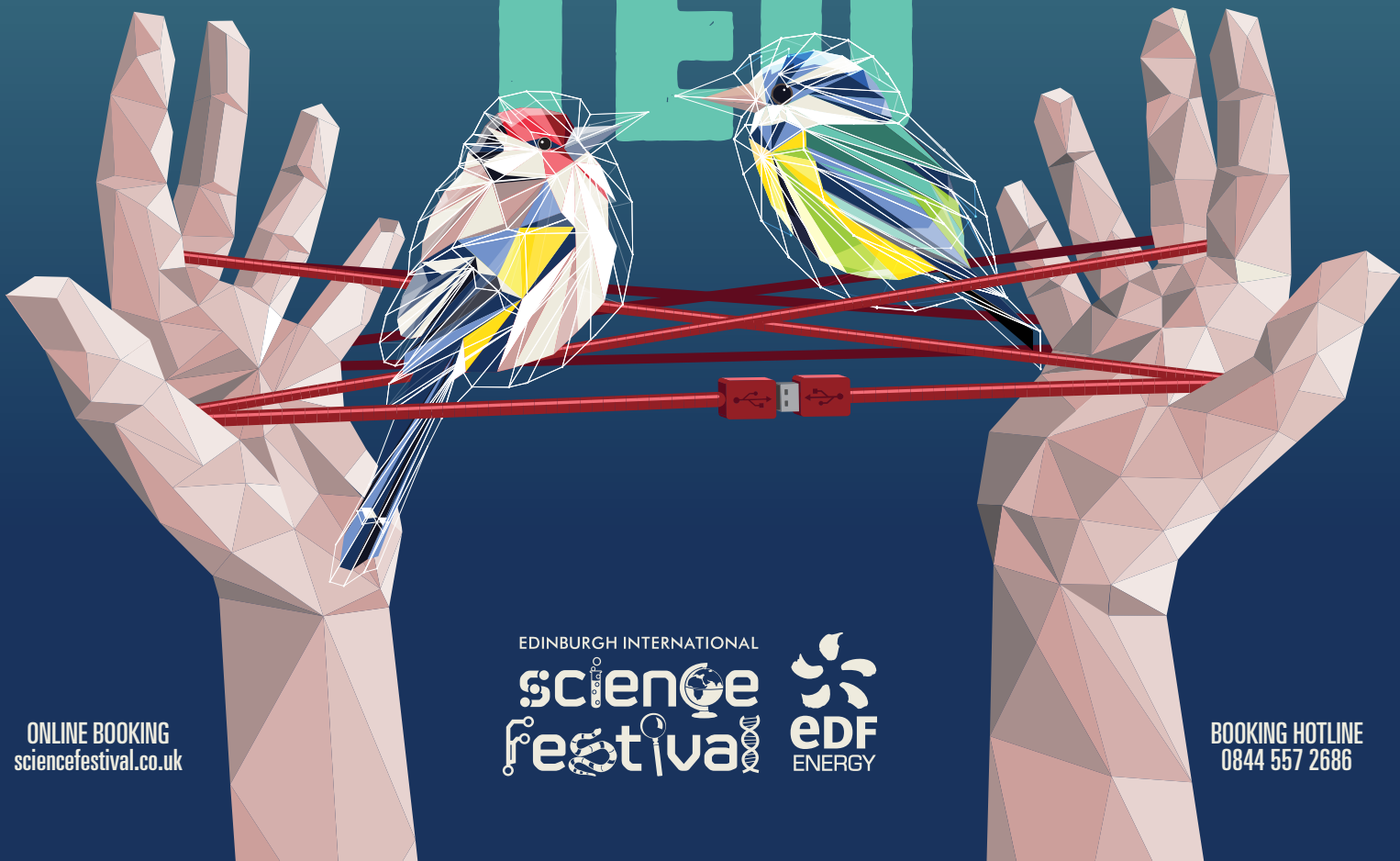


EDINBURGH INTERNATIONAL SCIENCE FESTIVAL 1-16 APRIL 2017

GET CON NED TED



ONLINE BOOKING
sciencefestival.co.uk

EDINBURGH INTERNATIONAL
science
festival



BOOKING HOTLINE
0844 557 2686

EDINBURGH INTERNATIONAL SCIENCE FESTIVAL SUPPORTERS

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PLUG IN TO SCIENCE FESTIVAL 2017...

In the 2017 Scottish Year of History, Heritage and Archaeology, Edinburgh International Science Festival invites you to *Get Connected*. . . to science, to one another and to the global community, as we attempt to secure the sustainable future we want to inhabit.

In 1947, in Edinburgh, a unique idea was born; the Edinburgh festivals created a platform for culture to bring people together, to reimagine a better future and help heal the wounds of war. The city set about reclaiming its place as a beacon of enlightenment – a global hub for creative, scientific and cultural excellence, promoting innovation and international exchange – and became the world's leading festival city.

70 years on, Edinburgh's spirit of internationalism and enlightenment is as relevant as ever as we make sense of the complex times in which we live. Science is a global endeavour. It works across borders, boundaries and disciplines and is rooted in international collaboration and connectivity.

The Science Festival itself is a node in a global network of like-minded organisations that provide opportunities to come together and connect, not only with inspirational speakers, artists and performers, but with each other, to explore science and technology and its impacts on society.

Conflict, cultural divisions, demographic shifts and environmental degradation are not new, but what is new is the degree to which we are all connected – both in real time and virtually in a wired world – to these issues and to each other.

These virtual, digital connections offer exciting opportunities for creativity, society and the economy. Science is at the heart of the technology, tools and techniques that have fuelled digital innovation, and Edinburgh is home to many established heavyweights, and innovative start-ups, that are driving global connectivity.

But what does it mean to live in the Information Age? This year's Science Festival will plug into the challenges, opportunities and power of the connectedness of our modern world, exploring how science and technology can help us secure a creative and sustainable future.

Join us!




Amanda Tyndall
Creative Director



GET CON NED TED





HOW TO USE THIS BROCHURE

WHERE TO FIND THE FESTIVAL (P4–7)

Each Easter, we transform spaces in and around Edinburgh into Science Festival hubs for discussions, debate, exploration, experimentation and discovery. In 2017, you'll find our expansive programme of events at City Art Centre, the National Museum of Scotland, Summerhall, Royal Botanic Garden Edinburgh, RZSS Edinburgh Zoo, Dynamic Earth and more.

EVENTS FOR FAMILIES (P8–37)

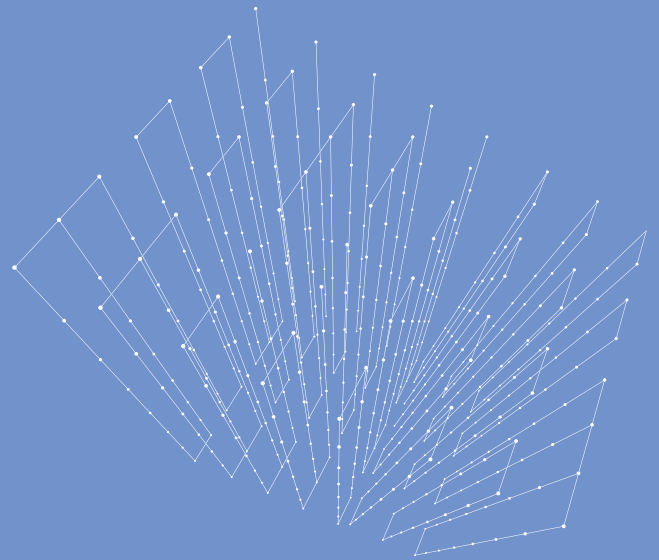
Our programme of events for families includes exciting, engaging and educational activities the whole family can enjoy. These are listed by date and then venue, with repeating events highlighted each day. To ensure the best possible experience for all our visitors, most events carry a minimum age recommendation. We ask that parents bear these in mind when choosing events for their children.

EVENTS FOR ADULTS (P38–64)

Our programme of adult events includes discussions, debates, workshops, screenings and nights out – all with a scientific twist. Adult events are listed by date then time, with cross-references included for repeating events. Most of the adult programme is designed for audiences aged 14+ (unless an age restriction is stated). This is a recommendation only and younger audiences are welcome. Please note: events where alcohol is served will be marked AGES 18+ and, due to licencing restrictions, under 18s will not be admitted. Proof of age may be required.

USEFUL INFORMATION (P65–66)

Head to the back of the brochure for further information about booking tickets, a full list of Festival venues and more information about Edinburgh International Science Festival.



CITY ART CENTRE

SIX FLOORS OF WORKSHOPS AND ACTIVITIES FOR FAMILIES

Join us right in the heart of Edinburgh. During the Science Festival we transform City Art Centre's gallery spaces into a sensational science playground for families, packed full of workshops, shows and interactive events. Discover the wonderful world of bees, create your own coral creature, build humanity's first Mars colony or scrub up and try your hand at some *ER Surgery*. Get a Day Pass to explore a mixture of bookable and drop-in sessions.

Adults can join in too with *Science Festival Lates* (p39) – get ready to party as we turn our flagship children's venue over to adults for one very special night.

Open Saturday 1–Saturday 15 April (not Sundays) | 9.30am–4.30pm

FACILITIES

City Art Centre has a café on the ground floor and a packed lunch area within the building. There is also a cloakroom and buggy park.

VENUE SPONSOR

Every day, hundreds of millions of consumers worldwide rely on Cirrus Logic audio and voice technology at home, in their car and on their mobile devices. From their headquarters in Austin, Texas, and major facilities in Edinburgh, London and Newbury in the UK, Cirrus Logic connects us with the world to deliver a great audio experience. Make your voice heard – through Cirrus Logic technology.

cirrus.com



Proud sponsor of Edinburgh International Science Festival



NATIONAL MUSEUM OF SCOTLAND

DROP-IN ACTIVITIES, WORKSHOPS AND EXHIBITIONS FOR FAMILIES DISCUSSIONS, DEBATES AND INTERACTIVE EVENTS FOR ADULTS

One of Edinburgh's most iconic buildings, the National Museum of Scotland houses treasures from around the world, all under one roof. This April we're inviting you to explore our exciting new *Play On* exhibition (p12) in the Grand Gallery and discover the impact of digital technology on how we play. You can also get hands-on with interactive workshops in the Learning Centre or find out more about our closest living relatives in the museum's *Monkey Business* exhibition and associated events.

FAMILY EVENTS FROM THE UNIVERSITY OF EDINBURGH

Discover science with real scientists from The University of Edinburgh. Visit the Learning Centre and Hawthornden Court for family-friendly drop-in activities, bookable workshops and shows.



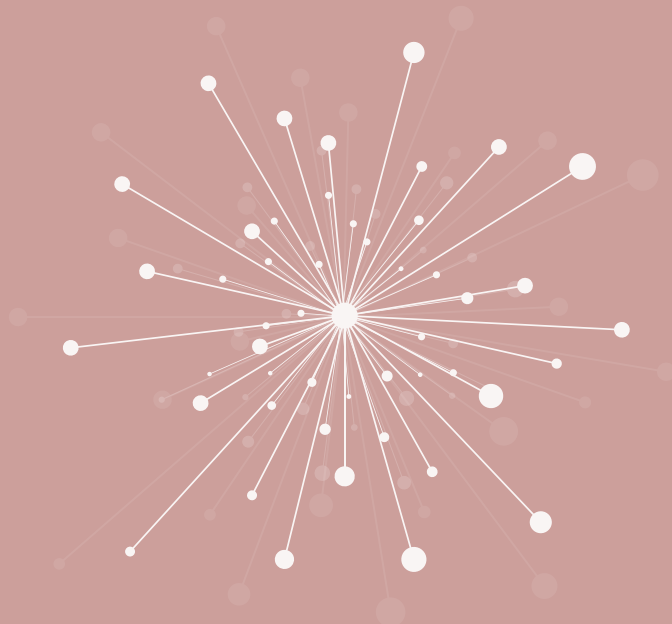
THE UNIVERSITY
of EDINBURGH

In the evenings, don't miss our exciting programme of discussions and debates. From dinosaurs to gravitational waves, birth cohort studies and AI powered healthcare, we're exploring a huge range of key issues. There's also a chance for you to *Party On* and explore the *Play On* exhibition in a very special adults-only night (p50).

Open daily | 10am–5pm and evenings for events, check listings for individual event times

FACILITIES

There are three places to eat within the museum, the Brasserie, Balcony Café and Tower Restaurant. Packed lunches can be eaten in the Group Space in the Entrance Hall. Cloakroom facilities are available.



SUMMERHALL

SHOWS AND ACTIVITIES FOR FAMILIES AND YOUNG PEOPLE DISCUSSIONS, DEBATES AND INTERACTIVE EVENTS FOR ADULTS

The former Royal (Dick) School of Veterinary Studies in Edinburgh is now a major creative venue for the arts with a host of studio and workshop spaces. During the Science Festival you'll find it packed full of shows, drop-in activities and special events. With an exciting programme for children and families during the day and entertaining evenings for adults and teenagers, there's a whole world of scientific adventure on offer.

Brand new for 2017 is *The Experimentarium*—a laboratory zone filled with hands-on activities for all ages (p28). And don't miss the *Edinburgh Mini Maker Faire* (p37) which returns as our fabulous Festival finale. Blackwell's pop-up bookshop will be open every day in the courtyard chalet.

Open daily | 11am–11pm, check listings for individual event times

FACILITIES

Food and drink is available throughout the day at the Summerhall Café and from noon until 9pm at The Royal Dick Bar.

SUMMERHALL

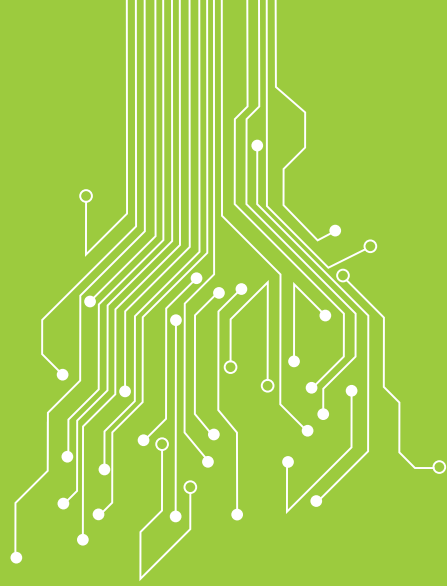
Open Minds Open Doors

VENUE SPONSOR

Baillie Gifford is delighted to support the Science Festival's hub, Summerhall. Headquartered in Edinburgh, Baillie Gifford has a significant global presence, managing investments on behalf of pension funds, financial institutions, charities and retail investors. The firm is proud to play an active role in its community by supporting a diverse variety of projects across festivals and the arts, education and social inclusion.
bailliegyfford.com



Investment managers



ROYAL BOTANIC GARDEN

INTERACTIVE ACTIVITIES FOR FAMILIES

The Botanics is a world-renowned centre for plant science and education, aiming to explore and explain the world of plants for a better future. This April, feed your hunger for knowledge in a series of drop-in events exploring the science behind Scotland's drive to be a Good Food Nation. Scientists working on Scottish Government research programmes will be running engaging, family-friendly activities about the connections between food and health.

Open daily | 10am–6pm, check listings for individual event times

FACILITIES

The Botanics has three on-site catering facilities – the Gateway Restaurant, the Terrace Café and the East Gate Coffee Bar.



Royal
Botanic Garden
Edinburgh



RZSS EDINBURGH ZOO

INTERACTIVE ACTIVITIES FOR FAMILIES

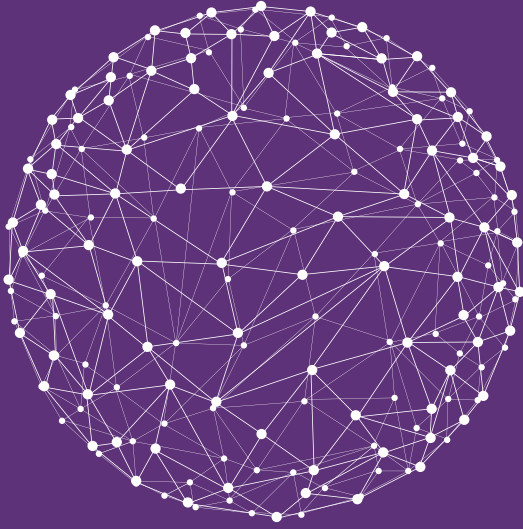
Edinburgh's world-class Zoo is set in 82 acres of sloping parkland three miles to the west of the city centre. Go wild at the Zoo this Easter and discover a range of Science Festival events in addition to all the usual animal antics. You'll find activities and exhibitions throughout the day and, once the sun goes down, join us for some nocturnal fun!

Open daily | 9am–6pm and evenings for events, check listings for individual event times

FACILITIES

The Zoo has a wide range of eating options, several play areas and a gift shop.





DYNAMIC EARTH

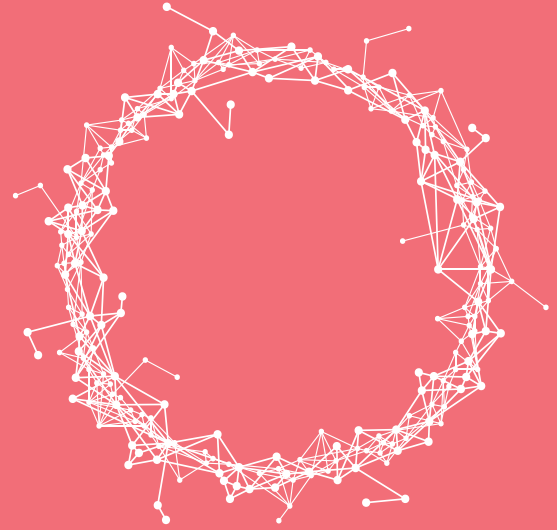
INTERACTIVE ACTIVITIES FOR FAMILIES SPECIAL EVENTS FOR ADULTS

Embark upon the interactive adventure of a lifetime at Dynamic Earth. Experience the primeval forces of nature and discover how they shaped our planet by journeying through space and time; blast through space in a time machine, feel the ground shake beneath your feet, get your hands on a real iceberg and even soak up the atmosphere of a rainforest. During the Science Festival you can enjoy special screenings, meet the expert events and hands-on activities exploring extreme environments that are both in and out of this world. Look out for evening events for adults too.

Open daily | 10am–5.30pm (last admission 4pm), check listings for individual event times

FACILITIES

Dynamic Earth has an on-site café, a gift shop, cloakroom facilities and underground parking is available.



AROUND EDINBURGH

DISCOVER SCIENCE AROUND THE CITY

As well as our core venues, you'll find a vast and varied selection of events in and around the city throughout the Festival – the perfect solution for a great scientific day (or night!) out.

At Science Festival 2017, we'll be putting science theatre in the spotlight (p24, p45), showcasing productions for families and adults at The Lyceum, The Festival Theatre Studio, the Traverse and Bedlam Theatre. To explore the intersection of science with art, look out for events at the National Galleries of Scotland (p25), Edinburgh Printmakers (p39, p43, p63) and Jupiter Artland (p33). You can also discover fashionable diseases at the Royal College of Physicians (p48), go green with events at the Edinburgh Centre for Carbon Innovation (p50, p52) or leave the city behind for an adventure at Siccar Point (p26).

A full venue list is available on p65, check listings for individual event times



EDINBURGH INTERNATIONAL SCIENCE FESTIVAL POWERED BY EDF ENERGY

As well as being Scotland's largest producer of low carbon electricity, EDF Energy is investing in the next generation of Scottish minds.

We are engaging them, inspiring them, and encouraging them to think about careers in Science, Technology, Engineering and Maths (STEM) because we know that if Scotland is to address the energy challenges of the future it needs to have a workforce with strong skills in STEM.

Our new three-year partnership with Edinburgh International Science Festival is part of our wider commitment to education. Each year we welcome thousands of schoolchildren through the doors of our visitor centres at Hunterston B and Torness, where our guides talk them through how electricity is made before taking them on a tour to the heart of the power station.

We also run the *Pretty Curious* campaign which encourages girls to consider STEM subjects and careers. At the end of last year we welcomed more than 350 girls to a series of hands-on workshops in Edinburgh where they were able to hear from female STEM role models and get creative with technology.

EDF Energy has been a long-standing supporter of Edinburgh International Science Festival and its values. We are excited to be working with an organisation that is committed to inspiring and educating the next generation.

We hope you and your family enjoy the Festival and that you leave feeling excited about STEM. We would love to see you so please come along and visit us at one of the pop-up events we will be running.

EDF Energy is proud to be powering Edinburgh International Science Festival.



THROUGHOUT THE FESTIVAL

AROUND TOWN

ALL AGES SHOW

STREET SCIENCE



times vary | drop-in
various dates throughout the Festival
Free | Around Edinburgh



With mind-boggling experiments and dazzling science demonstrations, our busking bikes take street performance to a whole new level. Witness explosions, weirdness and plenty of mess. Look out for our *Street Science* team around town during the Science Festival and follow us on Twitter @EdSciFest for real-time *Street Science* updates.

CITY ART CENTRE DAY PASS

SATURDAY 1 APRIL

During the Science Festival, we transform City Art Centre into a science playground packed full of workshops, shows and interactive events. The activities are ideal for children aged 5–12 and with a Day Pass you can explore a mixture of bookable and drop-in sessions – browse the following pages to see full activity listings.

You can select up to three bookable workshops per child's Day Pass (see bookable workshops schedule on page 11 for more information). These activities have limited capacity and City Art Centre is very popular, so we recommend pre-booking your passes and bookable workshops.

Please note, when attending City Art Centre, children must be accompanied by an adult. As this is a family-focused venue we do not issue tickets to lone adults, but adults can still explore City Art Centre at *Science Festival Lates* (p39). If you would like to discuss large group bookings for City Art Centre please call our Box Office on 0844 557 2686 and they will be happy to help you plan your visit.

9.30am–4.30pm | Allow 4–5 hours for your visit

Saturday 1–Saturday 16 April (not Sundays)

£8 adult/£9.50 child aged 7+/£7 child aged 3–6/free child under 3/£5 disabled/£5 registered unemployed (for each family member up to 6 people, ID required)

Early Bird offer: Book over the phone or in person before Tuesday 28 February and get £1 off all Day Passes on Saturday 1, Monday 3 and Tuesday 4 April.

giftaid it

GIFT AID SCHEME

The Edinburgh International Science Festival Foundation, which runs Edinburgh International Science Festival, is an educational charity and all ticket prices for City Art Centre events include a 10% donation. This allows us to reclaim the tax you pay to visit through the Gift Aid Scheme; every pound you pay is worth £1.25 to us. These donations help make the Science Festival accessible to those on lower incomes. If you are not a UK taxpayer or do not wish to make a charitable donation, the admission prices for the City Art Centre are as follows: £7.20 adults/£8.65 child aged 7+/£6.36 child aged 3–6.

CITY ART CENTRE

LITTLE GIANTS



10am–4pm (half-hourly) | 20 mins
on until Saturday 15 April (not Sundays)
City Art Centre Day Pass required

MARVELLOUS MAGNETS



10am–4pm (half-hourly) | 20 mins
on until Saturday 15 April (not Sundays)
City Art Centre Day Pass required

WEE WONDER WORLD



drop-in
on until Saturday 15 April (not Sundays)
City Art Centre Day Pass required

AGES 3+
WORKSHOP

AGES 3+
WORKSHOP

AGES 3+
ACTIVITY

SATURDAY 1 APRIL CONTINUED

CITY ART CENTRE

BRICKS AND BLOCKS



10am–4pm (hourly) | 45 mins
on until Saturday 15 April (not Sundays)
City Art Centre Day Pass required

DIG UP A DINOSAUR



10am–4pm (half-hourly) | 45 mins
on until Saturday 15 April (not Sundays)
City Art Centre Day Pass required



LITTLE SPARKS



10am–4pm (hourly) | 45 mins
on until Saturday 15 April (not Sundays)
City Art Centre Day Pass required



SECRET LIFE OF CORAL



drop-in
on until Saturday 15 April (not Sundays)
City Art Centre Day Pass required

Join the robot sports training camp where our coaches will put you through your paces. You'll learn about robots and coding as you use a LEGO® WeDo kit to build your own goalkeeper and program it to play. Then it's time to test everyone's skills in the *Robot World Cup* penalty shoot-out. How many attempts can your goalkeeper save?

Millions of years ago, dinosaurs ruled the Earth, but how do we find out more about them? Learn the techniques and tools scientists use to dig for bones and fossils, and then use your skills to brush away the sand and see what you can learn from your discovery.

Get stuck into circuits and discover what electricity does, as you work through challenges to create an electric-powered device. We'll start things off simply by making an easy electrodough circuit, move on to the next level with a snap circuit board, before using your skills and knowledge to build an electrical device.

Find out what's lurking underwater as you explore the *Secret Life of Coral*. Do you know about the incredible animals and plants in a coral reef? Discover the amazing creatures that live in its communities and help us build a coral reef by making your own sea creature in this captivating hands-on space.

AGES 5+
WORKSHOP



10am–4pm (half-hourly) | 20 mins
on until Saturday 15 April (not Sundays)
City Art Centre Day Pass required

BLOOD BAR



drop-in
on until Saturday 15 April (not Sundays)
City Art Centre Day Pass required

Supported by



MINI MECHANICS



10am–4pm (hourly) | 45 mins
on until Saturday 15 April (not Sundays)
City Art Centre Day Pass required

ER SURGERY



10am–4pm (hourly) | 45 mins
on until Saturday 15 April (not Sundays)
City Art Centre Day Pass required



GADGET FACTORY



10am–4pm (hourly) | 45 minutes
on until Saturday 15 April (not Sundays)
City Art Centre Day Pass required

Supported by



This interactive workshop invites you to get creative with chemistry and design your very own slime. Test its thickness and stickiness under the extreme conditions of our Splat-o-Meter and perform high-impact investigations into how the appearance and properties of materials can change when a chemical reaction takes place.

Prepare to be grossed out at the *Blood Bar* as you make your own scabs, mix up a gooey blood clot and even touch a real heart. Explore the science of blood and see how we can diagnose disease with some cutting-edge technology. Take a closer look at the heart, lungs and oxygen in *Don't Hold Your Breath*, and find out what really happens when we get cuts and bruises in the *Scab Lab*.

Take a closer look at what makes an engine tick and use real tools to take one apart. Discover which parts are required to make a car move while exploring our full-sized engine model. Then stand back as we create a fire piston explosion and demonstrate how power is created through combustion.

Emergency, emergency, there's been an accident! This is your chance to scrub up and save lives. Meet your 'patient', identify what's wrong and let a 'surgeon' help you operate using endoscopes supplied by KARL STORZ. Discover the secrets of surgery as you operate on the knee, abdomen and brain. Please note: this workshop is closed with no viewing area for parents.

Investigate and explore how everyday gadgets work and build your own in our mini *Gadget Factory*. After you've grasped the basics of creating an electrical circuit, pick your kit and use your skills to assemble your very own working electronic gadget. Once you've learned the secrets of soldering there's no end to the stuff you can make!

CARNIVAL OF THE MIND



ALL AGES
ACTIVITY

drop-in

on until Saturday 15 April (not Sundays)
City Art Centre Day Pass required

Supported by



The British Psychological Society
Promoting excellence in psychology

CHAIN REACTOR



ALL AGES
SHOW

drop-in

on until Saturday 15 April (not Sundays)
City Art Centre Day Pass required

HIDE AND SEEK WITH INDI



ALL AGES
ACTIVITY

drop-in

on until Saturday 15 April (not Sundays)
City Art Centre Day Pass required

Supported by



MARS MASTER CONSTRUCTORS



ALL AGES
ACTIVITY

drop-in

on until Saturday 15 April (not Sundays)
City Art Centre Day Pass required

SCIENCE MINI CINEMA



ALL AGES
FILM

drop-in

on until Saturday 15 April (not Sundays)
City Art Centre Day Pass required

Supported by



Roll up, roll up and step inside the *Carnival of the Mind* to discover the secrets of your brain! Visit our fortune teller to explore the function of your frontal lobe, take a turn on the high striker to uncover how you process pain and learn about vision at our coconut shy. It's all the fun of the fair but with added science!

This machine is quite simply bonkers. It's 10 metres of unstoppable reactions as the wonders of chemistry are revealed in a procession of knock-on effects. Stay behind the danger line as acids splash and alkalis flow and, if you're very lucky, you'll get to start the whole process using the spectacular Toroidal Vortex Generator.

Indi, our friendly IndigoVision monster, has lost her camera and she needs your help to find it! Using IndigoVision's video surveillance technology, you'll find Indi's monster friends and help her feel safe again. Each friend holds a clue to help you find where Indi has left her camera... Can you solve the clues and find it?

Humanity's first Mars colony needs your help! Come and build pods, buildings, labs, habitats, and anything else you think that humans need to live on another planet, out of LEGO® bricks. We've started with the first building, but now it's up to you to add to the Mars landscape and help construct the first colony.

Sit down, relax and enjoy our *Science Mini Cinema* where you can observe our world in a bit more detail, from slow motion to time lapse, as we explore our connected world through a series of short films. Be amazed as we watch food decompose or join the production line and see how an aeroplane is put together before taking to the skies.

INTERNATIONAL IMAGES FOR SCIENCE 2017



ALL AGES
EXHIBITION

drop-in

on until Saturday 15 April (not Sundays)
City Art Centre Day Pass required

image: Richard Beech

Supported by



The Royal Photographic Society brings its exciting new exhibition to the Science Festival. Supported by Siemens as part of the *Curiosity Project*, the exhibition includes amazing images of everything from galaxies and blood cells to a computer chip and dancing paint. Follow the discovery trail and find the key photos for your chance to win a Nikon camera!

BOOKABLE WORKSHOPS SCHEDULE

Many of our events are available to drop into during your visit. However some workshops have a limited capacity and should be booked in advance. You can reserve up to three bookable workshops per child's Day Pass purchase. Please use the schedule below to plan your day. We would ask you to keep this schedule and the minimum age recommendation in mind when selecting workshops for your child.

AGE	3+	3+	5+	5+	5+	5+	7+	8+	8+
START TIME	LITTLE GIANTS 20 MINS	MARVELLOUS MAGNETS 20 MINS	BRICKS AND BLOCKS 45 MINS	DIG UP A DINOSAUR 45 MINS	LITTLE SPARKS 45 MINS	SPLAT-TASTIC 20 MINS	MINI MECHANICS 45 MINS	ER SURGERY 45 MINS	GADGET FACTORY 45 MINS
10.00									
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3.30									
4.00									
4.30									



ALL AGES
EXHIBITION

play
on

10am–5pm | drop-in
on until Sunday 16 April
Free | National Museum of Scotland



Play is fun! And not just for kids. We all explore, discover and learn through play. It gives us the freedom to be creative, spontaneous and expressive, to feel relaxed, happy and entertained.

As our connected world responds to new digital technologies, the way we play is constantly changing. A decade ago, smartphones did not exist, but today it is commonly said that we have more computing power in our pockets than was used to take mankind to the Moon.

This interactive, family-friendly exhibition will let you get hands-on with the amazing ways technology influences our leisure time, showcasing the science behind why we play and the amazing new developments in how we do it.

Taking place across four immersive zones – *Picture This*, *Game Theory*, *Make Some Noise* and *Toy Box* – in the National Museum of Scotland's Grand Gallery, *Play On* will showcase digital innovation and technology from Scotland and beyond, including four specially commissioned artworks.

SATURDAY
1 APRIL

CONTINUED



NATIONAL MUSEUM OF
SCOTLAND

LOOK INSIDE YOUR MIND



10am–4.30pm | drop-in
on until Wednesday 5 April
Free | Learning Centre Level 2

Presented by The University of Edinburgh

Psychologists study how people think. But how can we test something that's inside your head and invisible? Play our interactive tablet games to measure your thinking speed and uncover the secrets behind the science of thought. Then try our eye-tracking machine to find out why your eyes really are the windows to your mind.

ALL AGES
ACTIVITY

OUR CHANGING PLANET



10am–4.30pm | drop-in
on until Wednesday 5 April
Free | Learning Centre Level 2

Presented by The University of Edinburgh

How do changes to our environment and increasing pollution on our planet affect the health of people living in mega cities? Our geoscientists are investigating these very things. Join them to discover what can be done to help, how pollution affects the lungs and heart, and look back in time to the environment of centuries ago by analysing tree rings yourself.

ALL AGES
ACTIVITY

PHOTOCHEMISTRY



10am–4.30pm | drop-in
on until Wednesday 5 April
Free | Learning Centre Level 2

Presented by The University of Edinburgh

Explore how chemists have moved from taking the first photographs to imaging the smallest particles of the Universe. Make your own photographic art, discover something new on the micro-scale, and get involved with the latest research taking place in the School of Chemistry.

ALL AGES
ACTIVITY

POP-UP SCIENCE IN HAWTHORNDEN COURT

10am–5pm | drop-in | on until Sunday 16 April
Free | Hawthornden Court

We're taking over the National Museum of Scotland's Hawthornden Court with a series of drop-in science activities. This exciting programme of free activities changes across the Festival – check out the first few activities below and look out for more later in the brochure.

POP-UP SCIENCE: POP-UP
ENGINEERING



10am–5pm | drop-in
on until Wednesday 5 April
Free | Hawthornden Court

Presented by The University of Edinburgh

Pop-ups may look simple, but they are ingenious engineering mechanisms. Pop in and make one yourself! Choose your favourite design, transform it from a flat cardboard shape to a magical 3D model, and then decorate it with your own personal touch to take home.

AGES 5+
ACTIVITY

POP-UP SCIENCE:
A TASTE OF SCI-FUN



10am–5pm | drop-in
on until Wednesday 5 April
Free | Hawthornden Court

Presented by The University of Edinburgh

Join the fun at this interactive mobile science centre from The University of Edinburgh, featuring an exciting selection of incredible activities. Control lightning, see a hole in your hand, solve a crime, generate electricity, confuse your senses, become part of a human circuit and discover why the 20p is the shape it is.

AGES 5+
ACTIVITY

PAUSE REALITY

The Dennis & Debbie Club invites you to escape into an immersive virtual reality experience that will lead you down a digital path to inner peace. Supported by the Edinburgh Festivals Innovation Lab.

ABSTRACT PLAYGROUND 2

Artist Will Hurt has created a digital interactive in which you can explore and play with the architectural structures of the Grand Gallery.

BE THE GOALIE

Designer Roy Shearer has created a riotous mashup of table football and camera-based motion detection, pitting life-sized gaming agility against pure, bar-honed foosball skills.

KATAKATA

Kirsty Keatch's digital kinetic sculpture re-creates a classic wooden Jacob's ladder toy that can be played with and controlled by a smartphone.

Look out for family workshops in the museum's Learning Centre for the chance to try more *Play On* activities.

Find out more at sciencefestival.co.uk/play-on



Play On has been developed with support from Creative Scotland through the Scottish Government's Edinburgh Festivals Expo Fund



FAMILY EVENTS



ALL AGES EXHIBITION

MONKEY BUSINESS



10am–5pm | drop-in throughout the Festival
Entrance fee applies – tickets available from the National Museum of Scotland Exhibition Gallery 1
Presented by National Museums Scotland

Get up close to the world of primates at the National Museum of Scotland and stand shoulder to shoulder with our closest living relatives. Featuring over 60 taxidermy specimens created especially for the exhibition, as well as photography, film and hands-on interactives for all ages, this immersive, family-friendly exhibition will take you into the heart of the jungle. Under 15s go free. Supported by players of People's Postcode Lottery.

ROBOT LAB



10am–5pm | drop-in on until Monday 3 April
Free | Grand Gallery
Presented by The University of Edinburgh

Come and interact with robots from the Edinburgh Centre for Robotics. From an assembly-line robot that wants to learn how to work with you, to cute football-playing robots, learn about the many ways in which robots are trying to understand and imitate human beings.

MY MONKEY AND ME



10.30am | 30 mins on until Thursday 6 April
£3 per child (accompanying adult free)
Learning Centre Level 4, Studio 2
Presented by National Museums Scotland

Bring your little ones for some sensory science, stories, songs and actions inspired by the National Museum of Scotland's *Monkey Business* exhibition. Whether you cling like a marmoset or sing like a howler monkey, all primate babies aged 0–2 years and their grown-ups are welcome. Tickets required for children only.

ALL AGES ACTIVITY

AGES 10+ ACTIVITY

DR BUNHEAD'S RUBBISH POP-UP PUPPET SHOW



11am, 12pm, 1.30pm, 2.30pm and 3.30pm
drop-in | 25 mins
on until Sunday 2 April
Free | Scotland galleries
Presented by The University of Edinburgh

Look out for **Dr Bunhead's** science puppet shows popping up in the museum on 1 and 2 April. Hear science stories told with the things we throw away, and meet the curious creatures amongst the rubbish. Monster Bin-bag, Paper Princess and all their friends find adventures and explosions in a secret world where anything can happen.

RESCUE ROBOTS



11am and 2pm | 1 hour
also on Sunday 2 April
£7 | Learning Centre Level 4, Studio 1
Presented by Robobu

Rescue Robots needs your help! A special item is stranded and we need a robot to get it back safely. Assemble your robot then programme it to cross the danger zone, retrieve the item and navigate back safely. The challenge is on in this simple and fun introduction to robotics. Part of *Play On* (p12).

PRIMATE PLAYGROUND



11.30am and 2pm | 40 mins
on until Thursday 6 April
£3 per child (accompanying adult free)
Learning Centre Level 4, Studio 2
Presented by National Museums Scotland

Discover the skills and adaptations different primates use to help them live and play in an activity inspired by the National Museum of Scotland's *Monkey Business* exhibition. This is a sensory science workshop for children aged 3–5 years and their adult helper. Tickets required for children only.

GAME ON!



1pm and 3pm | 1 hour
on until Tuesday 4 April
£5 | Learning Centre Level 4, Seminar Room
Presented by The University of Edinburgh

Explore the exciting world of video games, learn the basics of coding in *Scratch*, a visual programming language, and design and build your very own computer game! This workshop offers a hands-on and playful taster session in computer programming. Suitable for ages 8+ but perfect for ages 10–14. Each ticket also admits one adult if desired.

AGES 0–2 WORKSHOP

AGES 8+ WORKSHOP

SATURDAY 1 APRIL CONTINUED

SUMMERHALL

FAMILY STORY TIME



10.30am, 12pm and 2pm | 50 mins
also on Friday 7 April
£6/£20 family (4 tickets) | Dissection Room
Presented by Scottish Youth Theatres
Family Storytime

Ideal for young people aged 3–7 and their families, this delightful interactive theatre performance looks at the science bits inside some well-known stories. Will the Wee Experts solve the science problems and learn something new? Join us for an adventure and find out what happens when they set out to discover the wonderful world of science in *Goldilocks and the 3 Bears* on 1 April and *The Enormous Turnip* on 7 April.

DYNAMIC EARTH

EXTREME ENVIRONMENTS: LIFE AT THE POLES



10am–4pm | drop-in
also on Friday 7, Sunday 9, Monday 10 and Sunday 16 April
Free with admission | Stratosphere
Presented by Dynamic Earth

Become an explorer at Dynamic Earth and uncover a whole world of amazing experiences at Earth's poles. Discover how polar wildlife is specially adapted to survive in harsh climates, find out about the exciting polar research that's helping us understand our past, present and future and see if you have what it takes to become the ultimate polar explorer!

RZSS EDINBURGH ZOO

MPYD BIONICS LAB: LET'S PLAY WITH NATURE



11am–3pm | drop-in
on until Sunday 2 April
Free with admission | Budongo Trail
Presented by RZSS Edinburgh Zoo

Some amazing natural phenomena have been recreated and are now used in industry and manufacturing as well as being found in everyday products. In the *MPYD Bionics Lab* workshop, you can discover how basic natural phenomena can be reproduced using this special kit.

WEE SCIENCE



11am–3pm | drop-in
on until Sunday 2 April
Free with admission | Budongo Trail
Presented by RZSS Edinburgh Zoo

Dogs bark, meerkats call, and chimps hoot, but only humans use words. We learn our language very quickly: most children will know more than 10,000 words by the time they begin school. *Wee Science* studies how children learn language. Join us for a series of interactive games and demos that explore how we learn to understand language.

DR STIRLINGSHIRE'S DISCOVERY



6.30pm | 90 mins
Previews: Saturday 1 and Sunday 2 April | £10/£7, Performances: Tuesday 4–Sunday 9 April | £15/£10/£35 family (2 adults + 2 children) | Edinburgh Zoo
Presented by Grid Iron, Lung Ha Theatre Company, RZSS Edinburgh Zoo and the Royal Lyceum Theatre Company

Cryptozoologist Dr Vivien Stirlingshire travels the world seeking out hidden and, as yet, undiscovered animals, the ones they tell you aren't really there. She is unveiling her latest discovery at the world famous Edinburgh Zoo. This brand new family-friendly promenade theatre show by Grid Iron and Lung Ha Theatre Company takes you on a journey throughout the Zoo, so dress warmly and for wet weather. All performances are relaxed and there is a BSL performance on Wednesday 5 April.

AROUND TOWN

POWER TRIP



9am–4pm Monday–Friday
10am–4pm Saturday
throughout the Festival (not Sundays)
Free (booking required for tour) | Torness Power Station | Hunterston B Power Station
Presented by



Discover low carbon electricity at EDF Energy's Torness and Hunterston B power station visitor centres. These interactive exhibitions explain how electricity is generated in a nuclear power station with information panels covering nuclear safety, radiation, nuclear waste and other forms of electricity generation. To book a free power station tour at Torness contact tornessvisitorcentre@edf-energy.com 01368 873909, at Hunterston B contact hunterstonbtours@edf-energy.com 01294 826008.

WILD DAY OUT



10am–4pm | drop-in
Free | Holyrood Park Education Centre

Join the RSPB and Historic Environment Scotland for a wild day out exploring the rugged volcanic world of Holyrood Park. You'll find walking tours and talks, get the chance to learn about the amazing wildlife lurking in your back garden and discover how to create your own mini nature reserve. Full details at rspb.org.uk/events.

FLYING FOR FUN



12pm–4pm | drop-in
throughout the Festival
Free with admission
National Museum of Flight
Presented by National Museums Scotland

Explore the science of sport flying with a range of family activities at the National Museum of Flight. Follow the trail around the Civil Aviation hangar before taking part in the family technical challenge. Can you build a glider that will fly further than anyone else's? Allow 20 minutes for each activity. Full details at nms.ac.uk/whatsonflight.

MOMENTS IN TIME



ALL AGES
EXHIBITION

10am–5pm | drop-in
Free | The Mound Precinct

The 2017 Scottish Year of History, Heritage and Archaeology is a time to celebrate and explore Scotland's fascinating past – our greatest figures and iconic attractions, as well as our hidden gems.

At the Science Festival, we are using this opportunity to shine a spotlight on Scotland's rich scientific tradition, which has given rise to many discoveries that have changed the world.

Moments in Time is a family-friendly outdoor installation of iconic Scottish police boxes. Step inside and allow yourself to be transported back in time as we take you on a journey through some pivotal moments in Scotland's scientific history.

Through a series of immersive snapshots, you will discover milestones of Scottish scientific achievement from the flowering of philosophy and science during the Enlightenment, through the rapidly mechanising world of the Industrial Revolution, to the data rich and globally connected Information Age.

The boxes will also shine a spotlight on some very special Scottish endeavours and the scientists that have brought them to life, including how women in science, medical pioneers and some very important inventions have shaped our national heritage.

For a deeper exploration of Edinburgh's scientific heritage, our partners Curious Edinburgh have created a series of walking tours: curiousedinburgh.org.

Scotland
The Perfect Stage



EDINBURGH WORLD HERITAGE



HISTORY
HERITAGE &
ARCHAEOLOGY

• 2017 •

Part the 2017 Year
of History, Heritage
and Archaeology
Supported by
Event Scotland



LOTTERY FUNDED



UK
Science
Festivals
Network

SUNDAY 2 APRIL



NATIONAL MUSEUM OF SCOTLAND

See page 12 **10am–4.30pm**

See page 12 **10am–4.30pm**

See page 12 **10am–4.30pm**

See page 12 **10am–5pm**

See page 13 **10am–5pm**

See page 12 **10am–5pm**

See page 12 **10am–5pm**

See page 13 **10am–5pm**

See page 13 **10.30am**

See page 13 **11am and 2pm**

See page 13 **11am, 12.1.30, 2.30 and 3.30pm**

See page 13 **11.30am and 2pm**

See page 13 **1pm and 3pm**

LOOK INSIDE YOUR MIND

OUR CHANGING PLANET

PHOTOCHEMISTRY

A TASTE OF SCI-FUN

MONKEY BUSINESS

PLAY ON

POP-UP ENGINEERING

ROBOT LAB

MY MONKEY AND ME

RESCUE ROBOTS

DR BUNHEAD'S RUBBISH POP-UP PUPPET SHOW

PRIMATE PLAYGROUND

GAME ON!



SUMMERHALL

WHAT MIGHT HAVE BEEN: AN ALTERNATIVE HISTORY OF LIFE ON EARTH



11am and 2pm | 1 hour
£6/£20 family (4 tickets) | Dissection Room

Embark on a journey through 600 million years of animal life with fossil-hunter, zoologist and author **Jules Howard**. Discover what life could look like if volcanoes and meteorites hadn't twisted the fate of life on Earth forever. Explore Darwin's theory of evolution by natural selection and see how blood-drinking tadpoles and tiger-like reptiles could have existed if Earth's history had taken a very different path.



RZSS EDINBURGH ZOO

See page 14 **11am–3pm**

See page 14 **11am–3pm**

See page 14 **6.30pm**

MPYD: THE BIONICS LAB

WEE SCIENCE

DR STIRLINGSHIRE'S DISCOVERY (preview)



DYNAMIC EARTH

ICY WORLDS AND THE CHALLENGES OF CLIMATE CHANGE: MEET THE SCIENTISTS



10am–4pm | drop-in
on until Monday 3 April

Free with admission | Stratosphere

Presented by Dynamic Earth

Come and meet polar scientists from The University of Edinburgh whose research aims to uncover the secrets of our changing world. Discover how they live and work in the beautiful yet hostile polar environments, and explore how polar research is helping us understand and manage the changes and challenges we face in exciting hands-on activities and demonstrations.

AGES 5+
ACTIVITY



AROUND TOWN

See page 15 **10am–5pm**

See page 14 **12pm–4pm**

MOMENTS IN TIME

FLYING FOR FUN

MONDAY 3 APRIL

CITY ART CENTRE

ALL AGES
ACTIVITY



See page 8 **9.30am–4.30pm**

During the Science Festival we transform City Art Centre's gallery spaces into a sensational science playground, packed full of workshops, shows and interactive events. Day Pass required.

CITY ART CENTRE

AGES 14+
SHOW

COSMONAUT



8pm | 75 minutes
on until **Wednesday 5 April**
£10/£8 | Dissection Room

Co-commissioned by Edinburgh International Science Festival, presented by Francis Gallop and supported by Creative Scotland through the Scottish Government's Edinburgh Festivals Expo Fund



Lucia and her brother use homemade equipment to eavesdrop on Soviet space-launches from their Turin tower block. Chief Designer Sergei Korolev survives Stalin's gulag and takes humanity into space, but is written out of history. The *Cosmonaut* is the first man in space. He will never return. Using live performance, music and audio-visual data, *Cosmonaut* tells three interlocking stories from the early space race in a play about history, conspiracy, and myth.

NATIONAL MUSEUM OF SCOTLAND

- See page 12 **10am–4.30pm**
- See page 12 **10am–4.30pm**
- See page 12 **10am–4.30pm**
- See page 12 **10am–5pm**
- See page 13 **10am–5pm**
- See page 12 **10am–5pm**
- See page 12 **10am–5pm**
- See page 13 **10am–5pm**
- See page 13 **10.30am**
- See page 13 **11.30am and 2pm**
- See page 13 **1pm and 3pm**

LOOK INSIDE YOUR MIND
OUR CHANGING PLANET
PHOTOCHEMISTRY
A TASTE OF SCI-FUN
MONKEY BUSINESS
PLAY ON
POP-UP ENGINEERING
ROBOT LAB
MY MONKEY AND ME
PRIMATE PLAYGROUND
GAME ON!

SPARK CART SCIENCE



2pm–3.30pm | drop-in
on until **13 April (weekdays only)**
Free | Level 3

Presented by National Museums Scotland

Meet a different expert every day to discover a raft of things scientific and technological. Play a pepper piano, have your chance to handle some of the museum's newest objects or challenge the curators who care for the museum's internationally important collections. See the brand new Science and Technology galleries in the museum brought to life as never before.

ALL AGES
ACTIVITY

SUMMERHALL

MINI ZOOMERS: SENSORY SCIENTISTS



11am | 1 hour
also on **Wednesday 5, Friday 7, Monday 10,**
Wednesday 12 and Friday 14 April
£7 | The Zoom Club

Presented by The Zoom Club
Image: The Zoom Club

Discover hidden stories and explore fascinating phenomena from far away places and spaces through open-ended play and messy experiments in our sensory science adventure for early years and their grown-ups. Don't dress to impress, as things may get messy! Find full programme details at sciencefestival.co.uk/mini-zoomers-sensory-scientists. Each ticket also admits one adult.

UNDER 5
WORKSHOP

AGES 9+
WORKSHOP

AROUND TOWN

See page 14 **9am–4pm**
See page 15 **10am–5pm**

SURGICAL SLEUTHS



11am and 2pm | 1 hour
also on **Wednesday 5, Monday 10 and**
Wednesday 12 April
£4 | Surgeons' Hall Museums

Presented by Surgeons' Hall Museums

POWER TRIP MOMENTS IN TIME

Join Surgeons' Hall Museums for a hands-on workshop exploring the exciting world of medical diagnosis and surgical solutions. Adults and children can work together to learn how the body tells us when something is wrong and try out some of the amazing techniques surgeons use to help.

See page 14 **12pm–4pm**

FLYING FOR FUN

TUESDAY 4 APRIL

CITY ART CENTRE

ALL AGES
ACTIVITY



See page 8 **9.30am–4.30pm**

During the Science Festival we transform City Art Centre's gallery spaces into a sensational science playground, packed full of workshops, shows and interactive events. Day Pass required.

CITY ART CENTRE



NATIONAL MUSEUM OF SCOTLAND

See page 12 **10am–4.30pm**

See page 12 **10am–4.30pm**

See page 12 **10am–4.30pm**

See page 12 **10am–5pm**

See page 13 **10am–5pm**

See page 12 **10am–5pm**

See page 12 **10am–5pm**

See page 13 **10.30am**

LOOK INSIDE YOUR MIND
OUR CHANGING PLANET
PHOTOCHEMISTRY
A TASTE OF SCI-FUN
MONKEY BUSINESS
PLAY ON
POP-UP ENGINEERING
MY MONKEY AND ME

MADLAB SPACEFLAG



10.30am, 12.30pm and 2.30pm | 90 mins

£15 | Learning Centre Level 4, Studio 1

Presented by MadLab

Join MadLab as they return to the Science Festival with this hugely popular electronics workshop and build your very own SpaceFlag! A SpaceFlag is a gadget that uses persistence of vision to display a message as it's waved. This is your chance to get hands-on with electronics as you learn how to solder and build your own kit to take away. Part of *Play On* (p12).

DR BUNHEAD'S EGGCELLENT EGGSPLOSIONS



11am | 1 hour

on until Friday 7 April

£6/£20 family (4 tickets) | Auditorium

Presented by The University of Edinburgh

Join TV's favourite stunt scientist for a joy-ride through the sickest science experiments your teacher never dared to do. Easter eggs will be exploded, bunnies will be fired into space, things will go boom, and people will redecorate their underpants.

See page 13 **11.30am and 2pm**

See page 13 **1pm and 3pm**

See page 17 **2pm–3.30pm**

PRIMATE PLAYGROUND
GAME ON!
SPARK CART SCIENCE



SUMMERHALL

See page 17 **8pm**

COSMONAUT



ROYAL BOTANIC GARDEN EDINBURGH

HEALTHY SOIL HEALTHY FOOD



11am–4pm | drop-in

on until Wednesday 5 April

Free | Real Life Science Studio,

John Hope Gateway

Presented by Scotland's Rural College

Soil is really important! Crops like cereals, vegetables and fruit all depend on good soil. Become a soil scientist and find out what makes a healthy soil. Test soil samples and work out how they can be improved. We'll also introduce you to the critters that live in soil as they play a vital role in maintaining soil health.

ALL AGES
ACTIVITY



RZSS EDINBURGH ZOO

See page 17 **11am–3pm**

See page 14 **6.30pm**

WHAT MAKES US HUMAN?
DR STIRLINGSHIRE'S DISCOVERY

ONLINE BOOKING: sciencefestival.co.uk BOOKING HOTLINE: 0844 557 2686



AROUND TOWN

See page 14 **9am–4pm**
 See page 15 **10am–5pm**
 See page 14 **12pm–4pm**

POWER TRIP
MOMENTS IN TIME
FLYING FOR FUN

WILD ABOUT SCOTLAND BUS



10am–4pm | drop-in
Grassmarket: Tuesday 4–Wednesday 5
Summerhall: Monday 10–Thursday 13
Edinburgh Zoo: Saturday 15–Sunday 16 April
Free (Free with admission at the Zoo)
 Presented by RZSS Edinburgh Zoo

Explore this bespoke double-decker bus to find out all about Scottish wildlife and RZSS native conservation projects. Have a go at guessing the animal skull, building a beaver dam and examining mini-beasts under microscopes. The bus will visit different venues around Edinburgh throughout the Festival. Hop on board at Grassmarket, Summerhall and Edinburgh Zoo.

UNCANNY VALLEY



12pm and 2.30pm | 70 mins
on until Saturday 8 April
£10/£8 | The Festival Theatre Studio
 Commissioned by Edinburgh International Science Festival working in partnership with Imagine, produced by Borderline Theatre Company and supported by Creative Scotland through the Scottish Government's Edinburgh Festivals Expo Fund

An interactive show for 8–12 year olds, *Uncanny Valley* asks you, the audience, to interact with a real 'live' robot and help to tell the story of Ada and her best friend OKAY (Outstandingly Knowledgeable Android Youth). Watch OKAY grow and learn, join in by asking your own questions and see if you can really tell the difference between a robot and a human being. Written by Rob Drummond and presented by **Borderline Theatre Company**.

Winner of Best Production for Children and Young People at the 2015–16 Critics' Awards for Theatre in Scotland. *'Perfectly pitched as an educational piece aimed at young people... which offers complex, challenging-for-all-ages moral questions.'* The List

DYNAMIC EARTH

CREATIVE SCIENCE: POLAR FELTING



11am–3pm | drop-in
on until Thursday 6 April
Free with admission | Stratosphere
 Presented by Dynamic Earth

What's your favourite polar animal? Is it a penguin? An arctic fox? Or maybe a walrus? Back by popular demand at Dynamic Earth, join fibre artist **Ewa Kuniczak** to explore polar worlds and get hands-on by making your very own polar wildlife creation to take home with you.

DOUBLE DOME NIGHTS



5.30pm | 90 mins
also on Wednesday 5–Thursday 6 and
Wednesday 12–Thursday 13 April
£8 adults/£5 children/free for Explorer pass holders | ShowDome
 Presented by Dynamic Earth

Sit back and relax for a cinematic treat! *Double Dome Nights* feature a combination of two 30-minute films from Dynamic Earth's spectacular bank of out-of-this-world 360° immersive experiences. Pick up your popcorn on arrival and enjoy! Refreshments are available throughout the evening.

AGES 5+
ACTIVITY

AGES 5+
FILM

AGES 3+
ACTIVITY

AGES 8+
SHOW

WEDNESDAY 5 APRIL

CITY ART CENTRE



See page 8 **9.30am–4.30pm**

During the Science Festival we transform City Art Centre's gallery spaces into a sensational science playground, packed full of workshops, shows and interactive events. Day Pass required.

CITY ART CENTRE

ALL AGES
ACTIVITY

NATIONAL MUSEUM OF SCOTLAND

See page 12 **10am–4.30pm**

See page 12 **10am–4.30pm**

See page 12 **10am–4.30pm**

See page 12 **10am–5pm**

See page 13 **10am–5pm**

See page 12 **10am–5pm**

See page 12 **10am–5pm**

See page 13 **10.30am**

See page 18 **11am**

See page 13 **11.30am and 2pm**

LOOK INSIDE YOUR MIND
OUR CHANGING PLANET
PHOTOCHEMISTRY
A TASTE OF SCI-FUN
MONKEY BUSINESS
PLAY ON
POP-UP ENGINEERING
MY MONKEY AND ME
DR BUNHEAD'S EGGCELLENT EGGSPLOSIONS
PRIMATE PLAYGROUND

MARTY: ACTIVATE!

Get your hands on Marty, the walking, dancing robot, and learn how robots work. By coding in the programming language Scratch, teach a robot how to interact with the world around it. For ages 11–15, ideally with a little experience of using Scratch or coding at school. No Scratch experience? Do the *Game On* workshop (p13), then this one! Each ticket also admits one adult if desired.

1pm and 3pm | 1 hour
on until Thursday 6 April

£5 | Learning Centre Level 4, Seminar Room

Presented by The University of Edinburgh

See page 17 **2pm–3.30pm**

SPARK CART SCIENCE

AGES 11+
WORKSHOP



SUMMERHALL

See page 17 **10.30am, 12 and 2pm**

SING AND DANCE IN SPACE AND TIME WITH MR BOOM



11am | 1 hour

£6/£20 family (4 tickets) | Main Hall

See page 17 **8pm**

MINI ZOOMERS: SENSORY SCIENTISTS

Mr Boom, the children's one-man band, arrives from the Moon in the spaceship Imagination. Travel with him on an amazing musical adventure through time and space in an exciting, animated show that features song, dance and audience participation.

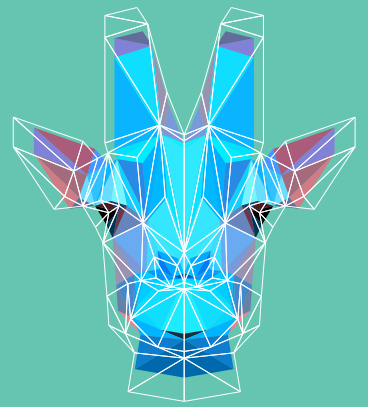
COSMONAUT

AGES 3+
SHOW

ROYAL BOTANIC GARDEN EDINBURGH

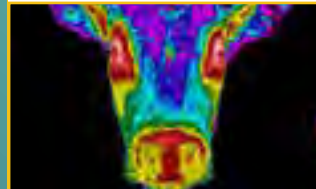
See page 18 **11am–4pm**

HEALTHY SOIL HEALTHY FOOD



RZSS EDINBURGH ZOO

SEEING THE HEAT: USING THERMOGRAPHY FOR ANIMAL HEALTH AND WELFARE



11am–3pm | drop-in
on until Friday 7 April

Free with admission | Budongo Trail

Presented by RZSS Edinburgh Zoo

AGES 5+
ACTIVITY

WHERE DOES BEESWAX COME FROM?



11am–3pm | drop-in
also on Wednesday 12 April

Free with admission | Budongo Trail

Presented by RZSS Edinburgh Zoo

AGES 5+
ACTIVITY

All objects, including animals and humans, emit infra-red radiation in proportion to their temperature. Discover how thermal imaging cameras can be used to measure and record the temperature of animals, assessing the animals' health and welfare in a non-invasive way.

Meet RZSS Beekeeper in Residence Brian Pool to learn all about bees. Find out where beeswax comes from and what it's used for, see a wild honey bee colony's nest and have a go at making your own beeswax candle.

See page 14 **6.30pm**

DR STIRLINGSHIRE'S DISCOVERY

DYNAMIC EARTH

See page 19 **11am–3pm**

See page 19 **5.30pm**

CREATIVE SCIENCE: POLAR FELTING
DOUBLE DOME NIGHTS

AROUND TOWN

See page 14 **9am–4pm**

See page 19 **10am–4pm**

See page 15 **10am–5pm**

See page 17 **11am and 2pm**

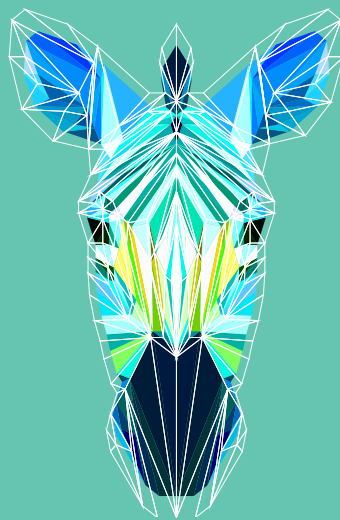
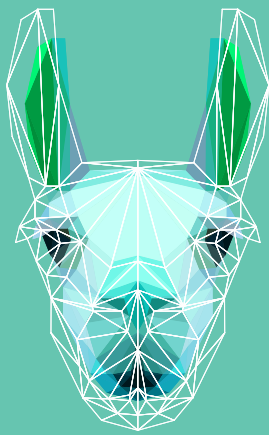
See page 19 **12pm and 2.30pm**

See page 14 **12pm–4pm**

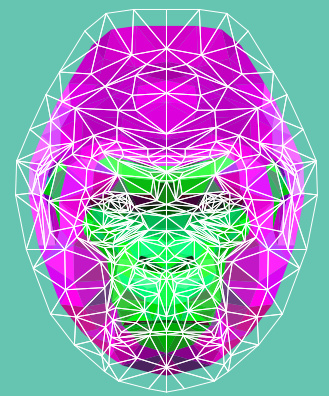
POWER TRIP
WILD ABOUT SCOTLAND BUS
MOMENTS IN TIME
SURGICAL SLEUTHS
UNCANNY VALLEY
FLYING FOR FUN

THURSDAY 6 APRIL

CITY ART CENTRE



FAMILY EVENTS



ALL AGES
ACTIVITY



See page 8 **9.30am–4.30pm**

During the Science Festival we transform City Art Centre's gallery spaces into a sensational science playground, packed full of workshops, shows and interactive events. Day Pass required.

CITY ART CENTRE

NATIONAL MUSEUM OF SCOTLAND

See page 13 **10am–5pm**

See page 12 **10am–5pm**

See page 13 **10.30am**

**MONKEY BUSINESS
PLAY ON
MY MONKEY AND ME**

What tricks do insects use to survive? How do cells make decisions? Meet biologists from The University of Edinburgh and find out what new things they've discovered this year about animals, plants and other living things. And get hands-on and make some exciting discoveries for yourself under the microscope!

BIO-DISCOVERIES



10am–4.30pm | drop-in

on until Monday 10 April

Free | Learning Centre Level 2

Presented by The University of Edinburgh

MATHS: CONNECTING OUR WORLD



10am–4.30pm | drop-in

on until Monday 10 April

Free | Learning Centre Level 2

Presented by The University of Edinburgh

How can we stop diseases from spreading? How do computers talk to each other? How can you find the fastest route to where you want to go? Maths is the answer, come and find out how. Build your own model of the internet, stop a disease from wiping out the planet and discover how maths connects our world.

SEEING MINDS ONLINE



10am–4.30pm | drop-in

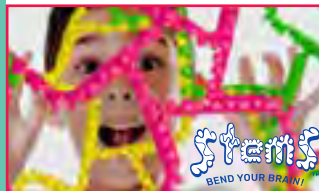
on until Monday 10 April

Free | Learning Centre Level 2

Presented by The University of Edinburgh

Chat-bots are clever computer programs that pretend to be humans. Join us to see if you can tell the difference between a human and a chat-bot. Learn about the secret signals that humans use to know they are talking to a human, and be better prepared to sniff out chat-bots!

ALL AGES
ACTIVITY



**POP-UP SCIENCE:
STEMS, BEND YOUR BRAIN**

10am–5pm | drop-in

on until Monday 10 April

Free | Hawthornden Court

Presented by Splatform

Come and play with the new 3D maker toy that's made from an incredibly flexible polymer for mind-bending fun. Take the seed of an idea, add curiosity and watch it grow as we discover what we can make with 5,000 stems... that's enough to make a 125m long double helix! Enjoy the most exciting and puzzling conversation your hands will ever have with your brain and put your questions to the inventor and other team members. Part of *Play On* (p12).

ALL AGES
ACTIVITY



**POP-UP SCIENCE:
UV DRAWING ROOM**

10am–5pm | drop-in

on until Monday 10 April

Free | Hawthornden Court

Enter the *UV Drawing Room* and create amazing drawings together using UV torches and special templates. You'll discover amazing facts about UV light and the history surrounding its discovery while you doodle across the walls and tables! Part of *Play On* (p12).

AGES 8+
WORKSHOP



SMART SOFT STUFF

12pm and 2pm | 1 hour

on until Friday 7 April

£5 | Learning Centre Level 4, Studio 1

Presented by The University of Edinburgh

**DR BUNHEAD'S EGGCELLENT EGGSPLOSIONS
PRIMATE PLAYGROUND**

Meet researchers who work on smart squishy materials. Learn how materials can be designed in a computer before they are made in the lab. Discover soft materials that react to their surroundings, changing colour or shape when you warm them up or shine light on them. Make your own smart soft materials! For ages 8–14. Each ticket also admits one adult if desired.

See page 20 **1pm and 3pm**

See page 17 **2pm–3.30pm**

**MARTY: ACTIVATE!
SPARK CART SCIENCE**

ONLINE BOOKING: sciencefestival.co.uk BOOKING HOTLINE: 0844 557 2686

CONTINUED...

THURSDAY 6 APRIL CONTINUED

SUMMERHALL

ENSONGLOPEDIA OF SCIENCE



11am and 2pm | 1 hour
£6/£20 family (4 tickets) | Dissection Room

Join multi-award-winning writer and performer **John Hinton** for his brand new peer-reviewed show, featuring a song about science for every letter of the alphabet! Expect atoms, big bangs and cells. Expect X-rays, Y-chromosomes and plenty of zoology. Expect the unexpected. And expect it to rhyme.

AGES 7+
SHOW

ROYAL BOTANIC GARDEN EDINBURGH

A PICTURE OF HEALTH



11am–4pm | drop-in
on until Friday 7 April
Free | Real Life Science Studio, John Hope Gateway
Presented by The James Hutton Institute

How can the crops we grow, and how we grow them, create healthy food and a healthy environment? Discover the science of farming for a healthier future.

ALL AGES
ACTIVITY

DYNAMIC EARTH

See page 19 11am–3pm
See page 19 5.30pm

CREATIVE SCIENCE: POLAR FELTING
DOUBLE DOME NIGHTS

RZSS EDINBURGH ZOO

See page 20 11am–3pm

HOW DO YOU WEIGH A CHIMPANZEE?



11am–3pm | drop-in
on until Friday 7 April
Free with admission | Budongo Trail
Presented by RZSS Edinburgh Zoo

SEEING THE HEAT, USING THERMOGRAPHY FOR ANIMAL HEALTH AND WELFARE

RZSS uses regular weight checks to monitor the health of its animals, but weighing animals can sometimes be a tricky task. Luckily some engineering students from Heriot-Watt University were able to make things a bit easier by creating special chimpanzee scales. This is your chance to meet the scientists and hear how they came up with their designs.

AGES 7+
ACTIVITY

See page 14 6.30pm

DR STIRLINGSHIRE'S DISCOVERY

AROUND TOWN

See page 14 9am–4pm
See page 15 10am–5pm
See page 19 12pm and 2.30pm
See page 14 12pm–4pm

POWER TRIP
MOMENTS IN TIME
UNCANNY VALLEY
FLYING FOR FUN

FRIDAY 7 APRIL

CITY ART CENTRE



See page 8 **9.30am–4.30pm**

During the Science Festival we transform City Art Centre's gallery spaces into a sensational science playground, packed full of workshops, shows and interactive events. Day Pass required.

CITY ART CENTRE

ROYAL BOTANIC GARDEN EDINBURGH

See page 22 **11am–4pm**

A PICTURE OF HEALTH

NATIONAL MUSEUM OF SCOTLAND

See page 21 **10am–4.30pm**
 See page 21 **10am–4.30pm**
 See page 21 **10am–4.30pm**
 See page 13 **10am–5pm**
 See page 12 **10am–5pm**
 See page 21 **10am–5pm**
 See page 21 **10am–5pm**
 See page 18 **11am**

BIO-DISCOVERIES
MATHS: CONNECTING OUR WORLD
SEEING MINDS ONLINE
MONKEY BUSINESS
PLAY ON
STEMS, BEND YOUR BRAIN
UV DRAWING ROOM
DR BUNHEAD'S EGGCELLENT EGGSPLORATIONS

MUSIC PRODUCER WORKSHOP



11am and 2pm | 2 hours
£15 | Learning Centre Level 4, Seminar Room
 Presented by ComputerXplorers

Write and publish your own music using the latest technology! Hip Hop, Rock 'n' Roll, Ballads or Reggae... you can write music and publish online. This workshop will have you creating music in a heartbeat. Whether you edit sounds, use instruments, add vocals or write music note-by-note, the musical possibilities are endless. Part of *Play On* (p12).

SMART SOFT STUFF
SPARK CART SCIENCE

See page 21 **12pm and 2pm**
 See page 17 **2pm–3.30pm**

SUMMERHALL

See page 14 **10.30am, 12 and 2pm**
 See page 17 **11am**

FAMILY STORY TIME
MINI ZOOMERS: SENSORY SCIENTISTS

RZSS EDINBURGH ZOO

See page 20 **11am–3pm**
 See page 22 **11am–3pm**
 See page 14 **6.30pm**

SEEING THE HEAT
HOW DO YOU WEIGH A CHIMPANZEE?
DR STIRLINGSHIRE'S DISCOVERY

DYNAMIC EARTH

See page 14 **10am–4pm**

EXTREME ENVIRONMENTS: LIFE AT THE POLES

VR WORLDS: MEET THE EXPERTS



10am–4pm | drop-in
Free with admission | Stratosphere
 Presented by Dynamic Earth

Come and meet experts from Heriot Watt University, Energy Skills Partnership and ORE Catapult who are working to develop a hybrid reality world that mixes up real and virtual reality worlds. You'll also get the chance to experience what it's like to conduct an inspection on the top of a wind turbine – all from the comfort of your head mounted display!

AROUND TOWN

See page 14 **9am–4pm**
 See page 15 **10am–5pm**
 See page 19 **12pm and 2.30pm**
 See page 14 **12pm–4pm**

POWER TRIP
MOMENTS IN TIME
UNCANNY VALLEY
FLYING FOR FUN



SCIENCE IN THE SPOT LIGHT

This year, our science theatre programme for families is bigger than ever before, with performances taking place at venues all over the city.

We are delighted that our 2016 *Science in the Spotlight* commissions – *Lost at Sea* by Catherine Wheels (p31), and Borderline Theatre Company's CATS award-winning *Uncanny Valley* (p19) – will return in 2017 at The Festival Theatre Studio. New for 2017 is *Cosmonaut* (p17), an audio-visual production telling three interlocking stories from the beginnings of the space race.

Grid Iron, Lung Ha Theatre Company, RZSS Edinburgh Zoo and the Royal Lyceum Theatre Company will come together to present the world premiere of *Dr Stirlingshire's Discovery* (p14), a family-friendly promenade performance seeking out a new and unusual animal at the Zoo.

Explore environmental sustainability in the darkly humorous *A Stone's Throw* by Giddy Aunt Theatre Company (p25), go fossil-hunting with Clydebuilt Puppet Theatre in *Dinosaur Detectives* (p27) or, for younger children and their families, discover the science in your favourite stories with Scottish Youth Theatre's *Family Story Time* (p14).

Visit sciencefestival.co.uk/science-in-the-spotlight for more information about science theatre events in both our family and adult programmes.



Science in the Spotlight commissions created with support from Creative Scotland through the Scottish Government's Edinburgh Festivals Expo Fund.

SATURDAY 8 APRIL

CITY ART CENTRE

ALL AGES
ACTIVITY



See page 8 **9.30am–4.30pm**

During the Science Festival we transform City Art Centre's gallery spaces into a sensational science playground, packed full of workshops, shows and interactive events. Day Pass required.

CITY ART CENTRE



NATIONAL MUSEUM OF SCOTLAND

See page 21 **10am–4.30pm**

See page 21 **10am–4.30pm**

See page 21 **10am–4.30pm**

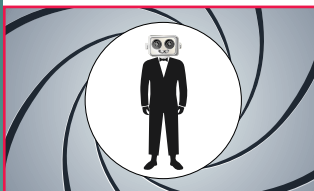
See page 13 **10am–5pm**

See page 12 **10am–5pm**

See page 21 **10am–5pm**

See page 21 **10am–5pm**

RASPBERRY PI ROBOTS: SPY CHALLENGE



10.30am, 12.30pm and 2.30pm
90 mins

£15 | Learning Centre Level 4, Studio 1

Presented by Arcola Energy

BIO-DISCOVERIES

MATHS: CONNECTING OUR WORLD

SEEING MINDS ONLINE

MONKEY BUSINESS

PLAY ON

STEMS, BEND YOUR BRAIN

UV DRAWING ROOM

Can you create the perfect hydrogen-powered robot spy? Your challenge is to program a Raspberry Pi computer via Scratch to control your robot's wheels and camera. You'll find out how hydrogen can be used to create electricity to power your robot, then send your robot spy into the secret base – and race to make it back before you run out of fuel! Part of *Play On* (p12).

AGES 8+
WORKSHOP

THE BIOPHILIA EDUCATION PROJECT



10.45am and 1.45pm | 90 mins
on until Monday 10 April

£15 | Learning Centre Level 4, Studio 2 on Saturday and Sunday, Studio 1 on Monday

In association with Björk, Nordic Council of Ministers, Ministry of Education, Science & Culture Iceland

Enter the world of *Biophilia*... Björk's 2011 album was the first of its kind – fully interactive, with each song accompanied by its own app exploring an element of musical theory, paired with a corresponding scientific phenomenon. Through a Nordic collaborative effort the educational aspect of *Biophilia* has been developed further. Join us for the Scottish premiere of these hands-on workshops. You'll learn about music and science and push your creative boundaries using new technologies. Listen, learn, create! Part of *Play On* (p12).

AGES 8+
WORKSHOP



AGES 8+
WORKSHOP

AUGMENTED REALITY (AR) WORKSHOP



11am and 2pm | 2 hours
£15 | Learning Centre Level 4, Seminar Room
Presented by ComputerXplorers

Welcome to the magic of augmented reality (AR), taking real-world items and enhancing them with computer-generated imagery. You'll use tablets to learn how to make content 3D (and even 4D) with the help of avatars, 3D models, animations and your own creativity. Talking newspapers, a NASA spacecraft in your hand and bringing your lip-syncing avatar to life will become your new reality. Part of *Play On* (p12).

SUMMERHALL

AGES 5+
SHOW

A STONE'S THROW



11am and 2pm | 50 mins
on until Sunday 9 April
£6/£20 family (4 tickets) | Dissection Room
Presented by Giddy Aunt

A girl knocks the sun out of the sky. As the world starts to fall apart, she embarks on a special mission to restore it back to its place in the sky. This adventurous and darkly humorous theatre piece uses object manipulation, live music and storytelling to explore environmental sustainability, self worth and our collective and individual responsibility to the planet.

ROYAL BOTANIC GARDEN EDINBURGH

ALL AGES
ACTIVITY

GARDENING THE EARTH



11am–4pm | drop-in
on until Sunday 9 April
Free | Real Life Science Studio,
John Hope Gateway
Presented by Royal Botanic Garden Edinburgh

We have been growing our food for at least 10,000 years, resulting in an incredible diversity of crops. Take the food plant ID challenge and find out how food production could become more environmentally friendly. Then design your own crop and see where your favourite foods sit on a giant family tree of plants.

RZSS EDINBURGH ZOO

ALL AGES
ACTIVITY

GPS NAVIGATION: FROM ANIMAL TRACKING TO GEOCACHING



11am–3pm | drop-in
on until Sunday 9 April
Free with admission | start at the main lawn
outside the Mansion House
Presented by RZSS Edinburgh Zoo

See page 14 **6.30pm**

Strange footprints and sightings have occurred in the zoo so the team have put out cameras and got extra animal trackers on watch, can you become a trainee animal tracker and help them? Follow the clues and use your GPS on your phone to solve the mystery of the zoo's extra animal.

DR STIRLINGSHIRE'S DISCOVERY

DYNAMIC EARTH

AGES 7+
ACTIVITY

ROCK DOCTORS TO THE RESCUE: MEET THE EXPERTS



Exhibition 10am–4pm
Walks 10.30am and 1.30pm
Free (walks ticketed) | Stratosphere
Presented by Dynamic Earth

Take a 145-million-year journey to discover the rocks that can help Britain's top geoscientists meet the urgent global climate challenge. Family-friendly activities are available throughout the day, and get your ticket for a fun 2.5km guided outdoor walk exploring the geology that makes carbon capture and storage possible. Moderate level of fitness, outdoor clothing and sturdy footwear required for walks. Run in partnership with UKCCSRC, SCCS and the GCCSI.

AROUND TOWN

AGES 4+
WORKSHOP

See page 14 **10am–4pm**
See page 15 **10am–5pm**
See page 19 **12pm and 2.30pm**
See page 14 **12pm–4pm**

CONSTABLE'S CLOUDS



2pm | 2 hours
also on Sunday 9, Saturday 15 and
Sunday 16 April
Free (ticket required) | Scottish National Gallery
Presented by the Scottish National Gallery

POWER TRIP
MOMENTS IN TIME
UNCANNY VALLEY
FLYING FOR FUN

Join the Scottish National Gallery and Eureka Edinburgh for a special hands-on science-art workshop inspired by some of the wild weather and stunning skyscapes on show in the gallery's collection. Build clouds like Constable, create your own rainbows, understand the science behind sunlight and more.

SUNDAY 9 APRIL

NATIONAL MUSEUM OF SCOTLAND

- See page 21 **10am–4.30pm**
- See page 21 **10am–4.30pm**
- See page 21 **10am–4.30pm**
- See page 13 **10am–5pm**
- See page 12 **10am–5pm**
- See page 21 **10am–5pm**
- See page 21 **10am–5pm**

CONDUCTIVE DJ



10.30am, 12pm and 2pm | 1 hour
£10 | Learning Centre Level 4, Studio 1
 Presented by Capturing Creativity

See page 24 **10.45am and 1.45pm**

GAME DESIGN USING XBOX CONTROLLERS



11am and 2pm | 2 hours
£15 | Learning Centre Level 4, Seminar Room
 Presented by ComputerXplorers

- BIO-DISCOVERIES**
- MATHS: CONNECTING OUR WORLD**
- SEEING MINDS ONLINE**
- MONKEY BUSINESS**
- PLAY ON**
- STEMS, GROW YOUR WORLD**
- UV DRAWING ROOM**

Learn to remix and create music using MaKey MaKey and anything that conducts electricity. A MaKey MaKey is an invention kit that turns everyday objects into touchpads allowing you to experiment with fruit, veg, pots, pans and even your friends! This hugely popular workshop returns to bring science and music together in a fun and active learning experience that's not to be missed! Part of *Play On* (p12).

THE BIOPHILIA EDUCATION PROJECT

Using an Xbox controller, learn how to create and design your very own video game. Create a range of terrains, worlds and characters, controlling the characters' movement, sound and vision using an intuitive icon-based programming language. Don't just play games, create them in this gamers' workshop! Part of *Play On* (p12).



SUMMERHALL

See page 25 **11am and 2pm** • **A STONE'S THROW**

ROYAL BOTANIC GARDEN EDINBURGH

See page 25 **11am–4pm** • **GARDENING THE EARTH**

RZSS EDINBURGH ZOO

See page 25 **11am–3pm**
 See page 14 **6.30pm** • **GPS NAVIGATION**
DR STIRLINGSHIRE'S DISCOVERY

DYNAMIC EARTH

See page 14 **10am–4pm** • **EXTREME ENVIRONMENTS: LIFE AT THE POLES**

AROUND TOWN

See page 15 **10am–5pm**
 See page 14 **12pm–4pm** • **MOMENTS IN TIME**
FLYING FOR FUN

SICCAR POINT: THE ABYSS OF TIME

Follow the journey of James Hutton, the father of modern geology, from the site of his home in central Edinburgh to the wild coastline at Siccar Point. At this beautiful natural site Hutton's evidence for deep time can be observed and appreciated. It is a short, easy walk to the viewpoint above Siccar Point. Visiting the Point itself involves a potentially difficult descent. Please wear appropriate clothing and footwear.



1pm | 4 hours
 also on **Wednesday 12 and Saturday 15 April**
£20/£16/£10 under 18
Coach leaves from the Pleasance Sports Complex, 46 Pleasance
 Presented by Edinburgh Geological Society

See page 25 **2pm** • **CONSTABLE'S CLOUDS**

AGES 10+
WORKSHOP

AGES 8+
WORKSHOP

AGES 10+
ACTIVITY

MONDAY 10 APRIL

CITY ART CENTRE



See page 8 **9.30am–4.30pm**

During the Science Festival we transform City Art Centre's gallery spaces into a sensational science playground, packed full of workshops, shows and interactive events. Day Pass required.

CITY ART CENTRE

ALL AGES
ACTIVITY

NATIONAL MUSEUM OF SCOTLAND

See page 21 **10am–4.30pm**

See page 21 **10am–4.30pm**

See page 21 **10am–4.30pm**

See page 13 **10am–5pm**

See page 12 **10am–5pm**

See page 21 **10am–5pm**

See page 21 **10am–5pm**

See page 24 **10.45am and 1.45pm**

- BIO-DISCOVERIES**
- MATHS: CONNECTING OUR WORLD**
- SEEING MINDS ONLINE**
- MONKEY BUSINESS**
- PLAY ON**
- STEMS, BEND YOUR MIND**
- UV DRAWING ROOM**
- THE BIOPHILIA EDUCATION PROJECT**

RFID TREASURE HUNT CHALLENGE



11am and 2pm | 90 mins

£15 | Learning Centre Level 4, Studio 2

Presented by MAKLab

Join us for a treasure hunt on a whole new level – an electronic level! You'll learn about Radio Frequency Identification (RFID) while your team designs and codes a treasure hunt puzzle using RFID tags and battles with another team to create the trickiest hunt. Then the race is on to see which team will solve the other team's clues first and find the prize. Part of *Play On* (p12).

SUPERHERO SCIENCE SHOW



11am, 1pm and 3pm | 45 mins
also on Tuesday 11 April

£3/£10 family (4 tickets) | Auditorium

Presented by National Museums Scotland

Are you a superhero scientist in the making? This live show packed full of experiments explores how real objects from the National Museum of Scotland have given us all super powers. Discover the science behind energy transfers and infrared technology, and learn about how people like you might discover the superpowers of the future.

SPARK CART SCIENCE

See page 17 **2pm–3.30pm**

AGES 8+
WORKSHOP

AGES 5+
SHOW



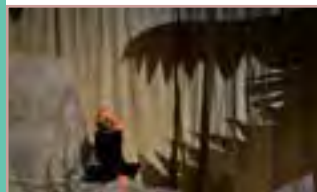
SUMMERHALL

See page 19 **10am–4pm**

See page 17 **11am**

WILD ABOUT SCOTLAND BUS
MINI ZOOMERS: SENSORY SCIENTISTS

DINOSAUR DETECTIVES



11am and 2pm | 1 hour

£6, family £20 (4 tickets) | Dissection Room

Presented by Clydebuilt Puppet Theatre

The *Dinosaur Detectives* are going on a journey to search for clues about the past. Follow them to discover how the first fossil finds of 18th-century palaeontologists Mary Anning, William Buckland and Gideon Mantell changed history in a performance featuring rod puppets, shadow play and large-scale projections.



**MONDAY
10 APRIL**

CONTINUED

SUMMERHALL

THE EXPERIMENTARIUM

11am–4pm | drop-in
on until Friday 14 April
Free | Main Hall

The Experimentarium is a brand new space for Science Festival 2017 that's packed full of weird, wonderful and cutting edge science. Browse individual event listings below or find out more at sciencefestival.co.uk/the-experimentarium.

**SEEING SPEECH,
HEARING TONGUES**



11am–4pm | drop-in
on until Friday 14 April
Free | Main Hall

Presented by Queen Margaret University

Speaking is a highly complex and uniquely human skill that we study with ultrasound scanners. Join us in *The Experimentarium* for this interactive activity to find out how your tongue (and the rest of your vocal tract) move and change to produce the sounds of speech; it's like having a whole orchestra inside your mouth!

ALL AGES
ACTIVITY

VETS, PETS AND DATASETS



11am–4pm | drop-in
on until Friday 14 April
Free | Main Hall

Presented by The University of Liverpool

Discover a new area of science called health informatics, which reuses electronic health records for research and surveillance. Join us in *The Experimentarium* and become a real big data detective! Hunt for parasitic ticks in our anonymised data collected from vets across the country by SAVSNET (the Small Animal Veterinary Surveillance Network) and learn how big data can help animal welfare and human health.

AGES 7+

**FOOD DISCOVERY ZONE: FOOD
SAFETY, NUTRITION AND YOU!**



11am–4pm | drop-in
on until Friday 14 April
Free | Main Hall

Presented by Food Standards Scotland

Join us in *The Experimentarium* for an interactive journey to explore the foods you eat and discover how the foods you choose to consume may affect your health and wellbeing in current and later life. See how bacteria can grow and spread through human connection and learn how to avoid cross-contamination when handling and cooking food.

ALL AGES
ACTIVITY



**POP-UP LAB: WHAT'S IT LIKE TO
BE A HEART SCIENTIST?**



11am–4pm | drop-in
on until Friday 14 April
Free | Main Hall

Presented by British Heart Foundation Scotland

Meet the British Heart Foundation in *The Experimentarium* as you enter our pop-up heart laboratory and try your hand at being a heart scientist! You can see heart imaging and watch heart cells beating, touch and feel some of the technology used in heart surgery and put your questions to real heart scientists.

THE BLOOD DOCTOR MYSTERY



11am–4pm | drop-in
on until Friday 14 April
Free | Main Hall

Presented by Haemophilia Scotland

Step into *The Experimentarium* to explore this unique, interactive crime scene, which aims to raise awareness of rare bleeding disorders through forensic science. Facilitators are on hand to help as you work through your crime pack to solve the mystery and solve the crime.

HOW DO RIVERS WORK?



11am–4pm | drop-in
On until Wednesday 12 April
Free | Main Hall

Presented by River Forth Fisheries Trust

The River Forth Fisheries Trust are delivering some of the biggest river restoration works in Scotland on the Almond and Avon. Join the RiverLife team in *The Experimentarium* to hear what is going on and learn all about the geomorphology of rivers with their table-top river. Create your own river and see the impacts of human activity in and around one of the most misused habitats on the planet.

ALL AGES
ACTIVITY

LARGE HONEYBEE COLLIDER



11am–4pm | drop-in
on until Friday 14 April
Free | Main Hall

Presented by The University of Edinburgh

Visit *The Experimentarium* to take part in our interactive exhibition all about bees! Try out the Beespoon and find out how much honey a single bee can make within her lifetime. Design your own beehive and discover the importance of the 'beespace' in honeybee architecture. See the world from the perspective of a bee and find out how they find the best flowers.

ALL AGES
ACTIVITY

**SCOTLAND'S SEAGRASS
MEADOWS**



11am–4pm | drop-in
on until Friday 14 April
Free | Main Hall

Presented by Project Seagrass

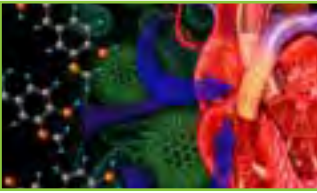
Project Seagrass is a charity on a mission to raise awareness of the importance of seagrass meadows. Come along to *The Experimentarium* and learn about this amazing underwater environment as you colour in your own sea creature to add to our meadow. Watch some amazing underwater videos from around the world and take a photo as a diver or marine biologist.

ALL AGES
ACTIVITY

FAMILY EVENTS

ROYAL BOTANIC GARDEN EDINBURGH

HARVESTING FOR HEALTH



11am–4pm | drop-in
also on Tuesday 11 April
Free | Real Life Science Studio, John Hope Gateway
Presented by The Rowett Institute

Explore how the bugs in your gut harvest the good stuff from your food, and discover what foods are good for your heart, gut and the environment. Then take your chance in a game of guts and bugs, make a placemat or try some of the tasty treats on offer.

RZSS EDINBURGH ZOO GOOGLE EXPEDITIONS



11am–3pm | drop-in
on until Tuesday 11 April
Free with admission | Budongo Trail
Presented by RZSS Edinburgh Zoo

Put on a virtual reality viewer and explore everywhere from the Amazonian Rainforest to the Arctic. With expeditions specially selected to match the animals at the Zoo and conservation projects supported by RZSS around the globe, you'll get a greater understanding of our natural world and the amazing animals, landscapes and plants that occupy it.

RZSS EDINBURGH ZOO

360 DEGREE ZOO



11am–3pm | drop-in
on until Tuesday 11 April
Free with admission | Budongo Trail
Presented by RZSS Edinburgh Zoo

Come to the Zoo, pop on a headset and see things in a new light! There's 360° footage of meerkats in a ball pool, a bug's eye view of cockroaches, special footage of chimps from the Budongo Field Station in Uganda and more. Bring your mobile device, click on the links and use free wi-fi to enter a whole new virtual world.

DYNAMIC EARTH

See page 14 10am–4pm

EXTREME ENVIRONMENTS: LIFE AT THE POLES

AROUND TOWN

See page 14 9am–4pm
See page 15 10am–5pm
See page 17 11am and 2pm
See page 14 12am–4pm

POWER TRIP
MOMENTS IN TIME
SURGICAL SLEUTHS
FLYING FOR FUN

Edinburgh International Children's Festival

27 May - 4 June 2017

An opportunity to see some of the world's best theatre, multi-media, dance and puppetry for children aged 18 months - 15 years and their families.

Opening weekend (27 - 28 May)

National Museum of Scotland

Free drop-in performances,

live music and arts activities.

Imagine

Pick up a programme in venues around Edinburgh or go to

ONLINE BOOKING: sciencefestival.co.uk BOOKING HOTLINE: 0844 597 2686

www.imagine.org.uk 29

TUESDAY 11 APRIL

CITY ART CENTRE

ALL AGES
ACTIVITY



See page 8 **9.30am–4.30pm**

During the Science Festival we transform City Art Centre's gallery spaces into a sensational science playground, packed full of workshops, shows and interactive events. Day Pass required.

CITY ART CENTRE

NATIONAL MUSEUM OF SCOTLAND

ALL AGES
ACTIVITY



See page 13 **10am–5pm**
See page 12 **10am–5pm**

CONNECTING CODES TO CURES

MONKEY BUSINESS PLAY ON

Get hands-on to crack the secret code of DNA, discovering how the hidden messages in our unhealthy cells could hold the key to finding the medicines that will make us better. Work with our medical scientists and doctors to match the best treatments to our patients, based on the code within us all.

10am–4.30pm | drop-in
on until **Saturday 15 April**
Free | Learning Centre Level 2

Presented by The University of Edinburgh

MICRO-ENGINEERS



10am–4.30pm | drop-in
on until **Saturday 15 April**
Free | Learning Centre Level 2

Presented by The University of Edinburgh

WHAT CAN SUPERCOMPUTERS DO?



10am–4.30pm | drop-in
on until **Saturday 15 April**
Free | Learning Centre Level 2

Presented by The University of Edinburgh

How can we solve complex problems fast? How do we predict the weather before it arrives? How do we design better aeroplanes? And how do we analyse the data the modern world generates? Come and use our Raspberry Pi mini-supercomputers to find out. With a little help from our supercomputer experts, you can model a cloud or design a wing and test it with a simulation!

AGES 5+
ACTIVITY



POP-UP SCIENCE: OUR WIRED WORLD

10am–5pm | drop-in
on until **Wednesday 12 April**
Free | Hawthornden Court

Presented by Edinburgh Napier University

See page 27 **11am, 1pm and 3pm**

Come and see what happens when you get creative with technology! Get hands-on with mobile robots, play games and have a go at a bit of programming. These interactive exhibits, developed by students from Edinburgh Napier University, will make you think... and laugh. Are they visions of the future, or just flights of technical whimsy? You decide... Part of *Play On* (p12).

SUPERHERO SCIENCE SHOW

Learn how to produce your very own stop motion animation! You will create a script and your own characters and backgrounds. As you learn the production process, you will animate, record and edit your own film which can then be viewed by family and friends on our video gallery. Watch out Wallace and Gromit, here comes ComputerXplorers! Part of *Play On* (p12).

AGES 7+
WORKSHOP



10.30am and 1.30pm | 2 hours
£15 | Learning Centre Level 4, Seminar Room
Presented by ComputerXplorers

STOP MOTION ANIMATION WORKSHOP

BUILD YOUR OWN DRAWING ROBOT



11am and 2pm | 90 mins
£15 | Learning Centre Level 4, Studio 2
Presented by MAKLab

Have a go at building your own robot in this fun introduction to electronics and motors. In this solderless workshop, we'll get you to assemble all the parts you need for a fully functioning vibrating robot, before adorning it with some felt pens and setting it loose on a sheet of paper. Who said robots couldn't have the soul of an artist? Part of *Play On* (p12).

AGES 7+
WORKSHOP

AMAZING IMMUNOLOGY



12pm | 1 hour
on until **Friday 14 April**
£5 | Learning Centre Level 4, Studio 1
Presented by The University of Edinburgh

Reveal the secrets of your immune system in a fun interactive session where you'll explore allergies, infections and vaccinations with real medical research scientists. Help Denny and the T-Team find and solve 3D puzzles, try the Rash Decisions ball pool challenge and complete your Immunological Stickers story. For ages 6–11. Each ticket also admits one adult if desired.

AGES 6+
WORKSHOP

See page 17 **2pm–3.30pm**

SPARK CART SCIENCE

SUMMERHALL

See page 19 **10am–4pm**

See page 28 **11am–4pm**

MAKING THE NEW HUMAN



11am and 2pm | 1 hour

£6/£20 family (4 tickets) | Dissection Room

WILD ABOUT SCOTLAND BUS THE EXPERIMENTARIUM

See yourself in a new way, with wired brain and augmented strength, in this interactive show about the future of humans in a technological world. Using a combination of scientific demonstration and technological illusion, Neil Monteiro brings to life the ideas of science fiction and real-world research around human augmentation in an experience that will both amaze and astound.

AGES 12+
SHOW

ROYAL BOTANIC GARDEN EDINBURGH

See page 29 **11am–4pm**

HARVESTING FOR HEALTH

RZSS EDINBURGH ZOO

See page 29 **11am–3pm**

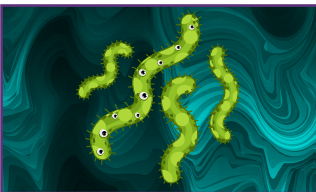
See page 29 **11am–3pm**

360 DEGREE ZOO

RZSS EDINBURGH ZOO GOOGLE EXPEDITIONS

DYNAMIC EARTH

RESEARCHING ALIEN WORLDS: MEET THE EXPERTS



10am–4pm | drop-in

Free with admission | Stratosphere

Presented by Dynamic Earth

RESEARCHING ALIEN WORLDS: SPECIAL SHOW DOME EVENT



5.30pm | 90 mins

£8 adults/£5 children/free for Explorer Pass holders | ShowDome

Presented by Dynamic Earth

Ever wondered if alien life could exist? Astrobiologists are scientists who study life in extreme environments on Earth and try to understand what it needs to survive and if life is possible elsewhere in the Universe. Come and take part in hands-on activities with astrobiologists from the UK Centre for Astrobiology and The University of Edinburgh.

Join us for an exclusive event in the 360° ShowDome. First Prof Charles Cockell from The University of Edinburgh will present the latest astrobiology research from the UK Centre for Astrobiology, then there will be a special immersive screening of the *We Are Aliens* 360° movie and a Q&A session.

AGES 5+
ACTIVITY

AGES 7+
FILM

AROUND TOWN

See page 14 **9am–4pm**

See page 15 **10am–5pm**

See page 14 **12pm–5pm**

LOST AT SEA



12pm and 2.30pm | 1 hour

on until Saturday 15 April

£10/£8 | The Festival Theatre Studio

Commissioned by Edinburgh International Science Festival working in partnership with Imagineate, produced by Catherine Wheels and supported by Creative Scotland through the Scottish Government's Edinburgh Festivals Expo Fund



POWER TRIP MOMENTS IN TIME FLYING FOR FUN

Award-winning theatre company Catherine Wheels returns to the Science Festival to be once again *Lost at Sea* and explore the ocean. The journey begins with a boy and a girl, fascinated by the story of 28,800 bath toys flung into the unrelenting currents of the Pacific Ocean. Through their investigation they uncover the mysteries of the sea and discover its importance to every one of us on Earth.

Shortlisted in the Best Production for Children and Young People category at the 2015–16 Critics' Awards for Theatre in Scotland. *'An entertaining oceanic journey across the globe.'* Edinburgh Guide

AGES 8+
SHOW

WEDNESDAY 12 APRIL

CITY ART CENTRE

ALL AGES
ACTIVITY



See page 8 **9.30am–4.30pm**

During the Science Festival we transform City Art Centre's gallery spaces into a sensational science playground, packed full of workshops, shows and interactive events. Day Pass required.

CITY ART CENTRE

NATIONAL MUSEUM OF SCOTLAND

See page 30 **10am–4.30pm**

See page 30 **10am–4.30pm**

See page 30 **10am–4.30pm**

See page 13 **10am–5pm**

See page 12 **10am–5pm**

See page 30 **10am–5pm**

**CONNECTING CODES TO CURES
MICRO-ENGINEERS
WHAT CAN SUPERCOMPUTERS DO?
MONKEY BUSINESS
PLAY ON
OUR WIRED WORLD**

LIGHT DRAWING



11am and 2pm | 1 hour
£10 | Learning Centre Level 4, Seminar Room

Returning after sell-out success at Science Festival 2016, this hands-on workshop for all artistic abilities brings the worlds of science and art together. Join **Dr Kathryn Harkup** to learn how to paint, sketch and doodle with light to create beautiful images, using long exposure photography and a bit of science along the way. Part of *Play On* (p12).

GADGET FACTORY



11am, 1pm and 3pm | 45 mins
on until Saturday 15 April
£7 | Learning Centre Level 4, Studio 2

Supported by

SIEMENS

See page 30 **12pm**

Investigate and explore how everyday gadgets work and build your own in our mini *Gadget Factory*. After you've grasped the basics of creating an electrical circuit, pick your kit and use your skills to assemble your very own working electronic gadget to take home with you. Once you've learned the secrets of soldering there's no end to the stuff you can make!

AMAZING IMMUNOLOGY

Expect bangs, flames and foam in a classic show of experiments and fun with two of Scotland's best communicators! How cold can we go? How can we make oxygen? And why should a lettuce be very, very afraid of **Paul Murray** and **Robin Andrews**? The vibrant show returns with a bang (or five). There might even be a song...

THE CHEMISTRY SHOW



12pm | 1 hour
on until Thursday 13 April
£6/£20 family (4 tickets) | Auditorium
Presented by The University of Edinburgh

See page 17 **2pm–3.30pm**

SPARK CART SCIENCE

SUMMERHALL

See page 19 **10am–4pm**

See page 17 **11am**

See page 28 **11am–4pm**

LOOK UP



11am and 2pm | 1 hour
£6/£20 family (4 tickets) | Dissection Room

AGES 8+
SHOW

**WILD ABOUT SCOTLAND BUS
MINI ZOOMERS: SENSORY SCIENTISTS
THE EXPERIMENTARIUM**

Simon Watt explores some of the science behind space exploration. Which planet is hottest? Which would float in a swimming pool? Which is the most studied? And just how much space is in space? Join him in this live show to see what experiments you can recreate at home and learn about what you can see if you only look up!

ROYAL BOTANIC GARDEN EDINBURGH

DESIGNER DIETS



11am–4pm | drop-in
Free | Real Life Science Studio,
John Hope Gateway
Presented by BioSS

ALL AGES
ACTIVITY

Discover the power of maths in a quest to create healthier diets. Design your own diet, making sure it is healthy, tasty, affordable and kind to the planet. Then use the diet construction app to create a week's food plan that's personalised for your age, gender and weight and that will meet your dietary requirements and minimise environmental impact.

RZSS EDINBURGH ZOO

See page 20 **11am–3pm**

BEYOND THE PANDA



11am–3pm | drop-in
on until Friday 14 April
Free with admission | Budongo Trail
Presented by RZSS Edinburgh Zoo

ALL AGES
ACTIVITY

WHERE DOES BEESWAX COME FROM?

The *Beyond the Panda* education programme is packed with fun interactive activities, games and puzzles. Sample some of the fascinating resources available as you learn about China, its language, culture and geography, as well as finding out more about giant pandas and other Chinese wildlife.

AGES 8+
WORKSHOP

AGES 8+
WORKSHOP

AGES 6+
SHOW

DYNAMIC EARTH

AGES 5+
ACTIVITY

CREATIVE SCIENCE: ULTIMATE ALIENS



10am–4pm | drop-in
on until Friday 14 April
Free with admission | Stratosphere
Presented by Dynamic Earth

See page 19 5.30pm

If we discovered alien life, what would it look like? Scientists researching extreme environments know what they think, but what about you? Would your alien have three eyes and two heads? Would it be red, green, or blue? Get creative as you explore the world of astrobiology at Dynamic Earth and design an ultimate alien to take home with you.

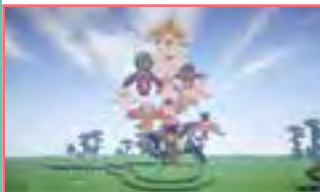
DOUBLE DOME NIGHTS

AROUND TOWN

AGES 7+
ACTIVITY

See page 14 9am–4pm
See page 15 10am–5pm

THE JUPITER ARTLAND MINECRAFT EXPERIENCE



10am and 2pm | 90 min
£5 | Jupiter Artland

See page 17 11am and 2pm
See page 14 12pm–4pm
See page 31 12pm and 2.30pm
See page 26 1pm

POWER TRIP MOMENTS IN TIME

What happened to the magical creatures who used to live in Jupiter Artland? Use a mobile app to find them, discover why they are hiding and why they can't get back to the Minecraft dimension, then solve the clues and find the treasure! This is a unique opportunity to explore a one-of-a-kind Minecraft environment with other connected players.

SURGICAL SLEUTHS
FLYING FOR FUN
LOST AT SEA
SICAR POINT: THE ABYSS OF TIME

CITY ART CENTRE

ALL AGES
ACTIVITY



See page 8 9.30am–4.30pm

During the Science Festival we transform City Art Centre's gallery spaces into a sensational science playground, packed full of workshops, shows and interactive events. Day Pass required.

CITY ART CENTRE



NATIONAL MUSEUM OF SCOTLAND

See page 30 10am–4.30pm
See page 30 10am–4.30pm
See page 30 10am–4.30pm
See page 13 10am–5pm
See page 12 10am–5pm

POP-UP SCIENCE: EXPAND YOUR SENSES



10am–5pm | drop-in
on until Sunday 16 April
Free | Hawthornden Court

CONNECTING CODES TO CURES
MICRO-ENGINEERS
WHAT CAN SUPERCOMPUTERS DO?
MONKEY BUSINESS
PLAY ON

As human modification technology develops, new devices are being created which can expand our senses and push the boundaries of our perceptions. Freelance artist Lesley-Ann Daly has created this unique interactive exhibition which allows you to experience how a sensory organ device affects the life of a user. Step up to explore how this amazing technology can change your heart, stomach and liver.

ALL AGES
ACTIVITY

POP-UP SCIENCE: GET INSIDE THE IMMUNE SYSTEM



10am–5pm | drop-in
on until Friday 14 April
Free | Hawthornden Court
Presented by Edinburgh Napier University

This is your chance to play inside your immune system and experience the amazing things it does and how it works first-hand. Researchers from Edinburgh Napier University are on hand to guide you through an exciting virtual reality game where you can influence the immune system to fight off infection, learning to utilise antibiotics effectively.

AGES 8+
ACTIVITY

POP-UP SCIENCE: THE RAIL CHALLENGE

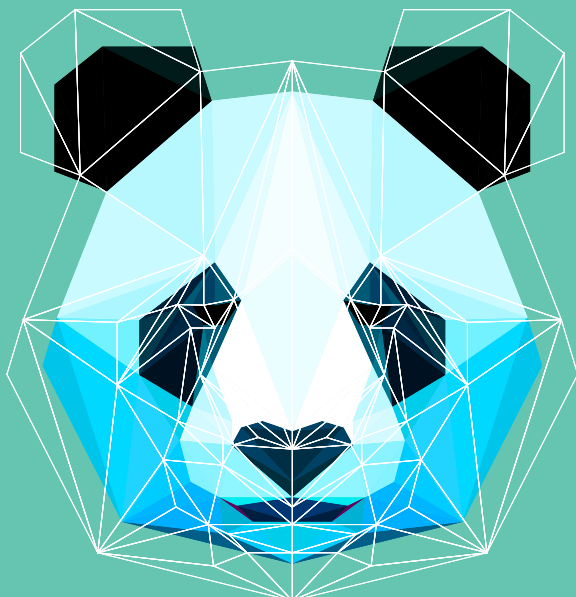


10am–5pm | drop-in
on until Sunday 16 April
Free | Hawthornden Court
Supported by

Can you write the code for trains to give automatic updates to passengers? This exciting drop-in activity will get you coding your way through a digital rail network using a BBC micro:bit.

AGES 8+
ACTIVITY

SIEMENS



THURSDAY 13 APRIL

CONTINUED

NATIONAL MUSEUM OF SCOTLAND

DIGITAL MAKER WORKSHOP



10.30am, 12.30pm and 2.30pm | 90 mins
£15 | Learning Centre Level 4, Seminar Room
Presented by Digital Maker

See page 32 11am, 1pm and 3pm
See page 30 12pm
See page 32 12pm
See page 17 2pm–3.30pm

Martin Evans and Phil Thompson from Digital Maker are back with another exciting programming workshop, this time looking at how to design and produce your very own 3D model using Raspberry Pi and 3D Slash. You'll also get to see how a 3D printer works as they print out some models. All participants will get their own model sent out to them within a week of attending the workshop. Part of *Play On* (p12).

GADGET FACTORY
AMAZING IMMUNOLOGY
CHEMISTRY SHOW
SPARK CART SCIENCE

See page 32 11am, 1pm and 3pm
See page 30 12pm
See page 32 12pm
See page 17 2pm–3.30pm

SUMMERHALL

See page 19 10am–4pm
See page 28 11am–4pm

THE SCIENCE OF TRANSPLANTATION



11am–4pm | drop-in
also on Friday 14 April
Free | Main Hall

Presented by NHS National Services Scotland
and the Royal College of Pathologists

WILD ABOUT SCOTLAND BUS THE EXPERIMENTARIUM

Organ transplantation is one of the miracles of modern medicine, but despite being performed for over 50 years it is far from routine. Join us in *The Experimentarium* to explore a series of hands-on activities, learn about how scientists support organ transplantation and find out how donors and recipients are matched and how blood grouping is performed.

Only science can save you from the worst case scenario! Join an expert Theoretical Zombiologist to learn what you should do if a zombie pandemic occurs. Supported by the Wellcome Trust and University of Glasgow and certified by the Zombie Institute for Theoretical Studies, this spoof tutorial on the real science behind a zombie epidemic features a multimedia presentation, demonstrations and audience participation.

ZOMBIE SCIENCE: WORST CASE SCENARIO



11am and 2pm | 1 hour
£6/£20 family (4 tickets) | Dissection Room
Presented by Time-Tastical Productions

THE ZOOM CLUB: ANIMATION LAB



1pm | 3 hours
also on Friday 14 April
£18 | The Zoom Club
Presented by The Zoom Club
Image: The Zoom Club

Join us in The Zoom Club's innovative *Animation Lab* where you can explore moving images using traditional and digital techniques. We'll uncover how animation really works and help you find the perfect technique to share your own stories and ideas. Please note: strobe lighting is used during this workshop.

AGES 8+
WORKSHOP

ROYAL BOTANIC GARDEN EDINBURGH

DISEASE DETECTIVES



11am–4pm | drop-in
on until Friday 14 April
Free | Real Life Science Studio,
John Hope Gateway
Presented by Moredun Research Institute

Become a disease detective and discover how science is helping us to prevent infection and fight disease, keeping farm animals and all of us safe and healthy. Your task is to diagnose the animal patients by identifying the viruses, bacteria and parasites that can cause disease.

ALL AGES
ACTIVITY

RZSS EDINBURGH ZOO

See page 32 11am–3pm

ZOO DATA AND TECHNOLOGY



11am–3pm | drop-in
on until Friday 14 April
Free with admission | Budongo Trail
Presented by RZSS Edinburgh Zoo

BEYOND THE PANDA

Ever wondered how zoos keep records of all their animals? This is your chance to find out about the ZIMS (Zoological Information Management System) web-based tool that allows zoos all around the world to share information. Discover how they use camera traps to collect data about wild animals and even analyse some wild photos yourself.

ALL AGES
ACTIVITY

DYNAMIC EARTH

See page 33 10am–4pm
See page 19 5.30pm

CREATIVE SCIENCE: ULTIMATE ALIENS DOUBLE DOME NIGHTS

AROUND TOWN

See page 14 9am–4pm
See page 15 10am–5pm
See page 31 12pm and 2.30pm
See page 14 12pm–4pm

POWER TRIP MOMENTS IN TIME LOST AT SEA FLYING FOR FUN

AGES 10+
WORKSHOP

ALL AGES
ACTIVITY

AGES 12+
SHOW

FRIDAY 14 APRIL

CITY ART CENTRE

ALL AGES
ACTIVITY



See page 8 **9.30am–4.30pm**

During the Science Festival we transform City Art Centre's gallery spaces into a sensational science playground, packed full of workshops, shows and interactive events. Day Pass required.

CITY ART CENTRE

NATIONAL MUSEUM OF SCOTLAND

- See page 30 **10am–4.30pm**
- See page 30 **10am–4.30pm**
- See page 30 **10am–4.30pm**
- See page 33 **10am–5pm**
- See page 33 **10am–5pm**
- See page 13 **10am–5pm**
- See page 12 **10am–5pm**
- See page 33 **10am–5pm**

- CONNECTING CODES TO CURES**
- MICRO-ENGINEERS**
- WHAT CAN SUPERCOMPUTERS DO?**
- EXPAND YOUR SENSES**
- GET INSIDE THE IMMUNE SYSTEM**
- MONKEY BUSINESS**
- PLAY ON**
- THE RAIL CHALLENGE**

A CODING ADVENTURE WORKSHOP!



10.30am and 1.30pm | 1 hour 45 mins
£15 | Learning Centre Level 4, Seminar Room
 Presented by Howling Mouse Workshop

Learn how to code your own animations in this unique event. You'll get a sneak peek of an exciting new computer coding show and discover how Scratch code is used to create animations. Then it's time to get hands-on as you complete a series of coding missions using original artwork and sounds from the show, before sitting back to enjoy a special screening of your work. This workshop is perfect for total beginners or those who want to further their knowledge. Part of *Play On* (p12).

See page 32 **11am, 1pm and 3pm**
 See page 30 **12am**

GADGET FACTORY
AMAZING IMMUNOLOGY

SUMMERHALL

See page 17 **11am**
 See page 28 **11am–4pm**
 See page 34 **1pm**

MINI ZOOMERS: SENSORY SCIENTISTS
THE EXPERIMENTARIUM
THE ZOOM CLUB: ANIMATION LAB

ROYAL BOTANIC GARDEN EDINBURGH

See page 35 **11am–4pm**

DISEASE DETECTIVES



RZSS EDINBURGH ZOO

See page 32 **11am–3pm**
 See page 35 **11am–3pm**

BEYOND THE PANDA
ZOO DATA AND TECHNOLOGY

ECO-TALES OF THE BRITISH ISLES



12.30pm and 1.30pm | 30 mins
Free with admission | Wildlife Garden
 Presented by RZSS Edinburgh Zoo

Scotland, England, Wales and Ireland have a rich tradition of stories about the natural world and humanity's place in it. Join us in the Wildlife Garden Yurt as RZSS Storyteller in Residence **Alette Willis** and special guest **Allison Galbraith** share tales with an environmental message from their newly published collection *Eco-Tales of the British Isles*.

AGES 5+
ACTIVITY

DYNAMIC EARTH

See page 33 **10am–4pm**

CREATIVE SCIENCE: ULTIMATE ALIENS

AROUND TOWN

See page 14 **9am–4pm**
 See page 14 **10am–5pm**
 See page 31 **12pm and 2.30pm**
 See page 14 **12pm–4pm**

POWER TRIP
MOMENTS IN TIME
LOST AT SEA
FLYING FOR FUN

SATURDAY 15 APRIL

ALL AGES
ACTIVITY

CITY ART CENTRE



See page 8 **9.30am–4.30pm**

During the Science Festival we transform City Art Centre's gallery spaces into a sensational science playground, packed full of workshops, shows and interactive events. Day Pass required.

CITY ART CENTRE



AROUND TOWN

See page 14 **10am–4pm**
See page 15 **10am–5pm**
See page 31 **12pm and 2.30pm**
See page 14 **12pm–4pm**
See page 26 **1pm**
See page 25 **2pm**

POWER TRIP
MOMENTS IN TIME
LOST AT SEA
FLYING FOR FUN
SICCAR POINT: THE ABYSS OF TIME
CONSTABLE'S CLOUDS

NATIONAL MUSEUM OF SCOTLAND

See page 30 **10am–4.30pm**
See page 30 **10am–4.30pm**
See page 30 **10am–4.30pm**
See page 33 **10am–5pm**
See page 13 **10am–5pm**
See page 12 **10am–5pm**
See page 33 **10am–5pm**

POP-UP SCIENCE: ADVENTURES IN VIRTUAL LAND



10am–5pm | drop-in
on until Sunday 16 April
Free | Hawthornden Court

Presented by Edinburgh Napier University

See page 32 **11am, 1pm and 3pm**

CONNECTING CODES TO CURES
MICRO-ENGINEERS
WHAT CAN SUPERCOMPUTERS DO?
EXPAND YOUR SENSES
MONKEY BUSINESS
PLAY ON
THE RAIL CHALLENGE

Meet the Mata-Mutts, cuddly space-fairing dogs who are desperate to be played with. But watch out! They have a surprise in store. Experience first-hand how it feels to be grown and shrunk by influencing perception in virtual reality in this exhibition created by researchers at Edinburgh Napier University's Graphics and Simulation Group. Part of *Play On* (p12).

GADGET FACTORY

AGES 8+
ACTIVITY

RZSS EDINBURGH ZOO

See page 19 **10am–4pm**

WILD ABOUT SCOTLAND BUS

DYNAMIC EARTH

RESEARCHING WITH DRONES: MEET THE EXPERTS



10am–4pm | drop-in
Free with admission | Stratosphere
Presented by Dynamic Earth

Scientists are making use of new drone technology in exciting and innovative ways. Meet experts from The University of Edinburgh who use it to understand the ways in which Arctic environments are changing, and scientists from the RSPB who use it much closer to home. You'll even get the chance to become a drone pilot yourself using a flight simulator!

AGES 5+
ACTIVITY



SUNDAY 16 APRIL



NATIONAL MUSEUM OF SCOTLAND

See page 36 **10am–5pm**
See page 33 **10am–5pm**
See page 13 **10am–5pm**
See page 12 **10am–5pm**
See page 33 **10am–5pm**

ADVENTURES IN VIRTUAL LAND
EXPAND YOUR SENSES
MONKEY BUSINESS
PLAY ON
THE RAIL CHALLENGE



SUMMERHALL

ALL AGES
SPECIAL EVENT

Edinburgh Mini Maker Faire®



10am–5pm | drop-in
£6/Free Under 3s | Throughout
Summerhall

Edinburgh Mini Maker Faire is back for its fifth year, gathering fascinating, curious people who enjoy making things and who love sharing what they can do. From engineers to artists, scientists to crafters, Maker Faire is a chance for these makers to show off their hobbies, experiments and projects, and for visitors to discover new ways to make their own ideas a reality.

We call it the Greatest Show (and Tell) on Earth – a family-friendly showcase of invention, creativity and resourcefulness. Throughout Summerhall's creative spaces, corridors and courtyards, you'll find demonstrations and interactive exhibits, inspiring talks and hands-on workshops, brought together to amaze, entertain and spark your creativity.

This year we'll be curating an even more interactive Faire, with soapbox talks from local makers such as MAKLab and Edinburgh Hacklab, installations around the venue, demonstrations of making techniques from electronics to carpentry and a whole host of projects from local makers to inspire your own creations.

Glimpse the future and get inspired!

Visit edinburgh.makerfaire.com for more information

Edinburgh Mini Maker Faire is independently organised and operated under licence from Maker Media Inc

Make:
makezine.com

Supported by



RZSS EDINBURGH ZOO

See page 19 **10am–4pm**

WILD ABOUT SCOTLAND BUS



DYNAMIC EARTH

See page 14 **10am–4pm**

EXTREME ENVIRONMENTS: LIFE AT THE POLES



AROUND TOWN

See page 15 **10am–5pm**
See page 14 **12pm–4pm**
See page 25 **2pm**

MOMENTS IN TIME
FLYING FOR FUN
CONSTABLE'S CLOUDS



ADULT EVENTS

'We are all undeniably and irrepressibly connected to science and technology'
– Carl Sagan

Edinburgh International Science Festival 2017 invites you to *Get Connected...* To science, to each other and to our connected world. From 1–16 April we will celebrate the connections that science and technology create and facilitate with creativity, society and economy and explore what it means to live in a globally networked, digital world.

CONNECT WITH... US

Use the hashtag #EdSciFest to share your images, comments, questions and feedback with us online. You'll find us on Twitter, Instagram and Facebook.

CONNECT WITH... TECHNOLOGY AND ME

Explore our cutting edge personal interactions with technology for health, wellbeing and happiness.

CONNECT WITH... OUR WIRED WORLD

Discover how science and technology help us live, work, learn and communicate on an interconnected planet.

CONNECT WITH... TECHNO TRIBES

Find out about the wide-ranging social impacts of the digital revolution.

CONNECT WITH... GLOBAL VILLAGE

Learn about ways we can harness technology to ensure the sustainability and success of our connected world.

CONNECT WITH... PLAY

Join the game to explore how digital technology is influencing the way we spend our leisure time and play.

SCIENCE FESTIVAL BEER

A special Science Festival brew from our friends at Barney's Beer has become a regular (and delicious!) annual tradition.

This year's beer will be produced in collaboration with crop scientists from the Hutton Institute using some innovative ingredients. Try it at our late night events or pop in to the Royal Dick Bar at Summerhall any time during the Festival. Don't miss the chance to meet Edinburgh's favourite beer man and go behind the scenes at Barney's Brewery in *How Beer Made Science History* (p48).



CALLING ALL SCIENCE COMMUNICATORS...

Are you an expert in the life sciences, Earth sciences or natural history? And are you passionate enough to want to share your expertise and knowledge? The BBC Natural History Unit will be holding a limited number of informal meet and greet sessions from 10–12 April. If you are interested in attending then please get in touch to find out more NHUTalent@bbc.co.uk.

AGE RESTRICTIONS

The adult programme is designed for visitors aged 14+. This is a recommendation only and younger audiences are very welcome. Please note that a small number of events have an enforced age limit of 18+. These are marked with AGES 18+. This restriction is in place due to event content and/or venue licensing laws. For these events identification will be required and under 18s will not be admitted under any circumstances.

EARLY BIRD OFFER

Buy four tickets for events in the adult programme and receive your fifth ticket free. Cheapest ticket free, valid for five separate events only. Early bird tickets can be booked by phone or in person. The Early Bird Offer closes on Monday 27 March.



SCIENCE FESTIVAL LATES

AGES 18+
SPECIAL EVENT



7.30pm | 3 hours
Thursday 30 March
£12/£10 | City Art Centre

Get ready to party as we turn our flagship family venue over to adults for one very special night. Enjoy all the fun of the fair with *Carnival of the Mind*, prop up our *Blood Bar* and make a connection in *Little Sparks*. We've got brains, blood, engines and slime mixed in with music, drinks and fun. Don't miss the chance to get hands-on and get your geek on.

#SCIFIVE STUDENTS

Students! Are you sci-curious? Get connected with tickets for £5 or less at most Science Festival events. Look out for the #scifive tag and follow @EdSciFest for special offers, news and jobs.



FIG 1. SCIPALS EMMY NOETHER AND JAMES CLERK MAXWELL DEMONSTRATE A SUCCESSFUL #SCIFIVE!

A HIDDEN ORDER



11am–6pm | drop-in
Saturday 1–Sunday 16 April
Free | Summerhall

Supported by



THE UNIVERSITY
of EDINBURGH
The Alwaleed Centre

A Hidden Order reveals the bonds between art and music through geometry and mathematics, bringing to light an unforeseen unity that merges the worlds of traditional Islamic art and Western contemporary composition. This unique, cross-disciplinary exhibition, which includes a collection of artworks and an interactive platform, is the culmination of a long-term collaboration between composer **Lee Westwood** and geometer **Sama Mara**.

LICHTSUCHENDE: CYBERNETIC SUNFLOWERS WITH MASLOVIAN BEHAVIOURS



11am–6pm | drop-in
Saturday 1–Sunday 16 April
Free | Summerhall

The *Lichtsuchende* are small static robotic creatures, forming an interactive, digital, photo-kinetic sculpture, created by **Dave Murray-Rust** and **Rocio von Jungfeld**. Their movement is modelled after sunflowers turning to face the sun in their constant search for light. As well as consuming light, they send out beams of light to communicate with each other. Enter with a torch and engage with the robots, setting up cascades of movement and light and exchanging photonic information with the cyber-society.

THROUGHOUT THE FESTIVAL

EXHIBITION

FIRE DAMP: REVISITING THE FLOOD BY SEAN CAULFIELD



10am–6pm | drop-in
Saturday 28 January–Saturday 15 April (not Sundays or Mondays)
Free | Edinburgh Printmakers
Presented by Edinburgh Printmakers

Sean Caulfield's creative research explores the impact of technology on the environment and our bodies. In his first UK solo exhibition of installation, printmaking, sculpture and artist's books, he references historic scientific illustrations and objects from other eras, fictional science, and biological forms, while suggesting imagined mythology or religious cosmology.

ACTIVITY

DATAFEST



event times and durations vary
Monday 20–Friday 24 March
Prices vary | Around Edinburgh

DataFest will be the UK's first week-long festival of data innovation. Run by The Data Lab with a theme of *Data Changes Everything*, events will include a Data Summit, recruitment event, fringe events across Scotland and technical and leadership training. For further information and full programme details visit datafest.global or follow @DataFest.

CONTEMPORARY CONNECTIONS

I touch therefore I am
François-Joseph Lapointe,
Université de Montréal

What happens when art and science connect, when artists and scientists meet and collaborate?

The arts and sciences have long been regarded as separated disciplines, but they share a fascination with making sense of the world around us and our place in it. Both, albeit in their own ways, seek answers to the same fundamental questions: who are we, why are we here, and where are we going?

On its own, science can have limited scope to tackle societal change, but in an increasingly connected world there is growing recognition of the complementarity between the sciences and the arts and humanities and the potential for creativity and innovation that these connections can generate.

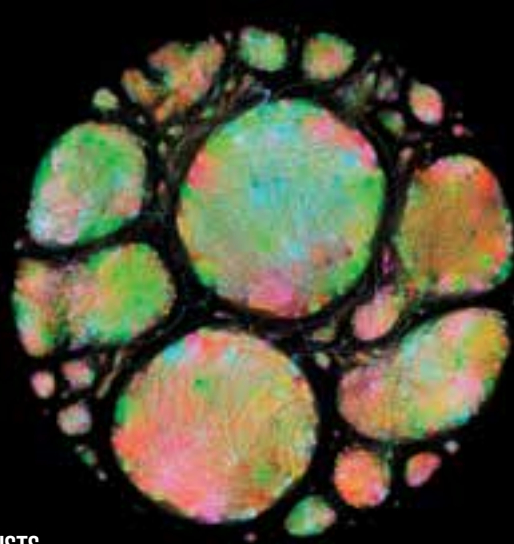
More and more artists are inspired by scientific ideas and concepts, and many scientists are using art to depict and explain the (often obscure) ideas that they grapple with every day, with artistic thinking influencing science and scientific methodology reaching into the arts.

Through residencies, ongoing collaborations and the sharing of ideas, artists take inspiration from real-world research and transform it into experiences that engage, enthrall and raise some profound questions about our relationship with our world and with each other.

This exhibition – co-curated by Edinburgh International Science Festival, Summerhall and ASCUS Art & Science – celebrates some of the very special works created when artists and scientists get together, showcasing collaborations and interpretations of real data that provide new windows onto some fascinating and intriguing areas of science.

11am–6pm | drop-in
Saturday 1 April–Sunday 12 May | Free | Throughout Summerhall

Exhibition launch: Friday 31 March | 7–9pm | Free



CONTRIBUTING ARTISTS

The outcome of a residency with the Extreme Light group at Heriot-Watt University, Lily Hibberd's *Black Hole Horizon* takes you on a 3D-sound journey into a black hole experiment, while the kinetic sculpture *Slow Light* takes the problem of the unearthly speed of light and transforms it into a tangible entity, seeing the fastest thing in the universe travel at snail's pace in a fluid medium.

Also arising from a Heriot-Watt residency, Hannah Imlach's project *From the Dark Ocean Comes Light* relates two areas of biological research; the ecology of Scottish deep-sea cold-water coral reefs and new techniques that have revealed a world of fluorescent molecules inside cells. Her sculptures reference historical and contemporary optical processes used by scientists to observe these inaccessible environments, offering an immersive glimpse into underwater and microscopic worlds.

Stephen Hurrell's *Beneath and Beyond: Seismic Sounds* brings together art, technology and nature to create a unique seismic sounds adventure. Tectonic shifts and on-going movements beneath the Earth's surface are the source for this immersive live sound and visual artwork.

A collaboration between Universidad Nacional de San Martín, Argentina and C-EENRG at Cambridge University, Sebastian Vereá's *Sounds of the Anthropocene* immersive sound installation aims to raise awareness of humankind's unprecedented footprint on the Earth. Translating data from stratigraphic markers of the Anthropocene into sound, it expresses the state of our planet in the shape of music stemming from the Earth's changing condition.

Forensic audio analyst and artist Lawrence Abu Hamdan's award-winning *Rubber Coated Steel* testifies to the relationship between technology and power. In 2014 Abu Hamdan was asked to work on audio files of the shootings of Nadeem Nawara and Mohamed Abu Daher in the West Bank of Palestine. These files, which proved that the boys were shot by real bullets and not rubber ones, are the starting point for a work about aesthetics, politics and the violence of sound and silence.

Making with Life

Louise Mackenzie

Rebuilding damaged bones

Ehsan Rezabeigi, Concordia University

Artist Louise Mackenzie researches the metaphysical aspects of making life in the context of biotechnology, focusing on the insertion of our thoughts into living cells through the creation of transgenic bacteria that house a question posed by the artist within their DNA. *The Genophone* presents custom-built software that converts text to DNA and then to speech and, in doing so, speaks aloud the predicted mutation of phrases according to an evolutionary algorithm.

A collaboration between artist Simon Sloan and communicators and scientists at The University of Edinburgh, Team Shrub's *Exploring the Art in Data* will create an interactive discussion of the untapped potential of data to convey both artistic and scientific meaning, including new work exploring Arctic environmental change.

CO₂ occurs naturally in the environment, but humans have caused atmospheric levels to increase rapidly, impacting upon our climate. *CO₂ Live* is a collaborative work by Daniel Budinov, Patrick Hickey, James Howie, Jim Jack, Ryan Lewis, Adam Linson and Iain Robinson that draws attention to this. It incorporates a carbon dioxide sensor, situated next to the street, connected to LED panels displaying real-time CO₂ levels at the top floor of Summerhall's TechCube.

The *Preuve par l'Image/Science Exposed* image contest, organised by the Natural Sciences and Engineering Research Council of Canada (NSERC) and the Association Francophone pour le Savoir (Acfas) in Quebec, challenges participants to tell science stories through vibrant and exciting images. Devoted exclusively to images of scientific research, in all fields of study, this selection of images brings science to vibrant, visual life.

Supported by



In association with Summerhall and ASCUS Art & Science. Hannah Imlach and Lily Hibberd's work was funded by a Leverhulme Trust Artist in Residence Grant.

Cambridge Centre for Environment, Energy and Natural Resource, the University of Cambridge; Universidad Nacional de San Martín; Instituto del Artes Mauricio Kagel

ONLINE BOOKING: sciencefestival.co.uk BOOKING HOTLINE: 0844 557 2686

MOMENTS IN TIME



10am–5pm | drop-in
on until Sunday 16 April | Free
The Mound Precinct

2017 is Scotland's Year of History, Heritage and Archaeology. Experience it yourself at *Moments in Time*. Step inside our iconic Scottish police boxes and immerse yourself in some pivotal moments in Scotland's scientific history. You'll discover milestones of Scottish scientific achievement from the Enlightenment, through the Industrial Revolution, to the Information Age and explore some very special Scottish endeavours, including how women in science, medical pioneers and some very important inventions have shaped our national heritage.

Scotland
The Perfect Stage



LOTTERY FUNDED



EDINBURGH WORLD HERITAGE



SATURDAY 1 APRIL

WORKSHOP

ASCUS LAB



event times and durations vary
on until Sunday 16 April
Prices vary | Summerhall | ASCUS Lab
Presented by ASCUS Art & Science

The ASCUS Lab is the UK's largest publicly accessible laboratory for experimentation in art and science. This is your chance to get creative in a real working lab and explore a range of activities. Step inside, get hands-on and be informed and inspired as you experience the technologies of real scientific research first hand! Visit sciencefestival.co.uk/ascus-lab for details of activities running throughout the Festival.

EXHIBITION

POETRY PERISCOPE



11am–6pm | drop-in
on until Sunday 16 April
Free | Summerhall
Presented by Edinburgh City of Literature Trust

A poetical periscope packed with international verse! Stop by and listen to 30 poems from 30 European cultures in a mash-up of technology and verse. A chance to discover how science can help inspire your poetry and broadcast your words. Developed by the European Literature Festival, The Poetry Society and Piána Na Ulici.

ACTIVITY

LEITH LABS



12pm–4pm | drop-in
also on Saturday 15 April
Free | Ocean Terminal
Presented by Leith Labs

Introducing the world's first long-term, curated Scientist-in-Residence programme in a shopping centre! Join us outside the Living Memory Association in Ocean Terminal for free science and art activities, informal discussions over tea and biscuits, a hacked lab unit for hands-on experiments and roaming scientists busking with science tricks.

DISCUSSION

DIALOGUES: WHEN ART MEETS TECHNOLOGY



12.30pm | 90 mins
Free (ticket required)
National Museum of Scotland | Auditorium
Supported by

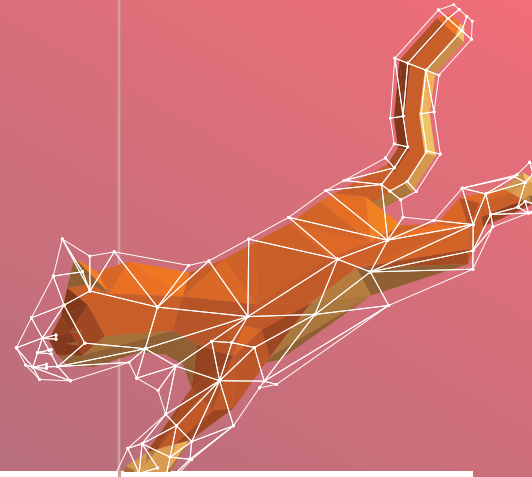
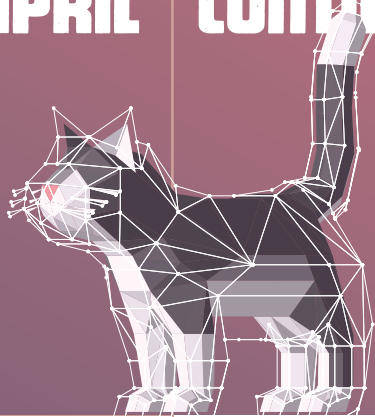


ALBA | CHRUTHACHAIL

This year we commissioned four artists to make the works at the heart of our *Play On* exhibition (p12). From an interactive foosball table to a virtual reality journey inspired by the National Museum of Scotland, these pieces seamlessly blend art and design with technology. Join the artists to discuss how they made their pieces, why artists use technology in their work and how they think we might play and interact with art in the future.

Image: *Abstract Playground 1*, Will Hurt

SATURDAY 1 APRIL CONTINUED



DISCUSSION

DIALOGUES: WHEN ART MEETS SCIENCE



2pm–4pm | drop-in
Free | Summerhall | Red Lecture Theatre

Supported by
HERIOT WATT
UNIVERSITY

Image: *Seismic waveforms (detail)*
Stephen Hurrell

What happens when art and science connect, when artists and scientists meet and collaborate? Exhibiting artists from *Contemporary Connections* join some of their scientific collaborators to discuss the subjects of their work and the nature of their collaborations. How might the arts and humanities inform science and contribute to its advancement? What roles do culture, imagination, argumentation, creativity, discovery and curiosity play in scientific enquiry? Is there a role for the arts in informing science? With Lily Hibberd, Hannah Imlach, Stephen Hurrell, Sebastian Verea, Jorge Viñuales, Louise Mackenzie and Simon Sloan.

DISCUSSION

BREXIT: BOOM OR BUST FOR BRITISH SCIENCE?



3pm | 90 mins
£8.50/£6.50/#scifive students £5
National Museum of Scotland | Auditorium

UK research currently receives 1 billion euros in EU funding and the scientific community were strongly in the Remain camp. Now, the uncertainty around Brexit is having immediate implications for scientists, raising questions not just about funding, but around researcher mobility, collaboration, regulation and resources. Join Dr Rob Davidson Executive Director, Scientists for EU, to explore the future of UK science post-Brexit.

DISCUSSION

SUPER HUMANS



5.30pm | 90 mins
£8.50/£6.50/#scifive students £5
Summerhall | Anatomy Lecture Theatre

Technology has made artificial limbs and assistive devices increasingly sophisticated and aesthetically enhanced, but what are their limitations and how does using them make you feel? Join avid gamer James Young, body positivity blogger Sam Cleasby and diabetes DIYer Tim Street to explore how living with medical technology can affect your sense of who you are. Hosted by bioethicist Andy Miah.

DISCUSSION

CITY FARMING



5.30pm | 90 mins
£8.50/£6.50/#scifive students £5
Summerhall | Dissection Room

With more than 120 city farms and 1,000 community-based gardens now operating in the UK, city farming is on the rise. But how does it work? Is it realistic to expect our roasts to have been raised in the city and could more animals in the urban environment also bring social benefits? Join staff from Gorgie City Farm and Steve Glover from the Severn project for this interactive event to learn about livestock farming in the city and plant some seeds of your own.

DISCUSSION

HEART ATTACK: SCIENCE'S BATTLE OF THE SEXES

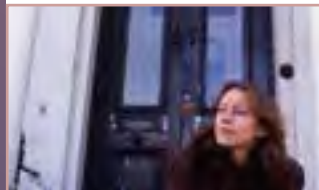


5.30pm | 90 mins
£8.50/£6.50/#scifive students £5
Summerhall | Main Hall
Presented by British Heart Foundation Scotland

Coronary heart disease is Scotland's single biggest killer, yet its diagnosis in women is often overlooked. Here in Edinburgh, British Heart Foundation-funded research scientists and cardiologists, Prof Nick Mills and Dr Anoop Shah, are fighting for every heartbeat – male or female. Join them as they pose questions and suggest answers with a panel including a female heart attack survivor and a GP.

SHOW

THE CONSCIOUS UNCOUPLING



8pm | 80 mins
£8.50/£6.50/#scifive students £5
Summerhall | Anatomy Lecture Theatre

Rosie Wilby's acclaimed storytelling comedy is a tender love story that investigates how technology and modern communications play a role in romance, nostalgia and the unravelling of relationships. After the show, Rosie will be joined by Qazi Rahman of King's College London to discuss whether anti-love drugs are a real prospect and whether serial break-ups are infecting modern society.

DISCUSSION

TEST TUBE TO YOUTUBE



8pm | 90 mins
£8.50/£6.50/#scifive students £5
Summerhall | Dissection Room

Ever wondered about the people and programs working behind the scenes to bring content to your news feed? Join us for a discussion with video creator Brady Haran – who brought us science video channels *Periodic Videos* and *Numberphile* – expert in data science Walid Magdy from The University of Edinburgh, and a psychology expert to investigate the factors that must come together to bring digital content to our multiple screens.

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WOODCUT AND LINOCUT MASTERCLASS



10.30am | 6 hours
£85 | Edinburgh Printmakers
Presented by Edinburgh Printmakers

SCIENCE FESTIVAL CHURCH SERVICE

11.30am | 2 hours | drop-in
Free | St Giles Cathedral

THE ART OF NEUROSCIENCE



12.30pm | 1 hour
£6/#scifive students £5
National Museum of Scotland | Auditorium

A VERY SHORT INTRODUCTION TO... BACTERIA



1pm | 1 hour
£6/#scifive students £5 | Summerhall
Anatomy Lecture Theatre
Presented by Oxford University Press

ZERO TO 5G: THE SCIENCE OF MOBILE COMMUNICATION



3pm | 90 mins
£8.50/£6.50/#scifive students £5
National Museum of Scotland | Auditorium
Supported by the James Clerk Maxwell Foundation

ASCUS LAB MOMENTS IN TIME CONTEMPORARY CONNECTIONS A HIDDEN ORDER LICHTSUCHE: CYBERNETIC SUNFLOWERS POETRY PERISCOPE

Join celebrated artist and prolific creator **Angie Lewin** for a one-off masterclass offering an insight into her practice. You'll experiment with wood engraving and learn how it differs from popular woodcut printing techniques, discovering its finer lines and ability to create highly intricate works, often of a smaller scale than conventional wood or linocut.

The Lord Provost of Edinburgh and the Minister of St Giles' Cathedral invite you to the annual church service celebrating the Edinburgh International Science Festival.

NHS Lothian's Art and Therapeutic Design programme awarded three Creative Research Artist Fellowships to explore the activity and research interests of the Department of Clinical Neuroscience in Edinburgh through dynamic arts/science collaborations. Language and Cognition Fellow **Gavin Inglis**, Music Fellows **Alex Menzies** and **Florence To** and Design Fellow **Susana Cámara Leret** talk publicly about their initial findings for the first time.

Bacteria form a fundamental branch of life. They are the oldest forms of life as we know it and still the most prolific living organisms. We often think of them as agents of disease, but benign bacteria are critical to ecology, the recycling of elements and human health. Join Prof **Sebastian Amyes** to explore the nature, origin and evolution of bacteria, as well as the challenges of antibiotic resistance.

UK mobile phone services began in 1985 and since then the technology has made massive leaps forward. **Trevor Gill**, former chief scientist of Vodafone Group R&D, will explain how the pioneering work of James Clerk Maxwell laid the foundations for the mobile phone, and discuss the key ideas behind each new generation of technology as we look forward to a world of 5G and connected things.

TEA-LIGHTFUL! THE ORIGINS, SCIENCE AND TRADITIONS OF TEA



3pm | 90 mins
£12 (includes tea) | Summerhall | Main Hall

HOW MUCH MEDICINE IS TOO MUCH?



5.30pm | 90 mins
£8.50/£6.50/#scifive students £5
Summerhall | Anatomy Lecture Theatre
Presented by the Royal College of Physicians Edinburgh

THE CRADLE OF HUMANITY



8pm | 1 hour
£8.50/£6.50/#scifive students £5
Summerhall | Anatomy Lecture Theatre
Presented by Oxford University Press

HOSPITALS OF THE FUTURE



8pm | 90 mins
£8.50/£6.50/#scifive students £5
Summerhall | Main Hall
Supported by

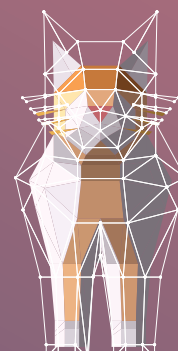
Dexcom

British people love tea, consuming tens of billions of cups every year. Join us for a tasting trip through the world of tea, sampling brews from Edinburgh's Pekoe Tea. Dietician **Dr Carrie Ruxton** of the Tea Advisory Panel will share some of her research on the health benefits of tea and **Jon Cooper** of Pekoe Tea will share stories of sourcing teas in India.

With advancing technologies, new drugs and the promise of genetic and stem cell engineering, medicine could potentially repair and restore our failing bodies and allow us to live for hundreds of years. But is this what we want? Join **Dr Caroline Whitworth**, a champion of realistic medicine, and **Prof Derek Bell**, President of the Royal College of Physicians of Edinburgh, for a thought-provoking event exploring the challenges facing healthcare organisations.

From the cradle of humanity in East Africa, humans have influenced almost every part of the Earth system and are changing its global environmental and evolutionary trajectory. How exactly did we become the world's top predator and take over the planet? Join leading climatologist **Prof Mark Maslin** to discover how astronomy, geology, climate and landscape all had a part to play in giving rise to the brainy ape and allowed us to dominate the planet.

Technology is transforming our hospitals in incredible ways. **Margaret Frame**, Director of the MRC Institute of Genetics and Molecular Medicine, is joined by surgical robotics nurse **Debbie Munro** and **Margaret Duffy** from the Scottish Government to discuss what our future hospitals will look like. Hosted by healthcare journalist **Pennie Taylor**.





MONDAY 3 APRIL

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See page 41 **11am–6pm**

A VERY SHORT INTRODUCTION TO... CLIMATE CHANGE



1pm | 1 hour
£6/#scifive students £5 | Summerhall
Anatomy Lecture Theatre
Presented by Oxford University Press

NAP TIME



2.30pm | 1 hour
£8.50/£6.50/#scifive students £5
Summerhall | Main Hall

SCIENTISTS HAVE YOUR DATA!



5.30pm | 90 mins
£8.50/£6.50/#scifive students £5
Summerhall | Anatomy Lecture Theatre
Presented by ADRC-Scotland, the Farr Institute
Scotland and the Usher Institute of Population
Health Sciences and Informatics

ASCUS LAB
MOMENTS IN TIME
CONTEMPORARY CONNECTIONS
A HIDDEN ORDER
LICHTSUCHENDE: CYBERNETIC SUNFLOWERS
POETRY PERISCOPE

Climate change is arguably the most critical issue facing the world in the 21st century. Join leading climate scientist **Prof Mark Maslin** as he explores the key issues, discusses the complexities – from political, social, environmental and scientific perspectives – and considers the predicated impacts and proposed solutions.

Psychologist and creator of YouTube's *Quirkology* **Prof Richard Wiseman** is on a mission to put the world to sleep. Research shows that a daily nap helps sharpen the mind and is good for your health, yet the nation has lost the art of napping. At this interactive event, you'll learn about how to nap, before lying down, listening to the world's most relaxing music and having the best nap of your life.

Health and social research is changing. Ground-breaking findings are often now discovered not in laboratories or hospitals, but on computers. With access to the right data from the public sector, researchers can work without expensive social surveys or access to people's organs or tissue samples, but who owns this data? And who decides how it should be used? Join data experts from The University of Edinburgh and have your say!

DISCUSSION



5.30pm | 90 mins
£8.50/£6.50/#scifive students £5
Summerhall | Main Hall
Presented by the British
Pharmacological Society

PREDICTING THE EFFECTS OF CLIMATE CHANGE BY 2100



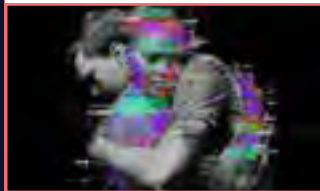
7pm | 90 mins
£8.50/£6.50, Explorer pass holders half price
Dynamic Earth | Biosphere
Presented by Dynamic Earth

EDINBURGH SKEPTICS AT THE SCIENCE FESTIVAL



7.30pm | 1 hour
on until Thursday 6 and Monday 10–Thursday
13 April
Free (donations requested)
The Banshee Labyrinth
Presented by Edinburgh Skeptics

GIRL IN THE MACHINE



7.30pm | 1 hour
Previews: Monday 3–Tuesday 4 | £12/£10,
Performances: Wednesday 5–Friday 22 April
(no performances on Sunday or Monday),
Matinees 2.30pm: Wednesday 12, Saturday
15, Saturday 22 April
£18/£14/£8 | Traverse Theatre | Theatre 1
Presented by Traverse Theatre Company,
supported by Creative Scotland and the City of
Edinburgh Council

DISCUSSION

AGES 18+
DISCUSSION

SHOW

Should we spend more on medicines for the elderly, or the young? Should cancer be a special case? Medicines assessment agencies make these decisions, but we're all responsible for the ethics that inform them. In this event hosted by **Vivienne Parry, Prof David Webb, Prof Ken Paterson** and **Prof Rachel Baker** will ask which medicines you want to fund and why – and examine how society might be able to really have its say.

Many experts are convinced that we have already passed a tipping point and climate change is now inevitable. But what might life on Earth be like at the end of the century? Join co-author of the UN 2014 report on the impacts of ocean acidification on marine biodiversity **Prof Murray Roberts**, geologist **Prof Dorrik Stow** and coordinator of the UK ocean acidification programme **Dr Phil Williamson** to uncover the issues.

The Edinburgh Skeptics Society was founded in 2009 to promote reason, science and critical thinking in Edinburgh and Scotland. In 2017 they return to the Science Festival with a lively series of talks focusing on the role of science in crime and punishment. Visit sciencefestival.co.uk/edinburgh-skeptics for full programme details.

Wildly in love and with successful careers, Polly and Owen feel ready to take on the world. It seems like life can't get much better. But when a mysterious new technology creeps into everyone's phones, their world is turned upside down. *Girl in the Machine* is a timely exploration of technology in a world that's falling apart. Written by Traverse Associate Artist **Stef Smith** and directed by Traverse Artistic Director **Orla O'Loughlin**. See sciencefestival.co.uk/girl-in-the-machine for details of accessible performances.

DISCUSSION

SPECIAL EVENT

DISCUSSION



CONNECT WITH... THEATRE

This year, our programme of science theatre for adults will bring a fascinating range of scientific events, issues and ideas to life.

Explore the history, conspiracy and myth of the early space race at Summerhall with our *Science in the Spotlight* commissioned production *Cosmonaut* (p45), which blends live performance, music and live data to tell three interlocking stories.

At The Lyceum, don't miss Caryl Churchill's powerful play about genetics, ethics and identity, *A Number* (p49), directed by award-winning playwright Zinnie Harris. The issues of the play will be explored in more detail through a series of pre-show panel discussions, programmed in partnership with the Royal Lyceum Theatre Company.

Girl in the Machine (p44), at the Traverse Theatre, is a timely exploration of new technology in a world that's falling apart, written by Traverse Associate Artist Stef Smith and directed by Traverse Artistic Director Orla O'Loughlin.

Back at Summerhall, Jenna Watt's provocative documentary theatre piece, *Faslane* (p55), is a hugely powerful insight into the UK's nuclear debate and our relationship with Trident, drawing upon interviews from people at the front line, including MOD officials, activists and local people.

Edinburgh University Theatre Company, at Bedlam Theatre, presents *Isaac's Eye* by American playwright Lucas Hnath (p48), a unique blend of history and fantasy that re-imagines Newton's contentious, plague-ravaged world, and examines how a rural farm boy could become one of the greatest thinkers in modern science.

Explore our *Science in the Spotlight* performances for adults and families at sciencefestival.co.uk/science-in-the-spotlight.



Cosmonaut supported by Creative Scotland through the Scottish Government's Edinburgh Festivals Expo Fund

ALBA | CHRUTHACHAIL

DISCUSSION

ECLIPSE: JOURNEYS TO THE DARK SIDE OF THE MOON



8pm | 1 hour

£8.50/£6.50/#scifive students £5

Summerhall | Anatomy Lecture Theatre

Presented by Oxford University Press

On 21 August 2017, over 100 million people will gather in a narrow belt across the USA to witness what will be the most watched total solar eclipse in history. Prof Frank Close from the University of Oxford has had a lifelong fascination with eclipses and has pursued them around the world. Join him as he describes the spellbinding allure of this beautiful natural phenomenon, explaining why eclipses happen and their role in history, literature and mythology.

SHOW



8pm | 75 mins

on until Wednesday 5 April

£10/£8 | Summerhall | Dissection Room

Co-commissioned by Edinburgh International Science Festival, presented by Francis Gallop and supported by Creative Scotland through the Scottish Government's Edinburgh Festivals Expo Fund



Lucia and her brother use homemade equipment to eavesdrop on Soviet space launches from their Turin tower block. Chief Designer Sergei Korolev survives Stalin's gulag and takes humanity into space, but is written out of history. The *Cosmonaut* is the first man in space. He will never return. Using live performance, music and audio-visual data, *Cosmonaut* tells three interlocking stories from the early space race in a play about history, conspiracy, and myth.

DISCUSSION

WEARABLES THAT SNITCH ON US



8pm | 90 mins

£8.50/£6.50/#scifive students £5

Summerhall | Main Hall

Presented by the British Computer Society

Over 250 million activity tracking wristbands, smart watches and personal health monitors will be in use by 2020. But given the rapid pace at which new wearables are launched and the predominantly wireless communications with their users, privacy concerns arise. Join expert in wireless networks Dr Paul Patras for the BCS Sidney Michaelson Memorial Lecture as he discusses the surveillance risks to which wearables are exposed, the challenges of preserving user privacy and some simple steps that could be taken to avoid tracking.

TUESDAY 4 APRIL

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A VERY SHORT INTRODUCTION TO... THE ATMOSPHERE



1pm | 1 hour
£6/#scifive students £5 | Summerhall
Anatomy Lecture Theatre
Presented by Oxford University Press

SPIRE HEALTHCARE AND MAKO LAUNCH



5.30pm | 45 mins
Free (ticket required)
National Museum of Scotland | Auditorium
Supported by
Spire
Edinburgh Hospitals
Murrayfield and Shawfair Park

GAMES: JUST WHAT THE DOCTOR ORDERED



5.30pm | 1 hour
£8.50/£6.50/#scifive students £5
Summerhall | Main Hall

ASCUS LAB MOMENTS IN TIME FIREAMP: REVISITING THE FLOOD CONTEMPORARY CONNECTIONS A HIDDEN ORDER LICHTSUCHENDE: CYBERNETIC SUNFLOWERS POETRY PERISCOPE

The atmosphere is a thin diffuse fluid that envelops Earth's surface. Despite its apparent fragility, the existence of this fluid is vital for all life on Earth. Join **Prof Paul Palmer** as he describes the physical and chemical characteristics of different layers in the atmosphere, shows how interactions with land, ocean and ice affect its properties and highlights the future challenges for atmospheric scientists.

Spire Murrayfield hospital is about to become the first in Scotland to introduce widespread use of robot technology that will transform the way hip and knee replacement operations are carried out. The robot, which costs almost one million pounds, will allow surgeons to carry out tailor-made hip and knee replacement surgery. Join the surgical team and robot developers for the groundbreaking launch of MAKO in Edinburgh and participate in an event exploring the evolution of robot technology and an insight into developing this type of technology.

Although games are fun to play, they can also be used as tools to teach, research and even heal. Bringing together the best minds in game development and healthcare is a new field of serious gaming that aims to improve health and wellbeing using game technologies. Join serious games expert **Dr Pam Kato** to explore the ground-breaking games being used to treat diseases. Part of *Play On* (p12).

DISCUSSION

DICTIONARY FOR A NEW WORLD



5.30pm | 1 hour
£8.50/£6.50/#scifive students £5
Summerhall | Anatomy Lecture Theatre

See page 44 7.30pm
See page 44 7.30pm
See page 45 8pm

Language is the ultimate human power. It might also be the world's best kept secret. Ground-breaking new research is exploring whether our 7,000-plus languages might represent the collective wisdom of humanity and help us address the biggest challenges of our time. Join us to learn about this and other cutting-edge research in cognitive science, neurolinguistics, positive psychology, evolutionary biology and anthropology.

EDINBURGH SKEPTICS AT THE SCIENCE FESTIVAL GIRL IN THE MACHINE (preview) COSMONAUT

DISCUSSION

THE FERTILITY COMPUTER



8pm | 90 mins
£8.50/£6.50/#scifive students £5
National Museum of Scotland | Auditorium

21st-century prospective parents have a suite of reproductive technologies at their disposal. A panel including bioethicist **Dr Calum MacKellar**, **Susan Seenan**, Chief Executive at Fertility Network UK, and **Dr Marco Gaudoin** from Glasgow Centre for Reproductive Medicine will explore new advances and consider why they are so vital, as well as the profound social challenges they pose, in a discussion chaired by **Jessica Hepburn**, author and director of *Fertility Fest*.

DISCUSSION

IDENTITY!



8pm | 90 mins
£8.50/£6.50/#scifive students £5
Summerhall | Anatomy Lecture Theatre

In a forensic context, the uniqueness of the individual can be crucial. Forensic investigators use a range of techniques to prove that evidence found at a crime scene identifies an individual. Join **Dr Tim Squires** and guest **Dr Kim Picozzi** to explore techniques including visual identification, DNA, fingerprints and other key biometrics with a focus on fact and a flirtation with fiction.

DISCUSSION

BORDERS, BENEFITS AND BIOMEDICINE: SURVEILLANCE AND SOCIAL JUSTICE



8pm | 90 mins
£8.50/£6.50/#scifive students £5
Summerhall | Main Hall
Presented by the Church of Scotland

Everyday life is already saturated with surveillance technologies, but some argue that the response to social issues lies in more and better surveillance. How is digital surveillance impacting upon issues of social justice and how can our thinking take us beyond narrower questions around privacy? Join cyber security expert **Prof Bill Buchanan**, Chairman of the CCBE Working Party on Surveillance **Iain Mitchell QC** and **Dr Eric Stoddart** from St Andrews University to explore the issues.

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ASCUS LAB
MOMENTS IN TIME
FIRE DAMP: REVISITING THE FLOOD
CONTEMPORARY CONNECTIONS
A HIDDEN ORDER
LICHTSUCHE: CYBERNETIC SUNFLOWERS
POETRY PERISCOPE

A VERY SHORT INTRODUCTION TO... THE ICE AGE



1pm | 1 hour

£6/#scifive students £5 | Summerhall
Anatomy Lecture Theatre
Presented by Oxford University Press

In an era of climate change, the study of the ice age past is now more important than ever. Join **Prof Jamie Woodward** for an exploration of the Quaternary ice age to find out how landscapes and ecosystems were repeatedly and rapidly transformed as plants, animals, and humans reorganised their worlds.

BEHIND THE SCENES OF THE TOMB



2pm | 1 hour

Free (ticket required)
National Museum of Scotland | Auditorium
Presented by National Museums Scotland

Dr **Margaret Maitland**, Senior Curator of the Ancient Mediterranean at the National Museum of Scotland and **Lynn McClean**, the museum's Principal Conservator of Paper and Textiles, examine the painted linen mummy shroud excavated from the ancient Egyptian tomb of Montsuef and describe how its conservation revealed an untold story.

YOUR PHENOMENAL PHONE AND WHAT IT SAYS ABOUT YOUR PRIVACY

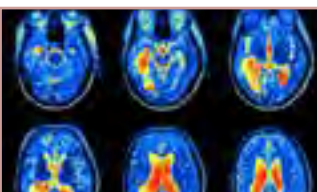


5.30pm | 90 mins

£8.50/£6.50/#scifive students £5
Summerhall | Anatomy Lecture Theatre

We use our phones every day, but how are they connected to the rest of the world? Join mobile technology specialist **Ken McBain** to discover the phenomenal science and engineering behind something we all now take for granted, and discuss what someone could learn about you from your mobile phone and who can access that information.

SEX, LIES AND BRAIN SCANS



5.30pm | 1 hour

£8.50/£6.50/#scifive students £5
Summerhall | Main Hall

In association with Oxford University Press

One of the key recent developments in neuroscience is non-invasive functional magnetic resonance imaging (fMRI), which allows us to observe brain activity in real time. Theoretically, we could now perform brain scans at airports, or use them to vet judges and teachers, but how far should we allow neuroscience to go? **Prof Barbara Sahakian** takes us beyond media headlines and examines which applications are possible today and which are science fiction.

See page 44 **7.30pm**
See page 44 **7.30pm**
See page 45 **8pm**

EDINBURGH SKEPTICS AT THE SCIENCE FESTIVAL
GIRL IN THE MACHINE
COSMONAUT

THE ART OF MEDICAL IMAGING



8pm | 1 hour

£8.50/£6.50/#scifive students £5
Summerhall | Anatomy Lecture Theatre

The challenges of visual representation tackled by artists since antiquity are identical to those faced by radiologists in acquiring and interpreting medical imaging examinations. Join X-ray artist **Hugh Turvey** in conversation with **Michael Jackson**, consultant radiologist from the Royal Hospital for Sick Children, Edinburgh, as they explore how art, artists and movies have helped radiologists to visualise the human body, and the ongoing symbiotic relationship between science and art.

GOATMAN: HOW I TOOK A HOLIDAY FROM BEING HUMAN



8pm | 1 hour

£8.50/£6.50/#scifive students £5
Summerhall | Main Hall
In association with Abrams & Chronicle
Books Ltd

An arts award offered **Thomas Thwaites** the chance to take a holiday from the complications of being human – by transforming himself into a goat! For his efforts, he was awarded a 2016 Ig Nobel Prize. Join Thomas as he talks about his experience of building a goat exoskeleton – including artificial legs, helmet, chest protector, raincoat from his mum and a prosthetic goat stomach to digest grass – and hear what happened when he set off across the Alps on four legs with a herd of his fellow goats.

SCIENCE IN A POST-TRUTH WORLD



8pm | 90 mins

£8.50/£6.50/#scifive students £5
Summerhall | Main Hall

Post-truth, an adjective '*relating to or denoting circumstances in which objective facts are less influential in shaping public opinion than appeals to emotion and personal belief*', was the Oxford Dictionaries 2016 Word of the Year. If the world no longer values knowledge, facts and learning – the principles on which science is based – what can we do to protect the pursuit of scientific truth? Join philosopher **Julian Baggini**, **Prof Dame Anne Glover**, Vice-Principal of the University of Aberdeen and former Chief Scientific Adviser to the President of the European Commission, and host, editor of *The List* **Yasmin Sulaiman**, to investigate.

DISCUSSION

See page 41 **10am–5pm**
 See page 39 **10am–6pm**
 See page 40 **11am–6pm**
 See page 39 **11am–6pm**
 See page 39 **11am–6pm**
 See page 41 **11am–6pm**

A VERY SHORT INTRODUCTION TO... ORGANIC CHEMISTRY



1pm | 1 hour

£6/#scifive students £5 | Summerhall
 Anatomy Lecture Theatre
 Presented by Oxford University Press

WHO WILL SCAM US NEXT, AND HOW?



5.30pm | 90 mins

£8.50/£6.50/#scifive students £5
 National Museum of Scotland | Auditorium
 Supported by



GREENING THE DEVELOPING WORLD



5.30pm | 1 hour

£8.50/£6.50/#scifive students £5
 Summerhall | Anatomy Lecture Theatre

FOOD EXPIRY DATES: WHAT TO BELIEVE



5.30pm | 90 mins

£8.50/£6.50/#scifive students £5
 Summerhall | Main Hall

ASCUS LAB MOMENTS IN TIME FIREDAMP: REVISITING THE FLOOD CONTEMPORARY CONNECTIONS A HIDDEN ORDER LICHTSUCHEDE: CYBERNETIC SUNFLOWERS POETRY PERISCOPE

Pharmaceuticals, polymers, food and drink, petrochemicals, and nanotechnology. Organic compounds are central to life, forming the basis for organic molecules such as nucleic acids, proteins, carbohydrates and lipids. Join **Dr Graham Patrick** as he covers the whole range of organic compounds and their roles and looks at how new materials, in particular the single layer form of carbon called graphene, are opening up exciting new possibilities for applications.

Join cyber security expert **Prof Bill Buchanan** from the School of Computing at Edinburgh Napier University to look at the innovative ways scammers can gain access to our money, data and passwords. He will discuss the science, maths and technology behind fooling the system and share real life examples of cyber crime and global trends in cyber security techniques.

How do we support the developing world to become more sustainable without creating a negative impact? Join a panel of experts including researcher **E Feng Tan Loh** from the Grantham Institute as they discuss the importance of clean tech and renewable energy provisions in helping these economies to not only grow, but to avoid adding to our current climate situation.

Huge quantities of food past its sell-by date are thrown out in homes, businesses and stores each day. In fact, in the UK, we produce about 10 million tonnes of food waste each year. But should we believe the dates on food labels and what can technology do to help us avoid waste? Join a panel including **Solveiga Pakstaite**, inventor of a bio-reactive food expiry label, to discuss these issues and more.

DISCUSSION

FASHIONABLE DISEASES: SYPHILIS, CONSUMPTION AND GOUT



6.30pm | 1 hour

also on at 2.30pm on Saturday 8 April
 £8/£6 | Royal College of Physicians of
 Edinburgh

Presented by the Royal College of Physicians
 of Edinburgh

See page 44 **7.30pm**

See page 44 **7.30pm**

ISAAC'S EYE



7.30pm | 2 hours

Preview: Thursday 6 April | £7/£6.50
 Performances: Friday 7–Saturday 15 April (not
 Monday 10 April) | £8/£7.50
 Bedlam Theatre

Presented by Bedlam Theatre and The
 Edinburgh University Theatre Company

SHOW

HOW BEER MADE SCIENCE HISTORY



8pm | 1 hour

also on Thursday 13 April
 £10 (includes beer samples) | Summerhall
 Summerhall Brewery

Take a behind-the-scenes tour of the Royal College of Physicians of Edinburgh and discover how fashionable behaviour and the breaking of taboos over things like heavy drinking, over-eating and sexual promiscuity gave rise to the prevalence of diseases such as syphilis, lethargy, gout and consumption. The College's fascinating early medical texts and illustrations will show how these previously shameful diseases became the height of fashion.

EDINBURGH SKEPTICS AT THE SCIENCE FESTIVAL GIRL IN THE MACHINE

This contemporary play looks into the life of a young Isaac Newton, using a mix of fact and fiction to explore the sacrifices great minds make to become great people. Playwright **Lucas Hnath** blends history and fantasy as he reimagines the contentious, plague-ravaged world Newton inhabited, exploring the dreams and longings that drove the rural farm boy to become one of the greatest thinkers in modern science.

Way back in the 18th and 19th centuries, brewing was the world's first high-tech industry. This was also the era when the original Summerhall brewery was established and flourished. Come for an after dark peek behind the scenes at the brewery with **Barney's Beer** brewer and founder **Andrew Barnett**. Taste some beer and learn not only how science influences beer flavour, but also how brewing science changed the world.

What makes effective night-time city design? How does lighting affect people's behaviour and their perception of urban spaces? Advances in technologies from LEDs to smart sensors are creating a new paradigm of connectivity and opening up fresh opportunities. Join **Florence Lam**, Arup's Global Lighting Design Leader, to explore the notion of the 24-hour city and how human-centred night-time design and lighting has the power to shape sustainable cities that are more enjoyable, safer and easier to navigate.

AGES 18+
 SPECIAL EVENT

THE ARUP LECTURE: RETHINKING THE SHADES OF NIGHT



8pm | 90 mins

£8.50/£6.50/#scifive students £5
 National Museum of Scotland | Auditorium

Supported by

ARUP

DISCUSSION

DISCUSSION

DISCUSSION

DISCUSSION

SHOW

STRANGER THAN FICTION: THE PANEL GAME



8pm | 1 hour

£8.50/£6.50/#scifive students £5
Summerhall | Anatomy Lecture Theatre
Presented by Stranger Than Fiction

UNLOCKING THE GAMER



8pm | 90 mins

£8.50/£6.50/#scifive students £5
Summerhall | Dissection Room

THE RISE OF E-DEMOCRACY



8pm | 90 mins

£8.50/£6.50/#scifive students £5
Summerhall | Main Hall

A NUMBER



8.30pm | 1 hour

Preview: Thursday 6 April | £10
Performances: on until Saturday 15 April
(not Sunday or Monday).
Matinees: 2pm on Saturdays
£20 | The Lyceum

Presented in partnership with the Royal Lyceum Theatre Company

DISCUSSION

DISCUSSION

SHOW

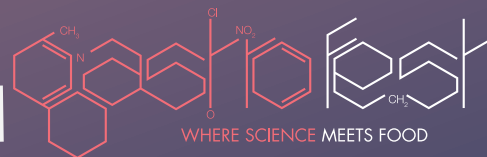
A panel game with a difference – it's the panel vs the audience! A motley team of non-fiction writers will try to pull the wool over your eyes by sneaking some surprising facts amongst ridiculous fiction and persistent science myth. Each round has a slightly different flavour, ranging from short fictional speeches to quickfire truth-or-fiction – get your noise-maker ready.

What kind of game player are you? Players come in different forms and enjoy interacting with each other and their virtual environments in different ways. Creators must understand this when they are designing virtual worlds. Discover your virtual self and join game developer **Timea Tabori**, Professor of Computer Game Design **Richard Bartle** and games writer **Kate Gray** as they discuss games design with the player in mind. Part of *Play On* (p12).

What role will emerging technologies play in the future of politics, public participation and democracy? Does e-democracy make governments more focused on the citizens they serve? Does technology drive increased participation in the political process? Join digital democracy expert **Emma Mulqueeny** and Digital Engagement Manager at the Scottish Government **Chris Connolly** to discuss the issues.

Bernard has spent 35 years believing he's an only child, one of a kind, until he learns the chilling truth. He's one of 'a number' of clones resulting from a nefarious genetic experiment. This dynamic play is the starting point for a powerful debate about the boundaries and ethics of science. A brilliantly compelling drama by Caryl Churchill, directed by multi award-winning playwright Zinnie Harris. See sciencefestival.co.uk/a-number for details of accessible performances.

Look out for associated *Who Do You Think You Are?* events throughout the Festival. These exciting standalone events feature scientists, authors and artists discussing the nature of identity and self as provoked by the play. Talks take place prior to the performances on Saturday 8 (p53), Tuesday 11 (p56), Wednesday 12 (p57), Thursday 13 (p61) and Saturday 15 April (p63).



CONNECT WITH... FOOD

If your ideal night out involves fine dining, our *GastroFest* events will tempt you to explore new flavours in the science of food and drink.

Taste tempting cheeses in *Cheeseology 2.0* (p56), join *The Burger Revolution* (p51), enjoy a cuppa at *Tea-lightful!* (p43) or watch *Distilling Live!* with Edinburgh Gin (p53).

There's the chance to take an interactive look at sustainable eating with a miniature, three-course *Low Impact Meal* (p55), and learn *How Beer Made Science History*, complete with Barney's Beer samples, at Summerhall Brewery (p48). You can even take part in a very special *Feeding Time at the Zoo* (p62) and enjoy a culinary adventure around the world inspired by the animals at RZSS Edinburgh Zoo.

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 See page 39 **11am–6pm**
 See page 41 **11am–6pm**

FUTURE VEHICLE SHOWCASE

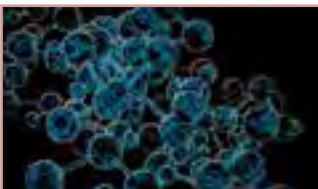


11am–4pm | drop-in

Free | Edinburgh Centre for Carbon Innovation

Presented by Edinburgh Centre for Carbon Innovation and The University of Edinburgh

A VERY SHORT INTRODUCTION TO... MOLECULAR BIOLOGY



1pm | 1 hour

£6/#scifive students £5 | Summerhall Anatomy Lecture Theatre

Presented by Oxford University Press

A DEATH ONLINE



5.30pm | 90 mins

£8.50/£6.50/#scifive students £5 | Summerhall | Anatomy Lecture Theatre

ASCUS LAB
MOMENTS IN TIME
FIRE DAMP: REVISITING THE FLOOD
CONTEMPORARY CONNECTIONS
A HIDDEN ORDER
LICHTSUCHENDE: CYBERNETIC SUNFLOWERS
POETRY PERISCOPE

Join The University of Edinburgh and the Edinburgh Centre for Carbon Innovation for a chance to discover a range of new low carbon vehicles and technologies on the market. Explore display stands and find out why electric vehicles are an important part of our future mobility. You'll also have the chance to test-ride a new eBike and explore the *Art, Space, Nature* exhibition inside the ECCI building and grounds.

Molecular biology lies at the heart of all life sciences. Join **Dr Janice Royds** to discover the importance of this modern field, and consider its modern day applications such as the development of new drugs, genetically modified crops and forensic science.

When we die, our physical possessions are only part of what we leave behind – there is also our diverse and data-rich online life. But what happens to your data when you die? Do our lives continue online after we die? Join BBC presenter and social psychologist **Dr Aleks Krotoski**, Prof **Wendy Moncur**, Chair of Digital Living at the University of Dundee, and psychologist **Dr Elaine Kasket** to discuss the technical, psychological and legal issues we now face in death due to our lives being increasingly lived online.

TV IN A CONNECTED CULTURE



5.30pm | 90 mins

£8.50/£6.50/#scifive students £5 | Summerhall | Main Hall

DISCUSSION

BIKE POWERED CINEMA



Doors open 6pm for screening starting at 6.30pm | 2 hours

£5 | Edinburgh Centre for Carbon Innovation
 Presented by The University of Edinburgh and Edinburgh Centre for Carbon Innovation

FILM

Is binge watching bad for you and should we feel guilty about it? What effect does YouTube have on the way TV programmes are made? Join a panel of experts including broadcast journalism expert **James Blake** to discuss the changes in our sofa-based habits. Part of *Play On* (p12).

Come and enjoy an evening of pedal powered cinema! We will be screening the award-winning documentary *Just Eat It*, which explores the issue of food waste, a huge sustainability challenge facing society. The film will be followed by a panel discussion with special guest speakers, giving you an opportunity to ask questions and share insights. Organised in partnership with Take One Action and Engineering for Change.

ACTIVITY

DISCUSSION

DISCUSSION



AGES 18+
 SPECIAL EVENT



7pm | 3.5 hours

£12/£10 | National Museum of Scotland Grand Gallery

In association with the National Museum of Scotland

Get playful at *Party On*, with exclusive adults-only access to our brand new *Play On* exhibition, an interactive game zone from the indie games duo **We Throw Switches**, live music and visuals and plenty of hands-on activities. There'll also be short talks from speakers including games writer **Kate Gray**, Ed Newton-Rex, composer and founder of artificial intelligence start-up JukeDeck and **Dr Ben Schogler**, co-inventor and founder of Skoogmusic. Not to mention the opportunity for a drink or two from the bar and the chance to dance the night away with live music from the Pause Menu Band created by the **Dennis & Debbie Club**. Part of *Play On* (p12).



See page 44 **7.30pm**
See page 48 **7.30pm**

GIRL IN THE MACHINE ISAAC'S EYE

REFLECTIONS ON TIME



8pm | 90 mins
£8.50/£6.50/#scifive students £5
Summerhall | Anatomy Lecture Theatre

Join philosopher, cultural critic and former medical physician **Prof Raymond Tallis** as he rescues time from the jaws of physics and criticises the claim that time is merely the fourth dimension of space-time. In this engaging event he will restore tenses and the sense of 'now' – an idea that is often denied or ignored by physicists – to the heart of our understanding of time and connect this with our unique sense of human freedom.

THE BURGER EVOLUTION



8pm | 90 mins
£20 (includes burgers and beer) | Summerhall
Dissection Room

Join us at our pop-up burger bar to taste the past, present and future of this much-loved sandwich. From humble beginnings, the burger has evolved into our favourite handheld meal. Join sensory expert **Prof Charles Spence**, chef and scientist **Charles Michel** and **Ben Reade** from the Edinburgh Food Studio to sample a variety of flavours and explore the deliciousness of the burger in the name of science.

DISRUPTING THE FOOD CHAIN



8pm | 90 mins
£8.50/£6.50/#scifive students £5
Summerhall | Main Hall

New technologies are being used to disrupt the food chain, but are they making our food systems better? **Charlotte Maberly** from the Queen Margaret University Gastronomy programme, chef and innovations manager **Scott Fraser** and other experts cast an eye over food innovations of the past and future and weigh up their effects on the systems that decide how food ends up on our plates.

WOLF AND WATCH: GATTACA



8pm | 90 mins
£15/£10 alcohol free ticket | Summerhall
Red Lecture Theatre
Presented by Jelly & Gin

Join edible experience innovators **Jelly & Gin** for a multi-sensory screening of cult classic science fiction film *Gattaca*. On arrival, you'll receive a welcome drink and a box with numbered packages of bite-sized food, drinks and aromas inspired by the narrative. Our special host **Mister Wolf** will signal when to open each one, helping you experience this futuristic story of eugenics and space travel in a different dimension.

See page 49 **8.30pm**

A NUMBER



CONNECT WITH... SOCIABLE SCIENCE

Join us for a night out with a scientific twist! Try all our brilliant City Art Centre activities without the kids at our Festival opening party, *Science Festival Lates* (p39), with music, drinks and fun.

Or head to the National Museum of Scotland for *Party On* (p50) and enjoy adults-only access to our brand new interactive exhibition, *Play On*. This special night in the Grand Gallery will include an interactive video games zone, live music, dancing, hands-on activities and a programme of speakers on all things playful and digital tech.

For a cinema experience with a difference, join edible experience innovators **Jelly & Gin** for a *Wolf and Watch* multi-sensory screening of cult classic sci-fi film *Gattaca* (left), accompanied by tastes and smells to enhance your viewing pleasure, with directions of when to consume them from a real life **Mister Wolf**.



DISCUSSION

AGES 18+
SPECIAL EVENT

DISCUSSION

AGES 18+
FILM

SATURDAY 8 APRIL

See page 41 **times vary**
 See page 41 **10am–5pm**
 See page 39 **10am–6pm**
 See page 40 **11am–6pm**
 See page 39 **11am–6pm**
 See page 39 **11am–6pm**
 See page 41 **11am–6pm**

CHIMPS ON TRIAL



12.30pm | 90 mins
£8.50/£6.50

National Museum of Scotland | Auditorium
 Presented by National Museums Scotland

WHY WE PLAY



12.30pm | 90 mins
£8.50/£6.50/#scifive students £5
Summerhall | Main Hall

THE CABARET OF DANGEROUS IDEAS: CLIMATE CHANGE IN A CONNECTED WORLD



1.30pm | 90 mins
£5 | Edinburgh Centre for Carbon Innovation
 Presented by the Edinburgh Centre for Carbon
 Innovation, Beltane Public Engagement
 Network and The University of Edinburgh

See page 49 **2pm and 8.30pm**
 See page 58 **2.30pm**

ASCUS LAB
MOMENTS IN TIME
FIRE DAMP: REVISITING THE FLOOD
CONTEMPORARY CONNECTIONS
A HIDDEN ORDER
LICHTSUCHE: CYBERNETIC SUNFLOWERS
POETRY PERISCOPE

A charity in America is campaigning to get chimpanzees recognised as people, giving them basic human rights. But with rights come responsibilities. Could a chimp ever be guilty of a human crime? Join primatologist **Dr Lewis Dean** to examine what we know about the mental abilities of our closest evolutionary cousins.

We all think we know what play is. It's what we do as children, what we do outside of work, what we do for no other reason than for pleasure. But this is only half of the truth. British musician, creator of NESTA's *FutureFest* and author of *The Play Ethic*, **Pat Kane** in conversation with early childhood education and play expert **Sue Palmer** to explore the real meaning of play, and discover how technology is changing the way we play. Part of *Play On* (p12).

Hosted by resident MC, comedian and broadcaster **Susan Morrison**, this special edition of *The Cabaret of Dangerous Ideas* will bring together academics, activists and comedians to pitch their visions of the future, explaining their views on the impact of climate change and their predictions for human interaction in our increasingly connected world. Expect debate, discussion and discourse with some of the fiercest intellects Scotland has to offer.

A NUMBER
FASHIONABLE DISEASES

DISCUSSION

THE RIGHT TO BE FORGOTTEN



3pm | 90 mins
£8.50/£6.50/#scifive students £5
Summerhall | Main Hall

Is anything ever forgotten online? Increasingly we live our lives online from an earlier age, generating more material that we may want to remove at a later date. Join a panel including digital memory specialist **Prof Andrew Hoskins** and **Prof George Brock** author of *The Right To Be Forgotten: Privacy and Media in the Digital Age* for an exploration of the legal, technical and personal issues and a special guest appearance from someone with a good reason for wanting to be forgotten.

DISCUSSION

YOUR ROBOT ROOMMATE



3pm | 90 mins
£8.50/£6.50/#scifive students £5
National Museum of Scotland | Auditorium

Robot companionship could offer many solutions for improving the way we live our lives, work and take care of others. Join **Prof Kerstin Dautenhahn** from the Adaptive Systems Research Group, University of Hertfordshire and intelligent home assistant expert **Ondrej Dusek** from Heriot-Watt University to find out what advances in robotics will mean for a possible future where robots and humans live happily together.

DISCUSSION

A TECHNOPHOBE'S GUIDE TO DISCONNECTING



3pm | 90 mins
£8.50/£6.50/#scifive students £5
Summerhall | Main Hall

In a world where we use more and more technology for everyday tasks, what would it take to live your life without technology, and why would you want to? Hear from a panel including open data expert **Prof Ewan Klein** and find out what it's like to live without leaving a digital trace, how to survive off-grid and what the digital breadcrumbs we leave behind can say about us.

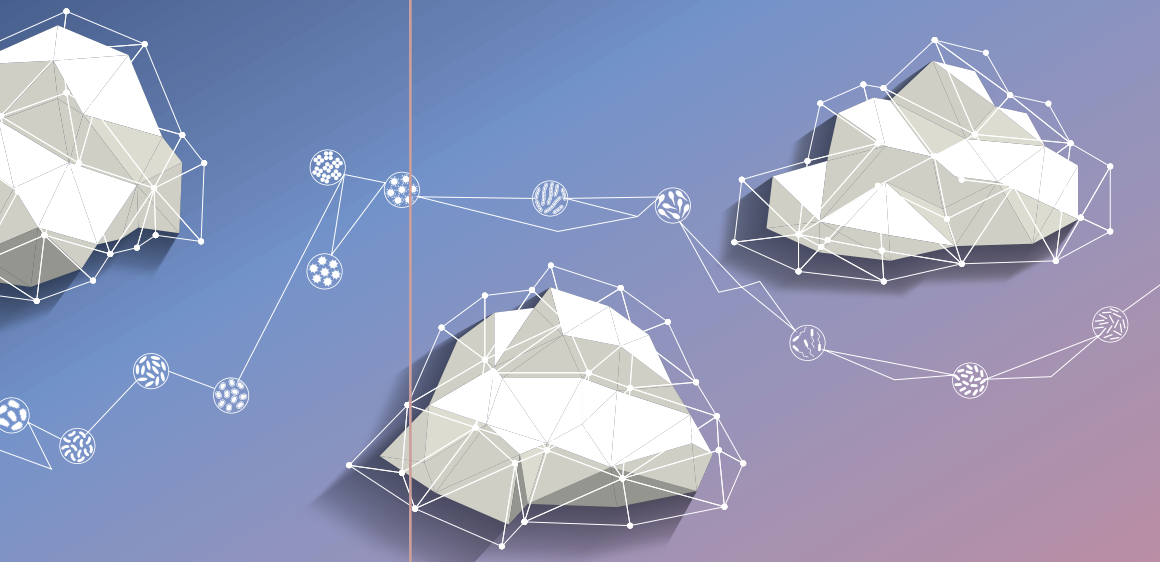
SPECIAL EVENT

DEATH OF THE PAPERBACK



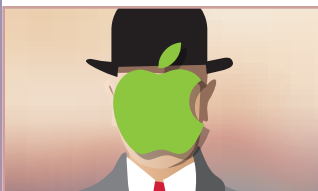
5.30pm | 90 mins
£8.50/£6.50/#scifive students £5
Summerhall | Dissection Room

Technology is changing the way we consume and experience books. We're bringing together Director of Literary Dundee **Peggy Hughes**, writer and Director of The Secret Experiment **Simon Meek**, Director of the Centre for the History of the Book **Tom Mole**, and **Ann Landmann** from Blackwell's Bookshop Edinburgh for this interactive event. Hear short presentations from speakers and take part in interactive activities, including the chance to make a book perfume, as we take a look, sniff and feel of our literary futures. Part of *Play On* (p12).



DISCUSSION

CAN COMPUTERS BE CREATIVE?



5.30pm | 1.90 mins
 £8.50/£6.50/#scifive students £5
 Summerhall | Main Hall

Thinking creatively is an essential component of human intelligence, something that defines us as human beings. This is an enormous challenge for artificial intelligence so it's unsurprising that many reject the idea of computers drawing, composing music or writing stories. Join **Dale Lane**, a lead developer on IBM's AI project Watson, **Ed Newton-Rex**, composer and founder of Jukedeck, and computer scientist **Dr Alison Pease** as they discuss the potential of computers to be creative. Part of *Play On* (p12).

DISCUSSION

HOW TO SUSTAIN: SUSTAINABILITY AND ITS SOCIETAL IMPLICATIONS



5.30pm | 1 hour
 £8.50/£6.50/#scifive students £5
 Summerhall | Red Lecture Theatre

Sustainability is a concept frequently discussed in the public sphere, but what do we really mean by it? And how can interdisciplinary approaches across ecology, economics, politics and culture help scientists and academics to clearly communicate ideas around sustainability and its implications? Join Heriot-Watt civil engineer **Dr Elli-Maria Charalampidou** and historian **Dr Nikolaos Papadogiannis** for an open discussion on this broad-ranging topic.

DISTILLING LIVE!



6pm | 2.5 hours
 £25 (includes gin tasting)
 Edinburgh Gin Distillery, Biscuit Factory
 Presented by Edinburgh Gin

Edinburgh Gin is celebrating the Science Festival with a live distillation event to produce three gins using recipes crowd-sourced from social media. Join us for an evening hosted by **David Wilkinson**, Head Distiller at Edinburgh Gin, which features a tutored tasting of Edinburgh Gin's range and the chance to sample the specially created gins once the distillation process is complete. The event will be live streamed through Edinburgh Gin's social media channels.

AGES 18+
 SPECIAL EVENT

DISCUSSION

ONLINE IDENTITY



7pm | 1 hour
 £8.50/£6.50
 £25 including ticket for *A Number The Lyceum*
 Presented in partnership with the Royal Lyceum Theatre Company

In an increasingly wired world, how is technology influencing how we present ourselves online and how we craft and create our identities? What are the challenges and opportunities of being whoever you want to be online? Join BBC presenter and social psychologist **Dr Aleks Krotoski** in conversation with writer and musician **Pat Kane** as they discuss authenticity versus artifice and how the information we share so openly online might one day hamper our freedom. Part of *Who Do You Think You Are?* a series of standalone events featuring scientists, authors and artists discussing the nature of identity and self as provoked by the play, *A Number* by Caryl Churchill (p49). This talk will take place prior to the evening's performance.

See page 44 7.30pm
 See page 48 7.30pm

DISCUSSION

CATCHING THE TRAVEL BUG



8pm | 1 hour
 £8.50/£6.50/#scifive students £5
 Summerhall | Anatomy Lecture Theatre

GIRL IN THE MACHINE ISAAC'S EYE

As our world becomes more connected, the spread of disease and viruses becomes more of an issue. Who is responsible for minimising the risks and what can be done to stop these diseases from becoming a global pandemic? Join **Karen Bartlett**, author of *The Health of Nations*, as we explore this very present issue.

DISCUSSION

FROM PAGE TO REALITY: SCI-FI MEETS MODERN LIFE



8pm | 90 mins
 £8.50/£6.50/#scifive students £5
 Summerhall | Main Hall

Many aspects of our modern life were once fanciful ideas on the pages of science fiction novels. But how good are science fiction's authors at predicting the future? And where do they get their ideas from? Writer, publisher and sci-fi superfan **Ramy Vance** will lead a discussion with a science fiction author and a scientist to explore the symbiotic relationship between science and fiction.

SUNDAY 9 APRIL

See page 41 **times vary**
See page 41 **10am–5pm**
See page 40 **11am–6pm**
See page 39 **11am–6pm**
See page 39 **11am–6pm**
See page 41 **11am–6pm**

EXPLORING THE INFLUENCE OF D'ARCY WENTWORTH THOMPSON



3pm | 90 mins

£8.50/£6.50/#scifive students £5
National Museum of Scotland | Auditorium

DIGITAL SMELLS IN A DIGITAL FUTURE



3pm | 1 hour

£8.50/£6.50/#scifive students £5
Summerhall | Anatomy Lecture Theatre

MORALITY OUT OF MONEY



5.30pm | 1 hour

£8.50/£6.50/#scifive students £5
Summerhall | Red Lecture Theatre

BLOCKCHAIN TECHNOLOGY: A SECURE SOLUTION



5.30pm | 1 hour

£8.50/£6.50/#scifive students £5
Summerhall | Anatomy Lecture Theatre

ASCUS LAB MOMENTS IN TIME CONTEMPORARY CONNECTIONS A HIDDEN ORDER LICHTSUCHENDE: CYBERNETIC SUNFLOWERS POETRY PERISCOPE

This year marks the centenary of the publication of *On Growth and Form*, the hugely influential book by the Scottish zoologist D'Arcy Wentworth Thompson, which has inspired scientists and artists ever since its publication. Join science writer **Philip Ball** in conversation with art historian **Ed Juler** and **Matthew Jarron**, curator of the D'Arcy Thompson Archive, to explore the continuing influence of this underappreciated figure.

Wouldn't it be great if we could experience the smells of action in films and video games, enjoy the smell of a pizza on-screen, and send perfumes digitally, just like images and sounds? Join pheromone expert **Dr Tristram Wyatt** of the University of Oxford to learn about the challenges of sending digital smells. It won't be easy and, despite our ingenuity, it may even be impossible.

The ethical norm of reciprocity is deeply imbedded in financial systems and together, reciprocity, charity and sincerity create the trust necessary for finance. Join **Timothy Johnson** and **Dr Taylor Spears** to explore how markets legislate for sincerity and uncover how these ideas are relevant for crowdfunding and bitcoin, yet sometimes missing in contemporary finance.

Can blockchains – the technology that made bitcoin transactions possible – be put to use in many other capacities? These complex systems are based on a simple idea – an encrypted database running on millions of devices and open to anyone, that can be moved and stored securely and privately. Join **Prof Aggelos Kiayias** and BBC presenter and social psychologist **Dr Aleks Krotoski** to consider the possibilities blockchain technology might offer us.



FORENSIC FACT MEETS FORENSIC FICTION



5.30pm | 90 mins

£8.50/£6.50/#scifive students £5
Summerhall | Dissection Room

See page 48 **7.30pm**

THE PARTICLE ZOO



8pm | 1 hour

£8.50/£6.50/#scifive students £5
Summerhall | Anatomy Lecture Theatre

In association with Quercus

THE ETHICAL CARNIVORE: MY YEAR KILLING TO EAT



8pm | 1 hour

£8.50/£6.50/#scifive students £5
Summerhall | Dissection Room

In association with Bloomsbury Publishing

Lin Anderson's latest novel takes place on Sanday, Orkney and involves using forensic soil science to track a killer. **Prof Lorna Dawson** of the Hutton Institute used similar methods during a real-life murder investigation on Sanday some years ago. Join them for a unique event featuring a reading from *None but the Dead* followed by an illustrated talk by Lorna to explore the reality of forensic soil science techniques.

ISAAC'S EYE

The next few years in particle physics are crucial – are we on the eve of a revolution in our understanding of the Universe, or at the end of an era of discovery? Join **Dr Gavin Hesketh**, an experimental particle physicist currently working on the ATLAS experiment at CERN, to explore the weirdness of the subatomic world: the quarks and neutrinos, gravitons and Higgs bosons that make up a reality we are only just beginning to understand.

Fed up of friends claiming to care about where their meat comes from, **Louise Gray** took the argument to its logical extreme in an attempt to become an ethical carnivore, eating only animals she had killed herself. From shucking oysters to shooting a red deer, join her as she shares her year-long adventure while examining the bigger picture of how meat is really raised and slaughtered.

DISCUSSION

DISCUSSION

DISCUSSION

DISCUSSION

DISCUSSION

DISCUSSION

DISCUSSION

MONDAY 10 APRIL

See page 41 **times vary**
See page 41 **10am–5pm**
See page 40 **11am–6pm**
See page 39 **11am–6pm**
See page 39 **11am–6pm**
See page 41 **11am–6pm**

A VERY SHORT INTRODUCTION TO... ANIMAL BEHAVIOUR



1pm | 1 hour
£6/#scifive students £5 | Summerhall
Anatomy Lecture Theatre
Presented by Oxford University Press

WHY IS LIFE SO COMPLICATED? CAN MY COMPUTER HELP?



5.30pm | 90 mins
£8.50/£6.50/#scifive students £5
Summerhall | Anatomy Lecture Theatre
Presented by the International Centre for
Mathematical Sciences

ASCUS LAB
MOMENTS IN TIME
CONTEMPORARY CONNECTIONS
A HIDDEN ORDER
LICHTSUCHE: CYBERNETIC SUNFLOWERS
POETRY PERISCOPE

From molecular tools to developments in computing, new technologies have caused a revolution in the study of animal behaviour, allowing us to investigate in ways never previously possible. Join **Dr Tristram Wyatt** to discover how animal behaviour has evolved, how we can understand animal societies better and even use its study to explore some aspects of human behaviour.

Computer simulations are capable of generating massive amounts of data, but this needs to be processed and analysed before it becomes useful. Computational biophysicist **Dr Sarah Harris** argues that the need to find simple mathematical and physical theories to explain our observations is even stronger now than before the advent of computation. Join her for an overview of complex computer simulations and submit your own suggestions of how simulations could help sort out our complex lives.

DISCUSSION

AGES 18+

SPECIAL EVENT

SHOW

See page 44 **7.30pm**

WHAT IS WELLNESS? THE PURSUIT OF EATING CLEAN



8pm | 90 mins
£8.50/£6.50/#scifive students £5
Summerhall | Anatomy Lecture Theatre

LOW IMPACT MEAL



8pm | 90 mins
£20 (includes 3 course mini meal and wine)
Summerhall | Dissection Room

FASLANE



8pm | 90 mins
on until Tuesday 11 April
£12/£10 | Summerhall | Red Lecture Theatre
Presented by Jenna Watt and Showroom

EDINBURGH SKEPTICS AT THE SCIENCE FESTIVAL

People's attitudes to food have changed in recent years with a desire to eat clean in the pursuit of wellness, but are all these changes really good for us? And why are all the alternatives so expensive? Join lecturer in nutrition and dietetics and freelance dietitian **Sophie Medlin** of King's College London as we learn the true impact of our pursuit for wellness.

How can we eat a more sustainable diet? There are arguments about what a low impact diet actually is. Should we all be eating vegan? Or should we all only eat food that is grown within our local community? Join **Pete Ritchie** from Nourish Scotland, Guardian journalist **Tom Levitt** and flexitarian **Annabelle Randles** to enjoy a three-course taster menu.

Award-winning artist **Jenna Watt** presents *Faslane* – a hugely powerful and timely insight into the UK's nuclear debate. Her Majesty's Naval Base Clyde, or Faslane, situated 40 miles outside Glasgow, is home to the UK's nuclear missile programme, Trident. Drawing upon interviews with individuals at the front line, Jenna's provocative performance seeks answers to the questions we should all be asking about the nuclear deterrent.

EDINBURGH MEDAL ADDRESS: ARE WE READY FOR THE NEXT EPIDEMIC?

SPECIAL EVENT



7pm | 1 hour | **£12/£10 | City Chambers | Main Chamber**

The Edinburgh Medal is a prestigious award given each year to men and women of science and technology who are judged to have made a significant contribution to the understanding and wellbeing of humanity.

The 2017 Edinburgh Medal is awarded to **Prof Peter Piot**, Director of the London School of Hygiene and Tropical Medicine and a Professor of Global Health, for his joint work in the discovery of the Ebola virus and subsequent work to stop its spread, and his academic and scientific work focusing on AIDS and women's health in the developing world.

Join Peter for this year's *Edinburgh Medal Address* as he discusses the challenges that infectious diseases pose for the human race, the lessons learned from recent outbreaks and the ways in which we are preparing for future pandemics. Oration by **Prof Sheila Rowan**, Chief Scientific Advisor for Scotland. Vote of thanks by **Prof Mark Woolhouse**, Professor of Infectious Disease Epidemiology, The University of Edinburgh.



PREVIOUS EDINBURGH MEDAL RECIPIENTS

2016 Kevin Govender and the IAU
2015 Mary Midgley
2014 Prof Mary Abukutsa-Onyango
2013 Prof Peter Higgs and CERN
2012 Dr James Hansen
2011 Prof Carl Djerassi
2010 Sir Alex Jefferies
2009 Prof Jonathan Beckwith
2008 Prof Chris Rapley
2007 Dr Richard Horton
2006 Prof James Lovelock
2005 Prof Colin Blakemore
2004 Prof Steven Rose
2003 Prof Wang Sung

2002 Dr Lise Kingo
2001 Sir John Sulston
2000 Prof Lynn Margulis
1999 Prof Jocelyn Bell Burnell
1998 Sir David Attenborough
1997 Prof Amartya Sen
1996 Prof Richard Levins
1995 Sir John Crofton
1994 Prof Manuel Patarroya
1993 Prof Wangari Maathai
1992 Prof Heinz Wolff
1991 Prof Jane Goodall
1990 Prof Stephen J Gould
1989 Prof Abdus Salam

TUESDAY 11 APRIL

See page 41 **times vary**
See page 41 **10am–5pm**
See page 39 **10am–6pm**
See page 40 **11am–6pm**
See page 39 **11am–6pm**
See page 39 **11am–6pm**
See page 41 **11am–6pm**

A VERY SHORT INTRODUCTION TO... INTELLIGENCE



1pm | 1 hour

£6/#scifive students £5 | Summerhall
Anatomy Lecture Theatre

Presented by Oxford University Press

LOTHIAN BIRTH COHORT PROJECT

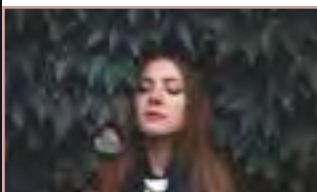


5.30pm | 90 mins

£8.50/£6.50 | National Museum of Scotland
Auditorium

Presented by National Museums Scotland

WHY PLACES MATTER FOR MENTAL WELLBEING



5.30pm | 90 mins

£8.50/£6.50/#scifive students £5
Summerhall | Anatomy Lecture Theatre

Presented by the Centre for Research on Environment, Society and Health,
The University of Edinburgh

GENETIC MODIFICATION: FOOD FOR THOUGHT



5.30pm | 90 mins

£8.50/£6.50/#scifive students £5
Summerhall | Dissection Room

Presented by Rothamsted Research

ASCUS LAB MOMENTS IN TIME

FIRE DAMP: REVISITING THE FLOOD CONTEMPORARY CONNECTIONS

A HIDDEN ORDER

LICHTSUCHE: CYBERNETIC SUNFLOWERS

POETRY PERISCOPE

Why do some people seem to drive a highly tuned Rolls Royce brain while others potter along with a merely serviceable Ford Fiesta? Are intelligence differences caused by genes or the environment? Does intelligence decline or increase as we grow older? Join **Prof Ian Deary** to explore what psychologists have discovered about how and why people differ in their thinking powers.

The Lothian Birth Cohort is the longest running study on cognitive ageing and the brain, analysing the intelligence of people born in Scotland in 1921 and 1936. Join researchers in this interactive event in association with the Centre for Cognitive Ageing and Epidemiology at The University of Edinburgh to discover how childhood mental capacity affects health and cognition in later life.

Join our panel of experts for an interactive discussion on the ways our surroundings can affect our mental health and wellbeing. **Prof Jamie Pearce**, **Dr Niamh Shortt**, **Prof Steve Platt** and **Prof Catharine Ward Thompson** from The University of Edinburgh, **Prof Sarah Curtis** from Durham University and other experts will explore a range of factors, from the built environment and access to green spaces, to the local labour market, neighbourhood social interaction and community cohesion.

Ensuring everyone has enough to eat is one of the biggest global challenges. This interactive discussion investigates the kind of agriculture and food systems that can provide the food and resources we need, drawing on the expertise of **Prof Johnathan Napier**, Associate Director for Crop Science at Rothamsted Research, and experts in policy and food sustainability to give you some food for thought.

DISCUSSION

SCOTTISH IDENTITY



7pm | 1 hour

£8.50/£6.50

£25 including ticket for **A Number**

The Lyceum

Presented in partnership with the Royal Lyceum
Theatre Company

See page 44 **7.30pm**

See page 44 **7.30pm**

See page 48 **7.30pm**

See page 55 **8pm**

What does it mean to be and/or feel Scottish? What contributes to our sense of national identity? Ethnicity? Culture? Religion? Politics? Psychology? What does science have to say about national identity? Join poet and novelist **James Robertson** in a discussion exploring the Scottish self. Part of *Who Do You Think You Are?* a series of standalone events featuring scientists, authors and artists discussing the nature of identity and self as provoked by the play, *A Number* by Caryl Churchill (p49). This talk will take place prior to the evening's performance.

EDINBURGH SKEPTICS AT THE SCIENCE FESTIVAL GIRL IN THE MACHINE

ISAAC'S EYE

FASLANE

Our vast pool of medical data is becoming a tangled mess. This is where AI systems come in, finding patterns and unseen connections to provide patients with the best standard of care. In this event chaired by healthcare journalist **Pennie Taylor**, the Scottish Government's National Clinical Director **Jason Leitch** joins healthcare technology and AI expert **Thomas Balkizas** from IBM Watson Health to discover the possibilities.

DISCUSSION

AI-POWERED HEALTHCARE



8pm | 90 mins

£8.50/£6.50/#scifive students £5
National Museum of Scotland | Auditorium

Supported by

Marks&Clerk
Intellectual Property Services

CHEMISTRY OF THE HUMAN BODY



8pm | 1 hour

£8.50/£6.50/#scifive students £5
Summerhall | Anatomy Lecture Theatre

There are 92 naturally occurring elements in the periodic table but how many of them would you need to make a human? The chemical formula for a human has some surprising inclusions and the recipe to make a fully functioning person is carefully balanced. Join chemist and science communicator **Dr Kathryn Harkup** to look at some interesting facts about the elements that make us what we are.

DISCUSSION

CHEESELOGY 2.0



8pm | 90 mins

£15 (includes cheese samples) | Summerhall
Dissection Room

The science of cheese is back! Join us on a tutored tasting journey that will transform your understanding of the scientific processes and sometimes innovative technologies that are used to produce cheese in its many delicious varieties. Presented by self-confessed curd nerd **Patrick McGuigan**, author of *The Cheese Chap* blog, in conversation with dairy technologist **Paul Thomas**.

SPECIAL EVENT

See page 49 **8.30pm**

A NUMBER

DISCUSSION

DISCUSSION

DISCUSSION

DISCUSSION

WEDNESDAY 12 APRIL

See page 41 **times vary**
 See page 41 **10am–5pm**
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 See page 40 **11am–6pm**
 See page 39 **11am–6pm**
 See page 39 **11am–6pm**
 See page 41 **11am–6pm**

A VERY SHORT INTRODUCTION TO... SAVANNAS



DISCUSSION

1pm | 1 hour
£6/#scifive students £5 | Summerhall
Anatomy Lecture Theatre
 Presented by Oxford University Press

THE BIG DATA SHOW



SHOW

1pm and 3pm | 90 mins
Free (ticket required) | Red Lecture Theatre

See page 44 **2.30pm and 7.30pm**

TRANSMISSION PODCAST LIVE RECORDING



SHOW

5.30pm | 90 mins
£8.50/£6.50/#scifive students £5
National Museum of Scotland | Auditorium

ASCUS LAB
MOMENTS IN TIME
FIREAMP: REVISITING THE FLOOD
CONTEMPORARY CONNECTIONS
A HIDDEN ORDER
LICHTSUCHENDE: CYBERNETIC SUNFLOWERS
POETRY PERISCOPE

Savannas form one of the largest and most important of the world's ecological zones. Covering one fifth of the Earth's land surface, they are home to some of the world's most iconic animals, but they are also extremely vulnerable to accelerating pressures on usable land. Join Prof Peter A Furley to explore the dynamic nature of savannas, discover how they have shaped human evolution and consider their conservation for the future.

Part digital magic show and part history of hacking. This work-in-progress interactive, digital performance will explore digital citizenship through your own mobile phone. Telling the story of the first prosecuted hack in the UK – and written with Rupert Goodwins, one of four who did it – *The Big Data Show* aims to demystify what big data is and how we choose to give it away.

GIRL IN THE MACHINE

At 4.22 light years away, Proxima Centauri is the nearest star to our Sun. Orbiting this star is a Proxima b, 1.3 times the mass of Earth with the potential to support life. *Transmission* speculates on the possibility of life on Proxima b and whether civilizations like our own could live there. What if we received their television and radio broadcasts? How would we listen in? Could we translate them? How could we communicate back? Join us for a live recording of this 15-part podcast series, a prologue to the August premiere of *Transmission*.

THE BLEEDING EDGE



DISCUSSION

5.30pm | 1 hour
£8.50/£6.50/#scifive students £5
Summerhall | Anatomy Lecture Theatre
 Presented by The Oxford Publicity Partnership

Does technology turn toxic in an unequal world? Capitalism likes us to believe in the steady, inevitable march of progress but the historical record tells of innumerable roads not taken, all of which could have led to better worlds. Join author of *The Bleeding Edge*, Bob Hughes, as he explores the latest discoveries about the effects of social inequality on human health and our environmental impact, and traces today's ecological crisis back to the rise of the world's first elites, 5,000 years ago.

NATURE, NURTURE OR NEITHER



DISCUSSION

7pm | 1 hour
£8.50/£6.50
£25 including ticket for A Number
The Lyceum
 Presented in partnership with the Royal Lyceum Theatre Company

Many see our genes and our environment as separate entities and believe that traits can be sliced into some sections controlled by inherited factors, or nature, and others by differences in the environment, or nurture. Join scientist and author Steve Jones to debate whether identity can really be split into nature and nurture, or whether heritability and what makes us who we are is better described as a subtle interaction between the two. Part of *Who Do You Think You Are?* a series of standalone events featuring scientists, authors and artists discussing the nature of identity and self as provoked by the play, *A Number* by Caryl Churchill (p49). This talk will take place prior to the evening's performance.

See page 44 **7.30pm**
 See page 48 **7.30pm**

EDINBURGH SKEPTICS AT THE SCIENCE FESTIVAL ISAAC'S EYE

PUBLIC SERVICE BROADCASTING

THE RACE FOR SPACE LIVE

WEDNESDAY
12 APRIL

CONTINUED

SPECIAL EVENT



'Circling the Earth in my orbital spaceship, I marvelled at the beauty of our planet. People of the world, let us safeguard and enhance this beauty – not destroy it!' Yuri Gagarin, first man in space



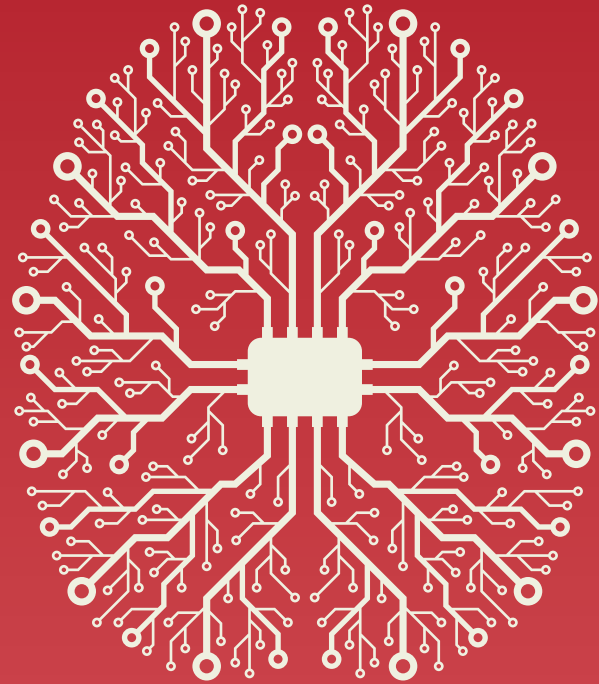
7.30pm | 3 hours
£28 | Usher Hall

Join us on Yuri's Night – the international celebration of human endeavour in space – as corduroy-clad London-based outfit **Public Service Broadcasting** perform their hit album *The Race for Space* from start to finish. With accompaniment from the **National Youth Choir of Scotland** and string quintet **Mr McFall's Chamber**, this very special evening will bring stories and samples from the American and Soviet space race to life before your eyes and ears.

PSB's uniquely spellbinding live AV transmissions see them weave samples from old public information films, archive footage and propaganda material around live drums, guitar, banjo and electronics as they teach the lessons of the past through the music of the future.

The evening will begin with the brains behind Public Service Broadcasting – **J. Willgoose Esq** – in conversation with science-obsessed comedian and broadcaster **Helen Keen**, discussing the making of the album and the fascinating tales of the space race that inspired it.





CONNECT WITH... BIG IDEAS

For Science Festival 2017 we're bringing together the biggest thinkers and brightest minds to debate and discuss some big ideas as we uncover the challenges and opportunities facing our world.

TECHNOLOGY AND ME

We're investigating the latest innovations in technologies designed to improve human health, wellbeing and happiness and unearthing the opportunities and questions raised by our interactions with these technologies along the way. Join us to explore the *Hospitals of the Future* (p43), *AI-Powered Healthcare* (p56) and *Super Humans* (p42).

OUR WIRED WORLD

Science and technology help us live, work, learn and communicate with others. We're examining the technologies that connect us and looking at how a networked way of living affects our homes, workplaces, schools and communities – from *Test Tube to YouTube* (p42) to *Who Will Scam Us Next, and How?* (p48).

TECHNO TRIBES

Focusing on the impact of the digital revolution on society, we're delving into the promises that living in a networked world brings and raising questions about the challenges in digital security that it poses. Join us to examine *The Right to be Forgotten* (p52), *The Rise of E-Democracy* (p49) and *A Death Online* (p50).

GLOBAL VILLAGE

We're exploring how we can harness technology to ensure the success and sustainability of our connected world – from *City Farming* (p42) to *Greening the Developing World* (p48). We're also focusing on challenges that arise from the political landscape in *Brexit: Boom or Bust for British Science* (p42).

WHO DO YOU THINK YOU ARE?

We're bringing together scientists, authors and artists in a series of standalone events to discuss the nature of identity and self as provoked by the play, *A Number* by Caryl Churchill (p49). Join us to investigate a range of issues, from *Online Identity* (p53) and *Scottish Identity* (p56) to *Nature, Nurture or Neither* (p57).

Visit sciencefestival.co.uk/big-ideas to find out more.

DISCUSSION

CAN YOU SOLVE MY PROBLEMS?



8pm | 1 hour

£8.50/£6.50/#scifive students £5
National Museum of Scotland | Auditorium
Presented by Faber and Faber

Calling all puzzle fans! Best-selling author and *Guardian* maths blogger **Alex Bellos** is back to challenge you with some more perplexing yet totally satisfying puzzles. Alex knows a good puzzle is ingenious, frustrating and *a-ha!*-inducing in equal measure, and will attempt to bamboozle you with some puzzles from his new book *Can You Solve My Problems?* He will also share stories from the history of puzzles, an ancient but eternally popular form of entertainment.

DISCUSSION

INTELLIGENT TRANSPORT: CONNECTING OUR WORLD



8pm | 90 mins

£8.50/£6.50/#scifive students £5
Summerhall | Anatomy Lecture Theatre
Presented by Aberdeen and Heriot-Watt
Universities and the Transport
Systems Catapult

From driverless pods to bespoke individual travel planning, how can we combine technology and data for better and more intelligent transport systems? Join **Prof John Nelson** and **Dr Caitlin Cottrill** from the University of Aberdeen, with **Dr Phil Greening** from Heriot-Watt University and **Dr Ron Oren** from Transport Systems Catapult, to explore initiatives aimed at promoting the travel experience. This event is presented under the University Partnership Programme.

DISCUSSION

THE SOUND REVOLUTION



8pm | 90 mins

£8.50/£6.50/#scifive students £5
Summerhall | Dissection Room

Digital technology is not only changing the style of music we can create but how we can make it. Join **Dr Martin Parker**, Director of Outreach at the Reid School of Music, and specially invited guests as we explore what influence digital technology has had on music and how it is performed, what effect it might have in the future and hear some of the exciting digital music projects taking place now. Part of *Play On* (p12).

SHOW

DR BUNHEAD'S IMPROVISED EXPLOSIONS



8pm | 1 hour

on until Friday 14 April
£8.50/£6.50/#scifive students £5
Summerhall | Red Lecture Theatre

Internationally-renowned TV science presenter **Dr Bunhead** (*Brainiac*, *Blue Peter*) joins forces with two of the UK's leading comedy improvisers – **Will Naameh** and **Sam Irving** – to provide a rollercoaster of serious science, audience interaction and gratuitous scenes of a spontaneous nature. Bursting with unexpected consequences, this show is different every time. Expect factual monologues, messy misunderstandings, science demonstrations, audience involvement and much more.

THURSDAY 13 APRIL

See page 41 times vary
 See page 41 10am–5pm
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 See page 40 11am–6pm
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 See page 41 11am–6pm

A VERY SHORT INTRODUCTION TO... VIRUSES



1pm | 1 hour
 £6/#scifive students £5 | Summerhall
 Anatomy Lecture Theatre
 Presented by Oxford University Press

THE HUNT FOR SUPERSYMMETRIC PARTICLES



5.30pm | 90 mins
 £8.50/£6.50/#scifive students £5
 National Museum of Scotland | Auditorium
 Presented by the European Research
 Council Consolidator Grant Perspectival
 Realism, n.647272

TECHNACEUTICALS



5.30pm | 90 mins
 £8.50/£6.50/#scifive students £5
 Summerhall | Anatomy Lecture Theatre

ASCUS LAB MOMENTS IN TIME FIREDAMP: REVISITING THE FLOOD CONTEMPORARY CONNECTIONS A HIDDEN ORDER LICHTSUCHEDE: CYBERNETIC SUNFLOWERS POETRY PERISCOPE

Our struggle against viruses is constant – from modern pandemics such as HIV, swine flu and SARS, to a whole variety of less well known viruses, there is always something new to fight. Outlining their origins, structure, and method of infection, Prof Dorothy Crawford will explore the vast variety of viruses, asking if we can live in harmony with them in the future.

In December 2015, the 750 GeV diphoton excess at the European Organisation for Nuclear Research (CERN) created great excitement in the scientific community. Could this bump be the sign of the so far elusive supersymmetric particles (SUSY)? Data in 2016 have disproved it, but the hunt for SUSY goes on. Prof Michela Massimi and science journalist David Malone host a panel of world-leading CERN physicists to discuss the prospects and challenges in the hunt for SUSY.

This emerging field is bringing neuroscientists and technologists together, using our understanding of how the brain works to treat disease. DIY brain hacker Andrew Vladimirov and Head of the Human Pain Research group Prof Anthony Jones join event host TV and radio science researcher Dr Julie Ann Lough to talk about the facts, effects and ethics of technaceuticals and swapping drugs for devices.

DISCUSSION

DISCUSSION

DISCUSSION

DISCUSSION

DISCUSSION

SHARED AUTONOMY: THE FUTURE OF INTERACTIVE ROBOTICS



5.30pm | 90 mins
 £8.50/£6.50/#scifive students £5
 Informatics Forum
 Supported by

SIEMENS

Join Prof Sethu Vijayakumar, Director of the Edinburgh Centre for Robotics, and judge on the latest season of the BBC's *Robot Wars* as he explores the role of informatics, digitisation, automation and robotics both off planet and closer to home.

Part of The University of Edinburgh's School of Informatics, the Edinburgh Centre for Robotics hosts one of only three NASA Valkyrie robots, one of the most advanced humanoid robots in the world. Designed and built by the Johnson Space Center, Valkyrie is robust, rugged, entirely electric, capable of operating in hostile environments and might one day pave the way for humans on Mars.

How can these technologies not only push the boundaries of what's possible in human exploration of other planets, but also improve lives on Earth? How do we rationalise and legislate the ethics of this and other artificial intelligence technologies? How can we use the allure of out-of-this-world innovations to inspire new thinking and encourage young people to innovate in software engineering and future technologies for the benefit of Scotland and beyond?

ME, MYSELF AND I



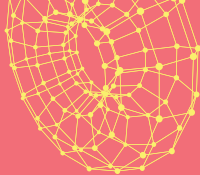
7pm | 1 hour
 £8.50/£6.50
 £25 including ticket for A Number
 The Lyceum
 Presented in partnership with the Royal Lyceum
 Theatre Company

From genetics to our cultural roots, from our shared passions to our individuality, what makes us who we are? Join author Christopher Brookmyre to discuss how artists and writers tackle this question and bring their characters and creations to vibrant life. Part of *Who Do You Think You Are?* a series of standalone events featuring scientists, authors and artists discussing the nature of identity and self as provoked by the play, *A Number* by Caryl Churchill (p49). This talk will take place prior to the evening's performance.

See page 44 7.30pm
 See page 44 7.30pm
 See page 48 7.30pm
 See page 48 8pm
 See page 57 8pm

EDINBURGH SKEPTICS AT THE SCIENCE FESTIVAL
 GIRL IN THE MACHINE
 ISAAC'S EYE
 HOW BEER MADE SCIENCE HISTORY
 DR BUNHEAD'S IMPROVISED EXPLOSIONS

ADULT EVENTS



DISCUSSION

GRAVITATIONAL WAVES



8pm | 90 mins

£8.50/£6.50/#scifive students £5
National Museum of Scotland | Auditorium

Join Prof Sheila Rowan, Director of the Institute of Gravitational Research and Chief Scientific Advisor for Scotland, and Prof Ken Strain, principal investigator of the UK Advanced LIGO project, as they talk about their research that led to the discovery of gravitational waves – something predicted to win the Nobel Prize one day. Host Marcus Chown, science broadcaster and writer, will help describe the present and future research, as experiments around the world ramp up their abilities.

THE INTERNET OF EVERYTHING: FRIEND OR FOE?



8pm | 90 mins

£8.50/£6.50/#scifive students £5
Summerhall | Anatomy Lecture Theatre
Presented by the University of Aberdeen
TrustLens team

Food-ordering fridges, automated lighting and smart energy meters are all becoming part of our everyday lives. But as the world around us becomes increasingly 'smart', what are the associated challenges and risks? This event brings together computer scientists, geographers and sociologists from the University of Aberdeen to discuss and demonstrate what communities really want from the Internet of Things and how people can come to trust these technologies and the data they produce.

DISCUSSION

SPECIAL EVENT

PARLOUR SOUNDS: WHEN HOUSEHOLD APPLIANCES BECOME INNOVATIVE ELECTRONIC INSTRUMENTS



8pm | 90 mins

£12/10 | Summerhall | Dissection Room
Presented by Red Note Ensemble and the Conservatoire National Supérieur de Paris

A live multimedia event by Patricia Alessandrini using innovative electronics to transform and invent instruments in an imaginative exploration of women's relationship to technology – from the advent of the home hi-fi to the smartphone. This world première performance which includes includes homemade electronic instruments will be followed by an after-show jam session to try out some of the electronics. Supported by Diaphonique, Creative Scotland, Sound and Music and the Esmée Fairbairn Foundation.

See page 49 8.30pm

A NUMBER



Scotland The Perfect Stage

EventScotland is proud to support the Edinburgh International Science Festival.

Scotland is the perfect stage for sporting and cultural events alike.

To find out more about what's on this year visit: visitscotland.com/events

VISITSCOTLAND.COM



HISTORY
HERITAGE &
ARCHAEOLOGY
• 2017 •

EventScotland™

FRIDAY 14 APRIL

See page 41 **times vary**
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See page 39 **11am–6pm**
See page 39 **11am–6pm**
See page 41 **11am–6pm**

A VERY SHORT INTRODUCTION TO... ISOTOPES



1pm | 1 hour

£6/#scifive students £5 | Summerhall
Anatomy Lecture Theatre

Presented by Oxford University Press

MIND MAGIC



5.30pm | 1 hour

£12/£10 | Summerhall | Dissection Room

FEEDING TIME AT THE ZOO



6pm | 3 hours

£40 (includes welcome drink and four small
dishes) | RZSS Edinburgh Zoo

Presented by RZSS Edinburgh Zoo

THE PENGUIN COUNTERS: SPECIAL SHOW DOME EVENT



7pm | 90 mins

£8.50/£6.50 | Dynamic Earth | ShowDome

Presented by Dynamic Earth

ASCUS LAB

MOMENTS IN TIME

FIRE DAMP: REVISITING THE FLOOD

CONTEMPORARY CONNECTIONS

A HIDDEN ORDER

LICHTSUCHE: CYBERNETIC SUNFLOWERS

POETRY PERISCOPE

Isotopes have proved enormously important across all the sciences and in archaeology. Radioactive isotopes may be familiar from their use in nuclear weapons, nuclear power, and in medicine, as well as in carbon dating. They have been central to establishing the age of the Earth and the origins of the Solar System. Prof Robert Ellam provides an overview of the nature of stable and radioactive isotopes, and considers their wide range of modern applications.

Magician, psychologist and creator of YouTube's *Quirkology* Prof Richard Wiseman invites you to step backstage and explore the secret science of sorcery. Experience amazing optical illusions, discover how the world's greatest magicians perform the impossible and learn how you can fool your friends with some jaw-dropping miracles. Packed with illusions, misdirection and sleight of hand, prepare to be amazed and amused.

Join us for a worldwide culinary adventure at RZSS Edinburgh Zoo. While feasting on a treat inspired by each country, you'll get bite-sized chunks of information from our keepers and conservation team about the animals you see and the conservation work being carried out to protect species in the wild. Enter via the members' gate at the top of the zoo car park. The event will involve some walking and time spent outdoors, so please dress appropriately.

The Penguin Counters is a cinematic experience documenting the research of Ron Naveen and his team in Antarctica. Their work tracks the impact of climate change and ocean health on penguin populations and asks what humans can learn from penguins' survival at the frontline of climate change in the world's fastest warming region. Join us in the bar for refreshments before this special screening, which will be followed by a Q&A with the film's production team.

DISCUSSION

SHOW

SPECIAL EVENT

FILM

DISCUSSION

DISCUSSION

See page 44 **7.30pm**

See page 48 **7.30pm**

See page 57 **8pm**

GIRL IN THE MACHINE

ISAAC'S EYE

DR BUNHEAD'S IMPROVISED EXPLOSIONS

FROM SÉANCE TO SCIENCE: WHO IS PSYCHOLOGY'S GREATEST HERO?



8pm | 90 mins

£8.50/£6.50/#scifive students £5

Summerhall | Anatomy Lecture Theatre

Presented by The University of Edinburgh

A BRIEF HISTORY OF EVERYONE WHO EVER LIVED



8pm | 1 hour

£8.50/£6.50/#scifive students £5

Summerhall | Dissection Room

See page 49 **8.30pm**

Nowadays psychology is one of the most vibrant sciences – studying brains and genes as much as societies and cultures. But who played the biggest role in transforming psychology from anecdotes into science? Join three of Edinburgh's finest psychological minds (so they tell us!) Prof Caroline Watt, Dr Thomas Bak and Dr Stuart Ritchie to discuss, debate and decide.

Since scientists first read the human genome in 2001 it has been subject to all sorts of claims, counterclaims and myths. Join geneticist, author and BBC Radio 4 broadcaster Dr Adam Rutherford as he argues that our genomes should be read not as instruction manuals, but as epic poems. DNA determines far less than we have been led to believe about us as individuals, but vastly more about us as a species.

A NUMBER

SATURDAY 15 APRIL

See page 41 times vary
 See page 41 10am–5pm
 See page 39 10am–6pm

BRANCHING OUT: DRAWING AND LINOCUT MASTERCLASS



10.30am | 9 hours across Saturday 15 and Sunday 16 April

£165 | Royal Botanic Garden Edinburgh and Edinburgh Printmakers

Presented by Edinburgh Printmakers in partnership with Royal Botanic Garden Edinburgh

See page 40 11am–6pm
 See page 39 11am–6pm
 See page 39 11am–6pm
 See page 41 11am–6pm
 See page 41 12pm–4pm
 See page 49 2pm and 8.30pm
 See page 44 2.30pm and 7.30pm

WHY DINOSAURS MATTER



3pm | 1 hour

£8.50/£6.50/#sciffive students £5

National Museum of Scotland | Auditorium

Supported by



ASCUS LAB MOMENTS IN TIME FIREDAMP: REVISITING THE FLOOD

This two-day masterclass with artist and educator Cecile Simonis, examines the themes and processes explored in Sean Caulfield's exhibition *Firedamp: Revisiting the Flood*. Take a guided drawing workshop at the Royal Botanic Garden Edinburgh – followed by a day of learning about and making linocut relief prints in Edinburgh Printmakers' world-class print studio. Suitable for absolute beginners and advanced drawers alike.

CONTEMPORARY CONNECTIONS A HIDDEN ORDER LICHTSUCHE: CYBERNETIC SUNFLOWERS POETRY PERISCOPE LEITH LABS A NUMBER GIRL IN THE MACHINE

Dinosaurs were tiny and huge, skittish and ferocious, fast and slow. They were runners, walkers, climbers, flyers and sometimes swimmers. They were drab, colourful, scaled and feathered, and astoundingly adaptable, but after 165 million years they died in the world's fifth mass extinction. Join Prof Ken Lacovara, who discovered the Dreadnoughtus, as he talks about his work and what we can learn from these incredible creatures.

THINK OF A NUMBER



7pm | 1 hour

£8.50/£6.50

£25 including ticket for *A Number*
 Royal Lyceum Theatre

Presented in partnership with the Royal Lyceum Theatre Company

Set in a future where human cloning has become possible, albeit still looked down upon and perhaps illegal, *A Number* poses powerful and provocative questions about the boundaries and ethics of science and what it means to be human. Join Director Zinnie Harris in conversation with Lyceum Artistic Director David Greig as she shares her fascination with the themes of this play and her thoughts on science as subject matter. Part of *Who Do You Think You Are?* a series of standalone events featuring scientists, authors and artists discussing the nature of identity and self as provoked by the play, *A Number* by Caryl Churchill (p49). This talk will take place prior to the evening's performance

DEMENTIA RESEARCH AND PREVENTION: ILLUMINATING BRAIN CHANGES



7pm | 90 mins

also on Sunday 16 April

Free | University of Edinburgh Centre for Cognitive and Neural Systems

Presented by The University of Edinburgh

Join us for an illuminating evening of scientific discussion and research at The University of Edinburgh's dementia research laboratory. Prof Craig Ritchie and Dr Tara Spire-Jones will discuss how the brain works and what goes wrong when people develop dementia. Then we'll take an interactive tour of the research laboratory, before finishing with a wine reception where you can meet the scientists in a relaxed setting.

See page 48 7.30pm

ISAAC'S EYE

**SUNDAY
16 APRIL**

Edinburgh Mini Maker Faire®



ALL AGES
SPECIAL EVENT

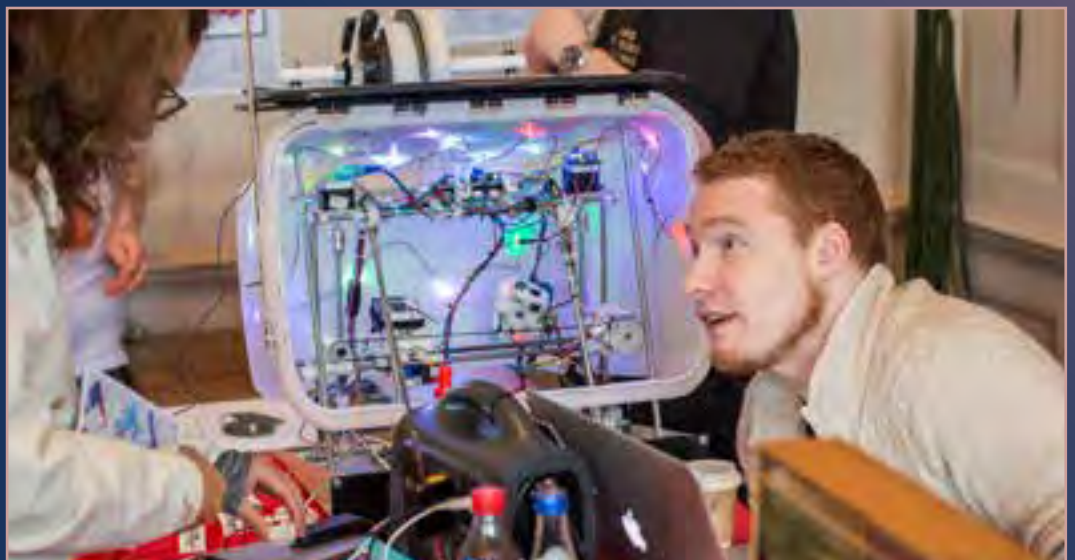
10am–5pm | drop-in
£6/free under 3s | Throughout Summerhall
Edinburgh Mini Maker Faire is independently
organised and operated under licence from
Maker Media Inc

Make:
makezine.com

Supported by



Edinburgh Mini Maker Faire is back for its fifth year, bringing together fascinating, curious people who enjoy making things and love sharing what they do. From engineers to artists, scientists to crafters, this event is a chance for makers to showcase their hobbies, experiments, and projects and for visitors to find out how to make their own ideas real. You'll find demonstrations and interactive exhibits, inspiring talks and hands-on workshops brought together to amaze, entertain and spark your creativity.



See page 41 **times vary**
See page 41 **10am–5pm**
See page 40 **11am–6pm**
See page 39 **11am–6pm**
See page 39 **11am–6pm**
See page 41 **11am–6pm**

ASCUS LAB
MOMENTS IN TIME
CONTEMPORARY CONNECTIONS
A HIDDEN ORDER
LICHTSUCHE: CYBERNETIC SUNFLOWERS
POETRY PERISCOPE

WIRED NATURE



12.30pm | 90 mins

£8.50/£6.50/#scifive students £5

National Museum of Scotland | Auditorium

Supported by



The British
Psychological Society
Promoting excellence in psychology

TAM DALYELL PRIZE LECTURE



6pm | 90 mins

Free (ticket required) | The Playfair Library

Presented by The University of Edinburgh

Join digital wellbeing expert Sue Thomas, and a panel including a psychologist and an app developer, as we investigate the research and ideas behind the effects of technology and nature on our health. We will look at the effects of wired nature on our brains, study the benefits of a natural world experienced in digital form and find out how we deal with an overload of information.

This very special lecture is held in memory of Dr Tam Dalyell, 1932–2017. Dr Tam Dalyell was the 47th Rector of The University of Edinburgh, from 2003–2006, and enjoyed an illustrious career as a teacher, author and politician. He was also an enthusiastic science communicator and weekly *New Scientist* columnist for 36 years. The annual Tam Dalyell Prize for Excellence in Engaging the Public with Science recognises and rewards the University's outstanding science communicators and was attended by Dr Dalyell every year from its inception in 2008. This year, the University will once again celebrate exceptional science communication with a ceremony and lecture given by the award winner. Details will be available at sciencefestival.co.uk/tam-dalyell-prize-lecture-2017 when announced.

See page 60 **7pm**
See page 44 **7.30pm**

DEMENCIA RESEARCH AND PREVENTION
GIRL IN THE MACHINE

2017 SCIENCE FESTIVAL VENUES

The Banshee Labyrinth (29-35 Niddry Street, Edinburgh, EH1 1LG) Lothian Buses: 3, 5, 7, 8, 14, 29, 30, 31, 33, 35, 37, 45, 49

Bedlam Theatre (11 Bristo Place, Edinburgh, EH1 1EZ) Lothian Buses: 2, 23, 29, 35, 41, 42, 45, 47, 67

City Art Centre (2 Market Street, Edinburgh, EH1 1DE) Lothian Buses: 5, 7, 8, 45, 49

City Chambers (253 High Street, Edinburgh, EH1 1YJ) Lothian Buses: 3, 5, 7, 8, 14, 23, 27, 29, 30, 31, 33, 35, 37, 41, 42, 45, 49, 67

Dynamic Earth (112-116 Holyrood Rd, Edinburgh, EH8 8AS) Lothian Buses: 6, 35, 60

Edinburgh Centre for Carbon Innovation (High School Yards, Infirmary Street, Edinburgh, EH1 1LZ) Lothian Buses: 3, 5, 7, 8, 14, 29, 30, 31, 33, 35, 37, 45, 49

Edinburgh Gin Distillery (The Biscuit Factory, 4-6 Anderson Place, Edinburgh, EH6 5NP) Lothian Buses: 1, 3, 4, 10, 11, 12, X15, 16, 19, 22, 24, 25, 26, 30, 31, 33, 34, 36, 37, 41, 44, 47

Edinburgh Printmakers (23 Union Street, Edinburgh, EH1 3LR) Lothian Buses: 1, 4, 5, 7, 8, 10, 11, 12, 14, 16, 19, 22, 25, 26, 34, 44, 45

The Festival Theatre Studio (22 Potterrow, Edinburgh, EH8 9BL) Lothian Buses: 3, 5, 7, 8, 14, 29, 30, 31, 33, 35, 37, 45, 47, 49

Holyrood Park Education Centre (Holyrood Park, 1 Queen's Drive, Edinburgh, EH8 8HG) Lothian Buses: 6, 35

Informatics Forum (10 Crichton St, Edinburgh, EH8 9LE) Lothian Buses: 41, 42, 47, 67

Jupiter Artland (Bonnington House Steadings, Wilkieston, Edinburgh, EH27 8BB) First Bus service: 27, X27

Lyceum Theatre (Grindlay Street, Edinburgh, EH3 9AX) Lothian Buses: 1, 10, 11, X15, 16, 24, 35, 36, 47

The Mound Precinct (Edinburgh, EH2 2EL) Lothian Buses: 3, 6, 10, 11, 12, 16, 23, 25, 26, 27, 31, 33, 41, 42 | East Coast Buses: 107, 124 | Lothian Country Buses: 104, 113 | Tram

National Museum of Flight (East Fortune Airfield, East Lothian, EH39 5LF) Eve coaches service: 121

National Museum of Scotland (Chambers Street, Edinburgh, EH1 1JF) Lothian Buses: 2, 23, 27, 35, 41, 42, 45, 47, 67

Ocean Terminal (Ocean Drive, Leith, Edinburgh, EH6 6JJ) Lothian Buses: 11, 22, 34, 35, 36

Playfair Library (Old College, University of Edinburgh, South Bridge, Edinburgh, EH8 9YL) Lothian Buses: 3, 5, 7, 8, 29, 30, 31, 33, 37, 47, 49

Royal Botanic Garden Edinburgh (20a Inverleith Row, Edinburgh, EH3 5LR) Lothian Buses: 8, 23, 27

Royal College of Physicians of Edinburgh (9 Queen Street, Edinburgh, EH2 1JQ) Lothian Buses: 10, 11, 12, 16, 26, 44

RZSS Edinburgh Zoo (134 Corstorphine Road, Edinburgh, EH12 6TS) Lothian Buses: 12, 26, 31

Scottish National Gallery (The Mound, Edinburgh, EH2 2EL) Lothian Buses: 3, 6, 10, 11, 12, 16, 23, 25, 26, 27, 31, 33, 41, 42 | East Coast Buses: 107, 124 | Lothian Country Buses: 104, 113 | Tram

St Giles Cathedral (High Street, Edinburgh, EH1 1RE) Lothian Buses: 3, 5, 7, 8, 14, 23, 27, 29, 30, 31, 33, 35, 37, 41, 42, 45, 49, 67

Summerhall (Summerhall Place, Edinburgh, EH9 1PL) Lothian Buses: 41, 42, 67

Surgeons' Hall Museums (Nicolson Street, Edinburgh, EH8 9DW) Lothian Buses: 2, 3, 5, 7, 8, 14, 29, 30, 31, 33, 37, 41, 42, 47, 49, 67

Torness Power Station (Dunbar, East Lothian, EH42 1QS)

Traverse Theatre (10 Cambridge Street, Edinburgh, EH1 2ED) Lothian Buses: 11, X15, 22, 24, 35, 36

University of Edinburgh Centre for Cognitive and Neural Systems (1 George Square, Edinburgh, EH8 9JZ) Lothian Buses: 41, 42, 47, 67

Usher Hall (Lothian Road, Edinburgh, EH1 2EA) Lothian Buses: 11, X15, 22, 24, 35, 36



Connecting you to the Edinburgh International Science Festival



Getting to the major venues:

City Art Centre 5, 7, 8, 45, 49 | **Summerhall** 41, 42, 67 | **Royal Botanic Garden Edinburgh** 8, 23, 27
National Museum of Scotland 2, 23, 27, 35, 41, 42, 45, 47, 67 | **Edinburgh Zoo** 12, 26, 31

Plan your journey at lothianbuses.co.uk or download your free app at TfEapp.com @on_lothianbuses

*The Family DAYticket allows up to 2 adults and up to 3 children, aged 5-15 years old inclusive, unlimited travel together on Lothian Buses day services and Edinburgh Trams (city fare zone only) for one day. Family DAYtickets are not valid on Tours, Airlink, Nightbus services, Service 98, and outside zones A & B on Lothian Country Buses/East Coast Buses. Standard Conditions of Carriage apply across all age groups.

BOOKING INFORMATION

All ticket prices include booking fees

ONLINE

sciencefestival.co.uk

If you experience any issues while attempting to make an online booking please email the Box Office: boxoffice@scifest.co.uk.

PHONE

0844 557 2686

Thursday 16 February–Friday 31

March:

10.30am–5.30pm (Monday–Friday)

Saturday 1–Sunday 16 April:

8.30am–6pm (Monday–Saturday)

11am–4pm (Sunday)

If phoning the box office, please note that calls cost between 2p to 7p per minute plus your phone company's access charge. Mobile network charges may be more expensive.

IN PERSON

Edinburgh Festival Fringe Shop

180 High Street, Edinburgh, EH1 1QS

10.30am–5.30pm (Monday–Friday)

If tickets for your event are available, they can be purchased from the venue 30 minutes prior to the start.

GROUP DISCOUNTS

We welcome groups to the Science Festival and discounts may be available depending on the event and party size. Please call the Box Office on 0844 557 2686 to discuss your needs.

CONCESSIONS

Unless otherwise stated, concessions are available for pensioners, the unemployed and disabled persons (with a complimentary ticket available for their carers – please book this by phone or in person at our Box Office). Proof of status may be required. Students #scifive – get £5 tickets for most of our adult events. See full information on p38.

REFUNDS

All Science Festival tickets are non-refundable, except in the case of cancellation.

ACCESSIBILITY

If you would like a copy of the brochure in a different format contact marketing@scifest.co.uk or call 0131 553 0320. Access information for each of our venues is available from the venue section of our website sciencefestival.co.uk/venues. If you have special access requirements or need to book wheelchair spaces please call our Box Office on 0844 557 2686.

FILMING AND PHOTOGRAPHY

Filming and photography will take place at Science Festival events and may be used for future promotional purposes. If you have any concerns please speak to a member of staff at the event.

GETTING HERE

Many of our venues in the city centre are easily accessible on foot or by public transport. Please consider using public transport when visiting our events.

BY BUS

See the venue list on page 64 for bus listings to each of our venues. Please visit lothianbuses.com or call 0131 555 6363 for further information.

BY TRAIN

For Scottish train travel information and tickets, visit scotrail.co.uk. For National Rail enquiries, see nationalrail.co.uk or call 0845 748 4950.

BY BIKE

Plan your journey at cyclestreets.net.

BY CAR

There are multi-storey car parks and metered parking around the city centre.

Please consider the environment when planning your travel to and from our events. Keep in mind that many of our venues are easily accessible on foot or by public transport.

TOURIST INFORMATION

Further information on Edinburgh and the surrounding area, along with accommodation listings and online booking, is available at visitscotland.com.

EDINBURGH INTERNATIONAL SCIENCE FESTIVAL

Edinburgh International Science Festival is a high profile and dynamic educational charity (Registered Charity no. SC003790). Each year it delivers one of Europe's largest science festivals; a primary school education programme which tours across Scotland and a variety of international projects including its role as Major Programme Partner for the Abu Dhabi Science Festival.

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Bill Addison Projects Officer

Edinburgh International Science Festival also employs around 150 additional staff to deliver its projects throughout the year

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Edinburgh Festival City.com

70 years of connecting the world

Edinburgh is the world's Festival City with events happening all year round. In 2017, Edinburgh celebrates the 70th anniversary of its world-famous festivals, with a year filled with celebrations and special events. Visit edinburghfestivalcity.com for news and images from Edinburgh's major festivals, plus festival history, information on the city and tips on planning your visit.

Edinburgh International Children's Festival
27 May–4 June 2017
imagine.org.uk

Edinburgh International Film Festival
21 June–2 July 2017
edfilmfest.org.uk

Edinburgh Jazz and Blues Festival
14–23 July 2017
edinburghjazzfestival.com

Edinburgh Art Festival
27 July–27 August 2017
edinburghartfestival.com

Royal Edinburgh Military Tattoo
4–26 August 2017
edintattoo.co.uk

Edinburgh International Festival
4–28 August 2017
eif.co.uk

Edinburgh Festival Fringe
4–28 August 2017
edfringe.com

Edinburgh International Book Festival
12–28 August 2017
edbookfest.co.uk

Scottish International Storytelling Festival
20–31 October 2017
scottishstorytellingcentre.co.uk

Edinburgh's Hogmanay
31 December 2017–1 January 2018
edinburghshogmanay.com

Edinburgh International Science Festival
31 March–15 April 2018
sciencefestival.co.uk

EDUCATION AND OUTREACH

In addition to our Festival we deliver an extensive education programme, inspiring Scotland's young learners with the wonder of science and technology and helping teachers deliver the Curriculum for Excellence. *Generation Science* brings interactive science shows and workshops to primary schools all over the country and *Careers Hive* gives thousands of secondary pupils a unique immersive STEM focused careers experience. Find out more at sciencefestival.co.uk/education.

HEADLINE SPONSOR: GENERATION SCIENCE



PRINCIPAL FUNDING PARTNERS



MAJOR FUNDING PARTNERS



FUNDING PARTNERS



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Generation Science Club is a network of individuals and companies who encourage the next generation to engage with science, technology, engineering and maths. *Generation Science* travels to primary schools all across Scotland, delivering world-class shows and workshops. By donating funds to support our work, *Generation Science Club* members ensure that our activities can be enjoyed by all pupils – wherever they are and whatever their economic background.

GENERATION SCIENCE CLUB MEMBERS IN 2016/17

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 And to all those who prefer to remain anonymous

To find out more please contact our Development team on 0131 553 0324 or email development@scifest.co.uk. Further information is available online at sciencefestival.co.uk/support-us.

Edinburgh

Mini Maker Faire®

GET IT MADE

**SUNDAY 16 APRIL
10AM-5PM
SUMMERHALL**

It's back! A family-friendly day out showcasing the diversity of human creativity, bringing all sorts of makers, crafters, tinkers, tailors and geeks together under one big roof.



Edinburgh Mini Maker Faire is independently organised and operated under licence from Maker Media Inc

Make:
makezine.com

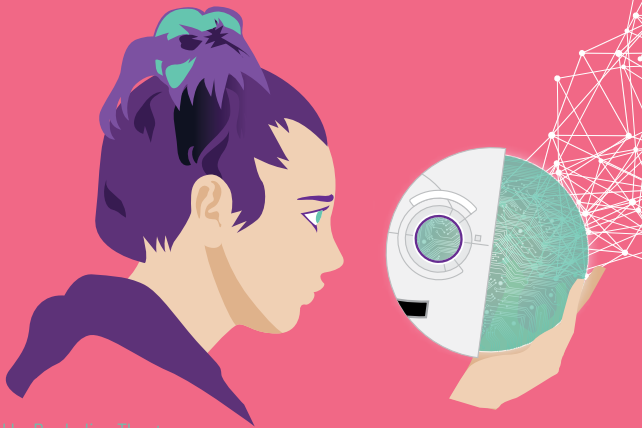
Supported by



WINNER Best Production for Children and Young People, Critics Awards for Theatre in Scotland

UNCANNY VALLEY **ON SALE NOW**

Tuesday 4–Saturday 8 April
12pm and 2.30pm • Festival Theatre Studio



Produced by Borderline Theatre Company and Ayr Gaury

LOST AT SEA **ON SALE NOW**

Tuesday 11–Saturday 15 April
12pm and 2.30pm • Festival Theatre Studio



Produced by Catherine Wheels Theatre Company



Lost at Sea and Uncanny Valley commissioned by Edinburgh International Science Festival working in partnership with Imagineate and supported by Creative Scotland through the Scottish Government's Edinburgh Festivals Expo Fund