A warm welcome to the 2017 #cheltscifest. This June we celebrate our 15th birthday and in our three headline themes we’ll be gazing into the future of our planet and human society, delving into the science of sound and music, and uncovering the mystery of how our brains make us who we are. We’ll also be attempting to understand the universe, exploring the link between science and the criminal justice system, discussing the latest research in health and wellbeing, looking at tech, wildlife, making, politics, history, comedy... and so much more! Join us in questioning everything.

I believe that science can change the world. It shouldn’t be a pipedream. In times of uncertainty it is essential to bridge walls and evoke and inspire a passion for truth and curiosity in all. To make our world a better place, we must first try to understand it. Come and ask the right questions with us at #cheltscifest.

Mark Lythgoe
Chair of Cheltenham Science Festival

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Our Future World

From climate change to the future of work, food and travel, we ask the big questions about our planet and human society, considering the issues and developments that will affect our lives in the years to come.

Dallas Campbell is one of the best known factual television presenters in the UK. He has worked across a wide range of subjects on programmes such as *The Gadget Show*, *Bang Goes The Theory* and *Stargazing Live*, and on documentary series including *Supersized Earth*, *City In The Sky*, and *Britain Beneath Your Feet*.

I’m thrilled to be back at everyone’s favourite Science Festival. Cheltenham always brings together the best of the best - from familiar faces to rising stars. This year I’m particularly excited about peering into our crystal ball to see what the future might hold, as we meet people whose ideas and research could define the way we live on planet earth.

Events to look out for:
The Future Of Travel page 31
Food: A Guilt-Free Future page 24
Living In A Machine World page 32
Brexit: Keeping Britain’s Science On Top page 22
Populations And People page 28
Our Connected Future page 19
Our Changing Climate page 26
The Future Of Work page 31
The Future Of Our Oceans page 19
Rewriting Economics page 34

Join Dallas to discuss Our Future World in our free Quick Chats on Wednesday and Thursday afternoon (see pages 19 & 23).

EDF Energy is delighted to be the Associate Title Partner of Cheltenham Science Festival

Come and find out about our programmes to inspire the next generation in Science, Technology, Engineering and Maths (STEM): visit us in the EDF Energy Zone in Imperial Square, or inside the Discover Zone in Cheltenham Town Hall, to find out how we are encouraging the scientists, engineers and thinkers of tomorrow.

As the UK’s largest producer of low carbon electricity, EDF Energy is committed to helping young people understand the great career opportunities available in a STEM related industry. Currently only one in five people working in core science, technology, engineering and maths fields is female. Our Pretty Curious campaign aims to change this, as we look to increase our intake of female STEM apprentices to 30% by 2018.

To find out more visit [www.edfenergy.com/prettycurious](http://www.edfenergy.com/prettycurious)
**Mysteries Of The Mind**

The human brain is made up of billions of neurons and trillions of connections, unconsciously ticking away and resetting while we sleep. How does this blob of matter not only allow us to function and make sense of the world around us, but also define us and give us our identity?

Whether it’s the busy hum of the city or the melody of your favourite pop song, sound and music are a universal feature of our culture and a permanent fixture of our daily lives. Join us as we trace the evolutionary origins of music, explore how we can not only hear but also feel sound, question what it takes to become a musician, learn how an instrument’s design can change its sound and understand how music is being used as medicine. Dazzle the senses with unique performance, lively debate and installations; our 2017 programme offers up a symphony of sound that you won’t want to miss.

**Events to look out for:**

What Is Reality? page 17
What Do Babies Think? page 33
What Is Consciousness For? page 31
Can You Retrain Your Brain? page 28
Why Do We Laugh? page 40
Is Pain All In The Brain? page 27
Stress page 16
Introvert, Extrovert, Or Just You? page 39
Your Irrational Brain page 20
Sex, Lies And Brain Scans page 18
The Machine Mind page 32

**Music And Sound**

Whether it’s the busy hum of the city or the melody of your favourite pop song, sound and music are a universal feature of our culture and a permanent fixture of our daily lives. Join us as we trace the evolutionary origins of music, explore how we can not only hear but also feel sound, question what it takes to become a musician, learn how an instrument’s design can change its sound and understand how music is being used as medicine. Dazzle the senses with unique performance, lively debate and installations; our 2017 programme offers up a symphony of sound that you won’t want to miss.

**Events to look out for:**

Sounds Of Science page 28
Evelyn Glennie: Feeling Sound page 30
Can Science Explain Music? page 16
The Singing Neanderthals page 27
Music On Prescription page 14
What Makes A Musician? page 17
Instrumental Acoustics page 21
Will Gregory: Writing Emotion Into Music page 37
The Sound Of Symmetry page 39
Chladni Plates Installation (Activity Tents) page 9

**Guest Director: Ellen Stofan**

Ellen Stofan is a planetary geologist and the former Chief Scientist of NASA. She has been at the forefront of incredibly exciting discoveries, informing our understanding of our own planet and our solar system. Ellen is also an Honorary Professor at University College London and co-chair of the World Economic Forum Space Council.

“**I’m looking forward to sharing the excitement of space exploration with everyone at Cheltenham Science Festival. This generation of kids will one day walk on the surface of Mars. I want to inspire those future Mars astronauts.**”

**Events to look out for:**

Fact, Fiction And The Rise of Fake News page 24
Ellen Stofan: A Life Scientific page 27
Ellen Stofan: Life Beyond Earth page 33
Family: A Voyage Through Our Solar System (Ideal for 8+) page 41
EDF Energy Zone
Open 10–12 June
All ages
Design your ideal high-tech smart bedroom. Work with EDF engineers to build electronic circuits and then test them live.

Siemens Curiosity Zone
Open 11–12 June
10am–6pm
All ages
See page 10 for details.

Discover Zone
Open daily 10am–5pm
All ages
(late opening for adults Fri 9 June 8–10pm)
See page 15 for details.

GE Pavilion
Open daily 10am–6pm
All ages
(late opening Wed 7 & Fri 9 June, till 8pm)
See page 12 for details.

MakerShack
Open daily
All ages
See page 11 for details and opening times.

16-25 Members receive 10% off at all cafés* Festival Café, Imperial Garden Bar & Regency Café in the Town Hall.
*Includes all food and hot drinks. Visit cheltenhamfestivals.com/16-25 to find out how to register.

Food & Drink
Have our speakers got your brain whirring? Share ideas, be inspired and join other audience members for an informal chat at Conversation Corner in the Festival Café. Places limited, unreserved seating.

Conversation Corner
Open Daily, Drop in

Have our speakers got your brain whirring? Share ideas, be inspired and join other audience members for an informal chat at Conversation Corner in the Festival Café. Places limited, unreserved seating.

RPS International Images For Science
Open daily
Town Hall
All ages
From head to hoof: Join a specialist team from Hartpury University Centre to explore equine anatomy through a detailed dissection.

Large Animal Dissection
11 June 10am–4pm
Activity Tents, Imperial Square

Collect your quiz sheet from the Science Trail start point and follow the Trail around Imperial Square.
11-12 June, 10am-6pm

Siemens Curiosity Zone

All ages
Free entry

Working with our friends from Greenpower and The London Transport Museum, there will be plenty of transport-themed interactive, hands-on activities for you to get involved with in the Siemens Curiosity Zone. Whether you want to have a go at assembling an electric car, building your own railway, or learning how to code your way through a digital rail-themed challenge using the BBC micro:bit, there are lots of activities to explore and experiments to tackle!

The Curiosity Project is a three-year engagement programme by Siemens, aimed at bringing science, technology, engineering and mathematics to life for young people in the UK, addressing the UK’s chronic shortage of engineers and inspiring the next generation. Find out more at siemens.co.uk/curiosity-project

Siemens is a global engineering and technology company, focusing on the areas of electrification, automation and digitalization, and is one of the world’s largest producers of energy-efficient, resource-saving technologies.

6–9 June 3–5pm, 10–11 June 10am–5pm
Free Entry, All Ages

Enter a carnival of creativity in the MakerShack: explore wondrous materials and intriguing techniques with a host of makers, engineers and craftspeople, and put your newfound knowledge to the test as you make your very own creations and inventions.

From the mysterious world of invisibility to curious materials with strange properties, get hands on with a surprising selection of stuff. Discover traditional and futuristic making technologies – and find out how makers are fusing past and current techniques to create new methods of craftsmanship.

From Tuesday to Friday, help us code a robot to get it ready to journey into space, and join us at Mission Control on Saturday 10th to launch and track its journey.

Friday 9 June 8–10pm
Late opening
Over 16s only. Free Entry
Discover Zone

Cheltenham Town Hall, Main Hall
All ages
Free entry

A huge, free interactive space to get hands-on with the latest exciting research and technology. Find out more about the world and how it works: with virtual reality, aeroplane engineering, steam, chemistry, cyber security, quantum computing, brains and memories, canal design, microscopic bugs and so much more!

Friday 9 June 8–10pm
Late opening for adults
Cheltenham Town Hall, Main Hall
Bar open. Over 18s only.
Free Entry

Don’t miss our special late opening for adults. Drop in to avoid the crowds, enjoy a drink and try all the activities for yourself – without kids and with the bar open.

Open Tuesday–Sunday, 10am–6pm
GE Pavilion

Late opening Wed 7 & Fri 9 June, till 8pm
All ages
Free entry

Plant yourself in GE’s green pavilion and unearth your passion for science, technology, engineering and maths. Embark on a journey to discover the new GE technologies that will shape the world, experience different branches of digital industrial engineering and explore how GE is digging down to the root issues that will affect the future of the planet. Enjoy hands-on activities and meet the engineers that are shaping our future.

Safran Landing Systems is the world leader in the design, development, manufacture and support of aircraft landing and braking systems. We are proud to support Cheltenham Science Festival and inspire the next generation of scientists and engineers as lead partner for the Discover Zone.

GE is the world’s Digital Industrial Company, transforming industry with software-defined machines and solutions that are connected, responsive and predictive. GE is organized around a global exchange of knowledge, the “GE Store,” where each business shares and accesses the same technology, markets, structure and intellect. Each invention further fuels innovation and application across our industrial sectors. With people, services, technology and scale, GE delivers better outcomes for customers by speaking the language of industry.
TUESDAY 6 JUNE
Box Office 01242 850270

1–2pm Becoming British: Immigration And Integration
Cheltenham Ladies' College, Parabola Arts Centre £7*

Belonging. Citizenship. Integration. These words resonate so strongly in a country that for many of us feels divided, shaped by an uncertain future where borders hang in the balance. Shining a spotlight on the experiences of immigrants and refugees, Nilufar Ahmed considers the psychological impact that fleeing political upheaval and arriving in sometimes hostile environments can have on those who have been displaced.

2.15–3.15pm Music And Sound
Music On Prescription
The Crucible £7*

We've all heard the saying that music is good for the soul, but how much evidence is there that it improves our mental and physical health? Social entrepreneur Tim Joss is joined by medicinal music expert Vera Brandes, singer-songwriter Hannah Peel and psychologist Lauren Stewart as they delve deeper into our understanding of healing harmonies and explore how this knowledge is being used both in clinical settings and our day-to-day lives.

3.30–4.30pm Living With Dementia
EDF Energy Arena £7*

Dementia affects thousands of people in the UK every year with devastating consequences. Broadcaster, journalist and campaigner Fiona Phillips is joined by a patient, their caregiver and memory research scientist Chris Butler to explore the reality of living with dementia. They consider signs and symptoms, the road to diagnosis and treatment, and explore how research is informing our understanding of the disease.

3.30–4.30pm The Seductive Myth Of Time Travel
Cheltenham Ladies' College, Parabola Arts Centre £7*

For most of us, time is composed of beginnings, beginnings and evenings. We hurry, we wait, we endure. Physics tries to explain time as the fourth dimension, where we can theoretically move forwards or backwards, with no consideration for our human experience at all. Philosopher Raymond Tallis snatches time back from the jaws of physics, criticising this idea of time travel and restoring human consciousness to the heart of our attempts to understand it.

4.45–5.45pm The Secret Lives Of Particle Accelerators
The Cube £7*

What good is a Higgs boson? Do particle accelerators have any impact on our day-to-day lives? Are they worth the billions of pounds we spend on them? Physicist Suzie Sheehy discusses how particle accelerators such as the Large Hadron Collider contribute to society, and ponders some tough practical, moral and ethical questions about her field.

4.45–5.45pm The Brilliance Of Birds
The Crucible £7*

Research has shown that many birds have sophisticated brains with abilities spanning empathy, imagination and problem solving. Join cognitive biologist Nathan Emery for a fascinating exploration of how birds learn, think and feel, as he gives a beautifully illustrated insight into some of the masterminds of the avian world.

5.15–6.45pm The Seductive Myth Of Time Travel
Cheltenham Ladies' College, Parabola Arts Centre £7*

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6–7pm How Does A Hack Work? LIVE
EDF Energy Arena £9*

Launching a hack live on stage, cybersecurity experts FC and Jessica Barker show us how some of the UK’s biggest companies have been infiltrated. Highlighting cracks in the system and exposing cyber criminals’ weapons of choice, they are joined by Olly Mann to reveal how they are striving to remain one step ahead of the hackers to keep our personal data safe.

* Plus transaction fee charged per order, not per ticket. £5.50 for online and telephone sales, and £1.50 for in person bookings with credit/debit cards. No fee for cash bookings.
Philosopher “no” from neuroscientist, doctor, and limits with brain systems expert happens when our brain is pushed to its Neuroscientist including anxiety and heart disease. But severe and chronic stress has been stress can help us reach our full potential. Whether it’s athletes stepping into the arena or that looming deadline, positive Heart racing, blood thumping – do explain using science? Arguing “yes” is physicist and musician against an emphatic
“no” from neuroscientist, doctor, and philosopher Raymond Tallis.

Physicists study vibrations, and the physical mechanisms of making music, and neuroscientists visualise our brain activity when listening to it. Is music ever going to be something that can be understood or explained using science? As we will see, our understanding of music is still far from complete. We can, however, start to make sense of it by exploring the physical mechanisms of making music, and the ways in which our brains respond to it.

Scientists and musicians have made many contributions to our understanding of music, and we will hear from some of the greatest pioneers. From the Baroque period to the present day, we will explore the ways in which music has been used to express emotion, tell stories, and bring people together. We will also hear from contemporary musicians who are pushing the boundaries of what music can be.

So, whether you’re a music lover or a science enthusiast, there is something for everyone in this talk. Join us as we delve into the mysteries of the mind and the world of music, and discover how these two disciplines can come together in unexpected ways.
WEDNESDAY 7 JUNE

**FameLab International Semi-Finals**

**Helix Theatre**

**Free** — no ticket required

The pressure is on as the world’s greatest international science competition returns — giving each contestant just three minutes to enlighten and entertain! Join our 31 national finalists from across the globe as they battle it out for a coveted place in the FameLab International Final. Hosted by Quentin Cooper.

See the final ten compete for the grand prize in the FameLab International Final on Thursday 9th June at 8.30pm.

**2.15–3.15pm**

**Can We Predict The Day You’ll Die?**

Cheltenham Ladies’ College, Parabola Arts Centre

**£7**

Half a million volunteers are having their genetics tested, their bodies imaged and their lifestyles monitored, all in the name of understanding more about a wide range of serious and life-threatening illnesses. Jimmy Bell joins Mark Lythgoe to discuss how imaging data from this revolutionary project is giving a completely new perspective to predicting our health, allowing us to see physical changes in the body before disease symptoms even develop.

**3.30–4.30pm**

**If We Could Talk To The Animals**

Cheltenham Ladies’ College, Parabola Arts Centre

**£7**

As our understanding of animal behaviour improves, we have discovered some surprisingly sophisticated communication systems. But will we ever be able to chat to chimpanzees or converse with whales? Biologist Katie Stroome and Luke Rendell join linguist David Adger to discuss whether animals have language in the same way we do, how we would ever know, and whether we could ever understand them.

**4.45–5.45pm**

**Quick Chats: Our Future World**

Cheltenham Ladies’ College, Parabola Arts Centre

**£7**

Pop in for an informal discussion with Guest Director Dallas Campbell, speakers from the day’s events and other audience members. What questions have been raised by our Festival theme, and what is your vision of Our Future World?

**4.45–5.45pm**

**Our Future World**

Cheltenham Ladies’ College, Parabola Arts Centre

**£7**

Our amazing oceans are home to millions of species, regulate the climate and the air we breathe, and are an integral part of the global economy. But they are at risk. What does the future hold for the beating heart of our planet? Physicist and oceanographer Helen Czerski, marine conservationist Steve Boustead, microbial oceanographer Sonya Dyrham and marine strandings expert Rob Davill dive headfirst into our changing ocean.

**11.45am–12.45pm**

**Mysteries Of The Mind Sex, Lies And Brain Scans**

Cheltenham Ladies’ College, Parabola Arts Centre

**£7**

Neuroimaging presents us with exciting possibilities, allowing the brain to be observed in real-time and giving us a greater insight into an individual’s thoughts, motivations and behaviour. But can brain scans really reveal what is going on inside our heads? Neuroscientist Barbara Sahakian examines what neuroimaging can tell us and considers the ethical risks associated with reading minds.

**1.15–3.15pm**

**Our Future World Our Connected Future**

**The Crucible**

**£7**

As our world becomes increasingly connected, how will our lives change? How can we use this technology to improve accessibility and care for our environment? Will we be more, or less connected to each other? Guest Director Dallas Campbell goes beyond the hype and headlines with digital transformation enthusiast Deborah Sherry, cognitive home designer Richard Harper and city innovation specialist Suzanne Wilson to discuss the benefits and pitfalls of hyperconnectivity.

**3.30–4.30pm**

**The Criminal Mind: Can You Blame Your Brain?**

**EDF Energy Arena**

**£7**

If an injury or illness causes you to act out of character and commit a crime, are you to blame? Could we one day be able to prove somebody’s guilt by using a brain scan? As our understanding of the brain improves, the courtroom is increasingly faced with difficult ethical questions. Neuroscientist Barbara Sahakian, Professor of Legal Theory Dennis Patterson and criminal law expert Lisa Claydon examine neuroscience’s impact upon crime and punishment.

**3.30–4.30pm**

**If We Could Talk To The Animals**

**The Crucible**

**£7**

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**10am–12noon**

**FameLab International Semi-Finals**

**Helix Theatre**

**Free** — no ticket required

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See the final ten compete for the grand prize in the FameLab International Final on Thursday 9th June at 8.30pm.

**Box Office 01242 850270**

**10am–12noon**

**£19**

**1.15–3.15pm**

**£20**

**4.15–6.15pm**

**£21**

**1–2pm**

**£23**

**3.30–4.30pm**

**£27**

**3.30–4.30pm**

**£26**

**3.30–4.30pm**

**£25**

**3.30–4.30pm**

**£28**

**3.30–4.30pm**

**£30**

**4.45–5.45pm**

**£29**

Harnessing the power of your immune system, immunotherapy has been heralded as a turning point in the fight against cancer, producing long-lasting responses even in late-stage disease. But why is cancer such a challenge for the immune system and how do these new immunotherapies work? Oncologist Sam Gotham is joined by medical oncologist Gary Middleton and molecular immunologist Ben Willcox, as they discuss some of the cutting-edge treatments that are currently in the pipeline.

**1.15–3.15pm**

**Can We Predict The Day You’ll Die?**

**Cheltenham Ladies’ College, Parabola Arts Centre**

**£7**

Half a million volunteers are having their genetics tested, their bodies imaged and their lifestyles monitored, all in the name of understanding more about a wide range of serious and life-threatening illnesses. Jimmy Bell joins Mark Lythgoe to discuss how imaging data from this revolutionary project is giving a completely new perspective to predicting our health, allowing us to see physical changes in the body before disease symptoms even develop.

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**cheltenhamfestivals.com**
5–7pm Engineering Digital Futures

GE Pavilion Free no ticket required For all ages

Join GE’s engineers to invent your very own solution to a global issue. Get hands on with a range of tech as you design, build, code and test your new creation.

5.30–6.30pm S031
6.45–7.45pm S032
8–9pm S033

Workshop The Real CSI

ExperiTent £8*

Explore the real science that goes into solving crimes as you try your hand at fingerprinting work? Which insects can learn about a victim from their bones? How true-to-life forensic analysis. What can we solve crimes as you try your hand at fingerprinting work? Which insects can learn about a victim from their bones? How true-to-life forensic analysis. What can we find out about a crime scene? Find out for yourself!

6–7pm S034
6–7pm Mystery Of The Mind The Recovering Brain

Town Hall, Pillar Room £8*

In 2010, Kate Atlet suffered a severe stroke that left her ‘locked-in’: unable to move or communicate, but fully aware of her surroundings. Told she would never walk or talk again, miraculously, move or communicate, but fully aware. She then began to regain speech and mobility in less than a year. Join Kate and neurologist Parashkev Nachev as they discuss her remarkable recovery and explore how her experiences are helping us to think differently about the brain after trauma.

6–7pm S035

What’s Next For Particle Physics

EDF Energy Arena £8

The discovery of the Higgs Boson marked a turning point in our understanding of the inner workings of the universe. But what remains to be discovered? It’s a question posed daily by experimental particle physicists. Gavin Hesketh and others like him who work at the Large Hadron Collider. Looking towards the next scientific revolution, he guides us through our latest understanding and asks how close we are to a Theory of Everything.

6–7pm S036

The Drugs Don’t Work: A Tale Of Resistance

The Crucible £7*

Tackling the global issue of antibiotic resistance with light-hearted sketches, microbiologist Anthony Hilton and his team of experts deliver a stage play with a difference. What happens when we misuse antibiotics? What happens when they stop working altogether? And what can we all do to prevent the antibiotic apocalypse?

6–7pm S037

Mysteries Of The Mind Your Irrational Brain

Helix Theatre £9*

What shall we have for dinner? Should I take that new job? Every day we make hundreds of decisions, from the trivial to the life-changing. So how do we make decisions and how sensible and rational are they? Ginny Smith puts your brain to the test to see just how rational, or irrational, you are. Please note, to get the most out of this event you will need an internet enabled device such as a smartphone or tablet.

6–7pm S038

Science, Business And Trust

The Cube £7*

In a post-Brexit economy, Britain’s fortunes are dependent upon the performance of our industry, particularly those linked to science. Yet whether it’s access to health data, development of medicines or the introduction of new technologies, confidence in industry has declined sharply to its lowest level since 2008. Vivienne Parry is joined by GE’s Duncan Frame and other top experts as they explore what business leaders need to do to earn the trust of the public and to restore our faith in industry.

The Bristol Psychological Society (Promoting excellence in psychology)

7.15–8.15pm S039

Workshop Make Your Own Telegraph Machine

Siemens Curiosity Zone £12*

Always wanted to try out morse code? Join the team from MadLab to wire up your own telegraph machine – inspired by the earliest form of electrical communication device. With specially designed circuits and a soldering iron, the team guide you through the process.

No experience of electronics or soldering required, completed telegraph machine is yours to take away.

7.45–9.15pm S040

Music And Sound Instrumental Acoustics

Cheltenham Ladies’ College, Parabola Arts Centre £12*

The harmonics of the violin, the deep and comforting bass of the cello. How do these of each of these individually exquisite instruments make the beautiful and heartwarming sounds that they do? Exploring their different vibrations, structures and resonances, acoustic expert Mark Lewney reveals it all alongside live music from a piano trio.

9.45–11.00pm S045

Stargazing In The Gardens

Meet at the Holst Statue Free no ticket required

Join members of the Cotswold Astronomical Society for a supervised evening of stargazing using members’ telescopes. Observe the night sky for yourself, with the chance to see Saturn and Jupiter. Full Moon is 5th June. This event is dependent on clear skies.

* Plus transaction fee: charged per order, not per ticket. £2.50 for online and telephone sales, and £1.50 for in person bookings with credit/debit cards. No fee for cash bookings.
THURSDAY 8 JUNE

10am
11am
12noon
1pm
2pm
3pm
4pm
5pm
6pm
7pm
8pm
9pm
10pm
11pm

Big Data And Mental Health
Cheltenham Ladies’ College, Parabola Arts Centre £7
From mood tracking apps and websites, to survey data and digital libraries of patient information, our individual behaviours are being collated and mapped, revealing startling new insights into mental illness. Psychiatrist and app developer John Geddes, psychiatric geneticist Gerome Breen and data expert Sally McManus discuss how big data is helping to unravel the complexity of our mental wellbeing.

Brexit: Keeping Britain’s Science On Top
The Crucible £7
Theresa May wrote in July 2016 that she wants “a positive outcome for science as we exit the EU”. How can we build co-operation and retain Britain’s leading position in the world of science and technology? Brexit looming? Join us to discuss the future with Wellcome Trust’s Innovation as Brexit looms? Join us to discuss the future with Wellcome Trust’s

3.15–4.15pm
Mysteries Of The Mind What The Heart Knows
Cheltenham Ladies’ College, Parabola Arts Centre £7
You may believe your thoughts and feelings originate solely in your brain, but what about heartache or gut instinct? Neuroscientist Sarah Garfinkel and philosopher Barry Smith cast light on the role our bodies play in the mind. They reveal how signals from the heart to the brain can shape the way we think and feel, what we remember and how we recognize others’ emotions.

3.30–4.30pm
The Spider Appreciation Society
EDF Energy Arena £7
Join arachnophiles Vivienne Parry, Adam Hart, Michelle Reeve and Sara Goodacre as they delve into the world of eight-legged creepy crawlies. Discover the sheer diversity of spiders, how our knowledge of their locomotion could lead to better robotics, how they travel incredible distances, the amazing properties of spider silk and so much more.

3.30–4.30pm
Language Unlocked
Helix Theatre £7
Imagine being able to go anywhere in the world without needing to worry about people understanding what you’re trying to say. Offering two-way translation in real-time, new technology is helping to remove barriers to conversation by converting speech into familiar language, with the potential to transform everything from socialising to medical scenarios. Raytheon’s Chief Scientist Jeff Mergen puts this cutting-edge tech to the test with BBC Technology Correspondent Rory Cellan-Jones.

4.45–5.45pm
Why Did The Chicken Cross The Globe?
The Cube £7

We Brits eat more than two million chickens a day, but until recently we knew practically nothing about this humble bird. How was it domesticated, and why has life evolved the way it has? We know surprisingly little about how all and why has life evolved the way it has? Evolutionary biochemist Nick Lane reveals fascinating new ideas about the singular event that sparked complex life into existence, and asks whether evolution would follow a similar path on other planets.

4.45–5.45pm
Quick Chats: Our Future World
Siemens Curiosity Zone Free
no ticket required
Pop in for an informal discussion with Guest Director Dallas Campbell, speakers from the day’s events and other audience members. What questions have been raised by our festival theme, and what is your vision of our society and whether companies and the government need to do more to explain how the media report science to the wider public?

5–7pm
Royal Society Michael Faraday Lecture
Why Is Life The Way It Is?
Cheltenham Ladies’ College, Parabola Arts Centre £9
We Brits eat more than two million chickens a day, but until recently we knew practically nothing about this humble bird. How was it domesticated, and why? Archaeologists Naomi Sykes and Gerger Larson discuss fascinating new research from The Chicken Project, revealing that the story of chickens is the story of us, charting the rise and fall of empires, cultures and ideologies and the impact of humans across the globe.
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<td>Our Future World: Food: A Guilt-Free Future?</td>
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* Plus transaction fee charged per order, not per ticket. £3.50 for orders and telephone sales, and £1.50 for in-person bookings with credit/debit cards. No fee for cash bookings.
A Guide To Forensics
Cheltenham Ladies’ College, Parabola Arts Centre
£8

4.45–5.45pm

What have you always wanted to know about the climate, but were afraid to ask? Guest Director Dallas Campbell leads a lively discussion between climate scientists Tamzin Edwards and Richard Seager as they explore why climate change is happening, the evidence behind global warming, and the link between climate change and weather phenomena such as floods and droughts.

11.45am–12.45pm

Food Allergies And Intolerances: Fact vs Fiction
Cheltenham Ladies’ College, Parabola Arts Centre
£7

For diagnosed sufferers, food allergies and intolerances can make life miserable. But there is a growing trend for people voluntarily cutting ingredients like wheat and dairy from their diet. Broadcaster Michael Mosley is joined by dietician Isabel Skyppa and allergist Adam Fox, as they dispel the myths, discuss how allergies and intolerances are detected and treated, and ask whether gluten really is friend or foe.

1–2pm

Our Future World: Our Changing Climate

The Crucible

£7

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2.15–3.15pm

Our Future World: The Healthcare Revolution

Helix Theatre

£7

From wearable sensors to Smartphone plug-ins, new technology is empowering patients to take control of their own well-being before setting foot inside the doctor’s surgery. Innovator UPE’s Ian Campbell is joined by self-proclaimed Disruptor-in-Chief, NHS Clinical Lead for Innovation Tony Young and GP and former chair of the Royal College of GPs Clare Gerada for an exclusive insight into the trailblazing tech at the forefront of the healthcare revolution.

3.30–4.30pm

Our Future World: The Real Urban Jungle

Town Hall, Pillar Room

£7

Nature is under attack. The rainforests are shrinking, the ice caps melting, the seas poisoned. But there is one habitat that is expanding and thriving: the urban jungle. Countless species are adapting to living in towns and, in some cases, entirely new species are emerging. Join biologist Simon Watt as he introduces us to our new neighbours.

3.30–4.30pm

Mysteries Of The Mind: Is Pain All In The Brain?

EDF Energy Arena

£8

Pain exists to protect us from harm, but our individual experiences can depend on mood, attitude and even cultural upbringing. And when pain becomes chronic, as it does for about 20% of adults, it causes serious suffering. Here to discuss the mysteries of pain and how brain imaging is helping us understand it is neuroscientist Irene Tracey.

3.30–4.30pm

Ellen Stefan: A Life Scientific

The Crucible

£8

Planetary geologist and former Chief Scientist for NASA Ellen Stefan has been at the forefront of some exciting discoveries, helping to inform our understanding of Mars, Venus, Saturn’s moon Titan and our own planet Earth. In an open and honest interview, she talks to Jim Al-Khalili about her remarkable career. She considers what’s next for space exploration and reveals her thoughts about the political situation unfolding in America.

4.45–5.45pm

The Drake Equation: Are We Alone?

The Cube

£7

In 1961 astronomer Frank Drake wanted to calculate the probability of other technologically advanced civilisations existing in our galaxy. Ignoring UFO-believers and Roswell theories, Drake proposed an equation to do just that. Drawing on astronomy, biology, space travel, philosophy and some pretty hard maths, physicist and comedian Lieven Scheire takes you on a humorous and lively tour of “The Drake Equation” and what it predicts.

4.45–5.45pm

Incredible Edible Insects

Helix Theatre

£7

Each year on France’s Picardie coast, the Scary Food Box, explains why you should eat bugs and reveals why you’re already an entomophagist without realising it. Expect live cricket, cool video footage, purple bug blood food, a few explosions, spectacular demonstrations and tasters of some delicious pests. Don’t worry, we won’t be eating live bugs, nobody really does.

4.45–5.45pm

CSI, Silent Witness, Midsomer Murders – there is no doubt that crime scene investigation has captured the modern imagination. But how does science really help to solve murder and other crimes? From DNA fingerprinting to post mortem, forensic scientist Angela Gallop, forensic pathologist Stuart Hamilton and historian of science and medicine Ian Burney explore the history and development of forensics and its role in catching suspects.

The Singing Neanderthals
Cheltenham Ladies’ College, Parabola Arts Centre
£8

Renowned linguist Steven Pinker has dismissed music as being a useless by-product of evolution, but surely there is more to this universal and much-enjoyed part of the human experience? Cognitive archaeologist Steven Milner joins Alice Roberts to examine the origins of music and language, drawing from a diverse range of expertise and sources to explain how music is a vital part of human evolution.

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FRIDAY 9 JUNE

5–7pm
Engineering Digital Futures
GE Pavilion
Free no ticket required
For all ages
Join GE’s engineers to invent your very own solution to a global issue. Get hands on with a range of tech as you design, build, code and test your new creation.

6–7pm
Our Future World Populations And People
Town Hall, Pillar Room
£8
The world is changing dramatically. How do variations in health, wealth, environment, politics and stability affect populations, both locally and globally? Guest Director Dallas Campbell joins forced migration expert Alex Betts, geographer Sarah Harper and geographer Ben Rogaly to discuss refugees and baby boomers, and compare today’s situation with historical fluctuations.

7–9pm
Music And Sound: Sounds Of Science
Dean Close, The Bacon Theatre
£8 * Suitable for families and adults
Blending musical performance, science and history, celebrated percussionist Evelyn Glennie, historian and writer Christopher Lloyd and composer Jiri Jarman reveal the awe-inspiring story of how humans have changed the world over the last 10,000 years. A unique collaboration unlike anything seen at the festival before.

8.30–9.30pm
The Incredibly Unlikely History Of Everyone Who Ever Lived
Parabola Arts Centre
£10
Our newfound ability to extract genomes from the long dead has forced us to radically rethink the whole of human history. We’ve discovered new human species in Africa and Siberia, and even phantom species that we only know about because their genes lurk in our own DNA. Anthropologist Alice Roberts and geneticist Adam Rutherford go back to the drawing board of our evolutionary past.

Workshop
Let’s Get Colourful: Fabric Dyeing Workshop
ExperiTent
£8 * Get colourful and try your hand at fabric dyeing with the Society of Dyers and Colourists. Art and science collide while you explore the history of the colour of cloth, discover what ‘a load of twaddle’ really means, and find out even more ideas to try at home.

6–7pm
Do We Exist In A Multiverse?
EDF Energy Arena
£10
Quantum mechanics may imply that our vast universe is just one of an infinite number. Physicist Jim Al-Khalili disagrees, pointing to far more down-to-Earth interpretations of quantum phenomena, but cosmologist Andrew Pontzen argues an incomprehensible vast multiverse could be the least weird explanation. Marieke Navin refers a lively debate and audience vote. Whose account of reality will be more convincing?

7–9pm
Our Future World: Augmented Reality
The Crucible
£8
Augmented Reality smash-hit Pokémon Go saw millions of gamers hunting a virtual cast of creatures in the real world. But from healthcare to heritage, the digital environments made possible by AR are being used in diverse and exciting new ways. Digital Jam’s Tanya Laird, Virtual and Augmented Reality veteran Bob Stone and Amplified Robot’s Steve Dann join Rory Cellan-Jones to showcase this technology and explore how AR is shaping the future of work and play.

5.45–6.45pm
How To Train For A Triathlon
Cheltenham Ladies’ College, Parabola Arts Centre
£9
Combining cycling, swimming and triathlon training is claimed to be the ultimate body workout. Broadcaster Michael Mosley gets the inside track from Olympic triathlon trainer and sports performance scientist Steve Ingham and sports psychologist Jennifer Cumming. Whether you’re a seasoned competitor or just starting out, they offer inspiring advice on how to get triathlon ready and train for success.

6.45–7.45pm
Mysteries Of The Mind Can You Retrain Your Brain?
Helix Theatre
£8 *
Neuroplasticity suggests our brains have the ability to adapt and change, but is it possible to improve the way they work? By passing a billion-dollar brain training industry which doesn’t seem to work, science journalist Caroline Williams joins neuroscientists Heidi Johansen-Berg, Maritijn van den Heuvel and Ben Martynoga to explore the possibility of changing our brains for the better, with tips and tricks to try for yourself.

8pm–10pm
Late Night In The Discover Zone & The MakerShack
Discover Zone & Maker Shack
Free no ticket required
Don’t miss our special late openings for adults. Drop in to avoid the crowds, enjoy a drink and try all the activities for yourself – without kids and with the bar open.

FRIDAY 9 JUNE

5–7pm
The Crucible LIVE
£10
A defendant stands accused in the courtroom. Are they guilty or not guilty? Presented with the evidence and the law, you, the Festival jury, decide their fate. To guide you through the forensic reports, forensic pathologist Stuart Hamilton, jury expert Cheryl Thomas and forensic pathologist Dr Jiggs Bowson are the most glamorous scientists in Britain (together with Caroline West), residing somewhere between the worlds of crime, law, flirting, facts and amazing hair. Expect giggles, flirting, facts and amazing hair. The bar will be open during this event.

7.15–8.15pm
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Cheltenham Ladies’ College, Parabola Arts Centre
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Combining cycling, swimming and triathlon training is claimed to be the ultimate body workout. Broadcaster Michael Mosley gets the inside track from Olympic triathlon trainer and sports performance scientist Steve Ingham and sports psychologist Jennifer Cumming. Whether you’re a seasoned competitor or just starting out, they offer inspiring advice on how to get triathlon ready and train for success.

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8.30–9.45pm
Jury
Helix Theatre
£10
A defendant stands accused in the courtroom. Are they guilty or not guilty? Presented with the evidence and the law, you, the Festival jury, decide their fate. To guide you through the forensic reports, expert witness statements and the law are our newfound ability to extract genomes from the long dead has forced us to radically rethink the whole of human history. We’ve discovered new human species in Africa and Siberia, and even phantom species that we only know about because their genes lurk in our own DNA. Anthropologist Alice Roberts and geneticist Adam Rutherford go back to the drawing board of our evolutionary past.

28
29
1.45–2.45pm $100
Mysteries Of The Mind
Geek Chic’s Weird Science
The Cube
£8

The role of the subconscious has been gaining attention, with recent research suggesting you make better decisions when you don’t think about them. But the conscious mind must play some part. Nick Shea and Ophelia Deroy ask what consciousness is doing for us and reveal results from data they collected at last year’s Festival that help us to answer this question.

3–4.15pm $101
The Universe: What Don’t We Know?
EDF Energy Arena
£9

93% of our universe is invisible to us. We assume the rest must be dark matter and dark energy, but despite the incredible progress of recent years, this massive mystery of the universe continues to defeat us. Cosmologists Andrew Pontzen, Emmina Calabrese and Sarah Bridle discuss the latest research, and ponder how a much-needed breakthrough might unfold.

11.30–1.30pm $99
Our Future World
The Psychology Of Bribery
Town Hall, Pillar Room
£8

Cash for kids to learn their times tables or bribing footballers to miss in a penalty shoot-out ought to be effective, but why do financial incentives so often backfire? Radio 4’s All in the Mind presenter Claudia Hammond explores the psychology behind what works when trying to get someone to do what we want.

2.30–3.30pm $94
Our Future World
The Future Of Travel
The Cube
£8

Imagine a pod flying you seamlessly from an airborne plane to train, watching a film whilst your car steers itself, or holidaying on your favourite cruise – in the sky. Are radical visions like these just flights of fancy, or could they soon be a reality? Airbus engineer Andy Reynolds, engineer and automotive expert Hugh Hunt and automotive expert Natasha Morst predict the future of travel with Guest Director Dallas Campbell.

2.30–3.30pm $96
Mysteries Of The Mind
What Is Consciousness For?
Helix Theatre
£8

Our Universe is at the very least 100 billion light years across – and that’s just the observable bit. But how do we know, and will we ever truly grasp the magnitude of the cosmos? Cosmologist Andrew Pontzen takes us on a voyage into the farthest reaches of space and time to explore what we’ve been able to measure so far.

11.15am–12.15pm $97
Our Future World
The Future Of Work
The Crucible
£8

From impending robot takeovers and technological revolutions to increasing populations and universal income systems, the changing nature of work is rarely out of the news. Join economist and co-author of The Future of the Professions, Daniel Saks, and as he explores the history of work and investigates what the future will bring for society, companies, governments and us as individuals.

11.15am–12.15pm $98
The Universe: What Do We Know?
Cheltenham Ladies’ College, Parabola Arts Centre
£7

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3–4.15pm $100
Mysteries Of The Mind
Geek Chic’s Weird Science
The Cube
£8

Do you get a kick out of the zanier elements of science? Join Radio X DJ Lliana Bird and neuroscientist Jack Lewis for a live recording of Geek Chic’s Weird Science (iTunes Best New Podcast 2014) as they rummage through the most bizarre and wacky science with some special guests from the Festival. This event is being recorded for the podcast. Latecomers may not be admitted.

3–4.15pm $102
Mysteries Of The Mind
Brainwash LIVE
The Crucible
£8

Ever needed to clear your mind? Researchers have recently discovered a hidden brain pathway, which detoxifies the brain while we sleep. Using powerful MRI scanners and live experiments, Mark Lythgoe, Ian Harrison, Oz Ismail, Jack Wells, Isabel Christie and the CAB team on live-link will see if a brainwash can open up our minds and give them a new sparkle.
4–5pm Our Future World Living In A Machine World
Town Hall, Pillar Room £8 *
If you believe the headlines, it seems as if machines are destined to do everything that a human can. But what are robots really capable of and what will always be beyond their abilities? Robotics expert Sabine Hauert, and creator of artistic AI The Painting Fool, Simon Colton, join political economist Daniel Susskind to examine the true limits of modern machines, and ponder the role of robots in our current and future society.

4–5.15pm Mysteries Of The Mind Drugs And The Brain
Cheltenham Ladies’ College, Parabola Arts Centre £8 *
Whether it’s impacting visual perception or altering states of consciousness, drug use can drastically affect brain states and behaviour. Psychologist and co-host Drugs podcast Suzi Gage joins by psychologist researcher Robin Carhart-Harris, health psychologist Sally Adams and journalist and novelist Lionel Shriver to discuss how different drugs affect the brain, and to explore the positive and negative impacts of both legal and illegal substances.

4.30–5.30pm Chocolatology
EDF Energy Arena £10 *
With crazy concoctions, sights and smells to delight your senses, and a bit of chemistry thrown in, the BBC’s resident gastropod Stefan Gates and chemist Andrea Sella present the most meltingly edible science show on Earth. Find out what makes chocolate SO delicious. Did we mention the mouthwatering chocolate tasters? gloucestershirelive.co.uk

5.30–6.30pm Surviving Social Media
Helix Theatre £8 *
Guilty of over-sharing on Twitter? Judging your life experiences against others on Facebook? Must... check... phone... now! Social media has had some bad press, so how can we work it to our advantage? Consumer behaviour expert Ben Marder, online behaviour expert Adam Joinson and media psychologist Ellen Helper discuss the pitfalls, and the positives and consider how not to let social media rule your life.

5.30–6.30pm Mysteries Of The Mind The Machine Mind
The Crucible £8 *
Do androids dream of electric sheep? From incognito twitter-bots to grandmaster-beating machines, artificial intelligence capable of highly sophisticated interactions is no longer restricted to science fiction. Adam Rutherford joins robotics and artificial intelligence expert Murray Shanahan and digital anthropologist Beth Singler to investigate the machine mind – exploring how we engineer intelligence, what we know about robot thought processes, and how similar they might be to our own.

6.45–7.45pm Ellen Stofan: Life Beyond Earth
EDF Energy Arena £8 *
With growing excitement around habitable distant planets, could extra-terrestrial life be closer than you think? Beneath their icy surfaces, the moons of our solar system’s giant planets hide oceans with the potential for life. With incredible images of Saturn’s Enceladus and Titan, and Jupiter’s Europa, planetary geologist and former NASA Chief Scientist Ellen Stofan considers the key conditions for life and where we should prioritise our search in the coming decades.

6–7pm Vampires
Town Hall, Pillar Room £9 *
120 years since vampires were immortalised in Bram Stoker’s Dracula, we explore the gruesome real-life medical reports and suspected sightings of the undead that are thought to have inspired the author’s work. Join broadcaster Liliana Bird as she steps into the night with professor of English Literature Nick Groom, cultural medical historian Catherine Oakley and Barts Pathology Museum Curator Carla Valentine for what is sure to be a bloodcurdlingly brilliant event. The bar will be open during this event.

6.45–7.45pm Ethics Committee LIVE
The Cube £8 *
The 100,000 Genomes Project is now in full swing, sequencing around 70,000 patients’ DNA codes. As genomics picks up speed, it raises a whole new set of ethical questions for Radio 4’s Inside the Ethics Committee regulars Deborah Bowman, Annette Luccassen and Bobbie Farsides to consider. Join them and chair Vivienne Parry to decide what you’d do as a typically complex and tricky case is discussed.

7.30–8.30pm Mysteries Of The Mind What Do Babies Think?
The Crucible £9 *
How do babies begin to understand the world and their place in it? From birth, we start to develop a sense of self as we play, learn new skills and begin to interact with others. Developmental psychologists and professional baby watchers Deborah and Michael Addyman and Anahtala Gjersøe delve into the minds of babies and young children and explore how this can help us better understand our adult psychology.
Humans are weaker than many other animals and have no natural weapons, yet we became the world’s apex predator. Fundamental to our success is our intelligence – not only individually, but more importantly, collectively. Mark Moxlin brings together the latest insights from hominin fossils and evidence of the changing landscape of the East African Rift Valley, and shows how astronomy, geology, climate and gossip caused evolution to favour our very large ultrasonic brains.

8.30–11.15am SF03

Mechanical Colour Wheels

ExperiTent
£8* Ideal for ages 5+

Combine art and science as you delve into the worlds of colour, illusion, animation and mechanical movement with Stephen Guy from Fire the Inventor. Create your own spinning machine, and see what surprising things can happen to colours, patterns and drawings as they whizz into motion at the turn of a handle.

10.30–11.15am SF06

Joys Of Toys

Cheltenham Ladies’ College, Parabola Arts Centre (Dance Studio)
£6* per baby (suitable for babies ages 6 months to 2 years, and their parents)
Psychologists Caspar Addyman and Nathalia Gipson reveal the science inside the toy box in this interactive play session with your baby. Let your little one enjoy the colours, textures, sounds and movements and discover how toys are helping their little brain develop.

12.30–1.30pm SF09

The Utterly Revolting Science Show

EDF Energy Arena
£6* Ideal for ages 7+

Embark on a hilarious, high tech and utterly disgusting journey through the body with festival favourites Stefan Gates and Andrea Sella. Expect robots, remote-controlled humans, mind-blowing video footage of our guts, digestive chemistry and a very noisy fart machine. You’ll never look at your own body in the same way again!

10–11am SF01

Let’s Find Out With Maddie

The Crucible
£6* Ideal for ages 4+

In her brand new show, children’s presenter Maddie Moate brings you on an adventure to answer your most asked questions! Using her marvellous machines and an awesome box of props, she takes you on a journey through different lands to discover more about the world around us. In a celebration of curiosity, wonder and imagination she invites you to come along and join the fun!

11.15am–12.15pm SF08

Rocketeers

Town Hall, Pillar Room
£6* Ideal for ages 5+

Journey into space with Simon Watt as he explores the science of space exploration through exciting experiments and demonstrations. Learn how to recreate your own rocket launch at home, discover what you can see if you’re only look up, and find out which planet would float in a swimming pool.

9–9.30pm S117

Survival Of The Smartest

Helix Theatre
£9*

Humans are weaker than many other animals and have no natural weapons, yet we became the world’s apex predator. Fundamental to our success is our intelligence – not only individually, but more importantly, collectively. Mark Moxlin brings together the latest insights from hominin fossils and evidence of the changing landscape of the East African Rift Valley, and shows how astronomy, geology, climate and gossip caused evolution to favour our very large ultrasonic brains.

8.15–9.30pm S118

Cheese

Town Hall, Pillar Room
£15* Event includes tasters and a glass of wine. Over 18s only

Ever wondered what makes some cheese so smelly, others mousy, or why it comes in so many different textures and flavours? Whether you’re a fan of the strong stuff or prefer things a little more mild, join Neal’s Yard Dairy’s Bronwen Percival and chemist Andrea Sella to taste the answers for yourself, as they dig into what makes cheese so downwards delicious with presenter Quentin Cooper in this sure to be Brie-Illant event. With thanks to Neal’s Yard Dairy.

8.45–10.30pm S120

Science Festival Variety Night

EDF Energy Arena
£15* Over 18s only

Funny, entertaining and enlightening – climb aboard our Science Festival Variety Night for late-night laughs, songs and silliness, with late-night laughs, songs and silliness, with some fascinating facts thrown in for good measure. TV science guy and YouTuber Greg Foot and marvellous mathematician Katie Steckles are your hosts for the evening. Expect the unexpected with engineer and Bake Off finalist Andrew Smyth, comedian Gemma Arrowsmith, materials engineer Mark Miodownik and geek songstress Helen Arney. More guests to be announced.

8.30–9.30pm S119

Our Future World Rewriting Economics

Cheltenham Ladies’ College, Parabola Arts Centre
£9*

Economic theory is centuries out of date and that’s a disaster for tackling the 21st century challenges of climate change, poverty, and extreme inequality. Renegade economist Kate Raworth tips our ancient thinking on its head as she strives for new models that are fit for a prosperous and sustainable future world.

10–11am SF02

Historic Heroes

Helix Theatre
£6* Ideal for ages 10+

It takes someone brave and clever to realise everybody else is wrong and to challenge how the world is seen. Returning for the 50th year with their infamous live experiments, our 2007 FameLabbers uncover the turning-points in scientific history and the heroes who inspired them. From Galileo, who proved heavy objects do not fall faster than lighter ones, to biologists who showed electricity makes the body work, could the next scientific breakthrough come from you?

10:30–11.15am SF03

12–1pm SF04

1.30–2.30pm SF05

Joys Of Toys

Cheltenham Ladies’ College, Parabola Arts Centre (Dance Studio)
£6* per baby (suitable for babies ages 6 months to 2 years, and their parents)
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£6* Ideal for ages 7+

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2–3pm SF11

Workshop Memory Games

Cheltenham Ladies’ College, Parabola Arts Centre (Dance Studio)
£6* Ideal for ages 10+

Uncover the mysteries of your memory with Ginny Smith, as she guides you through a range of quizzes and games to explore your memory and ways to improve it. Discover what happens in the brain when we learn and remember things, and find out whether you can really trust what you remember.

3–4pm SF13

Once Upon A Lab: The Scientist’s Storybook

Helix Theatre
£6* Ideal for ages 7+

In a lab far, far away, materials scientist Suze Kundu and engineer Jamie Gallagher have been wondering whether science can help them explain some of their favourite stories. Bringing their experiments and best theories with them, they ask whether princes can climb princesses’ hair, beanstalks can reach the clouds, rats can be charmed by pipers... and much much more.

3.30–4.30pm SF12

Workshop Memory Games

Cheltenham Ladies’ College, Parabola Arts Centre (Dance Studio)
£6* Ideal for ages 10+

Uncover the mysteries of your memory with Ginny Smith, as she guides you through a range of quizzes and games to explore your memory and ways to improve it. Discover what happens in the brain when we learn and remember things, and find out whether you can really trust what you remember.

3–4pm SF13

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### 11 June

#### Box Office 01242 850270

**10–11am**

**Magical Elements**

**The Crucible**

**£7**

Today’s advanced technology is often indistinguishable from magic. It relies on a special set of elements, each with astonishing properties. In a magic show like no other, materials engineer Mark Miodownik demonstrates the amazing and sometimes bizarre properties of the ingredients that make the miraculous happen inside our 21st century tech. Looking to the future, what can we do to ensure these rare, magical elements do not run out?

**Royal Academy of Engineering**

#### cheltenhamfestivals.com

**11.45am–12.45pm**

**Coffee: Just Brew It**

**镇 Hall, Pillar Room**

**£10**

Uncover the alchemy behind the perfect brew, as we dive into the art and science of coffee. Ashley Kent joins award-winning coffee taster Anna Nordström, Löfbergs UK’s Alex Morris and coffee roaster Phil Parr as they turn up the heat and discuss beans, brewing, coffee farming and the daily grind. Expect to learn a little.

With tasters thanks to Löfbergs UK

**£10**

#### SUNDAY 11 JUNE

**11.45am–12.45pm**

**How To Be Invincible: Lessons From Tardigrades**

**The Cube**

**£8**

From the top of the icy Himalayas to the bottom of boiling hot springs, the humble, bizarre, microscopic tardigrade is nothing short of a superhero. Neuroscientist Matthew Young takes you on a whistle-stop tour of (almost) invincibility. Find out how these tiny Earth-bound creatures can survive extreme conditions that would easily prove lethal to humans and how they are helping us develop new ways to survive the perils of space travel and beyond.

**£8**

#### SUNDAY 11 JUNE

**11.45am–12.45pm**

**In Conversation With Richard Dawkins**

**EDF Energy Arena**

**£10**

Richard Dawkins casts his eye back over a phenomenal career and muses upon some of his published and previously unpublished letters, lectures and essays. Ranging from Darwinian evolution to the search for alien life, the renowned scientist and passionate rationalist is joined by Guest Director Dallas Campbell to celebrate the wonder of scientific discovery with characteristic wit and clarity.

**£9**

#### SUNDAY 11 JUNE

**2–3pm**

**Music And Sound**

**Will Gregory: Writing Emotion Into Music**

**Cheltenham Ladies’ College, Parabola Arts’ Centre**

**£9**

TV and film composers like Goldfrapp’s Will Gregory use the psychology of music to manipulate emotions and tug at the heart-strings. So how does music evoke such powerful reactions and in what sense can it be said to behave like a language? With clips and live music, Will is joined by psychologist Catherine Lovelady to uncover music’s extraordinary power to play with our emotions and to explore how this can be used to great effect on screen.

**£9**

#### SUNDAY 11 JUNE

**2.15–3.30pm**

**Over-Ambitious Demo Challenge 2017**

**The Crucible**

**£8**

Steve Mould and Andrea Sella host our infamous annual contest to find the most spectacular, impressive and show-stopping science demos. Defending champions Suze Kundu and Brian Mackenwells, are joined by new contenders Ashley Kent and Karl Byrne as the challenge takes on a whole new level of competitiveness. Expect madness, mayhem and magic.

**£8**
3.30–5pm  S129
5.30–7pm  S130
Workshop
Build Your Own Quantum Computer

ExperiTent  S12 *

Delve into the incredible world of quantum computers and even build one for yourself with the Qubit Ninja Team. Untangle mysterious quantum phenomena such as qubits, superposition and entanglement, then try it all out for yourself on their specially designed quantum circuitry.

3.45–4.45pm  S132
How To Build A Star
EDF Energy Arena  £9 *

There are over 100 billion stars in our galaxy alone. Each one starts its life in a dense cloud of gas and dust, but what really happens when a star is born? And why do they form where they do? Impressionist and astronomy enthusiast Jon Culshaw and astrophysicists Chris Lintott and Lucie Green take you on a journey of stellar proportions as they explore how stars and galaxies are born.

5–6pm  S134
Engineering The Past: Did Victorians Ruin The World?
Town Hall, Pillar Room  £8 *

Flushing toilets and combustion engines are some of the most celebrated legacies of the Victorian age. But what would life be like now if their big thinkers had considered the environmental, economic and social impact of their innovations and done things differently? Combining sharp wits, true facts and tiny top hats, comedian Helen Arney, writer and broadcaster Kat Arney and engineers Hugh Hunt and Sarah Bell ask: did the Victorians ruin the world? The bar will be open during this event.

5–6pm  S135
Music And Sound Music On The Brain
The Crucible  £7 *

With Jurassic World 2 currently being filmed in the UK, palaeontologist and fossil detective Dean Lomax takes us back to the amazing British finds that sparked the original dinofania in the 1800s. From the Isle of Skye to the Isle of Wight, he reveals British dinosaur and ichthyosaur discoveries, including recent identification of new species and some incredibly rare finds.

5–6pm  S136
Roger Penrose And Marcus du Sautoy
Cheltenham Ladies’ College, Parabola Arts Centre  £9 *

What can fashion, faith, or fantasy possibly have to do with the scientific quest to understand the universe? One of the world’s leading theoretical physicists, Roger Penrose, and one of Britain’s foremost mathematicians, Marcus du Sautoy, explore the limits of human knowledge and discuss whether some of today’s researchers are being astray.

7–8pm  S138
A Tour Of The Periodic Table
EDF Energy Arena  £8 *

The periodic table has been an emblem of science for over 100 years. Behind this iconic classroom poster live tales of romance, murder, greed and wonder. Which element will make you reek of garlic? Why do we love gold? And what is the disgusting secret of antimony? Join chemical physicist and material scientist Jamie Gallagher on a guided tour around this elemental housing block.

6.15–7.15pm
Mysteries Of The Mind Introvert, Extrovert, Or Just You?
Cheltenham Ladies’ College, Parabola Arts Centre  £9 *

What makes you, you? Is your personality fixed in stone, or can life experiences change your very nature? Pioneering psychologist Brian Little goes beyond traditional personality traits, exploring when and why we transcend these misleading categories. Find out more about how your personality shapes your life, what you can – and can’t – change about it, and how to thrive in the best way for you.

7–8pm  S139
Gemma Arrowsmith: EARTHLING
The Crucible  £9 *

40 years ago, NASA’s twin Voyagers were launched into space carrying golden phonograph records with sounds and images from the people of Earth. This hilarious sketch show from comedian Gemma Arrowsmith (Davie Details’ Show, Dave Gorman’s Modern Life is Goodish, Charlie Brooker’s How TV Ruined Your Life) imagines the lifeforms who find those records. As they mull over what humanity has to offer, will they decide to reply?
Cancer kills a third of us, yet we spend under £3 per person per year looking for a cure. That’s six times less than we spend under £3 per person per year looking for Helix Theatre For Your Buck?

Science: Big Bang 7–8pm SUNDAY 11 JUNE

Imagine you’re a young fly, trying to survive in a world which wants to swat you, squash you, and sometimes even eat you. Author and cartoonist Mike Barfield takes you on a comedic and interactive adventure featuring flies, fly traps, maggots, and poo. You’ll leave buzzing for more!

What if a pesky asteroid hadn’t wiped out the dinosaurs? £6 million years later, what would life look like today? Fossil-hunter and zoologist Jules Howard uses Darwin’s theory of evolution by natural selection to see how blood-drinking tadpoles and tiger-like reptiles could have existed if Earth’s history had taken a very different path.

Are you ready to get quizzical and a little pedantic? Join science troubadour Andrew Steele for this madcap twist on the pub quiz where points mean the tapered end of objects, and prizes promise to enhance your nerd credentials. Be warned, each quiz where points mean the tapered end of objects, and prizes promise to enhance your nerd credentials. Be warned, each round will be a little bit weird. The bar will be open during this event and there is no need to bring a whole team.

Are you ready to get quizzical and a little pedantic? Join science troubadour Jonny Berliner and Ugly Animal wrangler Simon Watt for this madcap twist on the pub quiz where points mean the tapered end of objects, and prizes promise to enhance your nerd credentials. Be warned, each round will be a little bit weird. The bar will be open during this event and there is no need to bring a whole team.

Key to ticketing:

* Plus transaction fee: charged per order, not per ticket. £2.50 for online and telephone sales, and £1.50 for in person bookings with credit/debit cards. No fee for cash bookings.

** Clare Towler**
Who will win the science showdown?

Find out at FameLab, the global science communication competition. Watch 31 national finalists from across the globe battle it out to become the FameLab International Champion 2017.

**Semi-Finals:** page 18  
**International Final:** page 25

Look out for previous FameLab contestants in:
- *Can Science Explain Music?* page 16  
- *Born To Sum* page 28  
- *Historic Heroes* page 34  
- *Science: Big Bang For Your Buck?* page 40  
- *Do We Exist In A Multiverse?* page 28  
- *The Real Urban Jungle* page 27

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**Science for Schools 2017**

Four action-packed days of shows, workshops and interactive zones to inspire the scientists, technologists, engineers, and mathematicians of the future.

**FameLab Academy**

The outreach programme for Year 9 students which develops confidence, increases communication skills and encourages STEM enquiry.

**LabLive**

The national tour which brings the best of Cheltenham Science Festival to teenagers across the UK.

To find out more visit [cheltenhamfestivals.com/education](http://cheltenhamfestivals.com/education)

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**FOOD & DRINK**

- **Festival Café**
  - Breakfast served from 9am. Soups, salads, sandwiches, wraps & sharing platters served from noon till dusk.

- **Imperial Garden Bar**
  - Enjoy our alfresco platters, Longhorn meaty feasts and grab & go options served midday till 3pm. Pizzeria open every evening from 5.30pm till dusk.

- **Regency Café**
  - Perfect for brunch from 9am. Lunch served noon till 3pm. Evening platters served till 9pm. Vegetarian and gluten-free options available at all cafés.

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*FAMELAB*
Be first with Membership

Be amongst the first to book, save on tickets and help support Cheltenham Festivals. Being a Member is one of the best ways to enjoy all that the Festivals have to offer.

Our Three Levels of Membership:
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Registered Office
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With many thanks to the staff and volunteers who provide invaluable support and help make the Festival a success.

Contact
If you have any specific comments about any aspect of the Festival, please email boxoffice@cheltenhamfestivals.com

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HOW TO BOOK

Booking Dates

Members’ Priority Booking:
from 1pm, Wednesday 12 April 2017

Public Booking:
from 1pm, Wednesday 19 April 2017

cheltenhamfestivals.com
12 April – 11 June 2017
Booking open 24/7

e-tickets can be printed or shown on a mobile device

+44 (0)1242 850270
12–21 April 2017
Tuesday–Friday 10am–5pm

Before the Festival: CF Ticketing, 15 Suffolk Parade, Cheltenham, GL50 2AE
12–21 April 2017
Tuesday–Friday 10am–5pm

During the Festival: Festival Site Box Office, Imperial Square, Cheltenham, GL50 1QA

For any queries please contact us at
boxoffice@cheltenhamfestivals.com

For full details about Box Office opening hours, in person and telephone ticket sales, booking fees, terms & conditions and Membership, visit cheltenhamfestivals.com/booking

If you have any special access requirements, such as needing to book a wheelchair space, you can book using our online form which will be available from 12 April at cheltenhamfestivals.com/access-requirements

Quicker and Easier Booking with Wish Lists

Book tickets with just a few clicks by creating a Wish List in advance. Start yours at cheltenhamfestivals.com/science

Getting to Cheltenham

Science Festival

Most events take place in central Cheltenham, which is easily accessible from all over the UK, by road and rail.

For more information on public transport and car parks go to cheltenhamfestivals.com/your-visit

Venue Postcodes

Imperial Square (including EDF Energy Arena, The Crucible, Helix Theatre, The Cube, ExperiTent and MakerShack) GL50 1QA

Cheltenham Ladies’ College, Parabola Arts Centre GL50 3AA

Cheltenham Town Hall (including the Discover Zone) GL50 1QA

16-25? Get 20% off tickets* and 10% off food & drink† with our FREE 16-25 Membership. Visit cheltenhamfestivals.com/16-25 to find out how to join.

*excludes events with food & drink, family events and workshops †10% off all food and hot drinks