actually did it. Her group must be the epitome of multidisciplinary research, containing engineers, surgeons, chemists and mathematicians. She described some interesting work they [published last year](#) where they used nano-analytical electron microscopy techniques to visualise calcific lesions around heart valves, aortae and coronary arteries to better understand the pathophysiological processes underlying cardiovascular disease.

It was an early start on Saturday to fit in a couple of hours on the Royal Society of Chemistry's stand in the chemistry department. We had some fantastic experiments this year. One was based on a scenario where a famous painting has been stolen from the Fitzwilliam Museum in Cambridge. The 'thief' had left a note at the scene saying that they plan to strike again, so the children were tasked with using chromatography to analyse pens from the top three suspects and match it to the ink in the note. It turns out the culprit was Leonardo da Pinchi (teehee).

[The festival is still running this weekend so do go and check it out.](#)

Jennifer Newton



Rating: 9.5/10 (4 votes cast)

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A penguin made from crystals on the Royal Society of Chemistry stand





07:57 Saturday 22 March 2014

Tweet

Purnell backs Cambridge University team to be British cycling force

Written by AARON MASON

Tony Purnell has high hopes for Cambridge University RT-Hunter Gibson-Chain Reaction Cycles cycling team this season following its official launch.



Cambridge University RT-Hunter Gibson-Chain Reaction Cycles team

The team is the brainchild of British Cycling's head of technical development, who is also a professor at Cambridge University, and is managed by former Light Blues rider and president Mark Holt while Cambridge-based ex-professional David McLean mentors the squad.

Purnell unveiled the team during his talk at Cambridge Science Festival and believes they can become a force in British cycling this year.

He said: "I've made a new team happen for this year because of some sponsorship connections I've had.

"It's quite exciting because we've got some cracking riders and I'm sure one or two of them we could see in the British team in the future.

"They're very good cyclists, so it's a bit of a thrill getting something like this together and their results so far have been stellar."

The team is captained by multiple British Universities champion Wojciech Szlachta, but Purnell felt the likes of Ed Bradbury and Felix Barker also showed particular promise.

He said: "Ed is a beast. He looks pretty special and in Felix Barker, we're seeing a cyclist growing so you never quite know where they'll end up."

Following the launch, Bradbury and Szlachta finished second and third respectively in times of 43.08 and 44.04 behind AthlonSport-Cloudnine pro Russell Hampton at the Maldon & District 18-mile Time Trial while Barker came 10th in 46.37.

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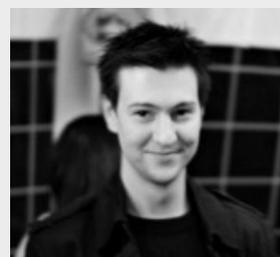
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The Cambridge Science Festival

Last night, I was honoured to have spoken at the final evening lecture at the Cambridge Science Festival, along with [Nick Crumpton](#), Anjali Goswami, Rob Asher, and Stephanie Pierce, about why palaeontology is important. Below is a rough transcript of some of what my talk was about. Unlike the others, I didn't discuss my own research. Instead, by general gist was that although palaeontology is useful in addressing some of the greatest scientific questions of our time, like the evolution and history of life on Earth, the current narrow framing of science in terms of impact is being quite detrimental to creativity and exploratory science. As such, should palaeontology be more focused on its emotive qualities, and be used as a 'hook', or 'gateway' into the other fields of science?

Intro

When people ask me why palaeontology is important, I picture that it's a drunk guy sitting in a pub, asking why he's paying taxes for our research. The last thing he probably wants to hear is that it's going on hunting for dinosaurs or some smidgen of a 500 million year old louse. Sometimes anyway. With science funding bodies being eternally squeezed, academics are being constantly asked what the point of their research is – there's little space for exploratory, or 'blue sky' research any more. Research now often has to be shown to have demonstrable 'impact', before you've even done it!



About

Palaeontologists have a unique position among scientists in unravelling the mystery of lost ancient worlds. Communicating this science is essential to maintain the fascination that captivates people of all ages. Jon Tennant is currently undertaking a PhD in vertebrate macroevolution in London and tweets as [@protohedgehog](#).

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One major area of palaeo-research at the moment is focussed towards unravelling large-scale patterns in the environment and biodiversity over millions to tens of millions of years – a concept we call macroevolution. The whole idea is that the past is the key to the present and future – the notion being that this kind of research can give us useful information about what is going to happen in the next 10-100 years with global climatic disruption and the impending biodiversity crisis. No, it doesn't make much sense to me either, and it's my field of research! We still haven't managed to reconcile the time-scale differences, and until we do, looking at above-species level dynamics isn't really going to tell us much about mitigating climate change or protecting our biodiversity. I know this is just one example of current palaeo research, but it's certainly a persistent theme throughout many current research areas.

So how do we demonstrate the impact of palaeontology? It doesn't offer much for the economy, in the same way that new technologies do, or benefit health care much, unless someone starts grinding dinosaur bones for some ridiculous form of holistic medicine. Its use for conservation, when looking back in deep geological time, is a bit tenuous. But does this mean it's unimportant? Certainly to a politician, or the drunk guy in the pub, it would be difficult to convey the 'importance' of palaeontology when so much of science is framed in having some sort of demonstrable economic or environmental impact these days.

But I think palaeontology is unique in that it goes beyond such a simple framing of science.

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Palaeontology is what I like to call a 'gateway science'. Modern palaeontology is a wonderful blend of the other sciences, from zoology to mechanics, and from molecular biology to biochemistry. What it gives us is a unique perspective, an opportunity if you like, to interact with other sciences outside of their usual 'raw' applications.

This isn't to say palaeontology is utterly useless by itself – go down to your local museum, and see the queues and inspired faces when seeing the dinosaurs. Every kid wants to be a dinosaur, but at some point, most of us lose that inspiration, and become estate agents or bankers. I don't have a clue why this is, but I'm quite happy to lay most of the blame on Michael Gove.

I'd like to give you some examples of how palaeontology can be a 'gateway science', and show that palaeontology as an integrative area of research can be used to inspire generations to think about the other sciences in different ways, and with any luck, go on to do great things in them!

Chemical ghosts

What if I told you we now have direct evidence of the remains of cellular material in dinosaurs? You'd probably jump to a similar conclusion to many others I've talked about this with – how long until Jurassic Park happens?! Well, that's still pretty much impossible, as we don't have any eccentric billionaires to buy us a Pacific Island. Or dinosaur DNA (yet).

My old lecturer, Phil Manning, coined the term 'chemical ghosts' – the chemical remains of an animal when the organic matter has decayed away. One example you may have seen in the media are the uses of the chemistry of fossil feathers to determine the colours of ancient dino-birds.

When this was discovered, interpreting colour was initially based on the structure of little melanin-bearing organelles called melanosomes. In modern birds, the structure of these provides information about colour, so it's safe to say this probably happened with ancient feathered dinosaurs too.

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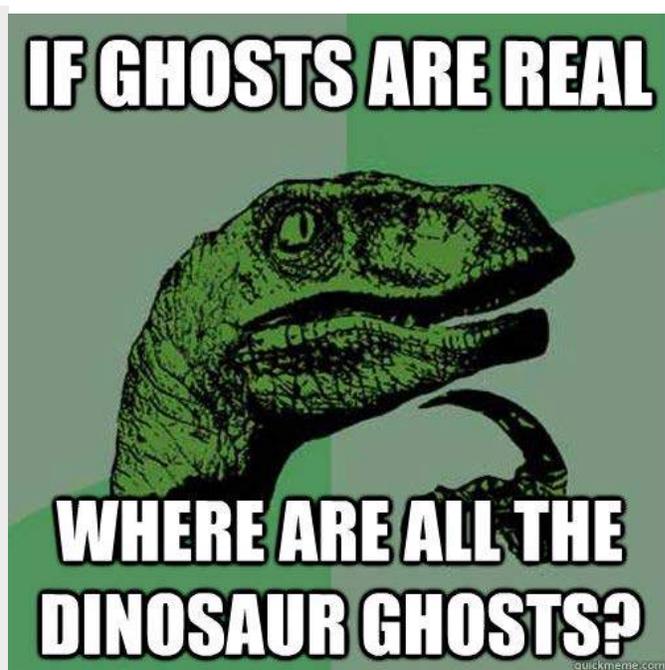
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But there has been, and still is, a lot of debate about whether this method is accurate, and whether the organelles are even melanosomes or just bacteria in a lot of cases! Enter chemistry.

Phil and his team used a machine called a synchrotron, which is a particle accelerator similar to the one housed at CERN. They analysed the remains of plumage preserved in *Archaeopteryx* – after all, what better specimens to bombard with electrons than the most infamous and valuable we have? They were able to map sulphur and trace metals over the whole body of *Archaeopteryx*, and the distribution of these elements was strongly tied to the preservation of the melanosomes, and allows you to more accurately reconstruct the colour of an animal that has been dead for 150 million years. Additionally, due to the structural implications of having trace metals and melanosomes in feathers, investigating the chemistry can have implications for the mechanics of the feathers, and the early evolution of flight in birds. Similar studies have been carried out in fossil fish too, but well, they're just fish..

Mary Schweitzer and the Philosopher's Stone

As well as this Mary Schweitzer and her team from the USA have been exploring molecular-level remains in dinosaurs, mostly with a hadrosaur called *Brachylophosaurus*, and the notorious *T. rex*. They've published several research papers on it now, each getting largely dismissed by the palaeontological community for what seems little more than pre-conceived notions of what is 'allowed' by the fossil record. But each time their work gets knocked down, they come back with a stronger argument for this exceptional preservation.

How do you find the molecular remains of 66 million year old tissue, how were the ravages of time stopped? Chanel has shown great interest in this research, naturally. But again, it comes down to chemistry, this time with a side helping of biotechnology.

In a study from early last year, Schweitzer and her team claimed to have found the remains of proteins in *T. rex*. They did this by essentially dissolving away the hard, mineralised parts, until all that was left were cell-like microstructures which turned out to be osteocytes, star-shaped cells found in bone. They then used biotechnological and chemical staining techniques that targeted proteins

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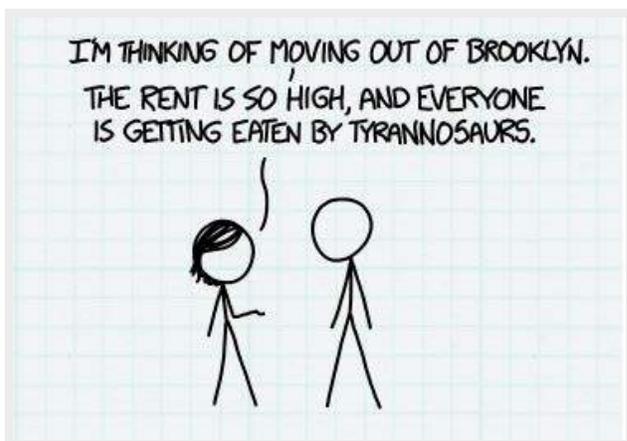


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associated with osteocytes in bird-line animals. What they actually found were not the chemical ghosts, but the structural ghosts of DNA-like structures within the cells – an analysis confirmed using dinosaurs extant relatives like ostriches and alligators.

Stealing a technique from analytical chemistry called mass spectrometry, they tested the chemical compositions of these preserved structures, and found that the dinosaurs contain peptides, a type of amino acid, as well as proteins associated with DNA called histones. So not only did they find incredible molecular-level preservation, but also evidence of proteins that you'd expect to find in the ancestors of modern birds, which is pretty cool evidence for their evolutionary descent.

Additionally, using more techniques borrowed from chemistry, they found that a type of 'tissue fixation' may be responsible for the preservation of these cellular structures as well as blood vessel networks. This is where in this case, iron, plays some sort of role in stabilising tissue enough so that it is preserved before the onset of organic decay – we're still trying to figure out the exact processes that take place here. The future of molecular-level discovery in fossils quite simply couldn't go ahead without a combination of biotechnology and chemistry.



So there we have it – palaeontology can be a gateway into chemistry and biology! I bet ten to fifteen years ago, the link between molecular chemistry and dinosaurs was nothing more than a child's dream – but it became true. We can now discuss the application of industrial analytical techniques, and those used in medical laboratories around the world, but in the context of something that is arguably more interesting and inspiring to younger generations.

How much of the past is key to the present?

Shifting topic quite dramatically now! I mentioned earlier that when we go back in time, palaeontology isn't really that useful, in the sense that it can't tell us much about how biodiversity is going to respond to imminent climate change. This is pretty much because the further you go back in time, the worse the quality of the fossil record becomes, and the more uncertainty goes into our dating and resolution of the rocks and fossils. This pretty much means that despite how cool stuff going on in the Jurassic and further back in time was, and no matter how much we analyse it, it probably won't ever be informative in the sense that we can use it to guide conservation efforts. Unless we're talking on a million year time-scale, in which case good luck submitting the grant application for that project.

But what if we burst forward in time to closer to the present? In a period of time called the Quaternary, we have a much better geological and fossil record. We

can see oscillations in climate that resulted in fluctuating hot house and ice house worlds, just like you see in the film Ice Age.

To give a few examples, this study shows how the pace of climate change has changed over the last 21,000 years, and how this has impacted on the geographic ranges of species. What we see is a global pattern – the faster climate change happens, the fewer unique species are present, particularly in mammals, birds and amphibians. Through knowing this historical pattern, we can apply it to the modern world – where climate is changing fastest, mammals, birds and amphibians that are unique to those areas will be the most under threat and need most conservation attention.

This next one focusses just on mammals from the Holocene period, from about 11,700 years ago until the present day. As such, it probably represents the best palaeontological record we'll ever have. The upper graphs show extinction, and the lower graphs show currently threatened species, with raw numbers on the left and proportions on the right. As such, you can use this as a basis to investigate spatial patterns of extinction, and use this to infer how animals in those geographic regions at the present will respond in the future. And of course, once you understand threat at an empirical and quantitative level, you can employ a mitigation strategy much more effectively.

So if we were to create a model of how the environment is going to affect future biodiversity, looking at the recent palaeontological and palaeoecological records is crucial to understand how things have changed in the past, and how similar animals are likely to respond in the future.

A point of ongoing research through all of this is pinpointing exactly what drove extinction, speciation and biogeographic patterns. Was it influenced by human evolution and hunting, environmental factors, something to do with the biology of the animals themselves, some combination of all of these, or just something obscure we haven't thought of yet.

Either way, the clearer this picture becomes in pinpointing exactly what has driven species' extinction in the past, the more confident we can be in our conservation efforts in the future. So palaeontology can provide a unique perspective into biology in a conservation or biodiversity-related context, something which is of clear importance in this time of dynamic global change.

Wrap up

One thing I want to emphasise from all of this is not to lose the point of what science is. It's a human endeavour of the senses – we explore, we ponder, we analyse the natural world around us. This in itself is a wonderful thing, and palaeontology is among the most exploratory of sciences out there. It hits us emotionally, in a way – we always want something that we can't have, from the stars, to a *T. rex*. Palaeontology is the girl you were always too afraid to ask out, who moved on, forever. You get that same longing feeling, wondering what could have been. It's this use of the imagination, I think, which encapsulates palaeontology, and makes it unique.

So while palaeontology isn't going to shift the economy or solve the next global health crisis, it can inspire people, particularly younger generations, to think in new ways about the different fields of science. And not just that, but think about it creatively and without bounds – palaeontology is science in its purest and rawest form, and we shouldn't ever forget that.

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Cambridge University radio powered by moss goes on display during Science Festival - and here's our 10 Ideas for the playlist

Written by ELEANOR DICKINSON

Listeners could soon be tuning in to their daily dose of Jeremy Vine on a moss-powered radio.

Scientists at Cambridge University have teamed up with a Swiss designer to create a radio powered entirely by moss.

Nicknamed Moss-FM, the device effectively turns Britain's most prolific plant into biological solar panels by using surplus electrons created during photosynthesis.



22/03/14 Moss Powered Radio 22/03/14 Moss-powered LCD weather station that has been developed by Cambridge scientists. Dr Paolo Bombelli, Institute for Manufacturing (IfM), 17 Charles Babbage Road, Cambridge. Picture: David Johnson

The radio has now gone on display at the Institute for Manufacturing (IfM) as part of the Cambridge Science Festival.

Though still in its very early stages, Cambridge scientists Paolo Bombelli, a biochemist, and Ross Dennis, a plant expert, alongside designer Fabienne Felder, hope this will be the start of big developments in solar-powered devices.

Speaking to the News, Mr Dennis said: "There are extremely-low powered LCD screens out there that use plants.

"The system is fine to harness the photosynthesis in the plants to generate electric current, but ideally we want it to be used for solar panels."

But Mr Dennis stressed they were a long way from listening to a bit of Robert Plant during the morning commute just yet.

He said: "At the moment, the radio takes about 80 minutes to charge for one minute of operation, so it's very early days.

"We have a long way to go, but I think it would be great to explore the mechanisms behind it and see how it could be scaled up."

He added: "More fundamental research is conducted as we try to create some exciting products and in the long term, give tangible solutions able to contribute to solve the energy crisis."

The Moss-FM prototype comes under the umbrella of the Bio-Photo-Voltaic (BPV) project, which studies the photosynthetic workings of algae, plants and mosses for generating electrical current.

The researchers hope to eventually create "biological solar panels".

This is not the first time moss has been used to create electricity.

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In 2011, Dr Bombelli collaborated with Alex Driver and Carlos Paralta from Cambridge's Institute for Manufacturing to develop a table which generated electricity using moss.

But, before people start hoping to get their Kiss FM fix from a plant radio, the team have only so far been able to harness about 0.1 per cent of the energy created by moss leaving considerable room for progress.

Top 10 songs and bands you could listen to on Moss FM

- 1) Red Hot Chili Peppers
- 2) Robert Plant
- 3) Octopus's Garden – The Beatles
- 4) Let it Grow – Eric Clapton
- 5) The Lightening Seeds
- 6) Brandon Flowers
- 7) Build Me Up Buttercup – The Foundations
- 8) Waltz of the Flowers – Tchaikovsky
- 9) Orange Crush – REM
- 10) Supergrass

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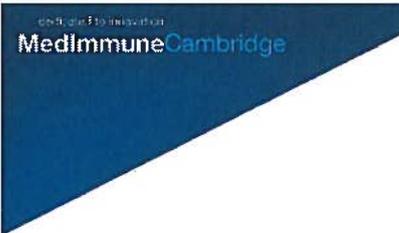
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Viruses in bacteria create buzz at Science Festival

www.Medimmune.com

MedImmune, the global biologics R&D arm of AstraZeneca, is always enthusiastic about explaining how its science benefits patients' lives. So taking part in Cambridge's highly successful Science Festival, which finished



last weekend, is a wonderful opportunity for the company to reach out and share its activities with the wider Cambridge community.

With many thousands of visitors, the Cambridge Science Festival provides the public with opportunities to explore and discuss topics of scientific interest and, importantly, is the perfect place to raise aspirations by encouraging young people to consider a career in science. Over both weekends of the Festival, firstly in the Corn Exchange and then at the Clinical School at the Cambridge Biomedical Campus, over 35 MedImmune scientists volunteered their time to demonstrate to a continual stream of visitors to understand how new antibody medicines are found using viruses which grow in bacteria.



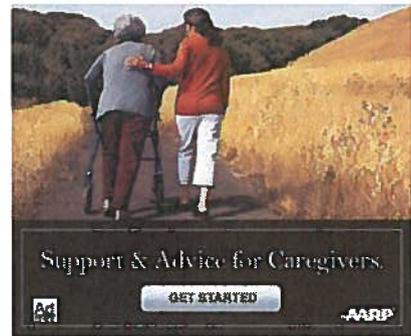
Dr Jane Osbourn, Site Leader and Vice President of R&D at MedImmune in Cambridge commented "Cambridge Science Festival is a truly cohesive event for the city – connecting people who live and work in Cambridge with a broad cross-section of both academia and local organisations. As usual, our stand at the event attracted a great deal of interest and it was both inspiring and rewarding to see so many young people wanting to understand more about the science behind our drug discovery techniques."

A few weeks earlier, MedImmune and AstraZeneca supported the Innovation Leaders Conference which took place at Clare College on 27th and 28th February. The Conference was hosted by the Innovation Forum to promote links between established leaders and young entrepreneurs in the Cambridge area. Over 300 academics, business leaders, disruptive entrepreneurs and investors came together to stimulate communication and catalyse partnering for the next generation of innovative technology.

Dr Matthew Sleeman, Senior Director of Biology – Respiratory, Inflammation and Autoimmunity (RIA) at MedImmune joined a prestigious list of speakers which included Dr Claire Brown, External Projects Director, Vice President, AstraZeneca; Professor Sir Leszek Borysiewicz, Vice Chancellor, University of Cambridge; Professor Sir Greg Winter, Master of Trinity College; and Patrick Verheyen, Head of

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Johnson & Johnson Innovation Centre London.

Dr Sleeman spoke on the significance of biologic medicines and their positive impact on pharmaceutical R&D around the world: "Because biologics behave differently from the more traditional 'small molecule' medicines, scientists and physicians have to think differently about the diseases they treat. Current technology provides a more detailed understanding of the biological mechanism underlying a patient's disease. By using this knowledge, companies such as MedImmune are better able to target the treatment of diseases in a more specific manner. For example, by being able to tailor a therapeutic strategy to individual patients, it's possible to improve dosing strategies and the safety of medicines. And, in addition to encouraging innovation, increasing competition in the field of biologic medicines has also influenced clinical trial design and the understanding of patient needs."



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BVA concern at call for sick animals to be slaughtered

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The British Veterinary Association is calling for a clarification of remarks made by the Chief Medical Officer in which she called for sick animals to be slaughtered rather than treated as part of the strategy to reduce antibiotic resistance in humans.

The Daily Mail reports that, speaking at the Cambridge Science Festival, CMO Dame Sally Davies called for a reduction in the use of antibiotics in farm animals and said that she had urged veterinary surgeons to slaughter badly infected animals rather than treat them.

Commenting, BVA President Robin Hargreaves, said: "As veterinary surgeons our first duty is to the animals under our care, and that means providing the most appropriate treatment. Badly infected animals may need to be slaughtered for their own good or for the good of the herd or flock. But those that have a good chance of recovery and the opportunity to be productive should be treated with the appropriate antibiotics used responsibly.

"To suggest that treatable animals should be slaughtered makes no sense in terms of animal health, public health, or the rural economy.



"It is unclear from the reported comments how such a strategy would be deployed and whether it would be extended to all animals, including pets. We are seeking clarification of the CMO's comments to ensure that the debate is based on facts.

"We know that the biggest cause of antibiotic resistance in humans is the overuse and misuse of antibiotics in human medicine and this is highlighted in the joint report on

resistance from the Department of Health and Defra.

"However, we are not complacent about the role of antibiotics use in veterinary

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CAMBRIDGE SCIENCE FESTIVAL BREAKS RECORDS

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Written by Jennifer Shelton on 26 March 2014.

Science has dominated Cambridge over the past two weeks and it was hard to miss the palpable buzz that infiltrated the city. With well over 250 events ranging from stem cell and medical research, to comedy, theatre and scientific photography – there was even an event on the science of sweets from the ever-engaging Stefan Gates – it was no surprise that the number of visits this year reached over 35,000.



During the first weekend alone, visits were estimated to reach a staggering 20,000; the first hour on Sunday at the Corn Exchange saw 1,500 visits. It was also a year of record breakers with Bubbly Maths breaking the world record for building the world's largest balloon pyramid at the Grafton Centre on Saturday 15 March.

Professor David Spiegelhalter, who was the official Judge for the balloon record-breaking attempt and also delivered a talk on coincidences, said: "For me the Festival was the usual slightly bizarre combination of events: talking to 400 people about their experiences of coincidences, judging an eight-metre high, world-record-beating Sierpinski pyramid of balloons in the Grafton Shopping Centre, then racing off to be on a panel with Robin Ince on whether scientists should get involved in politics. Exhausting but fun!"

It was also a year of firsts... The Science Festival joined forces with the Cambridge University Hospitals NHS Foundation Trust to organise and host a clinical Science Festival at the Cambridge Biomedical Campus on the Addenbrookes' site last Sunday.

To leave feedback about your experience of the Cambridge Science Festival 2014, visit: www.cam.ac.uk/science-festival/feedback

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BVA concern at call for sick animals to be slaughtered

FW Reporters

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The British Veterinary Association (BVA) has raised concerns about comments made by England's chief medical officer over the use of antibiotics in farm animals.

Speaking at the Cambridge Science Festival this week, CMO Prof Dame Sally Davies called for a reduction in the use of antibiotics on livestock.

And she controversially called for sick animals to be slaughtered rather than given antibiotics to help them to recover as part of the strategy to reduce antibiotic resistance in humans.

"I had a bit of a problem with some vets recently because I said, 'Why don't you just slaughter animals when they're badly infected?' It seems to me much better because then they can't transmit them [antibiotics]," the Daily Mail reported Prof Davies saying.

"At the moment, if you eat a farmed salmon in America it has probably eaten its own weight in antibiotics."

Her comments have provoked an angry response by the BVA, whose head called for a clarification.

BVA president and vet Robin Hargreaves said a vet's first duty was to care for animals and provide the most appropriate treatment.

Slaughtering treatable animals “made no sense at all” in terms public health or the rural economy, he added.

“Animals may need to be slaughtered for the good of the animals or the herd but should be treated with antibiotics if there is a good chance of recovery.”

And he asked: “Would this be extended to all animals, including pets?”

Mr Hargreaves said the BVA was one of the leading voices in the campaign for responsible use of antibiotics in all species.

Antibiotic resistance was a significant threat to animal and human health, he added, but the debate must be based on a “sound assessment of the risks involved and the sensible solutions”.

Earlier this month, Prof Davies [blamed the overuse of antibiotics in livestock farming for contributing to resistance drugs used in human medicine](#) .

A recent report from the Department of Health said increasing scientific evidence suggested that the clinical issues with antimicrobial resistance faced by human medicine were “primarily the result of antibiotic use in people, rather than the use of antibiotics in animals”.

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SLIDESHOW: It's a record-breaker: Cambridge Science Festival draws massive crowds

Written by CHRIS ELLIOTT



Virgin Media Science In Sport event at the University Sports Centre in Cambridge. Volunteer Matt Ward helping pupils test their reaction speed on the Batak Wall....Matthew Power Photography

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Open Slideshow

Organisers of Cambridge's annual Science Festival have hailed it a huge success, with more than 35,000 people attending its free events.

The unique two-week celebration of the city's scientific genius came to an end last weekend, and Cambridge University has revealed it broke records for the number of events staged, and attendees.

A spokeswoman told the News: "With well over 250 events, ranging from stem cell and medical research, to comedy, theatre and scientific photography, it was no surprise that the number of visits this year reached over 35,000.

"During the first weekend alone, visits were estimated to reach a staggering 20,000 - the first hour on Sunday at the Corn Exchange saw 1,500 visits.

"It was also a year of record breakers with Bubby Maths breaking the world record for building the world's largest balloon pyramid at The Grafton centre on Saturday, March 15."

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their experiences of coincidences, judging an eight-metre high, world record-boiling Sierpinski pyramid of balloons in The Grafton shopping centre, then racing off to be on a panel with Robin Ince on whether scientists should get involved in politics. Exhausting but fun."

Among the firsts for this year's festival was a clinical science event on the Cambridge Biomedical Campus at the Addenbrookes' site, organised jointly by the university and the Cambridge University Hospitals trust.

The Science Festival also teamed up with BlueBridge Education for the first time to bring an international dimension to the Schools Zone last Saturday, with a Japanese team joining teams of students from 12 regional schools and sixth form colleges to offer a range of science demonstrations.

The university's new sports centre hosted a Science of Sport event, where young people could try out a range of technology, including a cycling simulator.

Among the top speakers during the fortnight were Lord Rees, the Astronomer Royal, Prof Michael Green, one of the pioneers of string theory, Dame Sally Davies, Chief Medical Officer for England, and Prof Molly Stevens, recognised as one of the top 10 scientists under the age of 40.

Nicola Buckley, head of public engagement at the university, said: "I think many people have developed a greater understanding and realisation of what an important role science has in 21st century culture and, therefore, they also have a deeper curiosity about what's going on in science and technology.

"The special thing about the Science Festival is that active scientists are involved who help explain science and they really put a lot of their voluntary time into explaining and inviting questions on what they're doing on a day-to-day basis for everyone. It also gives people the opportunity to hear about scientific research at greater length and in more depth."

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Maths clown helps build world's largest balloon pyramid for African charity



Left to right: Elizabeth Freeman, Kristen Avis, Steve Benton, Caroline Ainslie, Anna Bubnova and Simon Payne.

by Bettina Trabant and Tim Lamden
Sunday, March 30, 2014
5:00 PM

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A mathematical clown and friends have set a new world record by building a 23ft pyramid made entirely out of balloons.

Caroline Ainslie, of Fortress Road, Kentish Town, constructed the giant Sierpinski pyramid with fellow "pyraloons" at Cambridge Science Festival earlier this month.

The 52-year-old helped build the pyramid dressed as her alter-ego Bubbles the Mathematical Clown to raise funds for charity the African Institute of Mathematical Sciences Schools Enrichment Centre (AIMSSEC), which helps train students and teachers in rural towns and villages in Africa.

Ms Ainslie runs Bubbly Maths, an educational organisation which tours primary schools worldwide delivering workshops that aim to make maths fun and accessible.

What is a Sierpinski pyramid?

a Sierpinski pyramid is formed by repeatedly cutting out pieces of a pyramid. To form it, you start with a pyramid and divide it into eight identical pyramids. You then cut out all of the smaller pyramids except for the ones at the vertices. You then do the same for the four pyramids left and continue infinitely.

The intriguing design consists entirely of simple equilateral triangles and was named after the

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She said: "The biggest problem in Africa is mathematical education, that's what's really holding them back.

Polish mathematician Waclaw Sierpinski, who described some of its interesting properties in 1916.

"Students who get to university will fail their first year because they don't have the maths grounding. It's absolutely tragic."

Ms Ainslie built the pyramid, named after Polish mathematician Wacla Sierpinski, as part of a team of 15 at the Grafton Centre in Cambridge.

The challenge took place over two days between March 14 and 15 and required 2,048 balloons.

Ms Ainslie explained: "On the Friday, we inflated about 1,000 balloons. Two balloons make one pyramid and the fractal shape we were making is made up of 1,024 small pyramids."

It took Ms Ainslie and her team about 10 hours to construct the pyramid and they are now preparing to officially register it with Guinness World Records as it is believed to be the largest Sierpinski pyramid ever made.

The team raised £225 on the day towards bursaries to fund teacher training for African students through AIMSSEC.

Ms Ainslie added: "We had a lot of technical problems because of balloons popping. The building had a glass roof so we had a greenhouse effect.

"When we finished at 4pm, a huge cheer went up. We had a lovely big crowd. We felt such relief."

If you wish to donate to AIMSSEC, visit www.givengain.com/activist/34783/projects/4204/

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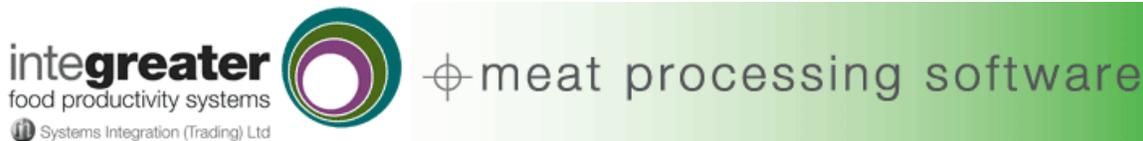
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BVA concerned at calls for sick animals to be slaughtered

31 March, 2014

By Georgi Gyton

The British Veterinary Association (BVA) has questioned remarks made by the Chief Medical Officer (CMO) Dame Sally Davies that sick animals should be slaughtered rather than treated, and has asked for clarification on the issue.

The calls for potential treatment to be ditched in favour of slaughter form part of a strategy to reduce antibiotic resistance in humans.

According to the Daily Mail, at the recent Cambridge Science Festival, Davies called for a reduction in the use of antibiotics in farm animals and said she had urged veterinary surgeons to slaughter badly infected animals rather than treat them.



Robin Hargreaves, president, BVA, said: "To suggest that treatable animals should be slaughtered makes no sense in terms of animal health, public health or the rural economy.

"As veterinary surgeons our first duty is to the animals under our care, and that means providing the most appropriate treatment. Badly infected animals may need to be slaughtered for their own good or for the good of the herd or flock. But those that have a good chance of recovery and the opportunity to be productive should be treated with the appropriate antibiotics used responsibly."

He said it was unclear how such a strategy would be deployed, and whether it would extend to pet animals as well as farm animals.

"We are seeking clarification of the CMO's comments to ensure the debate is based on facts. We know that the biggest cause of antibiotic resistance in humans is the overuse and misuse of antibiotics in human medicine – and this is highlighted in the joint report on resistance from the Department of Health and Defra.

"However, we are not complacent about the role of antibiotics use in veterinary medicine and we are one of the leading voices in the campaign for the responsible use of antibiotics in all species.

"Antibiotic resistance is a significant threat to animal and human health, but the debate must be based on a sound assessment of the risks involved and sensible solutions."

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Antibiotic resistance debate flares up in the UK

By [Margaret Donnelly](#) on April 2, 2014

The British Veterinary Association (BVA) has called for clarification around remarks made by the UK's Chief Medical Officer (CMO) in which it is reported she called for sick animals to be slaughtered rather than treated as part of the strategy to reduce antibiotic resistance in humans.

It was reported that the CMO, Sally Davies, called for a reduction in the use of antibiotics in farm animals and said that she had urged veterinary surgeons to slaughter badly infected animals rather than treat them, when speaking at the Cambridge Science Festival at the weekend.

Commenting, BVA President Robin Hargreaves, said: "As veterinary surgeons our first duty is to the animals under our care, and that means providing the most appropriate treatment. Badly infected animals may need to be slaughtered for their own good or for the good of the herd or flock. But those that have a good chance of recovery and the opportunity to be productive should be treated with the appropriate antibiotics used responsibly.

"To suggest that treatable animals should be slaughtered makes no sense in terms of animal health, public health, or the rural economy."

He said the biggest cause of antibiotic resistance in humans is

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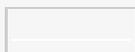
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Susan Boyle



Innovation competition called I-Teams for schoolchildren as part of Cambridge Science Festival, April 2014.

2 Images

Open Slideshow

Could moss be used to power fairy lights? Or could pigs reach their food through a cat flap?

These were some of the novel [ideas](#) dreamt up by schoolchildren for new inventions at Cambridge University's Institute of Manufacturing as part of the city's science festival.

Youngsters were given demonstrations of recent scientific [innovations](#), and were then asked to submit ideas about how they could be used in real life.

Among the winners were Mackenzie Donaldson, 7, from Hemingford Grey Primary School, who suggested using electricity generated from moss to power garden lights and fairy lights.

Scientists have already produced a moss-powered radio to demonstrate the technologies potential.

Lucy Quinn, 7, from Histon & Impington Infant School, wanted to use cat flaps which identify animals using microchip ID tags to let pigs reach their food.

Grace Hartley, 13, from Bottisham Village College, wanted to use novel laser inks called Illumink to create plastic sheets which would prevent birds from flying into glass windows.

The fourth and final winner was Michael Gilliland, who wanted to use a super-accurate timer created by Qinet Technologies to test very small nanotechnology designs.

There were three runners-up, including Oliver Wilkinson, who suggested using an interactive projector which turns any surface into a [touchscreen](#) for restaurant menus.

Organiser Amy Weatherup, said: "This is the fourth year of our competition and the busiest year yet. We had nearly 100 wonderfully [imaginative](#) entries, and we very much enjoyed reading through them."

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Building a bridge to maths

Submitted by mf344 on April 4, 2014

At last month's Cambridge Science Festival we decided to try and bring maths to the masses using one of our favourite puzzles. Our aim was to deliver a hands-on (or rather feet-on) activity that's fun and brings across the creative aspects of maths, but also links up to cutting edge mathematical research. We were really pleased with how it went, so we thought we'd share our game for others to put on at their own science or maths event.

The game is based on a puzzle known as the *Bridges of Königsberg* which, unsurprisingly, originated in the Prussian city of Königsberg (now Kaliningrad) in the 18th century. Königsberg was divided by a river containing two islands, with the various land masses connected by seven bridges (see the image below). The task the people of Königsberg posed each other was to find a walk through the city which crossed each bridge once and only once.



A young mathematician in action. (Photo by Alice Boagey, copyright University of Cambridge)

At the science festival we recreated the lay-out of land, river and bridges using coloured yoga mats you could walk around on and challenged people to find the path the Königsberg people had been after. The challenge (and the colourful yoga mats) proved irresistible to many passing punters, especially the younger ones. The task is easy to explain and it seems easy to solve — as people watched person after person try but fail to cross all seven bridges, many decided to have a go themselves. You could see their brains ticking over as they were searching for that clever lateral thought that would give the solution.

The perhaps slightly cruel thing is that a solution does not actually exist! There is no path that crosses every bridge exactly once. But thankfully, the beautifully simple explanation of why the puzzle is impossible to solve quickly makes up for the shock of the announcement. Any piece of land, unless it's the one you start or finish your walk on, needs to have an even number of bridges attached to it. That's because whenever you enter the piece of land via one bridge you need to leave it by another, so you need two bridges for every visit. Therefore, if more than two pieces of land have an odd number of bridges attached to them, the puzzle is impossible to solve (the two pieces that are allowed to have an odd number of bridges would have to contain the starting or finishing points of the path). And as you can easily establish with help from the youngest audience members, in the bridges of Königsberg problem, all pieces of land have an odd number of bridges attached to them — so the puzzle is impossible to solve.

This elegant argument, so simple yet so clever, inspired real eureka moments and did a great job at bringing across the beauty and power of creative mathematical thought. You can illustrate it further by "blowing up" a bridge to make the problem possible. We asked people which bridge they'd like to have blown up and took that one away. With the correct number of land pieces now having an even number of bridges attached to them, the

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Building a bridge to maths



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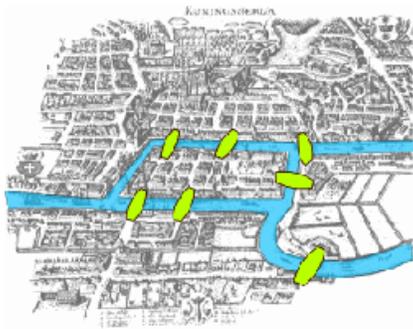
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The philosophy of cosmology



Can philosophy help explain our Universe?

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The seven bridges of Königsberg. Image: Bogdan Giuşcă.

problem becomes not only possible but also easy, so even the youngest audience member can have a go.

When the great mathematician [Leonhard Euler](#) first came up with this argument in 1735 he laid the foundation for a field of mathematics known as *graph theory*. A graph is a collection of nodes (in our case pieces of land)

connected together by links (in our case bridges). It's really just a network, and since networks permeate modern life, from road or rail networks to social networks and the internet, Euler's ingenious solution laid the foundation for an area of maths that couldn't be more relevant today.

The game is really easy to put on, here is how we did it.

- Use 6 yoga mats of two different colours: we used 4 green mats for the land masses and 2 purple mats chopped up for the bridges. (You can buy yoga mats quite cheaply online). Cut the mats into pieces: four pieces to represent the landmasses and seven for the bridges. The land pieces don't have to have the same shape as the ones shown in the map of Königsberg above: the important thing is not their shape but how they are connected by the bridges.
- Tape the land pieces to the floor and draw or tape a cross on one side of each bridge piece. Lay the pieces out (with the crossed side facing down) to re-create the Königsberg problem and wait for people to get curious.
- As people try and find a path through this mini-maze, turn over the bridges they have used so that the cross shows, indicating they can't cross that bridge again.
- After a few people had a go tell your audience the secret (it's impossible) and explain why. Ask people to nominate a bridge they want blown up, take the corresponding mat away, and let people find the now possible path.
- If appropriate give a brief talk explaining the relevance of graph theory to modern life (see [this](#) article for some information).
- Have fun!

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