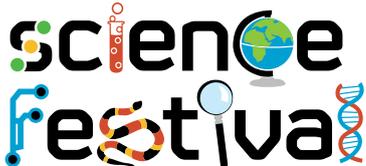


EDINBURGH INTERNATIONAL



EDINBURGH INTERNATIONAL

SCIENCE FESTIVAL

4-19 APRIL 2015



ONLINE BOOKING: sciencefestival.co.uk

BOOKING HOTLINE: 0844 557 2686

EDINBURGH INTERNATIONAL SCIENCE FESTIVAL SUPPORTERS

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SUMMERHALL


THE UNIVERSITY of EDINBURGH

WELCOME TO THE IDEAS FACTORY



We're celebrating the role of the Science Festival as a hub for information, ideas and innovation and production runs from 4–19 April. Join us over two weeks as we transform the halls, galleries, theatres and gardens of Edinburgh into *The Ideas Factory*.



BROWSE OUR EVENTS ONLINE

Visit our new website where you can filter and view our programme in your own way. You can search by date, event type, subject matter, age range, venue and much more. Find us on Facebook or Twitter @EdSciFest for festival information and exclusive ticket offers.

The Ideas Factory cover image, p.3 and p.30–31: art direction by Joshua Smythe and photography by Aly Wight on location at the Glencorse Water Treatment Works, Midlothian. With thanks to Scottish Water.

WHAT'S ON AT THE SCIENCE FESTIVAL?

FOR FAMILIES (P.6–29)

During the school holidays, the Science Festival provides exciting, engaging and educational activities the whole family can enjoy. Our flagship venue at City Art Centre is full of the unique immersive workshop experiences that the Science Festival is famous for, while Summerhall stages are bursting with some of the best science performers from around the world and technical workshops for older children. Don't miss our partner events at National Museum of Scotland and Royal Botanic Garden Edinburgh.

Our programme of events and days out suitable for families are listed by venue. To ensure the best possible experience for all our visitors, most events carry a minimum age recommendation. We ask parents to bear these in mind when choosing events for their children.

FOR ADULTS – AGES 14+ (P.30–61)

Science Festival Events is our programme of discussions, debates, workshops, screenings and nights out – all with a scientific twist. Our main venues are Summerhall, The Queen's Hall and the National Museum of Scotland. Don't miss *GastroFest*, *Brainwaves* and *LateLab* – we've got editorial strands in the events section that will provide full information. The adult events 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 will be marked with AGE 18+ next to the listing. This restriction is in place due to event content and/or venue licensing laws. Identification will be required and under 18s will not be admitted under any circumstances.

FOR BOX OFFICE AND BOOKING INFORMATION SEE P.62

WITH SPECIAL THANKS TO ALL OUR PARTNERS



The Edinburgh International Science Festival is produced annually by the Edinburgh International Science Foundation, an educational charity whose mission is to inspire, encourage and challenge people of all ages and backgrounds to explore and understand the world around them. We couldn't achieve this without the support of our funding partners, who allow us to engage with more than a quarter of a million people every year.

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WITH THANKS

Apache
Northlink Ferries
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Vento Ludens

EDINBURGH INTERNATIONAL SCIENCE FESTIVAL



GENERATION SCIENCE CLUB

We would like to thank Generation Science Club members for their support of Edinburgh International Science Festival's schools touring programme. Generation Science Club is a network of individuals and companies dedicated to engaging the next generation in science and technology. Members of the club donate funds to help ensure our school shows and workshops can be enjoyed by all pupils – wherever they are and whatever their financial background. With particular thanks to:

MEMBERS

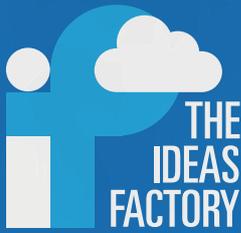
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THE IDEAS FACTORY

Welcome to *The Ideas Factory*. Clock in, catch up with friends and find out what we've got in production. Here's an overview of what to expect from our main venues and programme strands. Enjoy!

PROGRAMME STRANDS

CITY ART CENTRE

The Ideas Factory's family venue is a science playground packed full of workshops, shows and interactive events, perfect for entertaining the kids over Easter. Adults can join in too – don't miss our opening party *Science Festival Lates*.

FAMILIES



ADULTS

PAGES 6–11

PAGE 32

FAMILIES



ADULTS

PAGES 18–25 AND 30–61

LIGHT AND ENLIGHTENMENT
illuminating ourselves and the world

BRAINWAVES
exploring one of the universe's most mysterious objects

THE READING EXPERIMENT
uniting the worlds of science and words

ENERGY AND ENVIRONMENT
an important programme debating our climate future

GASTROFEST
a mini festival of food and drink... and science!

NUMBERS THAT MATTER
probing big data and the stats behind our lives

SUMMERHALL

The central hub of *The Ideas Factory*, during the day this venue is alive with activities and shows for children and families while evenings are packed with entertaining events for adults and teenagers. Visit our pop-up science bookstore from Blackwell's and mingle with scientists and artists in The Royal Dick Bar.

NATIONAL MUSEUM OF SCOTLAND

The Museum's factory floor includes free daytime pop-up activities in the Grand Gallery and workshops in the Learning Centre from The University of Edinburgh. Adults can head along after hours for our not-to-be-missed, out-of-this-world space party and events and discussions in the auditorium.

FAMILIES

PAGES 14–17



ADULTS

PAGES 30–61

ROYAL BOTANIC GARDEN EDINBURGH

The Botanics will be generating hands-on workshops and fun activities for all ages - head down to the Garden for Expedition Botanics and the chance to try some dining on the wild side.

FAMILIES

PAGES 12–13



ADULTS

PAGES 30–56

AROUND EDINBURGH

The Ideas Factory has production lines all over Edinburgh with entertaining events, exhibitions and activities to suit all ages. Look out for our programmes at Edinburgh International Conference Centre, The Queen's Hall, St Andrew Square and at partner venues around the city.

FAMILIES

PAGES 26–29



ADULTS

PAGES 30–61

CITY ART CENTRE

Open daily Saturday 4–Saturday 18 April
(not Sundays) 9.30am–4.30pm

During the Science Festival, we transform Edinburgh's City Art Centre into a science playground packed full of workshops, shows and interactive events.

HOW TO BOOK

A Day Pass gets you into City Art Centre to explore as many events as you like. The events are a mixture of bookable and drop-in sessions. Pre-booking your Day Pass and a selection of bookable events is strongly advised to avoid queues and disappointment.



VENUE SPONSOR

Cirrus Logic is passionate about science and technology and is thrilled to support the Science Festival at City Art Centre. Cirrus Logic is a premier supplier of high-precision analog and digital signal processing components for some of the world's highest profile consumer electronics products.

cirrus.com



NEW
ALL AGES

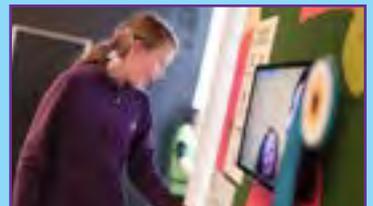
21ST CENTURY BRAIN

Even in today's world of advanced technology, the human brain is still the most complex structure known to man, containing almost 100 billion nerve cells that work together to control your behaviour. Using the latest technology, computer games and hands-on challenges for children and adults, we'll explore this mind-blowing organ – how it controls everything from your movement to your personality, and how it is affected by dementia.

Saturday 4 April– Saturday 11 April
drop-in

Supported by

**Alzheimer's
Research UK**
Defeating Dementia



ALL AGES

MANIC MONSTER HUNT

Get your hands on the world's best video technology used in surveillance operations, control the equipment and hunt for monsters hiding around the building. Look out though, you are being watched!

drop-in

Supported by



IndigoVision



NEW ALL AGES
WILD ABOUT SCOTLAND BUS
 Hop on board the *Wild About Scotland Bus* to marvel at the wonders of native Scottish wildlife. Packed full of interactive materials, our experts will take you into the watery world of the beaver, the wild existence of the highland tiger (the Scottish wildcat) and the wee lives of minibeasts. The double-decker wild bus spends its days travelling to all corners of Scotland delivering the *Wild About Scotland* education programme to P6 and P7 students.

NEW ALL AGES
CARNIVAL OF THE MIND
 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 and hall of mirrors. Brand new for 2015, this is all the fun of the fair but with added science!

ALL AGES
CHAIN REACTOR
 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.

ALL AGES
COSY COSY GAME SHOW
 A game show for parents and children in which we challenge you to work out how to stop heat leaking from model houses. Play the game against the clock and try to beat those around you by saving the most energy, and money!



Friday 10, Saturday 11 April
 10am-4pm | drop-in
 Free | (Market St, Outside City Art Centre, Summerhall Courtyard on Sunday 12 April)

drop-in
 Supported by

 The British Psychological Society
 Promoting excellence in psychology


drop-in
 Supported by

 Scottish Gas
 Looking after your world

 natural scotland
 SCOTTISH GOVERNMENT



ALL AGES
SCIENCE MINI CINEMA
 Our *Science Mini Cinema* screens a series of short films and documentaries from around the world. Sit down, relax and enjoy.



NEW ALL AGES
TECH SHOWCASE
 Discover some amazing cutting-edge technology in our terrific *Tech Showcase* throughout the City Art Centre. Look out for our intriguing interactive exhibits that will allow you to get hands-on with some fascinating gadgets and gizmos and find out how they work.



NEW AGES 3+
TIMMY THE TURBINE
 Snuggle into the story tent where our Storytelling Scientists are waiting to take you on an amazing adventure... Join *Timmy the Turbine* on his journey as he searches for a new home, learning fun songs and rhymes along the way and making something special to take home with you.



NEW AGES 3+
UNDER 5S TRAIL
 Have fun learning about science as you journey through our special trail for smaller scientists. Look out for a host of activities for under 5s throughout the City Art Centre including the chance to build your own colour wheel and create a spinning toy.

drop-in
 Supported by


drop-in
 10am-4pm (half-hourly) | 20 mins
 Bookable
 Developed by Vento Ludens

drop-in



NEW AGES 5+

LITTLE SPARKS

Get creative with circuits and discover what electricity does, working 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 your very own device.

10am–4pm (hourly) | 45 mins

Bookable

Supported by



NEW AGES 5+

RAMPAGING CHARIOTS RACE

Race a powerful robot around a challenging obstacle course then pitch your skills against your opponent in our Robot Football Champions League.

drop-in

Presented by Selex ES



NEW AGES 5+

SECRET LIFE OF CORAL

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.

drop-in



NEW AGES 7+

ER

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. Learn the medical names for parts of the body and discover the tools a surgeon needs to do their job.

Please note: this workshop is closed with no viewing area for parents.

10am–4pm (hourly) | 45 mins

Bookable

Supported by



NEW AGES 7+

PONGY POTIONS

Prepare your nostrils for some of the stinkiest smells imaginable and design your own sweet-smelling perfume (but please leave your natural stinks at home!) Test your senses in our blindfold taste challenge and uncover the secrets of the science of scent. Can you blend smells to create a nasal nirvana?

10am–4pm (hourly) | 45 mins

Bookable



NEW AGES 7+

VISUAL-EYES

Explore your eyes, inside and out. Peek inside our giant eye to see how eyes really work. Dissect eyeballs and play with lenses to uncover the secrets of vision. Learn about all the different parts of your eye and what they do.

drop-in



AGES 5+

SPLAT-TASTIC

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.



AGES 5+

ENERGISE!

Energise! is packed full of high energy, interactive activities to keep you fighting fit. Journey through a giant digestive system as we explain basic human biology and what impact the food you eat has on your body. Find out what you can do to stay healthy in this energising exploration of how the body works.



AGES 5+

JUNGLE SAFARI

Put on your safari gear and embark on an incredible and memorable journey through the deepest, darkest regions of the jungle. Our team will help you discover the fascinating world of animal communication and learn more about the amazing range of sounds the creatures of the jungle make.

Please note: this workshop is closed with no viewing area for parents.



AGES 5+

PHOTOLAB

Create and develop your own beautiful picture to take home by arranging unusual objects on a glass plate and exposing the pattern on to a piece of photographic paper in the darkroom. Chemistry has never been so cool.

10am–4pm (hourly) | 45 mins

Bookable

10am–4pm (half-hourly) | 20 mins

Bookable

10am–4pm (half-hourly) | 45 mins

Bookable

drop-in

Supported by



AGES 8+

BLOOD BAR

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*.

drop-in



AGES 8+

CSI: CRIME SCENE INVESTIGATION

A crime has been committed; can you help us solve it? Become a forensic scientist in our special *Crime Scene Investigation* workshop. Study the crime scene and decipher the clues left behind by finding fingerprints, identifying soil samples and investigating blood. Can you solve the mystery and help us catch the criminal?

Please note: this workshop is closed with no viewing area for parents.

10am–4pm (hourly) | 45 mins

Bookable



AGES 8+

RAMPAGING CHARIOTS WORKSHOP

Race a powerful robot round a challenging obstacle course. Once you've seen what a robot is capable of, create your own in a special workshop where you will learn how to construct, design and build a Rampaging Chariot from scratch. Once driven, never forgotten!

10am–3pm (hourly) | 45 mins

Bookable

Presented by Selex ES

TICKET AND VENUE INFO

CITY ART CENTRE OPENING HOURS

Saturday 4–Saturday 18 April
(not Sundays)
9.30am–4.30pm
Allow 4–5 hours for your visit

FACILITIES

Packed lunch area, secure buggy park, cloakroom, toilets, baby changing, café and shop

A CLEANER, GREENER FESTIVAL

Please use public transport when visiting the City Art Centre. Show us your bus or train ticket (or your bike!) when you arrive and receive a Science Festival gift. See p.62 and p.64 for public transport information.

DAY PASSES

Adult	£7.50
Adult concession	£7
Child aged 7+	£9.50
Child aged 3–6	£7
Child under 3	FREE
Registered unemployed	£5
(for each family member up to 6 people. ID required)	



EARLY BIRD BOOKING

City Art Centre Weekends
Book over the phone or in person before 28 March and get £2 off all children's Day Passes on Saturday 4 April, Saturday 11 April and Saturday 18 April. Children must be accompanied by an adult.

BOOKABLE EVENTS

Many of our events are available to drop into during your visit. However some do have a limited capacity and should be booked in advance. The events are marked as bookable in their entry. You can reserve up to three workshops per child's Day Pass purchase. Please use the schedule opposite to plan your day.

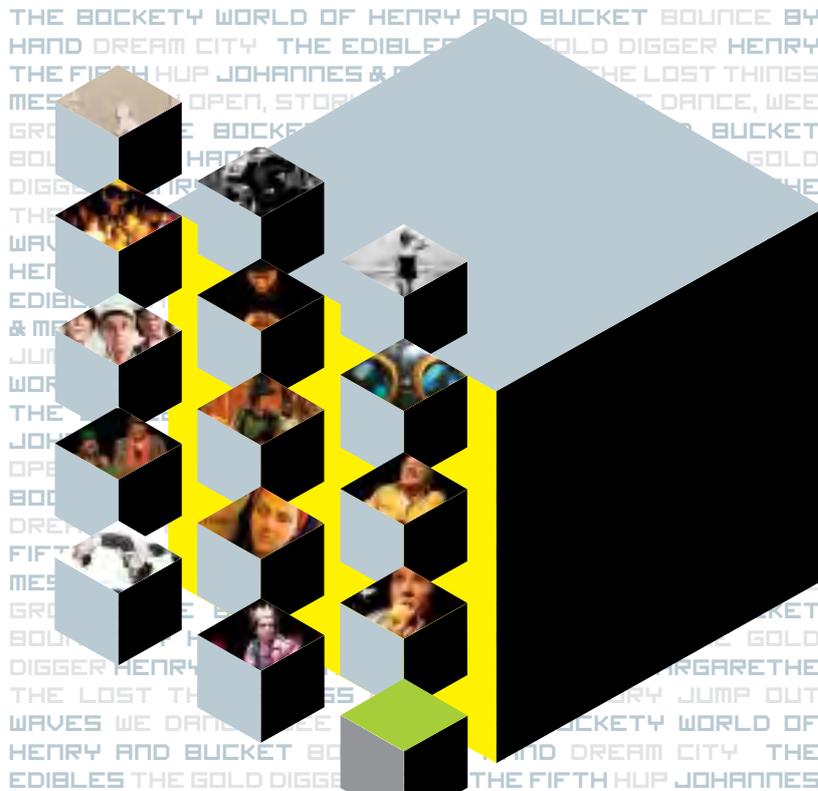
We would ask you to keep this schedule and the minimum age recommendation in mind when selecting workshops for your child.

GIFT AID SCHEME

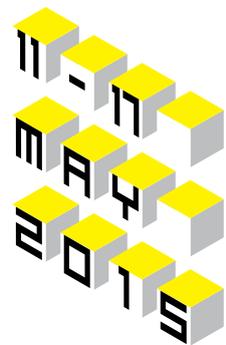
The Edinburgh International Science Foundation, which runs the Edinburgh International Science Festival, is an educational charity and all ticket prices for City Art Centre events include a 10% donation. This allows us to reclaim the tax you pay to visit through the Gift Aid Scheme; every pound you pay 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: adults (£6.80), adult concessions (£6.36), child aged 7+ (£8.65), child aged 3–6 (£6.36).

giftaid it

LET'S GO GREENER TOGETHER.
GREENERSCOTLAND.ORG



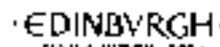
SCOTLAND'S INTERNATIONAL
FESTIVAL OF THE PERFORMING
ARTS FOR CHILDREN AND
YOUNG PEOPLE



FOR SCHOOLS AND FOR FAMILIES - ALL AGES AND STAGES AT VENUES ACROSS EDINBURGH
SIGN UP TO OUR MAILING LIST FOR MORE INFORMATION OR TO REQUEST A FESTIVAL BROCHURE BY VISITING WWW.IMAGINATE.ORG.UK

The Festival is produced by  promoting and developing performing arts for children and young people in Scotland

Imagine is a company limited by guarantee. Company No. SC115855 Charity No. SC016437

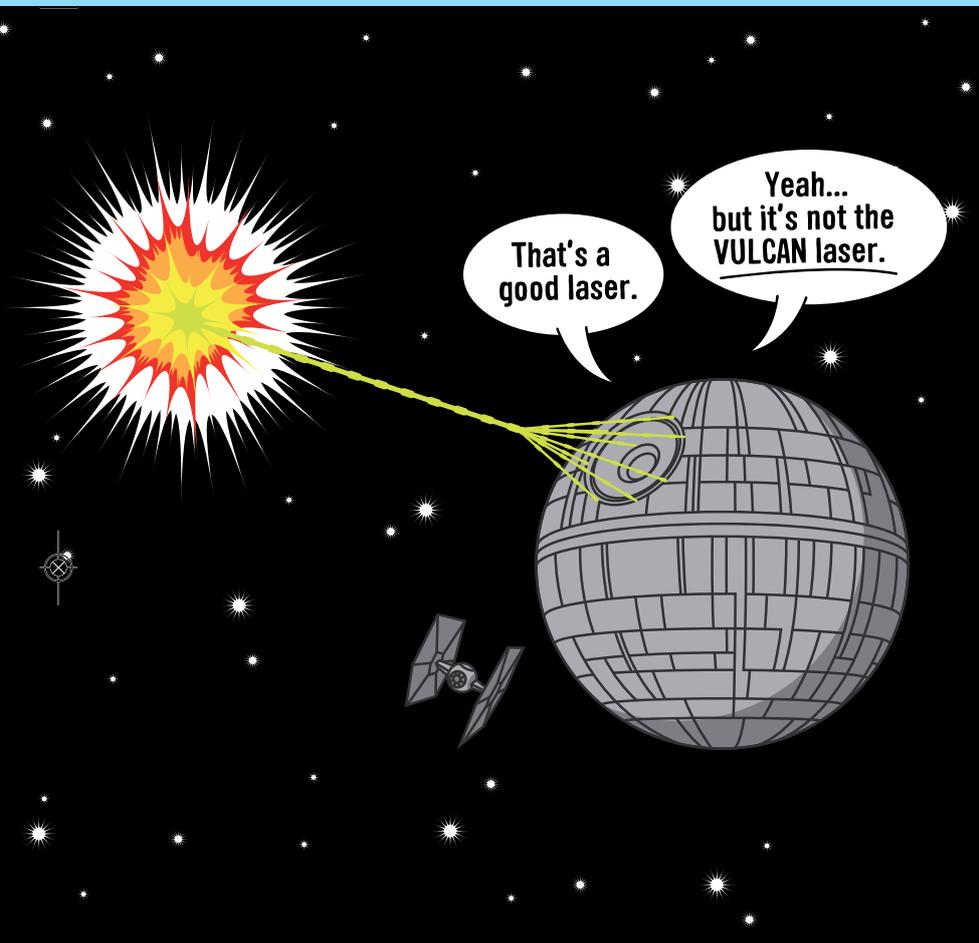


supported through the Scottish Government's Edinburgh Festivals Expo Fund

BOOKABLE WORKSHOP SCHEDULE

AGES	START TIMES	10.00	10.30	11.00	11.30	12.00	12.30	1.00	1.30	2.00	2.30	3.00	3.30	4.00	4.30
3+	TIMMY THE TURBINE 20min	█	█	█	█	█	█	█	█	█	█	█	█	█	
	SPLAT-TASTIC 45min	█		█	█	█	█	█	█	█	█	█	█	█	█
5+	*JUNGLE SAFARI 45min	█		█	█	█	█	█	█	█	█	█	█	█	█
	ENERGISE! 20min	█	█	█	█	█	█	█	█	█	█	█	█	█	█
	LITTLE SPARKS 45min	█		█	█	█	█	█	█	█	█	█	█	█	█
7+	PONGY POTIONS 45min	█		█	█	█	█	█	█	█	█	█	█	█	█
	*ER 45min	█		█	█	█	█	█	█	█	█	█	█	█	█
8+	RAMPAGING CHARIOTS 45min	█		█	█	█	█	█	█	█	█	█	█	█	█
	*CSI 45min	█		█	█	█	█	█	█	█	█	█	█	█	█

* these workshops are closed with no viewing area for parents.



Come and see the most powerful laser in the galaxy, **VULCAN!** And explore the incredible role lasers play in our lives in this **FREE** interactive exhibition at the Scottish Parliament.

The Incredible Power of Light exhibition

Wednesday 1 – Thursday 30 April 2015

www.scottish.parliament.uk/lasers

Like Follow

ROYAL BOTANIC GARDEN EDINBURGH

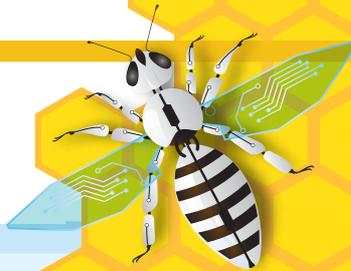
Saturday 4–Sunday 19 April
Garden open daily 10am–6pm

Find hands-on workshops and fun for all the family at the Botanics with activities, events and exhibitions to suit all ages.

Entry to the Garden is free. There is an admission charge for the Glasshouse, but you can get in free with an Expedition Botanics ticket.



Royal Botanic Garden Edinburgh



WORKSHOP AGES 5+

BRIGHT BREAD AND CRAFTY CRANACHAN

Join food scientists from The Rowett Institute of Nutrition and Health in a quest to improve Scotland's diet as you make and taste familiar Scottish recipes with a healthier twist. Recipes are taken from the Institute's new book, which exchanges and enhances ingredients to make these delicious dishes healthier and more nutritious.

7 February–7 June | 10am–5.45pm **URBAN BEES** See page 32
7 March–5 July | 10am–5.45pm **HONEYSCRIBE BY AMY SHELTON** See page 33
4 April | 3pm **COFFEE WITH A SHOT OF SCIENCE** See page 34
4 April | 7pm **CROP CIRCLE** See page 35

Wednesday 8–Thursday 9 April

11am–4pm | drop-in

Free | Real Life Science Studio, John Hope Gateway

ONLINE BOOKING: sciencefestival.co.uk BOOKING HOTLINE: 0844 557 2666



WORKSHOP AGES 5+

BUZZ AROUND THE BOTANICS

Join the Bumblebee Conservation Trust and the Open Air Laboratory in the hunt for bees and other minibeasts at the Botanics. Pick up your guide to identification and a recording sheet, explore the Garden, noting what you see, then add your results to our big map. All young scientists taking part will receive an activity pack to take home.



WORKSHOP AGES 5+

GO WILD!

Join the RSPB at the Science Festival and discover the wild elements of their conservation work across the world and closer to home, from garden birds to albatrosses and hedgehogs to Sumatran tigers. Come and be part of something wild.



WORKSHOP AGES 5+

FARMYARD ANIMALS: FRIENDS AND FOES

A hands-on, family-friendly session with activities, storytelling and interactive displays about the lives of farm animals. Moredun scientists show and tell how they help control pests and diseases, which leads to healthier and happier sheep, cows, pigs and chickens, and is better for the environment.



WORKSHOP AGES 5+

JUNIOR SCIENTIST TRAINING SCHOOL

Have you ever wondered what it would be like to work in agricultural science? Learn about the science of farming with real scientists from Scotland's rural college as you complete three challenges – an experiment, a game and a craft – to gain your Junior Scientist certificate.

Saturday 11 April
11am–4pm | drop-in
Free | Real Life Science Studio, John Hope Gateway

Saturday 11 April–Sunday 12 April
11am–4pm | drop-in
Free | Atrium, John Hope Gateway

Sunday 12–Monday 13 April
11am–4pm | drop-in
Free | Real Life Science Studio, John Hope Gateway

Tuesday 14 April
11am–4pm | drop-in
Free | Real Life Science Studio, John Hope Gateway



WORKSHOP AGES 4+

EXPEDITION BOTANICS

Join *Expedition Botanics* in the search for traditional knowledge about Colombian rainforest plants. Learn how to survive using the resources of the forest and help to discover how the people of the Amazon use plants in daily life. Collect stamps in your passport as you complete activities.

JOIN THE EXPEDITION!

FOREST SURVIVAL

Learn how the forest can supply all your basic needs and choose what to take on your journey.

PLANT HUNTERS

Track down the new species of plant that your research has shown grows in this part of the Colombian rainforest.

FOOD OF THE GODS

Find the chocolate tree and discover how it provides a variety of food and drink.

AMAZONIAN ANIMALS

See if you can spot some rainforest animals.

GARDENS IN THE FOREST

Taste the yuca plant, an important crop in the forest gardens, called '*chagra*' in Colombia.

WISE PEOPLE

See the achiote plant, used for body painting, and have a design painted on your face to show your plant knowledge.

INCREDIBLE EDIBLES

Sow seeds to take home and find out how lessons from the forest gardens of Colombia can help you to grow your own food at home.



WORKSHOP AGES 5+

HIVE STORY

Beekeeping is having a revival, with more and more of us getting involved, even in cities. A new generation of beekeepers is taking advantage of the variety of plants our cities provide for foraging bees. Join Edinburgh and Midlothian Beekeepers Association to learn more about bees and what they do for us.



Thursday 9–Wednesday 15 April
11am–3.45pm | 60 mins | drop-in
£5/£3 (under 3s free) | Palm House

Expedition lunchboxes are available from the Terrace Café for £3.95 and will help keep your young explorers going all day! There will also be a range of Colombian-themed dishes to enjoy in the Gateway Restaurant.

Friday 10 April
11am–4pm | drop-in | Free | Real Life
Science Studio, John Hope Gateway



SHOW AGES 3+

3 BEARS

The shiny metal world of Goldilocks meets the lovely natural wooden world of the three bears... and the result is a very sticky adventure all round as Goldilocks and the bears make friends and cook up a wonderful porridge recipe together. Join Clydebuilt Puppet Theatre in the kitchen where, using simple kitchen implements, they tell the classic tale in an intriguing and highly entertaining new way.

Wednesday 15–Thursday 16 April
11am and 2pm | 50 mins
£5 | Real Life Science Studio, John Hope Gateway
Part of Puppet Animation Festival



WORKSHOP ALL AGES

EDIBLE GARDENING PROJECT SPRING FESTIVAL

Come and join in with the Edible Gardening Project as we get started on the vegetable patch for another year. From growing chillies on the windowsill to creating a vegetable garden with habitat for wild pollinators, there will be information and hands-on activities for all the family. Take part in our fascinating *Really Wild Vegetable Trial*, comparing familiar veg varieties with their wild relatives, and sample our tasty seasonal garden produce. Supported by players of People's Postcode Lottery.

Friday 17–Sunday 19 April
1–4pm | drop-in
Free | Real Life Science Studio, John Hope Gateway

16 April | 7pm **DINING ON THE WILD SIDE** See page 56

ALSO AT THE BOTANICS...

Two exhibitions in the John Hope Gateway will explore the buzzing world of bees. *Urban Bees* (p.32) looks at the wild bees that inhabit our parks, gardens and street-sides and shows how our cities could help them flourish. And *Honeyscribe*, by artist Amy Shelton (p.33), takes a contemporary approach to the ancient Egyptian role of 'honey scribe', using pressed flower samples to map the diverse wild, cultivated and agricultural plants essential to honey bees' survival.

On Saturday 4 April, the Botanics will explore the world of food and drink pouring *Coffee with a Shot of Science* (p.34) and examining whether wild relatives of familiar vegetables could create a new breed of crops with improved taste and enhanced disease-fighting potential in *Crop Circle* (p.35).

The current gastronomic trend for wild food will also be the subject of *Dining on the Wild Side* (p.56) on Thursday 16 April, a discussion and gourmet three-course meal with former Noma chef Ben Reade and TV presenter and author Alys Fowler.

See individual entries in the Science Festival Events section of this brochure for more details.



NATIONAL MUSEUM OF SCOTLAND

FAMILY EVENTS

Open daily Saturday 4–Sunday 19 April | 10am–5pm

Enter *The Ideas Factory* and explore activities for the whole family around the museum. Look out for pop-up science in the Grand Gallery throughout the Festival, featuring demonstrations, short performances and mini-presentations of some of this year's Festival highlights.

FAMILY EVENTS FROM THE UNIVERSITY OF EDINBURGH 4–18 April | 10am–4.30pm (9 and 14 April | 12pm–4.30pm)

Discover science with real scientists from The University of Edinburgh. Visit the National Museum of Scotland's Learning Centre for free, family-friendly drop-in activities, workshops and shows.



THE UNIVERSITY
of EDINBURGH



EXHIBITION
ALLAGES

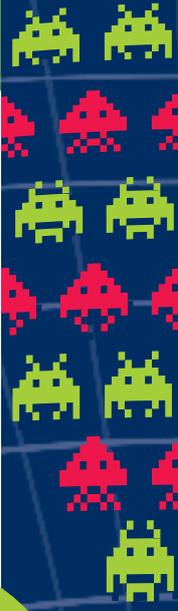
GAME MASTERS

Featuring over 100 playable games, including the likes of *Pac-Man*, *Mario Kart*, *Minecraft* and *SingStar*, *Game Masters* showcases the work of more than 30 leading videogame designers.

The exhibition explores the development of videogames through interviews with game designers, rare original game artwork and interactives, as well as looking forward to how independently produced games are leading the way in design, aesthetics and game play. Created by the Australian Centre for the Moving Image, Melbourne, supported by the Victorian Government.

Until Monday 20 April

Adult £10/£8, Child £6.50 (under 5s free), Family of 3 £23, Family of 4 £28, Students £5 (Tuesdays only) | National Museum of Scotland Exhibition Gallery 1, Level 3



ACTIVITY
AGES 5+

UNDERSTANDING OUR WORLD

Edinburgh is the birthplace of geosciences, and scientists here are still investigating everything about the Earth, from the ocean floor to the atmosphere. Discover some surprising things you didn't know about the world we live in, the hazards it faces, and what we can do to protect it.



ACTIVITY
AGES 5+

BIO-DISCOVERIES

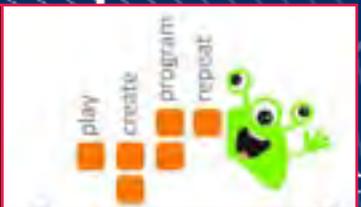
Get hands-on and make some exciting discoveries under the microscope. Find out from our biologists what new things they've discovered this year about animals, plants, microorganisms, cells and much more, then take your turn at the microscope and see what you can find.



WORKSHOP
AGES 5+

LOST IN SPACE

What is it like to grow up in the vastness of the Milky Way? Should we love or fear the universe? What happens when two galaxies collide? Lose yourself in the depths of the cosmos in an immersive and interactive experience complete with music and zooming images of the universe and remote sensing interactive technology. Perfect for ages 5+ and their families.



WORKSHOP
AGES 8+

CODE YOURSELF!

Try your hand at computer programming using Scratch: a fun and easy to use platform. You'll learn basic software engineering techniques, have a go at creating simple computer programmes, then build your very own computer game! For ages 8+ but perfect for ages 10–14.

Saturday 4–Wednesday 8 April | drop-in
Free | Learning Centre, Level 2

Saturday 4–Wednesday 8 April | drop-in
Free | Learning Centre, Level 2

Saturday 4–Wednesday 8 April | 11am
1 hour
Free (ticket required) | Learning Centre,
Level 4, Seminar Room

Saturday 4–Wednesday 8 April
12pm and 3pm | 1 hour
Free (ticket required) | Learning Centre,
Level 4, Studio 1



AGES 5+
ACTIVITY

LEARNING ENERGY SYSTEMS

How can we reduce the amount of energy that schools use in things like lighting and electrical equipment? Drop in to try some devices designed to solve this problem by allowing people, objects, sensors, data and machines to interact, creating opportunities to use energy more wisely.

Saturday 4–Wednesday 8 April | drop-in
Free | Learning Centre, Level 2

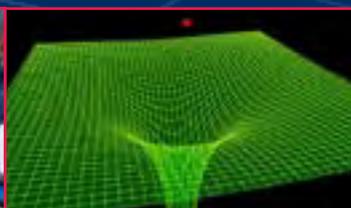


AGES 5+
ACTIVITY

THE SCI-FUN ROADSHOW

Join the fun at this exciting interactive project featuring more than fifty incredible science activities. Control lightning, see a hole in your hand, solve a crime, separate (fake!) blood, become part of a human circuit and then relax in our spinning chair. Pop in for a moment and stay for hours!

Saturday 4–Wednesday 8 April | drop-in
Free | Hawthornden Court

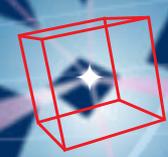


AGES 5+
ACTIVITY

BLACK HOLES AND EXTREME GEOMETRY

What happens when geometry gets extreme? In a black hole, space is so distorted that nothing can escape, not even light. Find out how maths can help us shed light on these darkest regions of the universe.

Saturday 4–Wednesday 8 April | drop-in
Free | Learning Centre, Level 2



EXHIBITION
ALL AGES

MARS ROVER

Come face to face with a scale model of the Curiosity Mars Rover, NASA's most technologically complex and famous rover which was designed and virtually tested using Siemens' software. Discover the features that allow the rover to explore the planet's surface, and how it's working to determine if Mars has ever had an environment suitable for life.

Saturday 4–Thursday 16 April | drop-in
Free | Grand Gallery

Presented by
SIEMENS



WORKSHOP
AGES 7+

HYPERGEOMETRY: MATHS IN 4D

What is the fourth dimension and how can we try to picture it? Let maths blow your mind as you build amazing 4-dimensional shapes using Zometool, a plastic construction kit, exploring geometric shapes and what we mean by dimension. For ages 7–16.

Sunday 5–Tuesday 7 April | 1pm | 1 hour
Free (ticket required) | Learning Centre, Level 4, Seminar Room



5 April | 1pm DIMS AURS AND THE MAKING OF THE MODERN WORLD See page 36
5 April | 3pm FORENSIC FICTION MEETS FORENSIC FACT See page 36
6 April | 1pm HEALTHY LUNCHES: P53, THE GENE THAT CRACKED THE CANCER CODE See page 37

WORKSHOP
AGES 5+

LAB RATS IN SPACE: EXPLORE YOUR UNIVERSE

The museum lab rat scientists have been to space and back! Help them relive their astronomical adventures through fun demonstrations and hands-on experiments. Perfect for ages 5–8 with an adult helper.

Tuesday 7 April–Saturday 11 April
10.30am, 11.30am, 2.30pm, 3.30pm | 45 mins
Free (book online at nms.ac.uk/sciencefestival or sign up on the day) | Learning Centre, Level 4, Studio 2

7 April | 1pm HEALTHY LUNCHES: MOTOR NEURONE DISEASE See page 38
8 April | 2.30pm THE WHISPERING MIND See page 41



FAMILY EVENTS AT NATIONAL MUSEUM OF SCOTLAND

FAMILY EVENTS FROM THE UNIVERSITY OF EDINBURGH



AGES 5+

ACTIVITY

BEYOND THE HIGGS BOSON

Did you know that we don't understand what 96% of the universe is made of? But you can explore the other 4% with our particle physicists! Drive a particle accelerator, catch cosmic rays, and blow your mind over what the discovery of the Higgs Boson particle means for the big questions about the universe.

Thursday 9–Monday 13 April | drop-in
Free | Learning Centre, Level 2



AGES 5+

ACTIVITY

POP-UP ENGINEERING

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.

Thursday 9–Monday 13 April | drop-in
Free | Learning Centre, Level 2



AGES 5+

ACTIVITY

LIGHT CHEMISTRY

To celebrate UN International Year of Light 2015, our chemists invite you to explore the fascinating properties of light and light-based technologies that help us make electricity, take photographs and analyse chemicals. Make a rainbow, check out some colourful chemical reactions and enter our pinhole camera competition.

Thursday 9–Monday 13 April | drop-in
Free | Learning Centre, Level 2



AGES 6+

ACTIVITY

DISCOVER MEDICAL AND VETERINARY SCIENCE

Everyone knows what doctors and vets do, but what about medical and veterinary scientists? Their job is to find out how humans and animals work and to find new ways to treat illness and injury. This is your chance to give it a try as you measure your blood pressure, play a stem cells game and explore how cancer treatments are discovered.

Tuesday 14–Saturday 18 April | drop-in
Free | Learning Centre, Level 2



AGES 6+

WORKSHOP

AMAZING IMMUNOLOGY

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.

Tuesday 14–Saturday 18 April | 12.30pm
1 hour
Free (ticket required) | Learning Centre, Level 4, Studio 1



AGES 8+

WORKSHOP

BRAIN BOX

What's in the Brain Box? There are clues inside but you'll need to use your brain to work it out! Become a brain scientist, find out how amazing your brain is and investigate how it works. Follow us on Twitter @brainboxone. For ages 8–12.

Tuesday 14–Saturday 18 April | 3pm
1 hour
Free (ticket required) | Learning Centre, Level 4, Studio 1



AGES 3 AND UNDER

WORKSHOP

ASTRO-TEENIES

A chance for very little ones to explore some of the fantastic things in the National Museum of Scotland as they reach for the stars in our space-themed story sessions. There'll be songs, science sensory activities and more. Perfect for ages 0–3 with an adult helper.

Tuesday 14 April–Sunday 19 April
10.30am, 11.30am | 30 mins
Free, limited spaces (book online at nms.ac.uk/sciencefestival or sign up on the day) | Learning Centre, Level 4, Studio 2

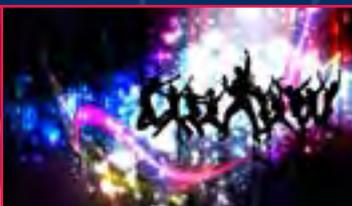


ACTIVITY
AGES 5+

WHO NEEDS SUPERCOMPUTERS?

What are supercomputers, what do we use them for and how do we make them work? Join us to find out the answers. Discover how supercomputers operate and how we use them to explore, understand and solve problems in palaeontology, cosmology and engineering.

Thursday 9–Monday 13 April | drop-in
Free | Learning Centre, Level 2



WORKSHOP
AGES 8+

DANCING LIGHT

If you think science and dance have nothing in common, think again. In this dance workshop you'll learn to move like a photon. We'll illustrate the features of light and its uses in everyday technologies using movement, dance, music and fun interactive activities. No dance experience needed. For ages 8–13.

Thursday 9–Monday 13 April
12pm | 1 hour
Free (ticket required) | Learning Centre,
Level 4, Studio 1



WORKSHOP
AGES 7+

WATER FOR THE WORLD

Water is the world's most valuable resource, but one in six people live without a clean supply. Our friendly engineering students will help you practice your survival skills, get your hands dirty, and learn how to make your very own portable sand filter. Amaze your friends with clean water wherever you go!

Friday 10–Monday 13 April | 2pm | 1 hour
Free (ticket required) | Learning Centre,
Level 4, Studio 1

9 April | 2pm SPOTLIGHT ONE: PHILOSOPHY AND THE SCIENCES See page 42
10 April | 1pm HEALTHY LUNCH: FAT PLANET See page 44

11 April | 1pm THE NATURE OF THE BEAST See page 46
11 April | 3pm AND THROUGH THE DARK THE BRILLIANT LIGHT See page 46
12 April | 1pm SERVING THE RECH See page 48
13 April | 1pm HEALTHY LUNCHES: CROWN'S See page 50



WORKSHOP
AGES 3+

ASTRO-TOTS

Toddlers will love our space science adventure as they explore some of the fantastic things in the National Museum of Scotland with space-themed stories, songs and mini experiments. Perfect for ages 3–5 with an adult helper.

Tuesday 14 April–Sunday 19 April
2.30pm, 3.30pm | 35 mins
Free (book online at nms.ac.uk/sciencefestival
or sign up on the day) | Learning Centre, Level
4, Studio 2



SHOW
ALL AGES

THE CHEMISTRY SHOW

Prepare yourself for bangs, colours, flames, foam and possibly learning something! How can we make cars that don't harm the environment? What happens when things get really cold? And why should you cover your ears when Paul Murray and Robin Andrews light a match? The vibrant chemistry show returns, jam-packed with experiments.

Wednesday 15–Thursday 16 April | 11am
| 1 hour
Free (ticket required) | National Museum of
Scotland Auditorium



SHOW
AGES 8+

SIMON MAYO: ITCHCRAFT

Itchcraft is the third book in BBC broadcaster Simon Mayo's series about Itchingham Lofte, a teenage element hunter and unlikely hero. Stumbling across an unknown radioactive element and trying to keep it out of the hands of those who want to use it for their own ends was hard enough. But when a school trip to Spain ends in exploding currency and rioting locals, Itch knows the lives of those closest to him are at risk and that he has to continue to look for answers, tracking down a deadly enemy who will stop at nothing to take his vengeance. Join Simon and one of our science communicators to explore the world of Itch and the science in the books. Simon will be available to sign books after the event.

Saturday 18 April | 1pm | 1 hour
£8/£6 | National Museum of Scotland Auditorium
Presented by Random House Children's Publishers

17 April | 2pm SPOTLIGHT ONE: SERIOUS GAMES See page 59

18 April | 3pm GAMEITY: MODERN PLAYING See page 60
19 April | 1pm SHINING A LIGHT ON THE BRAIN See page 61
19 April | 3pm OUR CLIMATE: OUR CULTURE See page 61

14 April | 1pm HEALTHY LUNCH: ALLERGIES See page 52

SUMMERHALL



INVESTMENT MANAGERS

Saturday 4–Sunday 19 April | 10am–late

Summerhall is back as the Edinburgh International Science Festival’s hub for 2015. During the day, our *Ideas Factory* will come alive with a series of activities for children and families and in the evening it will be filled with entertaining events for adults and teenagers.

You’ll find sensational science shows offering a world of new experiences for all ages along with interactive workshops for young people and adults that are full of scientific and creative challenges from building musical instruments to designing smartphone apps.

Listings of events for children and families are included in the following pages and full details of events for adults can be found in the Science Festival Events section, p.32–61.

Blackwell’s pop-up bookshop will be open every day in the courtyard chalet.

4 April and 6–17 April | 11.30am–8pm

5 April and 18–19 April | 10am–5pm

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.

bailliegifford.com

DINO DAY SATURDAY 4 APRIL

Join us for a day of prehistoric fun family activities. Play with robotic dinosaurs, discover dino fossils, meet Velma the Velociraptor and dig up the newest species of dinosaur yourself. There’ll also be the chance to try some dinosaur dressing-up, as well as face painting, colouring-in and, as it’s Easter, a dino egg hunt!



SATURDAY 4 APRIL – DINO DAY

AGES 5+
DINO DAY SHOW

ABOUTIMEYOU SAURUS: MEET THE NEWEST DINOSAURS

We are currently in the middle of a golden age of dinosaur discovery, with palaeontologists finding a new species of dinosaur somewhere around the world on average once a week! Just last year about 50 new species were found, ranging from one of the biggest long-necked dinosaurs ever discovered, to a four-winged dinosaur that could fly, to a weird long-snouted tyrannosaur, discovered in China by a team including **Dr Stephen Brusatte** from The University of Edinburgh. Join him as he introduces some of the most amazing new dinosaur discoveries and talks about his adventures digging up dinosaurs across the globe.

1.30pm | 30 minutes

£5, family ticket £16 (4 tickets) | Red Lecture Theatre

AGES 8+
DINO DAY SHOW

HOW TO BUILD A DINOSAUR!

Dinosaurs ruled the Earth for over 170 million years, but some of their skeletons defy our understanding of engineering principles, with their vast necks and giant bodies. Join **Prof Phil Manning** and **Dr Victoria Egerton** as they build a complete skeleton of Gorgosaurus, from the ground up, in under an hour. As they assemble their predatory tyrannosaur they will talk you through the function, biology, physiology and sheer awesomeness of dinosaurs. This is one lesson any aspiring palaeontologist cannot miss!

2.30pm | 1 hour

also on 12.30 Monday 6 and Tuesday 7 April
£5, family ticket £16 (4 tickets)
Dissection Room

AGES 5+
DINO DAY WORKSHOP

WHAT ON EARTH: WHEN AND WHERE?

Let **John Gordon-Reid** launch you on a journey of discovery and intrigue with a beautifully illustrated giant timeline of Natural Science. You’ll explore the 4.6 billion year-old story of life on this planet through hands-on workshop activities and with the help of the *What on Earth? Coat of Many Pockets*. What are the essentials of life? What can fossilised poo tell us? Who can find the creature from the clue?

3.30pm | 1 hour

£5 | Basement Gallery 3

Presented by What on Earth Publishing

SATURDAY 4 APRIL – DINO DAY

AGES 3+
SHOW

ISAAC, THE APPLE AND A BUMP OF THE HEAD

Not so long ago, a young man sat under a tree when 'OUCH!', an apple landed on his head! Join storyteller **Mara Menzies** for an exciting exploration into the wonderful world of Sir Isaac Newton, who discovered the phenomenon of gravity. Come and try your hand at some fascinating gravity and anti-gravity experiments, and don't worry, we'll try and stop you floating off into space!

10.30am and 12.30pm | 1 hour
£5, accompanying adults free (ticket required)
Yellow Room

AGES 7+
WORKSHOP

REALLY SMALL SCIENCE'S WORLD OF NANO!

Nanosized objects are surprisingly crucial to our lives, from the enzymes and proteins that keep us alive to the viruses that make us ill, and from washing powder and clean water to targeted drugs. This is your chance to find out about nanosized materials hands-on. You'll explore biological molecules by making your own nanojelly, use nanodirt to 'de-orange' a famous Scottish fizzy drink, play with nanosludge, draw your own nanoworld and discover the glow-in-the-dark properties of nanoglowtech.

10.30am, 12pm, 2pm | 1 hour
£5 | Basement Gallery 4
Presented by Really Small Science

AGES 8+
WORKSHOP

PAPER CIRCUITS

Learn the basics of electronics as you build circuits using only paper, scissors and copper tape. You'll also have the opportunity to use your new skills to create a great-looking light-up card with LEDs.

11am | 90 mins
£10 | Hacklab
Presented by Edinburgh Hacklab

AGES 5+
SHOW

WHAT ON EARTH: A JOURNEY THROUGH LIFE ON OUR PLANET

John Gordon-Reid will whizz you on a fast-moving journey covering the entire story of life on our planet using a giant timeline and his incredible coat of many pockets. Why did the dinosaurs prosper? Where did our oxygen come from? What are the White Cliffs of Dover? And is the *Ice Age* movie a true story? All this and much more will be answered when the pockets are picked...

12.30pm | 1 hour
£5 | Dissection Room
Presented by What on Earth Publishing



SUNDAY 5 APRIL

ALL AGES
SPECIAL EVENT

SCIMART

A farmers' market with a scientific twist, *SciMart* brings together food producers, researchers and chefs to reveal the fascinating science behind some of our favourite foodstuffs. With demonstrations from award-winning Edinburgh chef **Paul Wedgwood**, talks and tasty treats, *SciMart* brings you a packed menu and food for thought. New for this year is a mini-restaurant of food surprises for our younger visitors... Go to sciencefestival.co.uk for up-to-date listings of stallholders and full details of the talks programme.

11am–4pm | drop-in
£5 (under 12 free) | Throughout Summerhall
Supported by natural scotland SCOTTISH GOVERNMENT

MONDAY 6 APRIL

AGES 8+
WORKSHOP

VIDEO GAME DESIGN WITH KODU

Would you like to create and play your own video game using an Xbox controller? Then this ComputerXplorers workshop is for you! You'll use a graphical programming environment to programme and build games on a PC, using an Xbox controller to help you design your game quickly. You'll create a range of worlds and terrains and build characters whose movement, sound and vision can be controlled using an intuitive, icon-based programming language.

10.30am | 2 hours | on until Tuesday 7 April
£15 | Basement Gallery 4
Presented by ComputerXplorers

AGES 5+
SHOW

JOHN HINTON'S ENSONGLOPEDIA OF SCIENCE

Expect a trip into the atomic nucleus and up to the moons of Jupiter. Expect iridescent beetles, stridulating psyllids and hermaphrodite water lilies. Expect the unexpected. And expect it to rhyme. **John Hinton** has performed his musical comedies about Einstein and Darwin all over the world and has written songs for the Natural History Museum and Cambridge University Botanic Garden. In this special Science Festival performance he brings together a compilation of science songs you know and love, with his own compositions and some new songs written just for us.

12.30pm | 45 mins
£5, family ticket £16 (4 tickets) | Main Hall
Presented by Tangram Theatre Company

12.30pm HOW TO BUILD A DINOSAUR See page 18
1pm A VERY SHORT INTRODUCTION TO...GENES See page 36

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



WORKSHOP **AGES 8+**
APP DEVELOPER WORKSHOP
 Learn how to become an app developer and create and use your very own smartphone app. You'll learn the essentials of designing and programming a mobile app for iPhone or Android, using an intuitive and easy to use platform that's perfect for first-timers but also loaded with features for more adventurous developers.



SHOW **AGES 8+**
THE ORIGIN OF SPECIES...
...by means of natural selection or the survival of (r)evolutionary theories in the face of scientific ecclesiastical objections: being a musical comedy about Charles Darwin
 Calling all monkeys! This Edinburgh Fringe sell-out and international smash hit is a show for young and old alike, telling the incredible story of how Charles Darwin came to discover the secrets of evolution and why it took him over 20 years before he plucked up the courage to publish his remarkable idea. It's packed with big theories, terrible puns, brilliant physical comedy and six cracking original songs about everything from blasted boring barnacles to the perils of marrying your cousin.



SHOW **AGES 8+**
MURDEROUS MATHS WITH KJARTAN POSKITT
 Author of the *Murderous Maths* books Kjartan Poskitt brings the weird and fascinating world of maths to life in his extraordinary show full of jokes, puzzles, tales and much much more. Learning has never been so much fun!



WORKSHOP **AGES 14+**
SOLDER ON!
 Soldering is easy and we'll show you how. Starting with the absolute basics, you'll be shown the tools you need and how to make a solder joint, then you'll be able to get stuck in! Including your very own kit to solder and take home, this is your chance to learn a vital hacking skill.

2pm | 2 hours | on until Tuesday 7 April
 £15 | Basement Gallery 4
 Presented by ComputerXplorers

2.30pm | 1 hour | on until Tuesday 7 April
 £5, family ticket £16 (4 tickets)
 Dissection Room
 Presented by Tangram Theatre Company

2.30pm | 1 hour
 £5, family ticket £16 (4 tickets) | Main Hall
 Presented by Scholastic Publishing

7pm | 90 mins
 also on Wednesday 15 April
 £15 | Hacklab
 Presented by Edinburgh Hacklab



WORKSHOP **AGES 14+**
DRONE WHEEL LUTE
 Make a two-stringed electrical instrument that pulsates coloured light dependent on its volume, with magnetic coil pickups and a hand-cranked wheel. Part of the *Synæsthetic Drone Orchestra* project by sound artist Ed Devane and supported by Limerick City of Culture Legacy, you will learn a variety of skills from necked musical instrument construction and mechanisms to electronics and soldering, as well as fretting and improvisation with your new instrument. You are also invited to return as a performer in the *Synæsthetic Drone Orchestra* concert on Thursday 9 April.

3.30pm | 3 hours
 on until Thursday 9 April
 £40 | Basement Gallery 3



WORKSHOP **AGES 8+**
CODE CLUB WORKSHOP
 Join Code Club Scotland coordinators Martin Evans and Lorna Gibson for a full-on-fun hands-on coding workshop. You'll learn how computer programming works using a fun card game and code your own game using Scratch. You'll try some interactive electronics and use supercool Makey-Makeys to make a piano out of bananas. There will also be the chance to design and make your own games controller and build a brushbot robotic bug.

10.30am and 2pm | 90 mins
 on until Friday 10 April
 £10 | Basement Gallery 4
 Presented by Code Club Scotland



WORKSHOP **AGES 14+**
EXTREME SOLDERING: SURFACE MOUNT COMPONENTS
 Some hackers say surface mount soldering is hard because of the tiny components, but we'll show you it's really not that scary. Including your very own kit to build and take home, this session will show you the tricks and techniques that will help you solder on.

7pm | 90 mins
 also on Monday 13 April
 £15 | Hacklab
 Presented by Edinburgh Hacklab

10am, 10.45am, 11.30am TK-TAK-GLOW See page 21
 12.30pm INCANDESCENT BAGPIPES See page 21
 1pm A VERY SHORT INTRODUCTION TO... PARTICLE PHYSICS See page 40
 3.30pm DRONE WHEEL LUTE See page 20

TUESDAY 7 APRIL

WORKSHOP AGES 10+

TIK-TAK-GLOW

Build a simple percussion instrument with two heads, two beaters and an electronic circuit with an LED that lights up every beat. Part of the *Synæsthetic Drone Orchestra* project by sound artist Ed Devane and supported by Limerick City of Culture Legacy, you will learn a variety of skills while you create your new instrument and you are also invited to return as a performer in the *Synæsthetic Drone Orchestra* concert on Thursday 9 April.

10am, 10.45am, 11.30am | 30 mins
also on Thursday 9 April
£5 | Basement Gallery 3

10.30am VIDEO GAME DESIGN WITH KODU See page 19

SHOW AGES 8+

THE MARIE CURIE PROJECT

Marie Curie's incredible story is one of personal endurance in the face of unbelievable odds and her scientific achievements are almost unparalleled. **Tangram Theatre Company's** musical comedies about Darwin and Einstein have played to thousands over five years and this brand new show for 2015 will complete the trilogy, with your help. As research and development ahead of its Edinburgh Fringe premiere in August, the company will perform a work-in-progress extract, followed by an informal feedback session over tea and biscuits.

12.30pm | 1 hour
£3 | Main Hall
Presented by Tangram Theatre Company

WORKSHOP AGES 12+

INCANDESCENT BAGPIPES

Make bagpipes with three drone notes using silver and gold-coloured plastic sheets and embedded LEDs that match colour to pitch. Part of the *Synæsthetic Drone Orchestra* project by sound artist Ed Devane and supported by Limerick City of Culture Legacy. In this workshop you will learn a variety of skills from plastic welding and electronics. You are also invited to return as a performer in the *Synæsthetic Drone Orchestra* concert on Thursday 9 April.

12.30pm | 2 hours
also on Thursday 9 April
£20 | Basement Gallery 3

12.30pm HOW TO BUILD A DINOSAUR See page 18
1pm A VERY SHORT INTRODUCTION TO... FORENSIC PSYCHOLOGY See page 38
2pm APP DEVELOPER WORKSHOP See page 20
2.30pm THE ORIGIN OF SPECIES... See page 20



WORKSHOP ALL AGES

LIGHT DRAWING

Science and art have much in common and the nature and properties of light have intrigued them both. Photography is one of the best examples of where science and art merge, and this workshop with **Dr Kathryn Harkup** will teach you how to paint, sketch and doodle with light to create beautiful images, using long exposure photography and a bit of science along the way.

10.30am | 1 hour
on until Friday 10 April
£10 | Main Hall
Supported by



SHOW AGES 5+

COMETS

Comets are occasional but magnificent visitors in our night sky and have been studied by scientists and philosophers for millennia. To some they were fearful warnings of disasters and destruction; to others they portended the birth of great kings. The truth about comets is no less fantastic. They may have brought life to Earth, but almost certainly wiped out the dinosaurs and nearly destroyed it. They shattered the crystal sphere theory of the universe and beautifully confirmed Newton's theory of gravity. Find out more with **Dr Kathryn Harkup**.

12.30pm | 1 hour
on until Friday 10 April
£5, family ticket £16 (4 tickets)
Dissection Room



SHOW AGES 12+

POISONS

Do you have a relative tenaciously clinging to life? Does your tea taste funny? Explore the potted history of classic poisons, poisoners and their victims with **Dr Kathryn Harkup**. Expect mad monks, lethal umbrellas and deadly wallpaper, plus a few handy hints for your defence barrister! *Legal Disclaimer* This talk is designed for information rather than recommendation. The speaker cannot be held responsible for any subsequent unexplained deaths in the local area and any notes taken can and will be used in evidence!

2.30pm | 1 hour
on until Friday 10 April
£5, family ticket £16 (4 tickets)
Dissection Room

3.30pm DRONE WHEEL LUTE See page 20

THURSDAY 9 APRIL

10am, 10.45am, 11.30am TIK-TAK-GLOW See page 21
10.30am CODE CLUB WORKSHOP See page 20

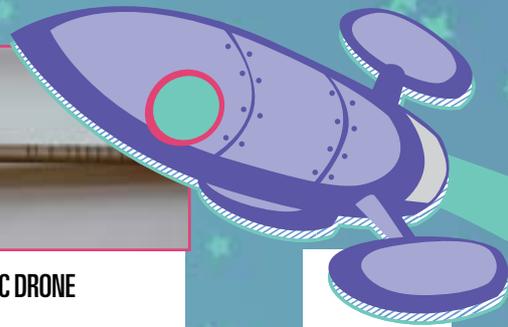
12.30pm INCANDESCENT BAGPIPES See page 21
1pm A VERY SHORT INTRODUCTION TO... GLOBAL CATASTROPHES See page 42
2pm CODE CLUB WORKSHOP See page 20

3.30pm DRONE WHEEL LUTE See page 20



ALL AGES
SHOW
SYNÆSTHETIC DRONE ORCHESTRA
 The *Synæsthetic Drone Orchestra* project from sound artist **Ed Devane** will create a collection of musical instruments that match pitch to coloured light and allow for the playing of continuous tones and textures. This concert is a 20-minute ambient music piece, composed by Ed and supported by Limerick City of Culture Legacy, which plays with space, colour and sonic texture. It includes performances by participants in the project's three hands-on workshops, playing the instruments they created during these sessions.

7pm | 30 mins
 Free (ticket required) | Basement Gallery 3



FRIDAY 10 APRIL

10.30am **LIGHT DRAWING** See page 21
 12.30pm **COMETS** See page 21
 1pm **A VERY SHORT INTRODUCTION TO... HUMAN ANATOMY** See page 44
 2.30pm **POISONS** See page 21

SATURDAY 11 APRIL



AGES 3+
SHOW
EUREKA! ANCIENT GREECE AND ITS BRILLIANT SCIENTIFIC DISCOVERIES
 A celebration of science from Ancient Greece as **Carolyne Latham** and her friendly little dog invite you to travel in time and discover the stories behind the science. The whole family will enjoy this gentle introduction to the wonders of the ancient world through interactive storytelling with soft hand puppets. You'll meet one of the earliest scientists, join in with a favourite animal fable and visit the first ever Olympic Games.

10.30am | 1 hour
 also on Sunday 12 April
 £5, accompanying adults free (ticket required)
 Basement Gallery 2
 Presented by Puppet Anima



AGES 8+
WORKSHOP
GADGET FACTORY
 Investigate and explore how everyday gadgets work and build your own in our mini *Gadget Factory*. Once you've learned the secrets of soldering there's no end to the stuff you can make! After you've grasped the basics of creating an electrical circuit, pick your kit from the wide range of gadgets on offer and use your skills to assemble your very own working electronic toy.

10.30am, 11.30am, 12.30pm | 45 mins
 also on Sunday 19 April
 £7 | Basement Gallery 4
 Supported by
SIEMENS

SPACE DAY SUNDAY 12 APRIL

Blast-off into outer space with intergalactic activities for the whole family. Space scientist **Marcus Chown** will talk about the wonders of the universe and answer your questions about the cosmos and there will be out-of-this-world demonstrations from the Royal Observatory Edinburgh. Look out for our 'rocket in your pocket' space science busking around Summerhall as well as face painting, space suit dressing-up and a planetarium.



SPACE DAY **SHOW** **ALL AGES**
SUNDAY 12 APRIL – SPACE DAY
HOW TO BE A SPACE EXPLORER
 Want to be an astronaut? Lonely Planet Kids' *How to be a Space Explorer* will help you discover all you need to know about space travel, including how to planet hop, how to pee in a spacesuit and how to build a solar system out of fruit, balloons and bog roll. Author **Mark Brake** and TV presenter **Jon Chase** present a lively, rap-ridden show about space.

2.30pm | 1 hour
 also on Monday 13 April
 £5, family ticket £16 (4 tickets) | Dissection Room (Sunday), Main Hall (Monday)
 Presented by iScience



AGES 7+
SHOW
DR DEATH AND THE MEDI-EVIL MEDICINE SHOW
 A historically and scientifically accurate panto for children and other childish people. Sneezes, wheezes, sickness and diseases are never welcome. But in the past, some of the treatments could be worse than the underlying illness. Join the time-travelling 'Dr Death', **Simon Watt**, to see if he can 'cure' you. Warning: this show promises blood, guts, gore and a lot more!

12.30pm | 1 hour
 on until Tuesday 14 April
 £5, family ticket £16 (4 tickets)
 Dissection Room
 Presented by Ready, Steady, Science



ALL AGES
SHOW
THE UGLY ANIMAL ROADSHOW
 Why should the panda get all the praise? The Ugly Animal Preservation Society is dedicated to raising the profile of the world's most aesthetically challenged endangered species. Join biologist and presenter **Simon Watt** for a performance that celebrates and explores the incredible biology of the animal kingdom's most monstrous, featuring videos, demonstrations and lots and lots of audience participation.

2.30pm | 1 hour
 on until Tuesday 14 April
 £5, family ticket £16 (4 tickets)
 Dissection Room
 Presented by Ready, Steady, Science

MONDAY 13 APRIL

10.30am, 11.30am, 12.30pm **GADGET FACTORY** See page 22
 10.30pm **EXTREME SOLDERING** See page 20

12.30pm **SCIENCE OF STAR WARS** See page 23
 2.30pm **HOW TO BE A SPACE EXPLORER** See page 22



ACTIVITY ALL AGES

DR BOOK

Stuck for something to read? Looking for new and exciting authors to explore? Then visit Edinburgh City Libraries' very own *Dr Book* where our book doctors will dispense advice and suggestions to cure all your reading ailments. You'll even get your own reading prescription to take away with you. Consultations available for children, teens and parents looking for reading ideas for their young ones too. No appointment necessary!

3pm REACHING OUT WITH ROSETTA (See page 47)

11am-1pm and 2pm-4pm | drop-in
Free | Café
Presented by Edinburgh City Libraries



ACTIVITY ALL AGES

WILD ABOUT SCOTLAND BUS

Hop on board the *Wild About Scotland Bus* to marvel at the wonders of native Scottish wildlife. Packed full of interactive materials, our experts will take you into the watery world of the beaver, the wild existence of the highland tiger (the Scottish wildcat) and the wee lives of minibeasts. The double-decker wild bus spends most of its days travelling to all corners of Scotland delivering the *Wild About Scotland* education programme to P6 and P7 students.

10.30am EUREKA! (See page 22)
10.30am, 11.30am, 12.30pm GADGET FACTORY (See page 22)

10am-4pm | drop-in
Free | Courtyard (Market St outside City Art Centre on Friday 10 and Saturday 11 April)



SPACE DAY SHOW AGES 8+

SCIENCE OF STAR WARS

Star Wars conjures up images of spaceships, super-weapons, and awe-inspiring visions of the future. But these movies' depictions of life in 'a galaxy far, far away' anticipate real life future science, right here on Earth. Author **Mark Brake** and TV science presenter **Jon Chase** probe the fantastic frontier between movie magic and cutting-edge science, using madcap antics, verve and flights of fancy from one of the most successful epics in film history.

12.30pm | 1 hour
also on Monday 13 April
£5, family ticket £16 (4 tickets) | Dissection Room (Sunday), Main Hall (Monday)
Presented by iScience



TUESDAY 14 APRIL



WORKSHOP AGES 5+

LIGHT, LASERS AND ILLUSIONS

Join **Tom Ward** from Tech Camp for some incredible illusions that have amazed audiences from New York to Abu Dhabi and beyond. Watch balloons burst with high-power lasers, see a drop of water turned into a microscope and even build your own ultraviolet torch to explore the secret world of invisible light at home!

10.30am and 11.30am | 45 mins
on until Wednesday 15 April
£10 | Basement Gallery 4



WORKSHOP AGES 8+

SMART INVENTIONS

Are you creative? Join **Tom Ward** for the newest workshop from Tech Camp that lets you play with five of the latest 'smart materials' and challenges you to come up with an idea for a new invention in 60 minutes flat! You'll experiment with 'instant snow', a metal that can remember its shape, a self-healing plastic, a colour-changing panel and an infinitely remouldable plastic.

12.30pm | 1 hour
on until Wednesday 15 April
£10 | Basement Gallery 3



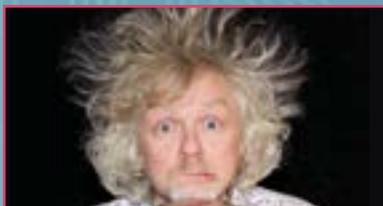
WORKSHOP AGES 10+

ROBOT BRAIN SURGERY

Get out your scalpel and soldering iron and learn the skills to give your favourite toy a brain transplant! Join **Tom Ward** from Tech Camp for this unique workshop, designed specially for the 2015 Science Festival, in which you'll replace the 'brains' of a simple toy. Everything is supplied, including a mechanical insect toy that you'll convert into your own intelligent, programmable robot to take home.

4pm and 6pm | 90 mins
on until Wednesday 15 April
£30 | Basement Gallery 4

12.30pm DR DEATH AND THE MED-EVIL MEDICINE SHOW (See page 22)
1pm A VERY SHORT INTRODUCTION TO...HORMONES (See page 52)
2.30pm THE UGLY ANIMAL ROAD SHOW (See page 22)



SHOW AGES 7+

ZAP, CRACKLE AND POP

Join **Dr Marty Jopson**, the BBC *One Show's* resident scientist as he takes a sparky journey through the story of electricity. Watch as he endures, at considerable personal risk and for your entertainment, half a million volts; gasp as he un-plucks a chicken and cower as he uses electricity to gratuitously set fire to things. From the Ancient Greeks through the electricians of the 18th century to Faraday's genius, this show will put the awesome into electricity, explaining everything from the difference between current and voltage to what you should do in a thunderstorm. Expect an electrifying performance!

2.30pm | 1 hour

£5, family ticket £16 (4 tickets) | Dissection Room



SHOW AGES 7+

RECORD BREAKING SCIENCE

From the biggest bubbles you've ever seen, to boomerangs nearly three metres across and giant Slinkys, join the BBC *One Show's* **Dr Marty Jopson** as he delves into the science behind his recent record attempts. Find out what it takes to be part of a Guinness World Record-holding team as Marty reveals the secrets of his success, including why the formula for folding paper in half means one of his records will never be beaten. He may even use science to (unofficially) break a record before your eyes. Breaking world records has never been so scientific!

5.30pm | 1 hour

£5, family ticket £16 (4 tickets) | Dissection Room



WORKSHOP AGES 8+

COMPUTER SCAVENGERS

Enter the dome of noise, junk, booming bass, raw analogue circuitry and audio anarchy. Leave your harmonic preconceptions at the door and take hold of a screwdriver. In this workshop we will be ruthlessly butchering innocent computers and making instruments with their innards. As well as being creatively destructive, we'll explore upcycling of consumer electronics, finding out what's really in them and discovering the consequences of disposing them.

10.30am | 1 hour

on until Sunday 19 April
£10 | Noisy Toys Dome | Courtyard

Presented by Noisy Toys

7pm SOLDIER ON! | See page 20



WORKSHOP AGES 12+

LASER CUT YOUR JEWELLERY FROM SCRAP

At MAKLab, we always have a lot of leftover scraps of material from the laser cutters and, rather than throwing it away, we turn it into beads and pendants. This is your chance to do the same and get creative with waste materials, turning someone else's leftover scraps into jewellery. You'll get the chance to try out our laser cutters and you'll come away with a necklace, bracelet or earrings in a design customised by you!

10.30am | 2 hours

on until Saturday 18 April
£20 | Basement Gallery 4 (Friday)
Basement Gallery 1 (Saturday)

Presented by MAKLab



WORKSHOP AGES 8+

TECH TEARDOWN WORKSHOP

Everyone wants the latest smartphone or music player and the old models often end up as landfill. But do we really know what's inside these household items and how they are made? This is your chance to strip down broken electronics equipment and think about how the design could be improved to avoid waste. With only screwdrivers allowed, your challenge is to take out the pieces without damaging the parts, and you'll create an exploded artwork to take home and hang on your wall.

2pm | 2 hours

on until Saturday 18 April
£20 | Basement Gallery 4 (Friday)
Basement Gallery 1 (Saturday)

Presented by MAKLab



SHOW AGES 8+

A BEGINNER'S GUIDE TO THE HUMAN BRAIN

Of all the extraordinary organs of the body, the brain is the most amazing. Find out some of the incredible things it can do, and how you can fool it! Is what you see the same as what you look at? Is flavour really just a matter of taste? And are humans really the most intelligent animals, or do we only think we are...? Join **Gill Arbuthnott** for some fun experiments that will help you get to grips with how your brain and senses work.

2.30pm | 1 hour

£5, family ticket £16 (4 tickets)
Dissection Room

Presented by Bloomsbury Children's Books



10.30am COMPUTER SCAVENGERS | See page 24
12.30am SING AND DANCE WITH MR BOOM | See page 25



SHOW AGES 5+

SING AND DANCE IN TIME AND SPACE WITH MR BOOM

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.

12.30pm | 1 hour
on until Friday 17 April
£5, family ticket £16 (4 tickets) | Dissection Room



WORKSHOP AGES 5+

MUSIC IS MATHS

Enter the dome of noise, junk, booming bass, raw analogue circuitry and audio anarchy. Leave your harmonic preconceptions at the door and take hold of a screwdriver. In this workshop we will be trying out some cross-rhythm activities and exploring how mathematical patterns cause all of the musical effects that we are so familiar with. Using 'Strawberry Tarts' (our recycled rival to the Pi) you can participate in a public Algo-Rave, culminating with a digital versus analogue Noise Jam.

12.30pm | 1 hour
on until Sunday 19 April
£10 | Noisy Toys Dome | Courtyard
Presented by Noisy Toys

1pm A VERY SHORT INTRODUCTION TO... THE ANIMAL KINGDOM See page 56



SHOW AGES 5+

HORRIBLE SCIENCE WITH TONY DE SAULLES

Join *Horrible Science* illustrator Tony De Saulles as he shares some drawing tips that will help you bring horrible science to life. Discover how to make your pictures look smelly and draw things that are exploding, cut in half, or even dead. You'll leave with a head full of horrible ideas!

2.30pm | 1 hour
£5, family ticket £16 (4 tickets) | Dissection Room
Presented by Scholastic Publishing



SHOW AGES 5+

ENTER THE MING RODULATOR

Enter the dome of noise, junk, booming bass, raw analogue circuitry and audio anarchy. Leave your harmonic preconceptions at the door and take hold of a screwdriver to experience our bizarre handmade interactive instruments. You'll try the world-renowned Nose Test, see some weird non-Newtonian nonsense in the Goop Test and feel 1,000 watts of bass in your fingertips in the Bass Buzz Test.

2.30pm | 1 hour
on until Sunday 19 April
£5, family ticket £16 (4 tickets) | Noisy Toys Dome | Courtyard
Presented by Noisy Toys

SATURDAY 18 APRIL

WORKSHOP ALL AGES

MAKE A MOBOT: VIRGIN MEDIA SWITCHED ON FUTURES

An action-packed introduction to computer programming created by the global computer programming club CoderDojo. You'll learn to design and code your own digital MoBot using Scratch, a visual programming language, and bring it to life and control it using Microsoft Kinect controllers.

10.30am, 1pm, 3pm | 90 mins
on until Sunday 19 April
Free (ticket required) | Basement Gallery 3
Supported by

- 10.30am COMPUTER SCAVENGERS See page 24
- 10.30am LASER CUT YOUR JEWELLERY FROM SCRAP See page 24
- 10.30am, 11.30am, 12.30pm GADGET FACTORY See page 22
- 12.30pm MUSIC IS MATHS See page 25
- 2pm TECH TEARDOWN WORKSHOP See page 24
- 2.30pm ENTER THE MING RODULATOR See page 25

SUNDAY 19 APRIL

SPECIAL EVENT ALL AGES



The *Edinburgh Mini Maker Faire* is back for its third year at Summerhall, showcasing the diversity of human creativity and bringing together all sorts of makers under one big roof. There will be gadgets, hardware, software, knitwear and food and the whole family will love interacting with robotic puppets, 3D printers, models, motorised skateboards, science experiments and even virtual Minecraft worlds. The Faire is a chance to discover hidden creative gems made by enthusiasts, engineers, artists and geeks in Scotland and further afield. Some makers will also be sharing their skills in a programme of in-depth workshops featuring everything from electronics to musical instruments.

10am-5pm
£5/under 3s free
Supported by



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

- 10.30am COMPUTER SCAVENGERS See page 24
- 10.30am, 11.30am, 12.30pm GADGET FACTORY See page 22
- 10.30am, 1pm, 3pm MAKE A MOBOT See page 25
- 12.30pm MUSIC IS MATHS See page 25
- 12.30pm ENTER THE MING RODULATOR See page 25



AROUND EDINBURGH



There's something for everyone, young and old, at Edinburgh International Science Festival this Easter. With a vast and varied selection of events in and around the city, you're sure to find the perfect solution for a great scientific day out.



ALL AGES
SHOW

STREET SCIENCE

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 and on your local high street up to and during the Science Festival and follow us on Twitter @EdSciFest for real-time *Street Science* updates.

Saturday 21 March–Sunday 19 April

Free

Supported by the Institute of Physics in Scotland and the Royal Society of Chemistry



WORKSHOP
ALL AGES

WHAT A DRAG!

Drag, also known as air resistance, is the force that air exerts on aircraft, slowing them down. See how this has shaped aeroplanes before learning more through science demonstrations with our facilitators. Then build your own model parachutist.

Friday 3–Sunday 12 April
12–4pm | drop-in

Free with museum admission
National Museum of Flight

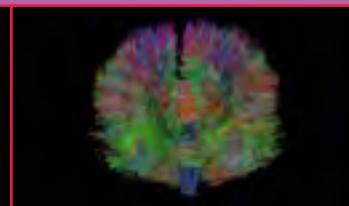


WORKSHOP
ALL AGES

PROFESSOR EGGHEAD AND THE ALIEN INVASION

Professor Egghead is taking action against the invasion of alien species! Join the interactive fun and become part of the 'Biosecurity Agency' helping to track down this global threat. Find out what action must be taken worldwide to control the invasion. Where do they come from? What do they look like? What can we do to help? With a mixture of games, challenges, experiments and fun, Professor Egghead will lead the way in the battle against these intruders.

Friday 3–Monday 20 April | 2pm | 50 mins
Free with admission | Scottish Seabird Centre
Wildlife Theatre



WORKSHOP
ALL AGES

THE ART OF SCIENCE

From biological sciences to particle physics, this exhibition of striking images and objects celebrates the diverse and surprising range of scientific research going on right now at The University of Edinburgh. Be inspired and ponder the science at the heart of so many aspects of our lives.

Saturday 4–Saturday 18 April (not Sundays)
9.30am–5.30pm | drop-in

Free | University of Edinburgh Visitors Centre



EXHIBITION
ALL AGES

FORAGE ON THE FARM

Experience the delicious delights of the farm and find out what it takes to get fresh ingredients from the field to your plate. Take a tour around Gorgie City Farm with some foraging for food along the way. Once your basket is full you'll have the opportunity to cook up a tasty treat and challenge your palette with our eggy taste test.

Saturday 4–Sunday 19 April
2pm | 90 mins

£6/£4 (under 3s free) | Gorgie City Farm



EXHIBITION ALL AGES

LIGHT WORKS

Celebrating the UN International Year of Light 2015, this brand new open-air exhibition organised by the Royal Photographic Society is a virtual journey through the electromagnetic spectrum from gamma rays to radio waves, showing how each kind of 'light' is used in our everyday lives through science, technology and medicine. 50 images, each printed two metres wide, explore ways of looking at ourselves and the world around us, taking us inside the human body and reaching out to the very edges of space. This exhibition has been supported by the Science and Technology Facilities Council, the Royal Astronomical Society and The Royal Photographic Society. Curated by Gary Evans ASIS FRPS.

EXHIBITION ALL AGES

INCREDIBLE POWER OF LIGHT: EXHIBITION AND EVENTS

Have you ever wondered how one of the world's most powerful lasers works? Vulcan is a laser facility – 10,000 times more powerful than the National Grid – that can deliver pulses of light of up to one petawatt of energy. A replica of this amazing laser forms the centrepiece of this exhibition, celebrating the UN International Year of Light 2015, along with interactive exhibits, animations, hardware and displays that tell the story of how lasers impact our daily lives. The exhibition is accompanied by an exciting events programme of talks and activities for the whole family: hear what a day in the life of a laser scientist is like or get involved in an interactive workshop. Presented by the Science and Technology Facilities Council, Engineering and Physical Science Research Council, Biotechnology and Biological Sciences Research Council and the Scottish Parliament. Visit scottish.parliament.uk/lasers for the full events programme.

Tuesday 3 March–Friday 17 April

8am–6pm | drop-in | Free | St Andrew Square

Presented by The Royal Photographic Society

Image: Z Machine Firing: Randy Montoya, Sandia National Laboratories

Wednesday 1–Thursday 30 April (not Sundays)

10am–5pm | drop-in, last entry 4.30pm

Free | The Scottish Parliament | Main Hall



EXHIBITION ALL AGES

MAKING IT

An interactive exhibition all about the modern maker movement and its links to science, technology and design. Celebrating the rise of do-it-yourself culture, this fun, engaging exhibition is packed with interactive demonstrations of modern design, innovation and technological futures, from 3D scanning to smartphone microscopes and live robotic drawing machines. This is your chance to interact with the modern digital design and fabrication tools that are taking the scientific, technological and design worlds by storm.

WORKSHOP ALL AGES

THE FUTURE'S BRIGHT

Join us to make a simple wind turbine and test it in the wind tunnel to see how fast it turns. Jump on the bike to see how much energy it takes to walk, cycle or drive to school and try out a range of fun activities that show how easy it is to have a cleaner, greener lifestyle.

WORKSHOP AGES 6+

EARTH CRAFT

Join us at Dynamic Earth for a celebration of Scotland's unique, diverse and awe-inspiring landscapes. We've teamed up with Voluntary Arts Scotland to enable you to get hands-on and create something inspired by our landscapes and learn about our environment as you do it. Drop in to find out more about Earth and environmental sciences – explore how our planet is shaped by the forces of nature and get creative with our *Earth Craft* activities.

Saturday 4–Sunday 19 April | 10am–5pm | drop-in

Free | Ocean Terminal

Also supported by



Making It... was developed with support from the Scottish Government's Edinburgh Festivals Expo Fund



Saturday 4–Sunday 19 April

11am–5pm | drop-in

Free | The Centre, Livingston

Supported by



Sunday 5–Tuesday 7 and Sunday 12–Tuesday 14 April

11am–4pm | drop-in

Free with admission | Our Dynamic Earth



AGES 7+
SHOW

DR BUNHEAD'S EXPLODING EASTER EGG SHOW

Witness the world's biggest Easter egg explosion, rainbow foam fountains, the Easter Bunny bazooka and loads more Easter science shenanigans with the world's favourite TV stunt scientist. *Dr Bunhead 'turns the science curriculum into a burning, bubbling, exploding ball of fun.'* Sunday Times



EXHIBITION
ALL AGES

WILD ABOUT SCOTLAND BUS

Hop on board the *Wild About Scotland Bus* to marvel at the wonders of native Scottish wildlife. Packed full of interactive materials, our experts will take you into the watery world of the beaver, the wild existence of the highland tiger (the Scottish wildcat) and the wee lives of minibeasts. The double-decker wild bus spends most of its days travelling to all corners of Scotland delivering the *Wild About Scotland* education programme to P6 and P7 students.



AGES 8+
WORKSHOP

EXPLORE THE ENERGY LAB: POWER TO MAKE THINGS GO

Almost everything in our homes today needs electricity to work, but what really is energy and how do we use it? And what do a duck, a snake and a wave have to do with it? Visit the *Energy Lab* at the National Mining Museum Scotland to discover how coal becomes electric light, how we generate electrical energy and how we can ensure there will be enough energy to meet our needs in the future.



FILM
ALL AGES

ILLUMINATION POP-UP CINEMA

A broad and varied selection of films, presented by the Scottish Historic Buildings Trust in a stunning and unusual New Town venue. Science-themed films will be shown during the afternoon for families and children, as informal sessions, with toys and refreshments available. For the evening screenings think Cinema Paradiso with a Scottish edge, with popcorn and hot chocolate included. This event is part of a series to launch Newtown Community Cinema. Visit shbt.org.uk for programme information and times.

Friday 10–Saturday 11 April
Friday 2pm, Saturday 11am | 1 hour
£6 | George Square Theatre
Presented by The University of Edinburgh

Friday 10–Sunday 12 April
10am–4pm | drop-in
Free | Around the City (City Art Centre on Friday 10 and Saturday 11 April, Summerhall on Sunday 12 April)

Monday 13–Friday 17 April
11.30am | 1 hour
£4 | National Mining Museum Scotland

Monday 13–Sunday 19 April
Daytime screenings vary, Evening screenings 8.30pm
£4/£2/£10 Family of 4 (2 adults, 2 children)
Glasite Meeting House



AGES 10+
WORKSHOP

INTRODUCTION TO CYANOTYPES

A hands-on workshop where you'll have the chance to experiment with different ways of creating blue and white cyanotype prints. You'll try photogram, where objects are placed directly on a light-sensitive surface and create a print from a hand-painted negative. No previous experience is necessary and all materials will be provided.



EXHIBITION
ALL AGES

ANIMAL CULTURES

Discover how learning in animals has led to the development of traditions that have affected how they feed, migrate and socialise. Researchers from across the UK will discuss their work on the amazing social lives of animals and an interactive trail will highlight how species such as capuchin monkeys, parrots and lemurs pass on their knowledge to others. In the Budongo Trail chimpanzee house, games activities and displays will explore the study of animal traditions and throughout the weekend there will be mini talks at animal enclosures by researchers competing for your vote to be crowned the 'top dog' of animal culture studies.



AGES 10+
EXHIBITION

THE INQUEST

Join the Inquest! We're taking you back to 1829 and an unidentified person has been found at Surgeons' Hall. Without any obvious cause of death, curator Robert Knox is finally called into question. Examine the scene of the crime, explore contemporary medical texts and illustrations, and discover the good and bad sides of Robert Knox. Should Robert Knox have been tried with Burke and Hare? The decision is yours...
In association with The National Libraries of Scotland, Napier University and The Royal College of Physicians of Edinburgh. Under 16s should be accompanied by an adult.

Thursday 16 April | 10am | 90 mins
£10 | Stills Gallery

Friday 17–Sunday 19 April | 10am–4pm | drop-in
Free with admission | Edinburgh Zoo

Sunday 19 April | 1pm, 2pm, 3pm and 4pm | 1 hour
Free (ticket required) | Surgeons' Hall | Quincentenary Hall
Presented by the Surgeons' Hall Museum

EXHIBITION ALLAGES

LIGHT WORKS

Light Works is a brand new open-air exhibition organised by the Royal Photographic Society, celebrating the UN International Year of Light 2015.

The exhibition is a virtual journey through the electromagnetic spectrum from gamma rays to radio waves, showing how each kind of light is used in our everyday lives through science, technology and medicine.

Visitors of all ages will find an image that captivates them among these 50 large-format photographs that explore ways of looking at ourselves and the world around us, taking us inside the human body and reaching out to the very edges of space.

Each image is accompanied by a description of the work and the photographer, a reading of where the 'light' it features sits on the electromagnetic spectrum and a QR code that can be scanned with a smartphone to find out more.

Find out more about the exhibition at rps.org/lw.

This exhibition has been supported by the Science and Technology Facilities Council, the Royal Astronomical Society and The Royal Photographic Society.

Curated by Gary Evans ASIS FRPS.

**Tuesday 3 March—Friday 17 April | 8am—6pm | drop-in
Free | St Andrew Square**

Presented by The Royal Photographic Society

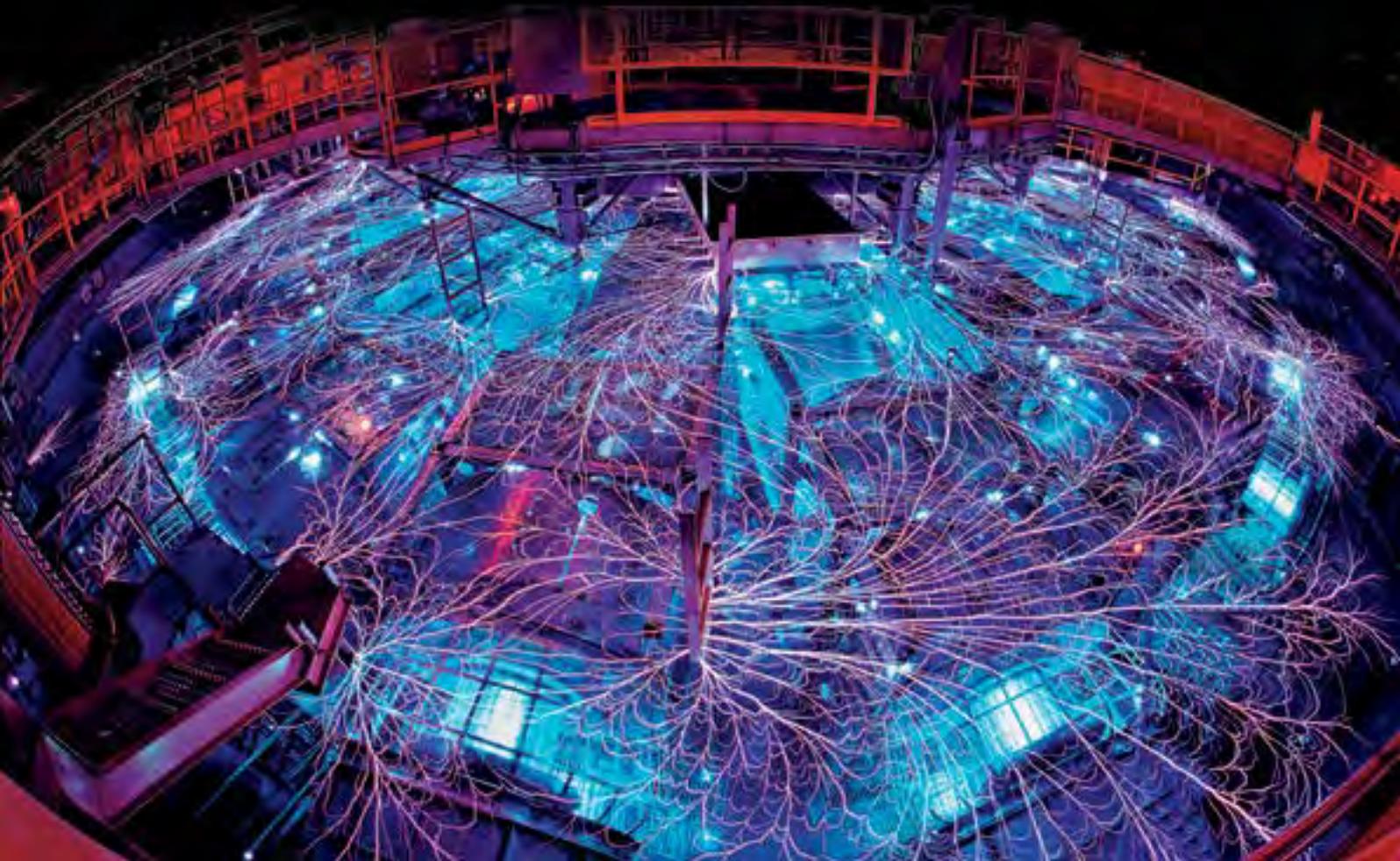
Images:

Lizard Micro-CT : Dan Sykes, Natural History Museum London

Cosmic Microwave Background : Carlos Clarivan

Space Telescope Mirror Test : NASA/MSFC/David Higginbotham

Z Machine Firing: Randy Montoya, Sandia National Laboratories





In 2015 we celebrate the role of the Science Festival as a hub for ideas, information, innovation and inspiration. *The Ideas Factory* brings great minds together: from makers of new inventions to makers of political policies and from world-class scientists to groundbreaking artists.

The result is a broad and exciting programme of discussions, workshops, performances, screenings, special events and exhibitions that will unite pioneering thinkers and foster dialogues about the future of our culture, our nation, our planet and our understanding.

We'll discover how Scotland's game-changing inventions shaped history and look to the cutting-edge science at the heart of the new Enlightenment; process the numbers that matter in our global big data society; look inside our brains, minds and consciousness; sample the science of food and drink and look to the future of our energy and environment.

Check out the 2015 production line...

PROGRAMME STRANDS

- Light and Enlightenment** – illuminating ourselves and the world
- Brainwaves** – exploring one of the universe's most mysterious objects
- GastroFest** – a mini festival of food and drink... and science!
- The Reading Experiment** – uniting the worlds of science and words
- Energy and Environment** – an important programme debating our climate future
- Numbers that Matter** – probing big data and the stats behind our lives

JOIN THE CONVERSATION

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

SUMMERHALL

We'd love to see you at Summerhall, our *Ideas Factory* Hub, where you'll find a huge variety of innovative and interactive events and exhibitions, a pop-up science bookstore from Blackwell's in the courtyard chalet and plenty of scientists and artists to mingle with over a drink in The Royal Dick bar.

BARNEY'S BEER

The Ideas Factory doesn't just create ideas - we're once again collaborating with our good friends at Barney's Beer to create a new brew for 2015. Try it at our late night events or pop into the Royal Dick Bar any time during the Festival (while stocks last, of course). If you're interested in hearing more from Edinburgh's favourite beer man, Barney will be appearing at *Brews, Blues and a Piano-Bar-Bike!* (p.41) and at the *Edinburgh Mini Maker Faire* (p.60)



NATIONAL MUSEUM OF SCOTLAND

Throughout the Festival, the National Museum of Scotland offers a wealth of events and activities for all ages. As well as talks, workshops and presentations, the Museum's Grand Gallery will play host to pop-up science with daily programmes of demonstrations, short performances and mini presentations of some of this year's Festival highlights.



EXPERIMENT

We're serious about science at *The Ideas Factory*, take part in some real science experiments during this year's events.

BARNEY'S BEER — THE TASTE TEST 2015

A delicious way to make a scientific contribution. Look out for our pop-up taste tests from Barney's Beer at various Science Festival events throughout the Festival. Our 2015 Festival concoction is an experimental beer from Barney's made in collaboration with the brewing boffins at the Hutton Institute.

THE UNIVERSITY OF OXFORD — THE GENETICS OF BEING SOCIAL

If you're an adult visiting City Art Centre from 13-18 April, researchers from the Social and Evolutionary Neuroscience Research Group at the University of Oxford need your help. They'll be tackling the question of why some people find it easier to get on with others, and trying to find out if the answer lies in our genes. All they need is a completed questionnaire and sample of saliva. Details at venue.

EARLY BIRD TICKET OFFER

Buy 4 tickets for the Science Festival Events programme and receive your 5th 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 Saturday 28 March.

AGE RESTRICTIONS

The Science Festival Events programme is designed for visitors aged 14+. This is a recommendation only and younger audiences are very welcome. However, please note that a small number of events have an enforced age limit of 18+. These will be marked with AGE 18+ next to the listing. This restriction is in place due to event content and/or venue licensing laws. Identification will be required and under 18s will not be admitted under any circumstances.

#SCIPALS

Students! Are you sci-curious? Let's be #SciPals! Half price student tickets are available for most Science Festival events – enjoy a lunchtime talk for just £2.50 or an evening out for as little as £4.

Sign up to our students mailing list sciencefestival.co.uk/students or follow @edscifest for special offers, news and jobs.

SCI-FIVE!

Not valid on every event, see individual entries for price information. Advance booking is recommended as half price tickets are subject to availability.



FIG 1. SCIPALS MARIE CURIE AND NIKOLA TESLA DEMONSTRATE A SUCCESSFUL SCI-FIVE!

#SciPals is supported by

SIEMENS

Siemens is proud to sponsor the Edinburgh International Science Festival. The UK needs more engineers and through our *Curiosity Project* we aim to bring science, technology, engineering and mathematics (STEM) to life, by supporting leading organisations that reach out and nurture the innate curiosity in young people and showcase the amazing and rewarding opportunities a career in engineering can provide.

siemens.co.uk/curiosity-project



EXHIBITION

GAME MASTERS

Featuring over 100 playable games, including the likes of *Pac-Man*, *Mario Kart*, *Minecraft* and *SingStar*, *Game Masters* showcases the work of more than 30 leading videogame designers.

The exhibition explores the development of videogames through interviews with game designers, rare original game artwork and interactives, as well as looking forward to how independently produced games are leading the way in design, aesthetics and game play.

Created by the Australian Centre for the Moving Image, Melbourne, supported by the Victorian Government.



EXHIBITION

URBAN BEES

Find out about our busy buzzing neighbours; the wild bees that inhabit our parks, gardens and roadsides. Most people are familiar with the honey bee, but it is just one of 2,000 bee species in Europe. The others are 'wild'; they don't produce honey but provide invaluable services to humans and nature as pollinators protecting plant and animal biodiversity. Like their domestic cousins, wild bee populations are under threat. Discover how our cities could help them flourish.

ENERGY & ENVIRONMENT

THROUGHOUT THE FESTIVAL

Friday 5 December 2014—Monday 20 April

Adult £10/£8, Child £6.50 (under 5s Free), Family of 3 £23, Family of 4 £28, Students £5 (Tuesdays only) | National Museum of Scotland Exhibition Gallery 1, Level 3

Image: © Ruth Armstrong

Saturday 7 February—Sunday 7 June 10am—5.45pm | drop-in

Free | Royal Botanic Garden Edinburgh | John Hope Gateway

Presented by the Royal Botanic Garden Edinburgh

Energy and Environment events are supported by E.ON



SHOW

PIONEER

It's 2029. The first human mission to Mars disappeared without a trace. A reclusive Indian billionaire has funded Ghara I, a new attempt to achieve this dream. Follow two Russian brothers travelling across Siberia, a Dutch marine biologist on the bottom of the Pacific Ocean and two astrobiologists on the surface of Mars. Winners of a Scotsman Fringe First 2014, *curious directive* presents a multimedia sci-fi thriller. Made in collaboration with astrobiologist Dr Lewis Dartnell (UCL). Post-show discussion with a noted astronomer, Thursday 2 April.



AGES 18+

SPECIAL EVENT

SCIENCE FESTIVAL LATES

Fancy embarking on a Jungle Safari? Or having a go at keyhole surgery in A&E? *Science Festival Lates* is just the ticket as we turn our flagship children's venue over to adults for one very special night. Celebrate the opening of the 2015 Festival with us as we clock in at *The Ideas Factory*—we've got eyeballs and brains, crime scenes and circuits, robots and slime all mixed in with music, bars and fun. Don't miss the chance to get hands-on and get your geek on; grab a drink and join the party!

THURSDAY 2 APRIL

Thursday 2—Saturday 4 April | 7.30pm | 80 mins
Post-show discussion Thursday 2 April
£16/£13 | Traverse Theatre
Presented by *curious directive*

7.30pm | 3 hours
£10/£8/#SciPals students £5
City Art Centre
Supported by

FRIDAY 3 APRIL

7pm HOW THE LIGHT GETS IN ART LAUNCH See page 34
7.30pm PIONEER See page 32





EXHIBITION
LIGHT & ENLIGHTENMENT

LIGHT WORKS

Light Works is a brand new open-air exhibition from the Royal Photographic Society, celebrating the UN International Year of Light 2015. The exhibition is a virtual journey through the electromagnetic spectrum from gamma rays to radio waves, showing how each kind of light is used in our everyday lives through science, technology and medicine. Visitors of all ages will find an image that captivates them among these 50 large-format photographs that explore ways of looking at ourselves and the world around us, taking us inside the human body and reaching out to the very edges of space. Each image is accompanied by a description of the work and the photographer, a reading of where the 'light' it features sits on the electromagnetic spectrum and a QR code that can be scanned with a smartphone to find out more. Find out more about the exhibition at rps.org/lw.

This exhibition has been supported by the Science and Technology Facilities Council, the Royal Astronomical Society and The Royal Photographic Society. Curated by Gary Evans ASIS FRPS.

Tuesday 3 March–Friday 17 April | 8am–6pm | drop-in

Free | St Andrew Square

Presented by the Royal Photographic Society

Image: Z Machine Firing; Randy Montoya, Sandia National Laboratories

EXHIBITION
ENERGY & ENVIRONMENT

HONEYScribe BY AMY SHELTON

Ancient Egyptian hieroglyphs tell of the 'honey scribe' tasked with recording every drop of honey produced. Here, artist Amy Shelton becomes a contemporary honey scribe, charting current threats to the honey bee and documenting the fleeting rhapsody of the flowers and pollen rich plants that sustain honey bee colonies from early spring to late autumn. Using hundreds of pressed flower samples, illuminated to create a vibrant colour palette, Shelton maps the bio-diverse wild, cultivated and agricultural plants essential to honey bees' survival.

Saturday 7 March–Sunday 5 July | 10am–5.45pm | drop-in

Free

Royal Botanic Garden Edinburgh | John Hope Gateway

Presented by the Royal Botanic Garden Edinburgh

Energy and Environment events are supported by E.ON

EXHIBITION
LIGHT & ENLIGHTENMENT

DARK MATTERS

Edinburgh Printmakers has commissioned artists, astronomers and space engineers to create art from space and new public art installations that explore the nature of dark matter and dark energy. The project comprises a number of new temporary installations that will be presented in various sites across the city over a period of 12 months, and launched in conjunction with this year's Science Festival theme of *Light and Enlightenment*. The exhibition is accompanied by a programme of events and celebrations. Visit edinburghprintmakers.co.uk for details. A collaborative partnership between Edinburgh Printmakers, the UK Astronomy Technology Centre and Edinburgh University. Curated by artist David Faithful.

Saturday 21 March–Saturday 23 May

10am–6pm | drop-in

Free | Edinburgh Printmakers

ENERGY AND ENVIRONMENT

We are merely the caretakers of our extraordinary planet; it does not belong to us but its future health depends directly on our current actions. Since the industrial revolution our demands for energy, largely from fossil fuels, have increased continuously, however our ideas about what is plentiful are now altering and we have to deal with the concept of changing our approach to energy while simultaneously dealing with the consequences of our past actions.

In December 2015 the 21st Conference of the Parties on Climate Change will meet in Paris, bringing together the nations of the world with the objective of producing a binding universal agreement on limiting climate change. Looking ahead to this landmark event, we'll be presenting a series of *Energy and Environment* events exploring and debating everything from controversial new sources of energy, like shale gas fracking (p.42), to the truth about the future of North Sea Oil (p.52). We'll also be taking a light-hearted look at energy from unusual sources in a fun packed interactive evening: *Unexpected Energy* (p.39).

This urgent programme will culminate in an unmissable event *The Road to Paris* featuring Dr Rajendra Pachauri, chair of the UN Intergovernmental Panel on Climate Change (IPCC) in discussion with an influential panel (p.56).

Look out for *Energy and Environment* tagged events throughout the events section of this brochure.

Supported by



We want to help ensure that the next generation fully appreciates the importance of energy and the environment in everyday life, and so, E.ON is thrilled to be part of such an exciting event which is bringing these subjects to life.



EXHIBITION
LIGHT & ENLIGHTENMENT
BRAINWAVES

HOW THE LIGHT GETS IN

'There is a crack in everything. That's how the light gets in' – Leonard Cohen

Co-curated by the **Science Festival**, **Summerhall** and **ASCUS Art & Science**, *How the Light Gets In* brings together a selection of works by international artists intrigued by light in all its form and facets with those aiming to shine a light on the workings of our brain, mind and consciousness. Celebrating the UN International Year of Light and the Science Festival's *Brainwaves* strand, the exhibitions explore the beauty, form and function of light and its role as a metaphor for knowledge and enlightenment.

With: **Oliver Jennings'** and producer **Benjamin Burtenshaw's** explorations of the life cycle of plants through technology, **Collins and Goto's** environmental works, **Fraser Ross'** experiments in creating artificial organisms and **Keith Lemley's** observations into the unseen, we explore the role

of light in the natural world. Computer-art pioneer **William Latham** blends organic imagery and computer animation, using software modelled upon the processes of evolution, and **Andrew Carnie's** time-based works link our light and brain themes through slowly unfolding narratives.

ASCUS take over the Lower Church Galleries with a group show resulting from art–science collaborations and residencies, including work from the University of Strathclyde's Chamberlain Lab, The University of Edinburgh's Centre for Immunity, Infection and Evolution and London-based **Art Neuro**. **Julia Malle's** neon and scientific glassblowing works link the exhibitions, illuminating and guiding visitors through the sprawling corridors of Summerhall.

SATURDAY 4 APRIL

Saturday 4 April – Friday 22 May | 11am–6pm | drop-in

Free | Summerhall | Various

PREVIEW/ART LAUNCH Friday 3 April | 7–9pm | Summerhall | Various

ARTIST TALKS PROGRAMME Saturday 4 April | Summerhall | Anatomy Lecture Theatre

In association with Summerhall and ASCUS.

Image: Julia Malle *Line of (f)light*



ENERGY & ENVIRONMENT
SPECIAL EVENT

REINDEER SAFARI

This award-winning environmental art piece from Finnish live arts collective **Other Spaces** allows the senses to sharpen as the group experiences the borderline between nature and human culture. Experience the city as a reindeer. Hear about the reindeer's way of life then walk, quietly and collectively as a herd would, through Edinburgh. On your return, the materials and 'data' collected on the walk will be displayed to the public, with the chance to ask questions of the organisers and participants. Bring walking shoes, a backpack, a water bottle and clothes appropriate to the weather. No costumes!

11am–4.30pm | 5.5 hours

£10 | Summerhall | meet at Old Lab

Energy and Environment events are supported by E-ON



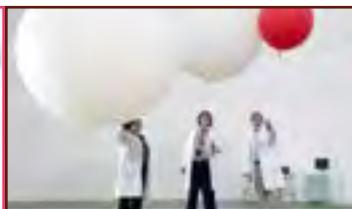
GASTROFEST
SPECIAL EVENT

COFFEE WITH A SHOT OF SCIENCE

Every step of the coffee journey is steeped in tradition and ritual, from the growing of the bean to the pouring of a cup. There is also a good dose of science in every drop. Join us for an exploration of coffee science taking in aroma, taste, health and history with **Ian Edwards** of the Royal Botanic Garden Edinburgh, scent technician **Ericka Duffy** and 2013 Scottish Barista Champion **Catherine O'Shea** of Artisan Roast.

3pm | 90 mins

£10/£8 | Royal Botanic Garden Edinburgh
Real Life Science Studio, John Hope
Gateway



ENERGY & ENVIRONMENT
DISCUSSION

FORECASTING TOMORROW'S WEATHER

The weather affects us all and we've all moaned if a forecast is wrong, but have you ever wondered how weather forecasts are made? In this event **Helen Roberts** from the Met Office teams up with **Mark Higgins** from EUMETSAT (operator of Europe's weather satellites) to explain how data from satellites and other sources is gathered and then fed into supercomputers to make the weather forecasts that we see on our phones and on the news. You'll even see a meteorologist use this data to make a live weather forecast for the following days, but will it be correct?

5.30pm | 90 mins

£8/£6/#SciPals students £4
Summerhall | Dissection Room

Presented by EUMETSAT and the Met Office

Energy and Environment events are supported by E-ON



DISCUSSION

TAM DALYELL PRIZE LECTURE: LIFE THROUGH A LENS

In this year's Tam Dalyell lecture, **Sarah Keer-Keer**, from the Wellcome Trust Centre for Cell Biology in The University of Edinburgh, reveals how taking a dramatic, artistic and fun approach to science helps cell biologists communicate with the public and how in turn the public have inspired the scientists. Join Sarah who will guide you through hundreds of years of science, up to the present day, when we will discover who today's scientists really are.

6pm | 90 mins

Free (ticket required) | Playfair Library

Presented by The University of Edinburgh



EXHIBITION

THE FORTH BRIDGE

Addressing the crowd at the opening of the Forth Bridge on 4 March 1890, the Prince of Wales observed that the bridge 'marks the triumph of science and engineering skill over obstacles of no ordinary kind'. Taking eight years to build, it was the longest single cantilever bridge span in the world for many years after completion and remains an iconic part of Scotland's landscape today. To mark the 125th anniversary of the opening of this engineering masterpiece, this display examines the construction of the bridge using photographs, plans, reports and other papers from the National Library of Scotland's collections.

Saturday 4–Sunday 19 April

Opening times vary | drop-in

Free | National Library of Scotland

Presented by the National Library of Scotland



EXHIBITION

PRIMORDIAL SOUP

An evolving exhibition of new artworks created in response to selected scientific projects, both high profile and lesser known, taking place during Spring 2015. The projects selected will promote debate, constructive reactions and vibrant and experimental art. The Number Shop artists will be collaborating with ASCUS-linked scientists in advance of and during the Festival. New artworks will be made daily in visible, accessible and approachable open studios, and will be created in parallel with a public opinion board, where visitors responses to questions and ideas will feed into the work created.

Saturday 4–Sunday 19 April | 12–5pm

drop-in | Open Saturday evenings 6pm–8pm

Free | The Number Shop Artist Studios and Gallery



AGES 18+

ACTIVITY

GASTROFEST

DISTILLING WITH EDINBURGH GIN

The Edinburgh Gin Visitor Centre is the only place in the capital where you can indulge both the mind and the palate in all things gin. From taking a tour or a guided tasting, to trying your hand at making your own, our goal is to educate. Working with our partners at Heriot-Watt University to establish a site of gin excellence and innovation in Edinburgh, we hope to excite and libate. Visit our exhibition area and take a tour of the distillery; getting sneak peeks at what we usually keep hidden from watchful eyes!

edinburghgindistillery.co.uk

Saturday 4–Sunday 19 April

See website for details of tour options, times and prices | Edinburgh Gin Distillery



EXHIBITION

ART OF THE MATTER

Art and science have long been considered opposites, despite being intertwined for centuries. These days, the parallels are even closer with technology being found in almost all aspects of our daily lives, including the arts. This exhibition showcases artists that have successfully made use of science and/or technology for the making of their work. It includes pieces by Scottish artist Fraser Ross, who makes fascinating sculptures out of magnetic liquid and *Nobody Does it Better*, an impressive life-size bronze and stainless steel sculpture, based on artist and inventor Leonardo da Vinci's Vitruvian Man, by British artists Björn and Amanda Sjoling.

Saturday 4 April–Sunday 3 May

Tuesday–Friday 11am–6pm

Saturday 11am–5pm | Sunday 12pm–4pm

drop-in

Free | Urbane Art Gallery



SPECIAL EVENT

GASTROFEST

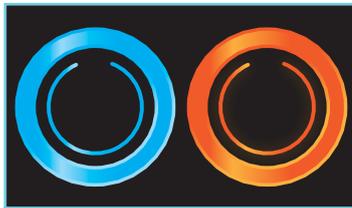
CROP CIRCLE

Have modern methods of agriculture and food production bred the nutrition and flavour out of our crops? Could their wild relatives be the genetic resource that holds the answer for putting them back? Join Dr Wendy Russell from The Rowett Institute of Nutrition and Health, with chef Neil Forbes and author and baker Andrew Whitley from Bread Matters, for a discussion around how wild crops can be conserved and utilised, and try some food samples in pursuit of science!

7pm | 90 mins

£8/£6 | Royal Botanic Garden Edinburgh
Lecture Theatre

Presented by the Royal Botanic Garden Edinburgh



SPECIAL EVENT

LIGHT & ENLIGHTENMENT

LATELAB: TRON V TRON: LEGACY

Greetings programme. Welcome to the Grid. Kick off the *LateLab* season by playing *Light Cycle* to decide which of these two films gets the *Atmosphere* treatment in this special expanded cinema event to complement the *Game Masters* exhibition. Be transported inside the software world of a mainframe computer where interaction between programmes good and malicious is the only way to get back out. Behind the smoke and mirrors, watch out for the bits and bytes. End of line. *LateLab* is a collaboration between Edinburgh International Science Festival and New Media Scotland.

7.30pm | 3 hours

£10/£8/#SciPals students £5
National Museum of Scotland | Auditorium

Supported by Marks & Clerk
In association with the National Museum of Scotland



ALL AGES

DISCUSSION

LIGHT & ENLIGHTENMENT

LIGHT FANTASTIC

Nature and Nature's Laws lay hid in Night; God said 'Let Newton be!' and all was light. From the *fiat lux* of the Old Testament to the 'idea bulb' of cartoon convention, light has been used throughout the ages as a metaphor for understanding, discovery and revelation. Join us on our opening weekend for an illuminating social event taking in art history, acrobatics, poetics, magic lanterns and optogenetics as we look at the uses and meanings of light across the spectrum of culture, with Dr Sophie Coulombeau, Prof Matthew Nolan and Dr Frances Fowle, senior curator at the Scottish National Gallery.

7.30pm | 2 hours

£10/£8/#SciPals students £5
Summerhall | Dissection Room



SPECIAL EVENT

INTO THE IMPOSSIBLE

Only a generation ago many modern devices were unimaginable and as technology progresses, so does the reach of reality. All of a sudden the everyday includes wonderous objects that were previous merely dreams. Invisibility cloaks, quantum physics, hoverboards and time machines sound futuristic today but what about tomorrow? Physicist and member of the Magic Circle Kevin McMahon presents a performance packed with realisations of magic and fantasy inspired by science fiction and science fact, exploring the next generation of scientific discovery.

8pm | 1 hour

£10/£8/#SciPals students £5
Summerhall | Main Hall

Presented by Edinburgh International Magic Festival

7.30pm PIONEER See page 32



GASTROFEST | SPECIAL EVENT | ALL AGES

SCIMART

A farmers' market with a scientific twist, *SciMart* brings together food producers, researchers and chefs to reveal the fascinating science behind some of our favourite foodstuffs. With demonstrations from award-winning Edinburgh chef **Paul Wedgwood**, talks and tasty treats, *SciMart* brings you a packed menu and food for thought. New for this year is a mini-restaurant of food surprises for our younger visitors... Go to sciencefestival.co.uk for up-to-date listings of stallholders and full details of the talks programme.

11am-4pm | drop-in
£5/#SciPals students £2.50/under 12s free
Summerhall | Various
Supported by



DISCUSSION

DINOSAURS AND THE MAKING OF THE MODERN WORLD

Kids love dinosaurs but so do adults! Dinosaurs were big, fierce and weird but they're long gone. Who cares about *T.rex* and *Triceratops*? The University of Edinburgh's **Dr Stephen Brusatte**, also resident palaeontologist for the BBC's *Walking with Dinosaurs* and discoverer of the new tyrannosaur 'Pinocchio rex', shows us why we all should, explaining the unbelievable ways dinosaurs have shaped our modern world and why, without them, we wouldn't be here.

1pm | 90 mins
£8/£6/#SciPals students £4
National Museum of Scotland | Auditorium
Presented by The University of Edinburgh



DISCUSSION | READING EXPERIMENT

FORENSIC FICTION MEETS FORENSIC FACT

Lin Anderson's fictional forensic expert **Dr Rhona MacLeod** has a great team behind her, and what's more, they are real forensic specialists. Join **Lin** in conversation with **Laura Fairley** and **Bruce Duncan**, of crime scene capture specialists **Return To Scene**, as we learn the forensic truth behind the fiction. Expect forensic evidence technology, real-world examples and possibly a hazmat suit.

3pm | 90 mins
£8/£6/#SciPals students £4
National Museum of Scotland | Auditorium
In association with Bloody Scotland

SUNDAY 5 APRIL



READING EXPERIMENT | DISCUSSION

A VERY SHORT INTRODUCTION TO...GENES

If you're curious about what genes are and how genetics can be put to use, this is the *Very Short Introduction*... for you. **Prof Jonathan Slack**, Emeritus Professor at the University of Bath, explores the discovery, nature, and role of genes in both evolution and development, explaining the nature of genetic variation in the human population, IQ, genetic heritability, and how certain specific mutations can lead to disease. He will also demonstrate how genetics has been understood and used by molecular biologists, population biologists, and social scientists around the world.

1pm | 1 hour
£5/#SciPals students £2.50
Summerhall | Red Lecture Theatre
Presented by Oxford University Press



DISCUSSION

ROBOTIC RIGHT AND WRONG

Prof Noel Sharkey is the chair of the Committee for Robot Arms Control, an NGO that is seeking an international treaty to prohibit the development and use of autonomous robot weapons: weapons that once launched can select human targets and kill them without human intervention. He has written and spoken widely concerning the responsibilities of governments and international organisations in a world where robotics applications are dramatically increasing. Here he will talk about the ethical dimension of the rapid development and deployment of robot weapons in both military and police contexts.

5.30pm | 1 hour
£8/£6/#SciPals students £4
Summerhall | Main Hall
Presented by the British Computer Society



DISCUSSION

GENETIC ME

With the rise of internet-based genetic testing, journalist and neurobiologist **Dr Lone Frank** has been able to ask questions about issues she and her family have struggled with: depression, difficulty getting on with people and more. Her film, *Genetic Me* is a humorous, 'sexy' and deeply personal tale that connects us with frontier genetic research and provides new perspectives on the eternal question of 'how did I become me?' The screening will be followed by a conversation between **Dr Frank** and developmental biologist **Prof Jonathan Slack**.

6.15pm | 90 mins
£10/£8/#SciPals students £5
Filmhouse | Screen 2
In association with the Danish Cultural Institute

MONDAY 6 APRIL



READING EXPERIMENT | EXHIBITION

CELEBRATING MARY MIDGLEY

Dr Mary Midgley, scientific philosopher and winner of this year's Edinburgh Medal, has been described as the 'foremost scourge of scientific pretension'. The National Library of Scotland is proud to commemorate her life and work with a display from its collections. Known as a supporter of the Gaia hypothesis of James Lovelock but an opponent of the views of Richard Dawkins, Mary Midgley is a fascinating and thought-provoking writer and thinker. Come and view a selection of her own work alongside that of others who have inspired her.



READING EXPERIMENT | DISCUSSION

HEALTHY LUNCHES: P53, THE GENE THAT CRACKED THE CANCER CODE

Science writer and broadcaster Sue Armstrong shares the story of p53, the single most important gene in cancer, whose normal job is to *prevent* tumours forming. Unsurprisingly, this enormously important gene has teased the minds of some of the most colourful and ambitious researchers around the world. You'll discover the frequently obsessive mission to unravel its mysteries and the scientists who study it intensively as they strive to understand and control this fearsome disease. Chaired by Ewan Aitken of the Cyrenians.

MONDAY 6 APRIL

Monday 6–Friday 17 April

Opening times vary | drop-in

Free | National Library of Scotland

Presented by the National Library of Scotland

1pm | 1 hour

£5/#SciPals students £2.50

National Museum of Scotland | Auditorium

Presented by Bloomsbury Publishing



GASTROFEST | SPECIAL EVENT

NOSE TO TAIL: THE NOT SO OFFAL TRUTH

Could a trotter ever be a treat? Is offal really awful? How tender is a heart? If you like your meat neatly processed and as far removed from its animal origins as possible, this is NOT the event for you. Join us for an experimental edible journey to actively connect with the food chain as we investigate the possibilities and benefits of whole animal eating: from the impact on our health to the ecological importance of sustainable eating. Featuring tempting tasters and demonstrations of innovative preparation techniques from roadkill enthusiast Alison Brierley and Fife's Food Ambassador and author of *The Whole Hog* Christopher Trotter alongside award-winning dietitian and TV nutritionist Dr Carrie Ruxton.

8pm | 90 mins

£12/£10 (includes tasters) | Summerhall | Dissection Room

BRAINWAVES | READING EXPERIMENT | SPECIAL EVENT | AGES 18+

LATELAB: ENCOUNTERS

Ginsberg is a new online tool that helps users understand themselves better by tracking their mood and activity, developed by the Scottish Government in partnership with NHS 24 and New Media Scotland, working in partnership with artists supported by the Alt-w Fund. Host Geoff Huggins will introduce author Matt Haig and mindfulness technologist Rohan Gunatillake. Explore the *Ginsberg* ecosystem through this salon-style evening of cerebral stimulation and debate ways to feel happier and sleep better. *LateLab* is a collaboration between Edinburgh International Science Festival and New Media Scotland.

8pm | 2 hours

£10/£8/#SciPals students £5 | Summerhall | Main Hall

Supported by Marks & Clerk

In association with Canongate Books



BRAINWAVES | DISCUSSION

ALL IN THE MIND?

Psychosomatic phenomena – experiences that affect both body and mind – are a source of both scientific and social intrigue and can reveal unexpected things about mental and physical conditions and the true nature of the relationship between body and mind. Stigmata and Stendhal syndrome, phantom pains, paralysis-by-painting and the placebo effect are all on the menu in this experimental evening featuring contributions by experts in this fascinating field including Dr Chris Bunhan from the University of Aberdeen.

8pm | 90 mins

£8/£6/#SciPals students £4

Summerhall | Anatomy Lecture Theatre

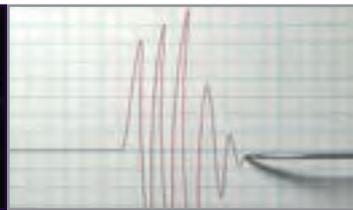


DISCUSSION
BRAINWAVES

HEALTHY LUNCHES: MOTOR NEURONE DISEASE

Motor neurone disease came to the attention of the wider world in the latter half of 2014, when a clever fundraising campaign known as the Ice Bucket Challenge became a popular social media trend. Altogether, the campaign is estimated to have raised over £100 million in funds. One of the recipients of a research grant made possible by donations is **Dr Tara Spire-Jones** of The University of Edinburgh, who is joined by a representative from The Euan MacDonald Centre to hear stories from the present and hopes for the future for those living and working with the condition.

1pm | 1 hour
£5/#SciPals students £2.50
National Museum of Scotland | Auditorium



DISCUSSION
READING EXPERIMENT
BRAINWAVES

A VERY SHORT INTRODUCTION TO...FORENSIC PSYCHOLOGY

Lie detection, offender profiling, jury selection, insanity in the law, predicting the risk of re-offending and the minds of serial killers are topics that fill both the news and fiction. They are all aspects of the rapidly developing area of scientific psychology broadly known as forensic psychology. This *Very Short Introduction...* with psychologist **Dr David Canter**, discusses how forensic psychology is relevant to the legal and criminal process, including explaining criminal behaviour and criminality and the role of mental disorder in crime, and how it helps with investigating crimes and catching the perpetrators.

1pm | 1 hour
£5/#SciPals students £2.50
Summerhall | Red Lecture Theatre
Presented by Oxford University Press



DISCUSSION

SCIENCE BRINGS US TOGETHER

While there is much in the world that can divide people, science is a common language that can unify them. This informative, invigorating and inspiring panel discussion will examine ways in which diplomatic science can build bridges between disparate communities, help resolve conflict and foster international collaboration and development. Featuring journalist **Priya Shetty**, who specialises in health and humanitarian issues in developing countries and **Prof Yasser Khalil** from SESAME, a synchrotron facility in Jordan that encourages a culture of peace through international cooperation in science. Chaired by **Ewan Aitken** of the Cyrenians.

5.30pm | 90 mins
£8/£6/#SciPals students £4 | National Museum of Scotland | Auditorium
Supported by



TUESDAY 7 APRIL



DISCUSSION
BRAINWAVES

EDINBURGH MEDAL ADDRESS: SCIENTISM

Scientism, uncritical veneration for physical science, distorts our idea of what science itself is. Scientism latches on to the dreams and tenet associated with that study rather than its actual message. Its central vision is mechanism, a fascination with interpreting organic life as essentially machinery, today, 'lumbering robots' helpless in the hands of inner demons, thanks to the mythology of *The Selfish Gene*. This year's Edinburgh Medallist **Mary Midgley** is one of the leading moral philosophers working today and her work enjoys a wide popular readership. Over the last 30 years her writings have informed debates concerning animals, the environment and evolutionary theory. Her work transcends intellectual boundaries, drawing upon philosophy, poetry, science and reason and has transformed our understanding of human beings through sensitivity to biological science that does not compromise our humanity. Oration from **Dr Jane Heal** and vote of thanks from **Baroness Warnock**.

7pm | 1 hour
£8/£6/#SciPals students £4 | City Chambers



SPECIAL EVENT
AGES 18+

AT THE FRINGE OF REASON: SKEPTICS IN THE PUB

Edinburgh Skeptics head back to the pub for Science Festival 2015. In the heart of the city that was at the centre of the Scottish Enlightenment, the Skeptics will consider a selection of topics relating to science, reason and critical thinking at the Banshee Labyrinth. Join them on Tuesday 7 April to hear about *Animal Intelligence* or on Thursday 9 April to chat about *Bitcoin* and *Crypto-currencies*. On Tuesday 14 April the subject is *Bat Sanctuaries* and on Thursday 16 April their event will take the form of evidence-based hustings: your chance to pose some questions and challenge the answers in a pre-election special. See edinburghskeptics.co.uk for programme information.

7.30pm | 1 hour
also on Thursday 9, Tuesday 14 and Thursday 16 April
Free | Banshee Labyrinth
Presented by the Edinburgh Skeptics



DISCUSSION

FOREVER YOUNG: CAN WE CURE AGEING?

News articles about anti-ageing wonder pills are becoming more frequent. Only last November when rapamycin hit the headlines trials of its life-extending properties began in dogs. Discuss the facts around these elixirs of life with a panel of experts: **Dr Richard Barrett-Jolley** from the Institute of Ageing and Chronic Diseases at The University of Liverpool; **Prof Lynne Cox**, Associate Professor of Biochemistry at The University of Oxford and **Prof Tom Kirkwood**, Associate Dean of Ageing at the NIHR Newcastle Biomedical Research Centre in Ageing. Chaired by **Glenda Watt**, Strategy Manager for Edinburgh's Joint Commissioning Plan for Older People.

8pm | 90 mins
£8/£6/#SciPals students £4
National Museum of Scotland | Auditorium
Presented by The Physiological Society and the British Pharmacological Society



DISCUSSION

THE INTERNET IS NOT THE ANSWER

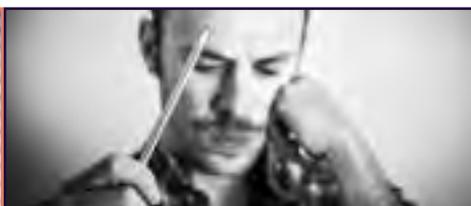
The worldwide web is now a quarter of a century old and there can be no doubt it has transformed the world. But according to entrepreneur, writer and *Techcrunch* host **Andrew Keen**, this disruption has also been a terrible failure. Is the unregulated digital world making us poorer rather than wealthier? Causing unemployment rather than generating jobs? Empowering mob rule rather than promoting democracy? And, rather than fostering a new renaissance, is it encouraging a culture of distraction, vulgarity and narcissism? Join Andrew in conversation with **John Naughton**, technology columnist of *The Observer* and Vice President of Wolfson College, Cambridge.

READING EXPERIMENT

5.30pm | 90 mins

£8/£6/#SciPals students £4 | Summerhall | Dissection Room

In association with Atlantic Books



DISCUSSION

NEW SCIENTIST LIVE: CONSCIOUSNESS AND THE EXTENDED MIND

It's one of the biggest questions of our existence. What is consciousness? Millennia after Aristotle and Hippocrates wrestled with the concept of the mind and self-awareness, neuroscientists, roboticists and psychologists are starting to pin down answers. Join a panel of experts for an evening of lively debate on what we know about the workings of our brains and how our minds extend into our bodies and the world around us, through walking sticks, prostheses, body swaps and machine melds. Artificial intelligence pioneer **Margaret Boden** of the University of Sussex and others will discuss what we can learn about ourselves from creating artificial consciousness and whether revealing the brain's inner workings will solve the hard problem of consciousness.

BRAINWAVES

5.30pm | 90 mins

£10 (ticket only)/£15 (includes a copy of *The Human Brain* bookazine RRP £9.99) | The Queen's Hall | Main Hall

Presented by



DISCUSSION

BAD SCIENCE BOOKS? JURASSIC PARK

Join science fiction author **Alastair Reynolds** and paleontologist **Dr Stephen Brusatte** for a conversation about the relationship between science fact and science fiction hosted by **Sasha de Buyl** from Scottish Book Trust. Using *Jurassic Park* as the basis for discussion, we'll explore whether accurate science is bad fiction and exciting stories are bad science; whether we believe the science we read in novels, and should we; and whether fiction writers have a responsibility to get the science right.

READING EXPERIMENT

5.30pm | 1 hour

£8/£6/#SciPals students £4

Summerhall | Anatomy Lecture Theatre

Presented by Scottish Book Trust



SPECIAL EVENT

UNEXPECTED ENERGY

We know we need a diverse energy supply, but should we be adding something a bit wackier into the mix? Join us for an interactive evening that celebrates energy from unusual sources: everyday objects. You'll hear from people working with these technologies including **Dr Michele Pozzi** of Newcastle University who developed an energy harvesting knee-bracket, and **Nick Scarratt** of the University of Sheffield who studies spray-on solar cell technology. Try other technologies to get hands-on to generate your own energy and help us keep the event sound system going by jumping on our energy generating bicycles.

ENERGY & ENVIRONMENT

8pm | 90 mins

£8/£6/#SciPals students £4 | Summerhall | Dissection Room

Energy and Environment events are supported by



DISCUSSION

THE ONE AND ONLY?

Binary pairings have long been seen as the cornerstone of many societies, both human and animal. Join **Prof Frederick Toates** author of *How Sexual Desire Works*, science communicator and broadcaster **Jules Howard**, award-winning comedian **Rosie Wilby** and author **Zoe Cormier** for a discussion of the merits, meanings and pitfalls of monogamous relationships versus alternative configurations as they explore the ways in which our sexual urges have helped to map the modern world.

READING EXPERIMENT

8pm | 90 mins

£8/£6/#SciPals students £4 | Summerhall | Main Hall

In association with Bloomsbury Publishing, Cambridge University Press and Profile Books



DISCUSSION

THE BLACK MIRROR: FRAGMENTS OF AN OBITUARY FOR LIFE

Inspired by E M Forster's thought that '*Death destroys a man but the idea of it saves him*' **Raymond Tallis** invites you to look back on your life from a posthumous standpoint. Reduction to a corpse, and hence to the material of which we are made illuminates by contrast the infinitely rich life we have left. This humanist celebration of the mystery of everyday life from the imaginary viewpoint of death will illustrate how '*Lucem demonstrat umbra*' or '*darkness shows forth the light*'.

READING EXPERIMENT

8pm | 90 mins

£8/£6/#SciPals students £4

Summerhall | Anatomy Lecture Theatre

Presented by Atlantic Books

WEDNESDAY

8 APRIL



ACTIVITY

THE LOST PHYSIC GARDENS OF EDINBURGH

In 1670 two doctors decided to create a physic garden – a herb garden of medicinal plants – in the shadow of Holyrood Abbey. It proved so successful that it moved time and time again to bigger sites in the city, ultimately becoming the Royal Botanic Garden Edinburgh. This walking tour will take you to the historic sites that were once home to these long lost gardens and you'll discover the gardeners and botanists who helped make them some of the greatest gardens of their eras. The walk begins outside the Palace of Holyroodhouse and ends on Leith Walk.

10am and 2pm | 2 hours

Free (ticket required) | Abbey Strand outside the Palace of Holyroodhouse

Presented by the Royal Botanic Garden Edinburgh



DISCUSSION
READING EXPERIMENT

A VERY SHORT INTRODUCTION TO... PARTICLE PHYSICS

Prof Frank Close, Professor of Physics at Oxford University, takes us on a journey into the atom to examine known particles such as quarks, electrons, and the ghostly neutrino. He will share how discoveries in particle physics have actually been made, and discuss how our picture of the world has been radically revised in the light of these developments. He will also look ahead to new ideas about the mystery of antimatter; the number of dimensions there might be in the universe, and what the next 50 years of research might reveal.

1pm | 1 hour

£5/#SciPals students £2.50

Summerhall | Red Lecture Theatre

Presented by Oxford University Press



SPECIAL EVENT
GASTROFEST

MAD HATTER'S TEA PARTY

We invite you to take a trip down the rabbit hole and join us for a unique and enlightening tea party with the father of molecular gastronomy **Hervé This** and hosted by food writer **Alex Renton**. Hervé is a physical chemist who brought gels, foams and innovative flavour infusions to the masses. Having deconstructed cooking into chemical and physical principles, he now wants to reconstruct the very nature of flavour with his 'note by note' method. He is on a mission to liberate cooks from the constraints of traditional ingredients and methods, creating entirely new taste experiences by cooking with pure molecular compounds and pushing the idea of what food is to a new frontier.

1.30pm | 90 mins

£15 (includes tea and cake)

Summerhall | Dissection Room



GASTROFEST
DISCUSSION

WILL YOU RECOGNISE THE FOOD ON YOUR PLATE IN 2050?

Who is going to shape what we eat in the future? And what will our food look like? Will changes be gradual, or will we be eating insect burgers and synthetic meat within the next ten years? Join The Nutrition Society, the largest nutrition group in Europe, and a panel of experts including **Prof Andrew Salter**, Professor of Nutritional Biochemistry at Nottingham University and **Dr Dean A Sewell**, Senior Lecturer, School of Life Sciences at Heriot-Watt University to discuss the future of food. Hear their perspectives and join in the discussion.

5.30pm | 90 mins

£8/£6/#SciPals students £4

Summerhall Main Hall

Presented by The Nutrition Society



SHOW

MINERVA SCIENTIFICA

Immerse yourself in a music-theatre programme reflecting stories of British women scientists told through the music of the British women composers. *Miriam*, for solo voice and bass clarinet, by Karen Wimhurst in association with Peter Smithers and Dr Ruth Gilbert, celebrates the eminent entomologist **Miriam Rothschild**. Judith Bingham's *Mary Anning*, for solo voice gravel and stones, is a study of the famous Victorian palaeontologist. This musical adventure from electric voice theatre will be interspersed with thought-provoking talks from prominent women in science.

5.30pm | 90 mins

£10/£8

Summerhall | Red Lecture Theatre

Presented by electric voice theatre



DISCUSSION
ENERGY & ENVIRONMENT
BRAINWAVES

MARY MIDGLEY IN CONVERSATION WITH JAMES LOVELOCK

Mary Midgley is one of the leading moral philosophers working today. Her work has drawn upon philosophy, poetry, science and reason and informed debates around animals, the environment and evolutionary theory. She is the 2015 recipient of the Science Festival's Edinburgh Medal. In this event, independent natural philosopher and originator of the Gaia theory **James Lovelock** will join her in a discussion of their lives in science, exploring the places where their worlds and works collide.

5.30pm | 90 mins

£10/£8/#SciPals students £5

The Queen's Hall

Energy and Environment events are supported by E-ON



DISCUSSION

GAMES FOR EVERYONE, BY EVERYONE

Dr Jo Twist, CEO of the Association for UK Interactive Entertainment will discuss diversity in video games and gaming and share stories from some of the industry's most successful women. She will also take an in-depth look at the UK computing curriculum and the measures that need to be put in place to attract more women into STEAM subjects, including computer science and coding.

8pm | 90 mins

£8/£6/#SciPals students £4

National Museum of Scotland | Auditorium

Presented by the National Museum of Scotland



DISCUSSION

HABITATS FOR HAPPY AGEING

Can architecture generate happiness? Can the environment affect our health? Drawing on the latest empirical research, **Prof Catharine Ward Thompson** and **Prof Jamie Pearce** will talk about the links between mood, health and place; and there will be demonstrations of the cutting-edge technology currently used here in Edinburgh to research older people's emotional responses to outdoor environments. A specially curated exhibition will feature images taken by older people on the theme of 'habitats for happy ageing' alongside design work by current postgraduate architecture and landscape architecture students, showing proposals for age-friendly environments.

2pm | 1 hour

Free (ticket required)

Edinburgh College of Art | Evolution House Boardroom

Presented by the OPENspace Research Centre



DISCUSSION

THE WHISPERING MIND

Edinburgh Medal recipient **Mary Midgley** is one of the most important moral philosophers working today. Over the last thirty years, her writings have informed debates concerning animals, the environment and evolutionary theory. This festschrift event will celebrate her work, featuring contributions by Emeritus Professors of Philosophy **Prof Stephen R L Clark** of the University of Liverpool and **Prof David E Cooper** from Durham University; doctor, philosopher, poet and cultural commentator **Prof Raymond Tallis** and **Prof Jane Heal**, Professor of Philosophy at St John's College, University of Cambridge.

BRAINWAVES

2.30pm | 2 hours

£8/£6/#SciPals students £4

National Museum of Scotland | Auditorium



DISCUSSION

ANTIBIOTICS APOCALYPSE

No new antibiotics have been introduced since 1987, but new pathogens are emerging and existing bacteria are developing resistance to drugs. Nesta have established the Longitude Prize, which offers £10 million to anyone who can come up with a way to prevent the rise of antibiotic resistance. Join Longitude Committee member and CEO of the British Science Association **Imran Khan** for a discussion with **Prof Dilip Nathwani**, Chair of the Scottish Antimicrobial Prescribing Group, MRSA superbug expert **Prof Jacqui Reilly** and author of *Penicillin: Triumph and Tragedy* **Dr Robert Bud** as they examine the heroic history and potentially tragic future of antibiotics.

5.30pm | 90 mins

£8/£6/#SciPals students £4

National Museum of Scotland | Auditorium



DISCUSSION

LETHAL LASSIES

Society has always been outraged and fascinated by the figure of the murderess. *Previously...* festival director, comedian and probable woman **Susan Morrison** hosts a killer evening of insights into the psychology of femme fatales, joined by crime writer and Bloody Scotland co-founder **Lin Anderson**, internationally-renowned criminal psychologist **David Canter** and **Dr Kathryn Harkup**, who will be delving into the annals of history to explore the methods and motives of women who kill. Expect twisted tales, toxins and taboos, along with some hands-on investigation.

8pm | 2.5 hours

£10/£8/#SciPals students £5

Summerhall | Dissection Room



DISCUSSION

SUGAR IN THE DOCK

Like it or lump it, sugar plays a large part in our modern diets and with consumption at an all-time high, what can we do to fight our addiction? BBC Scotland Heath Correspondent **Eleanor Bradford** will lead a discussion featuring nutrition expert **Prof Geraldine McNeill** of the University of Aberdeen, **Pete Ritchie** of sustainable food group Nourish Scotland and **Naveed Sattar**, Professor of Metabolic Medicine at the University of Glasgow examining the role of sugar in our lives. Delve into its past, present and future, investigate how much we consume and consider alternatives.

8pm | 90 mins

£8/£6/#SciPals students £8

Summerhall | Main Hall



DISCUSSION

BREWS, BLUES AND A PIANO-BAR-BIKE!

A musical and scientific journey, by piano-bar-bike, through the history of brewing, with Barney's Beer brewer **Andrew Barnett** and **Will Pickvance** from the sell-out Fringe show *The Anatomy of the Piano*. The show will take place at Summerhall brewery, the longest established, non-continuously operating brewery in Edinburgh, now home to Barney's Beer. Brewing science, during a science festival, in a working brewery... yes, there will be beer!

8pm | 50 mins

Wednesday 8–Saturday 11 April

£15 | Summerhall | Summerhall Brewery



DISCUSSION

PETER HIGGS IN CONVERSATION

Prof Peter Higgs returns to The Queen's Hall in conversation with particle physicist and science writer **Prof Frank Close** as they explore the idea of bringing science to the masses, and the masses to science. How do the scientists doing great things best communicate their findings to engage and inspire the public? How can the media help make science accessible and what are the challenges of science education in schools? Prof Higgs will talk about his own experiences of a life in science, the boundaries of understanding and how he sees physics developing in the future.

8pm | 90 mins

£10/£8/#SciPals students £5

The Queen's Hall

Supported by

SIEMENS

THURSDAY

9 APRIL



READING EXPERIMENT | DISCUSSION

A VERY SHORT INTRODUCTION TO... GLOBAL CATASTROPHES

Life on earth will come to an end. It's just a matter of when. In this *Very Short Introduction...* academic, science writer and broadcaster **Bill McGuire** explores the many potential catastrophes facing our planet and our species, from global warming and the New Ice Age, to asteroids and comets, super-volcanoes and mega-tsunami, and looks at both the probability of these events happening and our chances of survival.



DISCUSSION

SPOTLIGHT ON: PHILOSOPHY AND THE SCIENCES

How did cosmology evolve from metaphysics to science? How can the laws of cosmology be tested? What are dark matter and dark energy, and what is the evidence for them? Join philosopher of science **Michela Massimi** and National Museum of Scotland curator **Peter Davidson** to ask the big questions about our universe.

1pm | 1 hour

£5/#SciPals students £2.50

Summerhall | Red Lecture Theatre

Presented by Oxford University Press

2pm | 1 hour

Free (ticket required)

National Museum of Scotland | Auditorium

Presented by the National Museum of Scotland



NUMBERS THAT MATTER | DISCUSSION

SOCIAL MEDIA: SPYING? SENTIMENT? SOURCE OF DATA?

Social media is an amazing resource telling stories and spreading news. Research is only just starting to work out how to use the data these posts generate, considering who owns the information we post, who can use it and for what and what the risks might be. Join **Drs David Emele, Paul Gault, Jennifer Holden** and **Chengwua Lin** from the University of Aberdeen for presentations, discussion and the chance to explore the tools being developed to curate and analyse social media data.

7.30pm AT THE FRINGE OF REASON: SKEPTICS IN THE PUB See page 36



ENERGY & ENVIRONMENT | SPECIAL EVENT

ENGINEERING OUR ENERGY FUTURE: TO FRACK OR NOT TO FRACK?

We all agree we need to find new sources of energy, but we disagree on how to do it. One controversial new source is shale gas obtained by fracking. At a time when the Scottish Parliament has announced a moratorium on planning consents for all unconventional gas development, including fracking, we ask is shale gas a plentiful homegrown option that will plug the energy gap as we progress towards a renewable future or is it an environmental nightmare? A panel including **Prof Jim Watson**, Director of the UK Energy Research Centre and **Prof Paul Younger** of the University of Glasgow, hosted by former MSP **Susan Deacon** of The University of Edinburgh will examine fracking and the issues around discussing energy research with the public.

8pm | 90 mins

£8/£6/#SciPals students £4

National Museum of Scotland | Auditorium

Supported by



GASTROFEST | BRAINWAVES | SPECIAL EVENT | AGES 18+

SENSORY EXPERIMENTATION

Join us for an experimental exploration of the surprising links between our senses and our taste buds. With the head of the University of Oxford's Crossmodal Research Laboratory **Prof Charles Spence**, scent technician **Ericka Duffy** and former Head of Culinary Research and Development at the Nordic Food lab, **Ben Reade**. Through a series of experiments and tricksome tasters we will delve in to sensuous flavours, smells and textures to intrigue and excite your palette. Dinner will never be the same again!

8pm | 90 mins

£20 (includes tasters) | Summerhall | Dissection Room

In association with Oxford Publishing Partnership

5.30pm | 90 mins

£8/£6/#SciPals students £4

Summerhall | Red Lecture Theatre

Presented by Digital Economy Research at the University of Aberdeen



ENERGY & ENVIRONMENT | READING EXPERIMENT | DISCUSSION

THE PRICE OF NATURE

'Natural capital' describes the Earth's stock of natural assets in financial terms, implying that wise management of our ecosystems, soil, air, water and biodiversity can generate dividends and returns. Is this a helpful approach to considering our resources that should inform economic and environmental policy, or does it obscure the fact that nature is priceless? Join environmentalist **Tony Juniper**, author of *What Nature Does for Britain*, for a passionate discussion about natural capital with **Prof Alison Hester** from the James Hutton Institute, **Jonny Hughes** from the World Forum on Natural Capital and **Prof John O'Neill** from the University of Manchester.

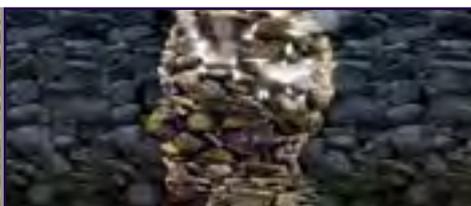
5.30pm | 90 mins

£8/£6/#SciPals students £4

National Museum of Scotland | Auditorium

In association with Profile Books

Energy and Environment events are supported by E.ON



BRAINWAVES | DISCUSSION

FEAR AND RESILIENCE

Learn how the brain, the most complex of organs, copes in a crisis and helps motivate us and push us to the limits of our mental and physical abilities. Militants in Lebanon held special envoy **Terry Waite** hostage in solitary confinement for almost five years. He had no contact with the outside world and was denied access to books and papers. Join him and **Sir Colin Blakemore**, Emeritus Professor of Neuroscience at Oxford University to celebrate what research has taught us about the brain's ability to cope in a crisis and motivate us to the very limits of endurance. Hosted by **Dr Mary Baker**, President of the Year of the Brain and chaired by **Prof Richard Morris**, Director of the Centre for Cognitive and Neural Systems at The University of Edinburgh.

5.30pm | 90 mins

£8/£6/#SciPals students £4 | Summerhall | Main Hall

Presented by the European Brain Council



READING EXPERIMENT | DISCUSSION

LESSONS FROM THE CREMATORIUM

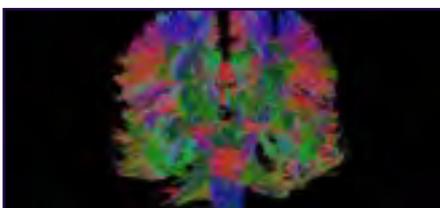
Most people want to avoid thinking about death, but **Caitlin Doughty**, a twenty-something with a degree in medieval history and a flair for the macabre, took a job at a crematorium, turning morbid curiosity into her life's work. Thrown into a profession of gallows humour and vivid characters (both living and very dead), Caitlin learned to navigate the secretive culture of those who care for the deceased. She will share her bizarre encounters and unforgettable scenes in the world of the dead, demystifying death and leading us behind the black curtain of her unique profession. She'll answer questions you didn't know you had, such as: can you catch a disease from a corpse? How many dead bodies can you fit in a Dodge van? And, what exactly does a flaming skull look like?

5.30pm | 90 mins

£8/£6/#SciPals students £4

Summerhall | Anatomy Lecture Theatre

Presented by Canongate Books



BRAINWAVES | DISCUSSION | AGES 18+

THE LIVING BRAIN

How does your brain change throughout your lifetime? How do scientists study the ageing brain? Should we focus on ageing or living? Comedian **Susan Morrison** will be joined by **Dr Susie Shenkin**, **Dr Stuart Ritchie** and filmmaker **Anne Milne** to tackle these questions. Hear how Edinburgh scientists are leading the way in understanding the ageing brain; quiz the experts, hear from some research participants and test your brain. There will be an exclusive screening of Anne Milne's short film *The Living Brain*, the inspiring story of William and Jean and their involvement in some unique research.

8pm | 90 mins

£8/£6/#SciPals students £4 | Summerhall | Main Hall

Presented by The University of Edinburgh



SPECIAL EVENT | AGES 18+

LATELAB: PECHA KUCHA

PechaKucha Night was devised in Tokyo in February 2003 as an event for young designers to meet, network and show their work in public. It has turned into a massive celebration, with events happening in hundreds of cities around the world, inspiring creatives worldwide. Drawing its name from the Japanese term for the sound of 'chit chat', it rests on a presentation format that is based on a simple idea: 20 images x 20 seconds. Start the clock...

LateLab is a collaboration between Edinburgh International Science Festival and New Media Scotland.

8pm | 90 mins

£8/£6/#SciPals students £4

Summerhall | Red Lecture Theatre

Supported by Marks & Clerk



BRAINWAVES | READING EXPERIMENT | DISCUSSION

SLEEPING ON IT: SHORT STORIES FROM THE NEW SCIENCE OF SLEEP

Shakespeare called sleep 'the balm of hurt minds, great nature's second course'. But recent studies show that, as well as being restorative, sleep is an incredibly dynamic period of activity for the brain: a vital opportunity for the mind to subconsciously solve problems, build memories and develop motor functions and instincts. Join editors **Ra Page** and **Dr Penelope Lewis** from The University of Manchester as they discuss their new book, *Spindles*, that pairs neuroscientists with authors to explore the science of sleep, with award-winning writer **Sara Maitland** and **Prof Russell Foster**, Director of the Sleep and Circadian Neuroscience Institute.

8pm | 90 mins

£8/£6/#SciPals students £4

Summerhall | Anatomy Lecture Theatre

Presented by Comma Press

8pm BREWS, BLUES AND A PIANO-BAR-BIKE! See page 41

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



READING EXPERIMENT | DISCUSSION

HEALTHY LUNCHES: FAT PLANET

Our planet is in the grip of an obesity pandemic. More than a billion people worldwide are overweight and over 600 million are obese. We live in an environment in which it is much easier to get fat than to stay fit. How has this come to be? Who is to blame? What can we do? **Dr David Lewis** of MindLab International and **Dr Margaret Leitch** examine the social and psychological causes of the obesity pandemic to answer these questions.

1pm | 1 hour

£5/#SciPals students £2.50

National Museum of Scotland | Auditorium

Presented by Random House Books

READING EXPERIMENT | DISCUSSION

A VERY SHORT INTRODUCTION TO... HUMAN ANATOMY

With strange vocabulary and an apparent mass of facts, human anatomy can at first appear confusing. But the basic construction of the human body – the skeleton, the organs, the nervous system – is vital for anyone studying medicine, biology, and health studies. In this *Very Short Introduction*. . . **Leslie Klenerman**, Emeritus Professor of Orthopaedic Surgery at the University of Liverpool, provides a clear, concise, and accessible introduction to the structure, function, and main systems of the human body, including clear and simple illustrations to explain the key areas.

1pm | 1 hour

£5/#SciPals students £2.50

Summerhall | Red Lecture Theatre

Presented by Oxford University Press

READING EXPERIMENT | DISCUSSION

GENDER AND THE BRAIN

Is there such a thing as a 'male' or 'female' brain? Are observed behavioural gender differences hardwired, culturally-imposed, or even there at all? And what might we be able to learn from people whose gender is not so easily defined? The BBC Radio Scotland series *Brainwaves* explores the science behind our everyday experiences. With the help of Edinburgh University cell physiologist **Prof Richard Ribchester**, behavioural neuroscientist **Dr Gillian Brown**, **Prof Polly Arnold** and **Prof Simon Baron-Cohen** of the University of Cambridge, presenter **Pennie Latin** explores a question that has fascinated and vexed societies for centuries.

5.30pm | 90 minutes

Free (ticket required) | Summerhall | Main Hall

This event will be recorded for broadcast on BBC Radio Scotland.

In association with



FRIDAY

10 APRIL



BRAINWAVES | DISCUSSION

NEUROETHICS ON TRIAL

At the dawn of the 19th century, anatomist Franz Gall declared that the new science of phrenology – predicting personality from the shape of a person's skull – would revolutionise our understanding of human behaviour and criminal responsibility. 200 years later, the issue of whether brain imaging and genetics should be admissible in a court of law, or even used for predictive diagnostics, has become a crucial debate. Join our courtroom of experts including **Prof Simon Baron-Cohen**, **Prof Uri Hasson** of Princeton University, legal ethics specialist **Dr John Danaher** and neuroscientist **Prof James Fallon** who in the course of his research into psychopathy made a truly shocking discovery about his own brain, as the audience becomes the jury and we put neuroethics on trial.

8pm | 90 minutes

£10/£8/#SciPals students £5

Summerhall | Dissection Room



READING EXPERIMENT | SPECIAL EVENING

THE SCIENCE OF GAME OF THRONES

A new series of dazzling skulduggery, bloodshed and frozen-zombie-warrior-creatures begins! Join us for an evening of Ice and Fire (though if we're honest about it, mostly Fire). Award-winning comedian **Helen Keen** and explosive science communicator **Ian Simmons** from Newcastle's Centre for Life, bring you experiments and demonstrations exploring some of the burning issues raised by George R R Martin's epic adventure. Are fire breathing dragons likely? What really happens when royal families inter-breed? Could real world pyromancers create green wildfire and destroy a fleet of ships? And can you actually, really, crush someone's skull with your bare hands? Think you know the answers? Or, do you know nothing (Jon Snow)? Come along either way, in costume if you want, we would love that!

8pm | 1 hour

£8/£6 #SciPals students £4 | Summerhall | Main Hall



SHOW | AGES 18+

LATELAB: DIALOGUES

Michael Edwards is an Edinburgh-based composer, performer, and software developer. For this concert he presents 'hyperboles', a series of pieces that allow flautist **Anne La Berge** to tweak the algorithmic parameters that are used to generate the work's score. This open invitation enables the musician to get involved in the compositional process. Anne delicately spins microtonal textures and melodies, and a wholly unique array of powerfully percussive flute effects, all are combined with electronic processing in this guided improvisation. *LateLab* is a collaboration between Edinburgh International Science Festival and New Media Scotland.

8pm | 2 hours

Free (ticket required) | Summerhall | Old Lab

Supported by Marks & Clerk

8pm BREWS, BLUES AND A PIANO-BAR-BIKE! See page 41



DISCUSSION

BRUNO PONTECORVO: PHYSICIST AND ATOMIC SPY?

Join **Tam Dalyell** (MP for West Lothian 1962–2005 and columnist for *New Scientist* 1967–2005) in conversation with acclaimed physicist **Prof Frank Close** of the University of Oxford as they explore the life of Bruno Pontecorvo, a brilliant atomic physicist who defected from the West to the Soviet Union at the height of the Cold War. Learn about the mystery that surrounded his sudden disappearance as Tam and Frank open up a world of intelligence and counter-intelligence, revealing for the first time the tipoff that led to Pontecorvo's defection.

5.30pm | 90 mins

£8/£6/#SciPals students £4

Summerhall | Dissection Room

DISCUSSION

THE EDGE OF THE SKY

From the big bang to alien worlds, from dark matter to dark energy, from the origins of the universe to its destiny, *The Edge of Sky: All You Need to Know About the All-There-Is* is a science book unlike any other you have read before: it explains the entire universe using only the most common 1,000 words in the English language (and 'universe' is not one of them!). Astrophysicist and author **Dr Roberto Trotta** takes you on a wonder-filled journey through the great discoveries and amazing mysteries of our cosmos, explained in beautifully simple terms that everyone can understand.

5.30pm | 1 hour

£8/£6/#SciPals students £4

Summerhall | Red Lecture Theatre

Presented by Perseus Books

DISCUSSION

DEMENTIA RESEARCH: ILLUMINATING BRAIN CHANGES

An illuminating evening of scientific discussion and research in a working dementia research laboratory. This is a unique opportunity to see how neuroscientists are striving to understand and eventually cure dementia. **Dr Tara Spires-Jones** of The University of Edinburgh will give a brief lecture to introduce you to the brain and what goes wrong when people are diagnosed with dementia. Then you will take an interactive tour of the research laboratory, followed by a drinks reception where you can chat with scientists and learn how you can help us defeat dementia. Supported by Alzheimer's Research UK.

5 and 7pm | 90 minutes

Saturday 11 April | 5 and 7pm | 90 minutes

Free (ticket required) | University of Edinburgh

Centre for Cognitive and Neural Systems

SPECIAL EVENT

AGES 18+

BIG BANG BASH

An out-of-this-world party celebrating the wonders of space. Sample a space-themed cocktail from the *Bar at the End of the Universe*, discover the solar system in our portable planetarium then have a go at making your own space craft to take home. Challenge yourself to build an interstellar structure using Splatform, watch roving scientists perform mind-boggling experiments, hear short talks from space experts, including authors **Marcus Chown**, **Prof Monica Grady** and **Dr Roberto Trotta**, or relax and enjoy vintage sci-films and our space-tacular DJ.

7pm | 3.5 hours

£12/£10

National Museum of Scotland | Grand Gallery

In association with the National Museum of Scotland

LATELABS

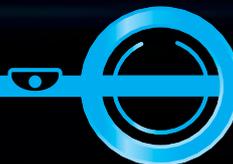
Back for its fourth Science Festival, *LateLab* is an inspirational wunderkammer of presentations, performances, interactives and installations for the sci-curious. Each event is a uniquely memorable experience, with no two *LateLabs* ever the same. Expect real-time experiments, unusual inventions and creative encounters...

This year, we kick off with *TRON v TRON: Legacy* (p.35), a new take on the Atmosphere screening complementing the National Museum of Scotland's *Game Masters* exhibition. Step inside the digital world and play to decide which film we screen. *Encounters* (p.37) will introduce you to Ginsberg, a new online tool that helps us understand ourselves better by tracking our activity and mood, with a salon-style evening of cerebral stimulation and debate.

Regular *LateLab* favourite *Dialogues* (p.44) will celebrate experimental music and sonic art. *PechaKecha* (p.43) presents a science-infused night of quick-fire presentations and *GastroLab* shakes up some cocktails with *Molecular Mastery* (p.46). In the final *LateLab* of the Festival, *Beauty by Design* (p.58) explores the chemistry, engineering, politics and sometime brutality of beauty regimes past and present, complementing the exhibition of the same name at the Scottish National Portrait Gallery.

LateLab is a collaboration between Edinburgh International Science Festival and New Media Scotland.

See individual entries throughout this brochure and visit our website for more information.



Supported by

Marks&Clerk
Intellectual Property Services

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

SATURDAY 11 APRIL



READING EXPERIMENT | DISCUSSION

THE NATURE OF THE BEAST
Almost, but not quite human, the yeti and its counterparts from wild regions of the world still fascinate us. But are these creatures real or imagined? **Prof Bryan Sykes** from The University of Oxford, presenter of the Channel 4 documentary *Bigfoot Files*, set out to unlock this mystery using DNA analysis of hair samples from the Himalayan yeti, Russian almasly and American bigfoot. Join him as he explains some of the surprising and significant discoveries his genetic research has uncovered and find out why the yeti remains an enigma. There is something out there, but what?

1pm | 1 hour
£8/£6/#SciPals students £4
National Museum of Scotland | Auditorium
Presented by Hodder and Stoughton



LIGHT & ENLIGHTENMENT | DISCUSSION

AND THROUGH THE DARK THE BRILLIANT LIGHT
James Clerk Maxwell is to science in Scotland as Burns is to poetry. Born in Edinburgh in 1831, he ranks with Newton and Einstein as one of the three greatest physicists of all time. His mathematical demonstration that light is an electromagnetic wave, published 150 years ago, is celebrated in the current UN International Year of Light. Maxwell was also a humorous and warm-hearted man, with a deep religious belief, who wrote mystical and sometimes romantic poems. Maxwell's life is narrated by **Howie Firth** of Orkney International Science Festival, accompanied by music and song from **Andy and Flora Munro**.

3pm | 90 mins
£8/£6/#SciPals students £4
National Museum of Scotland | Auditorium
Presented by the Church of Scotland



GASTROFEST | SPECIAL EVENT | AGES 18+

LATELAB: GASTROLAB: MOLECULAR MASTERY
Molecular mixology uses the scientific equipment and techniques of molecular gastronomy to create cocktails with greater intensities and variety of flavour, unexpected combinations and new ways of presenting drinks. Join **Prof Andrea Sella** and top drinks consultants and developers **Zoe Burgess** and **Max Venning** from London's Drink Factory as they demonstrate how the art of cocktail making has become a science and show you tricks of the trade that will help you experiment at home. *LateLab* is a collaboration between Edinburgh International Science Festival and New Media Scotland.

3pm | 90 mins
£25 (includes cocktails)
Summerhall | Dissection Room
Supported by Marks & Clerk



BRAINWAVES | DISCUSSION

MUSIC ON THE BRAIN
Are we fundamentally wired for sound, and what effects do different notes, tones and harmonies, including those that we cannot 'hear', have on our perception? **Prof Trevor Cox** of the University of Salford is joined by eminent science writer **Philip Ball**, psychology of music expert **Dr Katie Overy**, pianist **Will Pickvance** and sound designer **Peregrine Andrews** for a sonic odyssey in psychoacoustics, featuring live performance, tales of how to live without music and a look at the surprising effects of silence on the human brain. Hosted by **Helen Arney**.

8pm | 90 mins
£8/£6/#SciPals students £4
Summerhall | Dissection Room



BRAINWAVES | GASTROFEST | READING EXPERIMENT | DISCUSSION

FATES, FATS AND FACTS: WHAT REALLY DRIVES FOOD CHOICE
With the obesity 'pandemic' costing societies dearly, questions of how and why we choose our food are in the spotlight. Are we culpable for what is on our plates, or are we subject to forces beyond our control? Join prominent academics for discussion, experimentation and investigation into who is in the driving seat when it comes to food choice, and what the outcomes of different choices might be. We'll be busting myths about obesity, mortality, health and weight loss in a lively and interactive evening featuring **Prof Gareth Leng** and behavioural economist **Prof Bradley Love**.

8pm | 2 hours
£8/£6/#SciPals students £4 | Summerhall | Main Hall
Supported by
DIABETES SCOTLAND
CARE. CONNECT. CAMPAIGN.
In association with Random House Books



AGES 18+ | SHOW

ADA ADA ADA
Ada Lovelace, born in 1815, is often attributed as the world's first computer programmer, and her contribution was both profound and inspirational. She was able to glimpse a future in which machines would become partners of the human imagination and perceived how such a device might process any form of information. And so Ada, Countess of Lovelace, helped sow the seeds for a digital age. In this witty, engaging, thought-provoking and fun interactive storytelling performance, you'll become a participant in the story using postage labels, wearable technology and a lot of string.

8pm | 1 hour
£8/£6/#SciPals students £4
Summerhall | Anatomy Lecture Theatre
Image: Duncan Hull



NUMBERS THAT MATTER | SHOW

THE SAVANT GARDE: MATHEMATICAL FEATS BY THE NERDY ELITE
Enter the mind of the mathematical savant. An intellectual maverick riding free on a horse named Genius. Where have their mathematical adventures taken them? What treasures have they uncovered? What hope has anyone of understanding it?! Step in **Simon Pampena**, Stand-up Mathematician and Australian Numeracy Ambassador. He is the bridge between their achievements and your brain. Join Simon on a comedy adventure featuring some of the hardest maths problems of all time and the people who solved them.

8pm | 1 hour
£8/£6/#SciPals students £4
Summerhall | Red Lecture Theatre



SPECIAL EVENT

REACHING OUT WITH ROSETTA

Last year, the European Space Agency's probe Rosetta reached comet 67P/Churyumov-Gerasimenko. Just as the Rosetta Stone unlocked the mysteries of an ancient civilisation it is hoped that the Rosetta probe will provide the key to the secrets of comets, the oldest and most primitive objects in our solar system. Join us for a discussion with astronomers **Prof Hugh Jones** of the University of Hertfordshire, **Prof Monica Grady** of the Open University, science fiction writer **Ken MacLeod**, and writer and broadcaster **Marcus Chown** as they discuss comets from several perspectives. There will be a presentation of the Royal Observatory Edinburgh's super cool comet-making demonstration.

3pm | 90 mins

£8/£6 / #SciPals students £4 | Summerhall | Main Hall

Supported by the Geological Society of London and the Royal Astronomical Society

5pm DEMENTIA RESEARCH: ILLUMINATING BRAIN CHANGES See page 45



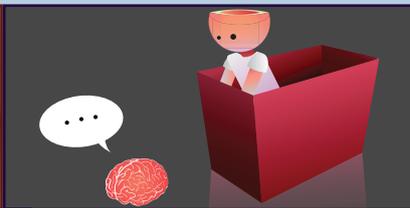
WHAT ABOUT THE BEES?

Honeybees and bumblebees are familiar but with more than 250 species of bee in the UK, they are far more diverse than you might think. We rely on bees to pollinate the plants and trees that produce our food but they are struggling. Join biologist and broadcaster **Prof Adam Hart** for a discussion with Ecological Entomologist **Dr Helen Roy** from the NERC Centre for Ecology and Hydrology, **Warren Bader** of Plan Bee and **Gill Perkins** from The Bumblebee Conservation Trust. Make your own seed-bombs to take away and sample Plan Bee's delicious honey and honeybee beer.

5.30pm | 90 mins

£12/£10 (includes samples and seed bombs) Summerhall | Dissection Room

Energy and Environment events are supported by E-ON



THINKING OUTSIDE THE BRAIN

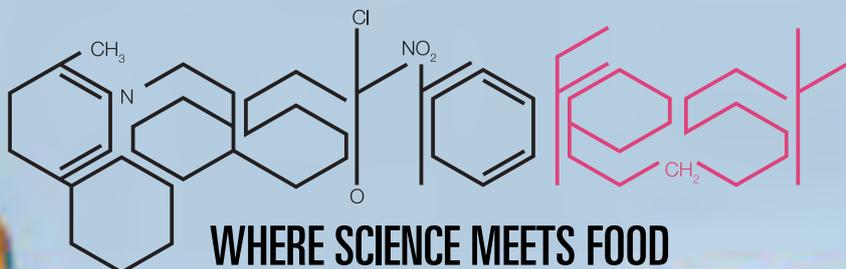
More and more, you're being told that everything you think and do is in the brain. Politics is in the brain, religion is in the brain, art is in the brain, you are your brain. Now the brain is a wonderful thing, but it's not the whole thing. From the moment you're born you interact with the world and with other people. In the process of doing that, you work out how to think and what to think, about politics, religion, art and everything else. Your brain is just part of a larger process of thinking, which involves not only the connections in your brain, but also the connections between our brains. **Dr Peter Lamont** of The University of Edinburgh explores the wider context of thought and attempts to uncover the 'real' location of our minds.

5.30pm | 90 mins

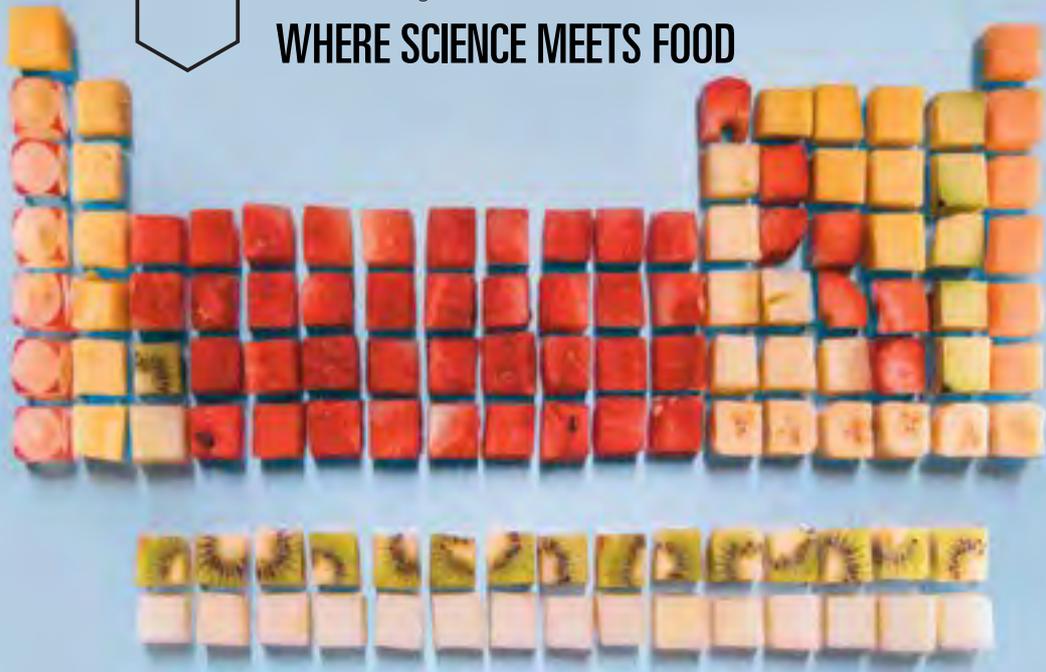
£8/£6 / #SciPals students £4 Summerhall | Red Lecture Theatre

7pm DEMENTIA RESEARCH: ILLUMINATING BRAIN CHANGES See page 45

8pm BREWS, BLUES AND A PIANO-BAR-BIKE! See page 41



WHERE SCIENCE MEETS FOOD



Showcasing the importance of science in the most delicious way possible, *GastroFest* returns in 2015 with a packed menu featuring producers, artisans, scientists and chefs. From the tempting and tantalising to downright delicious this smorgasbord of insightful discussions, thought-provoking presentations and out-of-this-world foodie experiences offers options to suit all tastes.

For a sip of something surprising, *Give in to Fermentation* (p.55) and enjoy a series of beer and fermented food pairings, or take a mouth-watering journey into the science of gin in *Gin-omics for Generation Gin* (p.48). Pick-up some tasty treats as you explore a farmers' market with a scientific twist at *SciMart* (p.36), discover the links between your senses and tastebuds in *Sensory Experimentation* (p.42) or investigate whole animal eating in *Nose to Tail: The Not-So Offal Truth* (p.37).

GastroFest is supported by:



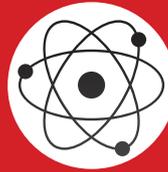
ONLINE BOOKING: sciencefestival.co.uk BOOKING HOTLINE: 0844 557 2686



SPECIAL EVENT

SCIENCE FESTIVAL CHURCH SERVICE

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.



DISCUSSION

SERVING THE REICH: THE STRUGGLE FOR THE SOUL OF PHYSICS UNDER HITLER

Explore the moral dilemmas of physicists working in Nazi Germany with author **Philip Ball**. While some scientists colluded with or supported the regime, most were caught in a grey area between collaboration and resistance. Did they set out to give Hitler the atomic bomb, or were they just undertaking regular scientific research in extraordinary circumstances? Find out as Phillip delves into the stories of three of Nazi Germany's leading physicists: Max Planck, Peter Debye and Werner Heisenberg.



SPECIAL EVENT

BOARD GAMES WITH A SCIENCE-Y TWIST!

Enjoy an afternoon of science-inspired board games that will give you the chance to tackle climate change, cure diseases or prevent lab explosions. Drop in for anything from 15 minutes of dice-throwing and collecting dinosaurs, to an hour or two of solving puzzles and saving the world. Children are very welcome but must be accompanied by an adult.

SUNDAY

12 APRIL

11.30am | 2 hours
Free | St Giles Cathedral

1pm | 1 hour
£8/£6/#SciPals students £4
National Museum of Scotland | Auditorium
Presented by the Royal Society

2-5pm | drop-in
Free | Summerhall | Cafe
Presented by State of Play



AGES 18+ | DISCUSSION

INVISIBLE

The concept of invisibility has inspired us for centuries: from Plato and Shakespeare to James Clerk Maxwell and the magicians of the Victorian music hall. This territory takes us from medieval grimoires to cutting-edge nanotechnology, from fairytales to telecommunications, from camouflage to early cinematography, and from beliefs about ghosts to the dawn of nuclear physics and the discovery of dark energy. Join author **Phillip Ball** to discover new worlds, some real, some fantasy, and some whose existence is yet to be proved.

DISCUSSION | LIGHT & ENLIGHTENMENT

WHY SCOTLAND SHOULD LEAD THE NEUROSCIENTIFIC ENLIGHTENMENT

The regulation of drugs – including alcohol and tobacco – is an issue of pressing importance. Healthcare costs associated with their use are rising and new synthetic agents are being developed and sold online. Scotland has pioneered the UK's progress in recent years: introducing smoking bans and minimum unit pricing and reducing the drink-driving limit. **Prof David Nutt** of Imperial College London has ten years' experience on the UK Government's Advisory Council on the Misuse of Drugs. Here he will reflect on these policy successes and suggest ways we can improve responses to harmful drugs and encourage innovations in treatment.



AGES 18+ | SPECIAL EVENT | GASTROFEST

GIN-OMICS FOR GENERATION GIN

Discover a mouth-watering journey into the science of gin with **Ewan Henderson** of Scotch Broth Events, **Dr Richard Burchmore**, **Dr Isabel Vincent** and **Dr Stefan Weidt** from the University of Glasgow Polyomics and gin expert **Geraldine Coates**. Comparing gin styles, the chemistry of botanicals, science experiments and tasting delicious Scottish craft gins including Pickering's, Strathearn, Makar and The Botanist with cocktails and molecular paired canapés.

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

5.30pm | 1 hour
£8/£6/#SciPals students £4 | Summerhall | Main Hall
Presented by Random House Books

8pm | 75 mins
£10/£8 | Edinburgh International Conference Centre
Pentland Suite
In association with
Part of the EICC InnovationNation series



8pm | 2 hours
£25 (includes gin) | Summerhall | Dissection Room



TUNNEL VISION

DISCUSSION
BRAINWAVES
 Red Bull athlete **Danny MacAskill** is the street trials rider who shot to global fame in 2009 after a video of him displaying his skills on the streets and rooftops of Edinburgh went viral. Since then, he has performed incredible feats with his bike in locations across the globe, most recently conquering the magnificent Cuillin Ridge line on his native Isle of Skye. This special event explores the nature of focus: how it transforms our behaviour, unlocks the potential of our brains and drives us to achieve extraordinary things. Danny is joined by **Prof Ian Robertson**, psychologist and founding director of the Trinity College Dublin Institute of Neuroscience, whose work on the brain function of attention has transformed the lives of patients across the globe.



CYCLING SCIENCE

DISCUSSION
READING EXPERIMENT
 Journalist and author **Max Glaskin** presents an evening of science hacks for cyclists, exploring how and why a bicycle works whilst investigating topics such as: the enigma of self-stable bikes; the make-up of metal; the secrets of slipstreaming; the dirt behind these 'clean machines' and the truth about hairy legs! He will be joined by **Prof Andrea Sella**, one of the UK's top science communicators, and a cycling fanatic as they discuss topics from Max's book *Cycling Science: How Rider and Machine Work Together* in a fun and informative exploration of all things biking.

3pm | 90 mins

£10/£8/#SciPals students £5

National Museum of Scotland | Auditorium

5.30pm | 90 mins

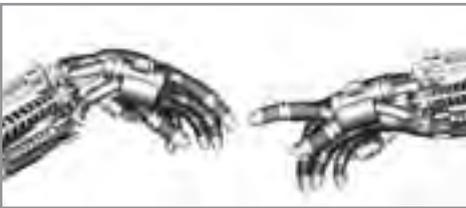
£8/£6/#SciPals students £4 | Summerhall | Dissection Room



FIG 1. SCIPALS MARIE CURIE AND NIKOLA TESLA DEMONSTRATE A SUCCESSFUL SCI-FIVE!

SCIENCEFESTIVAL.CO.UK/STUDENTS
 #SCIPALS SUPPORTED BY

SIEMENS



CAN ROBOTS EVOLVE?

DISCUSSION
 As robots become more embedded in everyday life they are also cooperating and adapting to each other, similar to the swarming behaviour seen in ants, birds and fish. **Prof Jon Timmis**, Director of the York Robotics Laboratory, will explain, with interactive demonstrations, how biology is now influencing robotics research. Understanding biological systems unlocks key concepts that will inform how robots will be designed and operate in the future and bio-inspired robotics could have significant implications for human activities in the home, transport, medicine, industry and defence. Hosted by **Prof Alan Winfield** of the Bristol Robotics Lab.



LAB NOTES

SHOW
 A natural selection of statistically significant comedy songs from geek songstress **Helen Arney**, science troubadour **Jonny Berliner** and actual cosmologist **Andrew Pontzen**. As individuals they've been heard on BBC Radio 4's *Infinite Monkey Cage*, *The Guardian's Science Weekly* podcast and in Festival of the Spoken Nerd, but together they create a celebratory Venn diagram of science and song, using only the most precise scales and finely tuned instruments. These songs are outliers you don't want to dismiss.



MAPPING THE MACHINE

DISCUSSION
BRAINWAVES
 Understanding the human brain is one of the greatest challenges of the 21st century. The Human Brain Project, funded by the European Commission, is building a computer-based copy of the human brain to help understand brain function, neurological disorders and the effects of drugs. Join us for a discussion with neurobiologist **Prof Seth Grant**, University of Edinburgh, computational subproject leader **Prof Steve Furber** of Manchester University and **Prof Barbara Sahakian** of Cambridge University as they discuss the scale, importance, and social and ethical dimensions of this project.

8pm | 90 mins

£8/£6/#SciPals students £4 | Summerhall | Main Hall

Presented by Edinburgh Napier University

8pm | 60 mins

£8/£6/#SciPals students £4

Summerhall | Red Lecture Theatre

8pm | 90 mins

£8/£6/#SciPals students £4

Summerhall | Anatomy Lecture Theatre



DISCUSSION

HEALTHY LUNCHES: CROHN'S

Crohn's disease is a lifelong immune-mediated condition that causes inflammation of the lining of the bowel. The recent sharp rise in its diagnosis in young people has been attributed to better screening methods, over-prescription of antibiotics in early life and poor diet, but what are the facts behind the current excitement?

Prof Jack Satsangi, Chair of Gastroenterology at The University of Edinburgh, leads a discussion of the research into new therapies taking place in Scotland and further afield, including the possibilities offered by epigenetics (chemical changes in cells not attributed to DNA) for Crohn's and associated conditions.

1pm | 1 hour

£5/#SciPals students £2.50

National Museum of Scotland | Auditorium



READING EXPERIMENT | DISCUSSION

DID LIFE ORIGINATE IN THE QUANTUM MULTIVERSE?

The origin of life is one of the biggest problems in the whole of science.

The simplest living organisms alive today are actually highly complex creatures that could not have arisen by chance chemical reactions; they must have been preceded by simpler self-replicating systems. But even these are unlikely to have arisen by chance, at least in a single classical universe. Join author and broadcaster **Prof Jim Al-Khalili** and his University of Surrey colleague **Prof Johnjoe McFadden** co-author of *Life on the Edge: The Coming of Age of Quantum Biology* as they propose the idea that life may be quantum mechanical.

5.30pm | 90 mins

£8/£6/#SciPals students £4

Summerhall | Dissection Room

Presented by Transworld Publishers



DISCUSSION | LIGHT & ENLIGHTENMENT

CATCHING THE RAINBOW: PLANTS, PEOPLE AND SOLAR CELLS IN SCOTLAND

The Schools of Chemistry and Biological Sciences at The University of Edinburgh combine to present an intriguing comparison of how humans are replicating some of the processes that plants use to interact with the sun and what the rise in solar energy in Scotland means for our society. **Dr Neil Robertson** will describe how the latest solar panel technologies mirror plant life behaviours and you'll be able to investigate a range of hands-on activities related to solar power and plant sciences and meet the researchers involved in this work.

5.30pm | 90 mins

£8/£6/#SciPals students £4

Summerhall | Main Hall

Presented by The University of Edinburgh



MONDAY
13 APRIL

BRAIN * MIND * CONSCIOUSNESS

BRAINWAVES



EDINBURGH INTERNATIONAL
SCIENCE FESTIVAL

This April, Edinburgh will host the British Neuroscience Association's (BNA) biennial Festival of Neuroscience. This prestigious professional conference, now in its 50th year, will see neuroscientists from across the country gather in Edinburgh. In celebration, we'll be presenting *Brainwaves*, a mini-festival of brain, mind and consciousness exploring one of the most mysterious objects in the universe.

With the mind/machine interface, the cultural history of the brain and the ethics of neurological experimentation on the menu, our *Brainwaves* programme offers up a mind-blowing selection of stimulating encounters with our own personal supercomputers.

From the formation of neural pathways to theory of mind, we will be putting grey matter under the microscope. We'll investigate the nature of addiction, attempting to explore the specific circuitry and neurobiology that drives compulsive behaviour. We'll take a look at the age-old questions of gender and the brain (p.44) and conduct some on-your-feet investigations into brain-research and the relationships between movement, cognition and memory (p.56 and p.58).

BNA KEYNOTE LECTURES

In partnership with the BNA, we'll be opening two of their keynote events to the public.

WHY SCOTLAND SHOULD LEAD THE NEUROSCIENTIFIC ENLIGHTENMENT

with Prof David Nutt

Sunday 12 April

See page 48

THE SEARCH FOR CONSCIOUSNESS: DETECTING AWARENESS IN THE VEGETATIVE STATE

with Dr Adrian Owen

Tuesday 14 April

See page 53

ONLINE BOOKING: sciencefestival.co.uk BOOKING HOTLINE: 0844 557 2666

50

Look out for *Brainwaves* tagged events throughout the events section of this brochure.

Programming Partner





DISCUSSION
LIGHT & ENLIGHTENMENT

ON THE SPECTRUM

Join us for a fascinating investigation into the everyday yet marvellous nature of colour that explores how we use, interact with and understand it, from the electromagnetic wavelength to the bedroom wall. Chaired by *Bright Earth* author **Philip Ball**, engineer **Guy Howlett**, synaesthesia expert **Jennifer Mankin** and author of *The Brilliant History of Color in Art* **Victoria Finlay** take a journey from the ultramarine mines of Afghanistan to the UK laboratory that has created a material so black we can't see it. Discover the surprising source of some 'everyday' pigments, how colours change cultures, how it feels to hear crimson and taste gold and hear the tale of the lethal dangers of a fashionable shade of green.

DISCUSSION
BRAINWAVES

BECAUSE YOU KNOW... IT'S ALL ABOUT THAT BRAIN

Between 2013 and 2014, 5,000 young people in Scotland became homeless due to family relationship breakdown and conflict. But what are the causes and effects of conflict and what role does the brain play? The Cyrenians pioneering Scottish Centre for Conflict Resolution (SCCR) collaborates with professionals in the fields of health, psychology and conflict resolution on early interventions for families in this situation to reduce youth homelessness. Join SCCR conflict resolution advisor **Abbey Krause** in discussion with medical advisor **Dr Sara Watkin** to examine the physical and emotional impact of conflict and how it connects to the brain. Hosted by **Ewan Aitken** of the Cyrenians.

DISCUSSION
LIGHT & ENLIGHTENMENT
BRAINWAVES

ENLIGHTENMENT: MOLECULES, BRAINS, LIGHT AND ART

Discover the recent and largely untold revolution that has taken place in the world of biological microscopy. In 2014, the Nobel Prize in Chemistry was awarded to three researchers who created new techniques that allow scientists to see inside living cells with higher resolution than they could have imagined even 5 years ago. Through presentations, demonstrations and audience participation, **Prof Rory Duncan** and **Dr Paul Dalgarno** of Heriot-Watt University will show how neurobiologists can now see the molecular protein machines that make neurotransmission happen, using tricks from astronomy to see and track thousands of single molecules moving in living cells.

8pm | 90 mins

£8/£6/#SciPals students £4 | Summerhall | Dissection Room

8pm | 90 mins

£8/£6/#SciPals students £4 | Summerhall | Main Hall

8pm | 1 hour

£8/£6/#SciPals students £4

Summerhall | Anatomy Lecture Theatre

Presented by Heriot-Watt University

EDINBURGH MEDAL

The 2015 Edinburgh Medal is awarded to **Mary Midgley**, one of the most important moral philosophers working today. Over the past thirty years, her writings have informed debates concerning animal rights, the environment and evolutionary theory. Mary was a senior lecturer in Philosophy at Newcastle University and wrote her first book, *Beast and Man*, when she was in her fifties. She has since published over fifteen books, including *Animals and Why They Matter*, *Science and Salvation* and *Evolution as a Religion*.

The Edinburgh Medal is a prestigious award given each year to men and women of science and technology whose professional achievements are judged to have made a significant contribution to the understanding and well-being of humanity.



Mary will appear in three events celebrating her life and work at this year's Science Festival, including a special in conversation event with leading environmentalist and originator of the Gaia theory, **James Lovelock**, at The Queen's Hall.

EDINBURGH MEDAL ADDRESS: SCIENTISM

Tuesday 7 April

See page 38

THE WHISPERING MIND

Wednesday 8 April

See page 41

MARY MIDGLEY IN CONVERSATION WITH JAMES LOVELOCK

Wednesday 8 April

See page 40

PREVIOUS RECIPIENTS

- 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



DISCUSSION

HEALTHY LUNCHES: ALLERGIES

Allergies from the bothersome to the life-threatening are on the rise, and fast. Year on year, the number of people in the UK affected by an allergic condition increases by an average of 5%, and half of these are children. Could this surge be down to our increasingly sterilised habitats, dietary factors, or even environmental changes? Are we over-diagnosing some types of allergy, and what cutting-edge treatments might be available in the future? Join our panel of experts as they attempt to unravel these and other key questions.



READING EXPERIMENT

A VERY SHORT INTRODUCTION TO...HORMONES

Hormones play an integral part in the balance and workings of the body. While many people are broadly aware of their existence, there are many misconceptions about the endocrine system. In this *Very Short Introduction*... physiologist **Martin Luck** explains what hormones are, what they do, where they come from, and how they work. He explains how the endocrine system operates, highlighting the importance of hormones in the regulation of water and salt in the body, how they affect reproduction and our appetites, and how they help us adjust to different environments.



NUMBERS THAT MATTER

THE COMPUTING UNIVERSE

In a short time, computers have come to impact almost every aspect of our lives, and this is just the beginning. Join **Tony Hey** formerly of Microsoft, now Senior Data Science Fellow at the University of Washington as he describes computing from the early days in the 1930s to the present. Along the way you'll find out about hardware and software, algorithms, Moore's law, the birth of the personal computer, the Internet, the Turing test, Jeopardy-winning supercomputer Watson, World of Warcraft, spyware, Google, Facebook and quantum computing. You'll also meet the fascinating dreamers and inventors who brought this amazing technology to the modern world.

TUESDAY 14 APRIL

1pm | 1 hour

£5/#SciPals students £2.50

National Museum of Scotland | Auditorium

1pm | 1 hour

£5/#SciPals students £2.50

Summerhall | Red Lecture Theatre

Presented by Oxford University Press

5.30pm | 90 mins

£8/£6/#SciPals students £4

Summerhall | Dissection Room

Presented by Cambridge University Press



DISCUSSION

BLACK GOLD, WHITE LIES? THE TRUTH ABOUT NORTH SEA OIL

North Sea oil was a big issue in the run-up to the Scottish independence referendum. Now the referendum is over, we want to know how much oil is really left in the North Sea and what its value is. Can we find a way to extract it all in a commercially and technologically viable way? Or perhaps we should concentrate our efforts on renewables? Join Dean of Aberdeen Business School **Prof Rita Marcella** as she hosts a discussion with Aberdeen University's oil economist **Prof Alex Kemp**, **Oonagh Werngren**, Operations Director at Oil and Gas UK, **Baroness Worthington**, the Shadow Minister for Energy and Climate Change in the House of Lords and petroleum geoengineer **Prof Patrick Corbett** from Heriot-Watt University as they talk about North Sea oil and help settle the debate about Scotland's black gold.

8pm | 90 mins

£8/£6/#SciPals students £4

National Museum of Scotland | Auditorium

Supported by



Energy and Environment events are supported by E-ON



DISCUSSION

ENGINEERING THE NEW ENLIGHTENMENT

Taking inspiration from the UN International Year of Light 2015, we will be exploring how light engineering is opening up unknown and far-reaching possibilities. Scientists, engineers and technicians are performing cutting-edge research with light, using it to revolutionise communications, cure diseases and solve crimes. Our inspiring demonstrations and presentations include **Dr Jonathan Leach** from Heriot-Watt University, who can take images that show light travelling through air and has made a camera that can see around corners, and **Prof Michael Wharmby** of Diamond Light Source, the UK's national synchrotron science facility who will explore the emergence and evolution of these highly complex machines.

8pm | 90 mins

£8/£6/#SciPals students £4 | Summerhall | Dissection Room

Supported by



DISCUSSION

THE INTELLIGENT WEB

As we use the web, we leave a personal trail. Products you look at appear as you move around the Internet, and search engines now look deep into the data on the web for the word you are looking for. **Dr Gautam Shroff**, Chief Scientist for TCS Research based in Delhi, India and **Prof David Roberston** from the School of Informatics at The University of Edinburgh take us on a journey through the computer science of search and the increasingly sophisticated algorithms that operate on the web, discussing sifting, selecting, comparing, aggregating and correcting, and the simple but powerful rules that decide what matters.

8pm | 90 mins

£8/£6/#SciPals students £4 | Summerhall | Main Hall

In association with Oxford University Press



DISCUSSION

PRESCRIBING: IS IT TIME FOR PATIENTS TO REGAIN CONTROL?

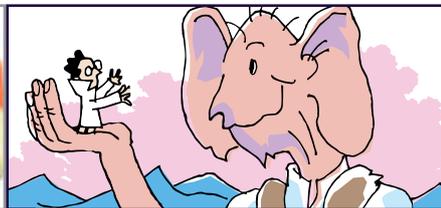
The average number of NHS prescriptions has risen over the last decade. Medicines are no longer only short-term lifesavers but long-term preventative 'lifestyle' drugs, such as statins, aspirin, high blood pressure and osteoporosis treatments, and antidepressants. Do they help otherwise active people to live longer, healthier lives; or are they trapping patients in a spiral of appointments, blood tests and repeat prescriptions? Join **Prof Simon Maxwell** from The University of Edinburgh, **Dr Patricia McGettigan** from the William Harvey Research Institute and **Sandra Auld**, Acting Director, Association of the British Pharmaceutical Industry to discuss the future of prescribing in the NHS.

5.30pm | 90 mins

£8/£6/#SciPals students £4

National Museum of Scotland | Auditorium

Presented by the British Pharmacological Society



DISCUSSION

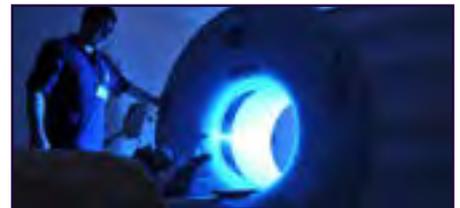
ROALD DAHL AND THE BIG FRIENDLY NEUROSCIENTIST

Most people know Roald Dahl as a famous writer of children's books and adult short stories, but few are aware of his fascination with medicine, especially neuroscience. As a junior doctor, **Prof Tom Solomon** looked after Roald during his last illness, and spent hours discussing medicine with him. Tom is now Professor of Neurology, and Director of the Institute of Infection and Global Health at the University of Liverpool. He is also a leading science communicator, the *Running Mad Professor*, winning a Guinness World Record for creating the world's biggest brain. Join Tom, who recently discussed Roald on BBC Radio 4's *Great Lives*, to learn about Roald's extraordinary medical encounters and try some fun neuroscience experiments which Roald would have loved!

5.30pm | 90 mins

£8/£6/#SciPals students £4

Summerhall | Red Lecture Theatre



DISCUSSION

THE SEARCH FOR CONSCIOUSNESS: DETECTING AWARENESS IN THE VEGETATIVE STATE

The thought of being 'locked in' following a brain injury, or aware during general anaesthesia, troubles many of us. Improvements in imaging the human brain have started to change the way we think about and measure consciousness and have demonstrated that some patients who were thought to be in a vegetative state are, in fact, conscious and aware. Pioneering neuroscientist **Dr Adrian Owen** discusses how studies of coma, vegetative state and general anaesthesia are helping us to understand human consciousness and how it can be measured after serious brain injury.

7pm | 75 mins

£10/£8/#SciPals students £5

Edinburgh International Conference Centre | Pentland Suite

In association with 
Part of the EICC InnovationNation series



DISCUSSION

HIGHLIGHT ARCTIC

Highlight Arts present an evening of films, slides, stories and discussion on the landscape, ecology and culture of the High North, at a time when the Arctic region is experiencing enormous and rapid transition. Join award-winning author **Gavin Francis**, geographic-architects **Lateral North** and the Highlight Arctic team to uncover some of the unique peoples, events, research and artworks shaping and defining this fascinating region today.

8pm | 90 mins

£8/£6/#SciPals students £4

Summerhall | Red Lecture Theatre

Presented by Highlight Arts

Energy and Environment events are supported by E-ON



DISCUSSION

DE-EXTINCTIONS: BACK TO THE FUTURE

De-extinction science is about bringing the extinct back in to existence, and scientists are now developing technologies to make this possible. But can we and should we re-design animal life? Join CEO of Cyrenians **Ewan Aitken** with **Errol Fuller**, author of *The Passenger Pigeon*, a North American species which became extinct in the early 20th century, de-extinction scientist **Dr Mike McGrew** of the Roslin Institute and comedian and author of *Bring Back The King* **Dr Helen Pilcher** for a discussion about bringing the extinct back in to existence.

8pm | 90 mins

£8/£6/#SciPals students £4

Summerhall | Anatomy Lecture Theatre

In association with Princeton University Press

Energy and Environment events are supported by E-ON



AGES 18+

DISCUSSION

THE WORLD OF ILLUSIONS

Is seeing always believing? Join neuroscientists, psychologists and illusionists for an evening in the five-floor wunderkammer of Edinburgh's Camera Obscura to explore the multi-faceted mechanics of perception. Enjoy a glass of wine and a chat with our scientists as The University of Edinburgh's **Dr Dave Carmel** and **Prof Roger Newport** discuss the workings of the human mind and how crafty mathematics can be used to exploit the glitches in our mammalian brains. Learn how an Ames Room works, navigate the vortex tunnel and discover how we are programmed to find human faces in the mirror maze.

8.30pm | 2 hours

£15/£13

Camera Obscura and World of Illusions

In association with Camera Obscura



AGES 18+

SPECIAL EVENT

ELECTRIC TALES: THE SCIENCE YEARS

An night of comedy storytelling packed with love, competitions and a healthy dose of weirdos. Come and join us for an event that celebrates the place where science meets comedy and tells you a story about it. Please note: some facts may be twisted by whimsy and no dissertations should be based around this evening of divine entertainment.

8.30pm | 2 hours

£5/£4 | The Stand Comedy Club



BRAINWAVES | READING EXPERIMENT | DISCUSSION

A VERY SHORT INTRODUCTION TO... CHILD PSYCHOLOGY

This *Very Short Introduction*... provides an up-to-date, authoritative, and accessible guide to modern child psychology, from birth to early adolescence. Beginning with infancy, **Usha Goswami**, Professor of Cognitive Developmental Neuroscience at the University of Cambridge, considers the process of attachment and 'bonding', showing how secure attachments enable the development of self-understanding. You'll discover how babies and toddlers develop an understanding of the physical, biological, and social worlds, and develop complex abilities like language and morality.

READING EXPERIMENT | DISCUSSION

PHYSICS TO BLOW YOUR MIND

Physics to Blow your Mind is back! Join a top astronomer and a leading astrophysicist for a curious journey through some of the most mysterious and intriguing secrets of the cosmos. Theoretical astrophysicist **Dr Katherine Freese** will ponder what the universe is made of, the longest outstanding problem in all of modern physics and the most important research topic in cosmology and particle physics today. Astronomer **Dr Jacqueline Mitton** will then look into the origin and evolution of our solar system, which may one day provide answers to the mystery of the origin of life on Earth.

WEDNESDAY

15 APRIL

1pm | 1 hour

£5/£6/#SciPals students £2.50

Summerhall | Red Lecture Theatre

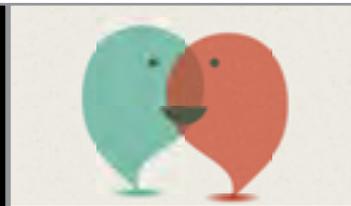
Presented by Oxford University Press

5.30pm | 90 mins

£8/£6/#SciPals students £4

National Museum of Scotland | Auditorium

In association with Princeton University Press



SHOW

APOLLO 21: LOST AMONG STARS

It's 1975 and the Apollo programme – the golden age of space travel, is coming to an end. Tara Beckett is boarding Apollo 21, a dream come true. But soon after reaching orbit, the mission is thrown into jeopardy. Lost, alone, and running out of air, will she make it back to Earth or is she destined to wander between worlds forever? Performed by an ensemble cast, **Illicit Ink Skyground** explores the beauty, hostility and wonder of the cosmos through touching, funny and scientific storytelling.

7pm | 90 mins

£6/£4 | Royal Observatory Edinburgh

Presented by the Illicit Ink and Royal Observatory Edinburgh

DISCUSSION

MADE IN SCOTLAND, PLAYED BY THE WORLD

Editor at Kotaku UK **Keza MacDonald** discusses artistry, innovation, independence and success with a panel of Scottish independent games developers including Dundee-based Space Budgie, Edinburgh-based Lucky Frame and original members of DMA Design, original creators of *Lemmings* and *Grand Theft Auto*.

8pm | 90 mins

£8/£6/#SciPals students £4

National Museum of Scotland | Auditorium

Presented by the National Museum of Scotland

BRAINWAVES | READING EXPERIMENT | DISCUSSION

SPEAKING OUR MINDS

Is language arbitrary, or innate? Is there a universal grammar, or does each community of speakers just make it up as they go along? Professor of Linguistics **Vyvan Evans** and evolutionary anthropologist **Dr Thom Scott-Phillips** join natural language processing expert **Dr Diarmuid Ó Séaghdha** and primatologist **Prof Klaus Zuberbuehler** as they attempt to unravel what comes first, the word or the thought. From Saussure to the Sapir-Whorf hypothesis, expect sparks to fly in this exploration of the origins of language and its role in both human and non-human cognition.

8pm | 90 mins

£8/£6/#SciPals students £4

Summerhall | Red Lecture Theatre

In association with Cambridge University Press and Palgrave Macmillan

READING EXPERIMENT | DISCUSSION

THE SCIENCE OF STORYTELLING

Science sparks stories, and brings a fresh inspiration to writers who love science. Explore this relationship with three of Scotland's most talented new writers from Scottish Book Trust New Writers Awards programme: **Lucy Ribchester** (Simon & Schuster), 2014 Manchester Fiction Prize winner **Martin MacInnes**, and Poet&Geek founder **Bridget Khurshed**. They will read from their work and discuss how science was the catalyst for creating exciting and dynamic fictional worlds.

8pm | 1 hour

£8/£6/#SciPals students £4

Summerhall | Anatomy Lecture Theatre

Presented by Scottish Book Trust

DISCUSSION
LIGHT & ENLIGHTENMENT

A SENSE OF WONDER

2015 marks the 150th anniversary of the publication of one of the greatest scientific papers of all time, in which James Clerk Maxwell described his transformative theory of electromagnetism. This 40-minute film celebrates his life, his poetry, his creative genius as a mathematician and scientist and his love of Galloway, told through the journey of poet and writer **Rab Wilson** and featuring conversations with contemporary scientists, music, poetry and songs. After the screening Wilson will be joined by **Dr Aiden Robson** for a conversation and Q&A session about film, Maxwell, physics and poetry. This film was produced with support from The James Clerk Maxwell Foundation and the Dr David Summers Charitable trust. Commissioned by Wigtown Festival Company.

5.30pm | 90 mins

£8/£6/#SciPals students £4 | Summerhall | Main Hall

Supported by the James Clerk Maxwell Foundation

DISCUSSION
ENERGY & ENVIRONMENT

ENERGY FUTURES: THE PUBLIC DEBATE

We live in a world that is driven by the advances and solutions offered by science and technology. Unprecedented changes in the natural and human world require us to find methods of adaptation and mitigation. Energy resources, their use and abuse now and in the future, are at the very centre stage of this global debate. To protect our planet and resources, society as a whole needs to engage, advise and be adequately informed to do so. Join our panel that includes **Prof Mercedes Maroto-Valer**, Professor of Sustainable Energy Engineering, Heriot-Watt University and **Dr Gareth Davies** Director of Aquatera for a lively debate on our Energy Futures. Chaired by **Prof Dorrik Stow** Head of Institute, School of Energy, Geoscience, Infrastructure & Society, Heriot-Watt University.

5.30pm | 75 mins

£8/£6/#SciPals students £4

Summerhall | Red Lecture Theatre

Presented by Heriot-Watt University

Energy and Environment events are supported by E-ON

DISCUSSION
NUMBERS THAT MATTER

SCOTTISH INDEPENDENCE: BIG DATA AND BIG CONVERSATIONS

The independence debate was a huge event in Scottish history. It got the nation thinking, and talking. Explore the debate with representatives from both the yes and no campaigns as (mis?) represented by social media and uncovered using big data analytics. Data scientist **Dr Daniel Winterstein** analyses the myriad conversations from across Twitter to reveal patterns about our country and community and explores how a big important debate plays out in the modern world where everyone has a voice. If you're on Twitter, register your account online at sodash.com/indyref for a personal report as part of the event.

5.30pm | 1 hour

£8/£6/#SciPals students £4

Summerhall | Anatomy Lecture Theatre

Presented by SoDash

AGES 18+
SPECIAL EVENT
GASTROFEST

GIVE IN TO FERMENTATION

Humans have been experimenting with fermented food and drink since Neolithic times, from beer to breads, cheeses, yoghurt, pickles and a host of other foods and alcoholic beverages. Fermentation is a magical process that can make food more flavoursome and digestible, increase storage life, turn waste into tasty products and even reduce flatulence! Enjoy a series of beer and fermented food pairings with short presentations from experts including **Graeme Walker**, Professor of Zymology from Abertay University, **Ben Reade**, former Head of Culinary Research and Development at the Nordic Food lab and experimental brewer **Nick Zeigler** of BrewDog. Hosted by **Donald Reid**, Food and Drink Editor for *The List*.

8pm | 90 mins

£20 (includes tasting platters and drinks)

Summerhall | Dissection Room

Supported by

DISCUSSION
BRAINWAVES

ME AND GRANNY ARE LEARNING SPANISH: IS IT EVER TOO LATE TO LEARN A SECOND LANGUAGE?

What happens when we learn a language and does speaking two affect how our brains develop and age? Is it too late for those of us who only speak English? **Prof Antonella Sorace** and **Dr Thomas Bak** will take you on the journey of a language learner's brain, from infancy to old age, sharing what language-learning can do for us. They will be joined by zoologist and lifelong monolingual **Prof Aubrey Manning** alongside **Louise Glen** from Education Scotland to discuss language policy and the public health and social side-effects of a national shortage of language skills.

8pm | 90 mins

£8/£6/#SciPals students £4 | Summerhall | Main Hall

Presented by Bilingualism Matters and the Centre for Cognitive Ageing and Cognitive Epidemiology, The University of Edinburgh



FIG 1. SCIPALS MARIE CURIE AND NIKOLA TESLA DEMONSTRATE A SUCCESSFUL SCI-FIVE!

SCIENCEFESTIVAL.CO.UK/STUDENTS
#SCIPALS SUPPORTED BY

SIEMENS



DISCUSSION
READING EXPERIMENT

A VERY SHORT INTRODUCTION TO... THE ANIMAL KINGDOM

DNA analysis and the study of evolution and development has greatly enhanced our understanding of the animal world. In this *Very Short Introduction...* Prof Peter Holland, Linacre Professor of Zoology at The University of Oxford, presents a modern tour of the animal kingdom. He will give an overview of the biology of each animal group – explaining why our definition of ‘animals’ is not obvious in biological terms – and share new views on their evolutionary relationships based on molecular data.

1pm | 1 hour
£5/#SciPals students £2.50
Summerhall | Red Lecture Theatre
Presented by Oxford University Press



DISCUSSION
ENERGY & ENVIRONMENT

THE ROAD TO PARIS

The UN Intergovernmental Panel on Climate Change (IPCC) summit in Paris in December this year sets out to take action to mitigate the effects of climate change. At the summit, 196 countries are set to sign a new global climate change agreement, but how likely is it that any action taken will be meaningful? Join the Chair of the IPCC Dr Rajendra Pachauri in discussion with the Minister for Environment & Climate Change Dr Aileen Macleod MSP, Head of the Met Office Hadley Centre Prof Stephen Belcher and Prof Corinne Le Quéré, Director of the Tyndall Centre for Climate Change Research.

5.30pm | 90 mins
£8/£6 | National Museum of Scotland
Auditorium
Supported by
Energy and Environment
events are supported by E-ON



DISCUSSION

JOCELYN BELL BURNELL IN CONVERSATION

Prof Jocelyn Bell Burnell is one of the most influential scientists in the UK. But getting there was not easy and, as a woman, her journey has been fraught with resistance. Her discovery of radio pulsars in 1967 pays testament to her dogged pursuit of the truth and remains one of the most significant astronomical discoveries of the last 100 years. Join her as she discusses her incredible career and her thoughts on the future of science and its place in society with Andrew Cohen, Head of Science at the BBC.

5.30pm | 1 hour
£8/£6/#SciPals students £4
Summerhall | Dissection Room
Presented by the Royal Society and the Royal Society of Edinburgh

THURSDAY 16 APRIL



GASTROFEST | SPECIAL EVENT

DINING ON THE WILD SIDE

After 10,000 years of farming plants and animals, we now pay a premium for 'wild' foods. Is it flavour, nutrition or environmental concerns that drive this latest gastronomic trend to eat on the wild side? Rising star chef Ben Reade and TV presenter and author Alys Fowler will lead a discussion around the science and fashions of wild food, accompanied by a gourmet three-course meal. Menu contains wild meat and fish but vegetarian options will be available.

7pm | 3 hours
£40
Royal Botanic Garden Edinburgh | John Hope Gateway
Presented by the Royal Botanic Garden Edinburgh

7.30PM | AT THE FRINGE OF REASON: SKEPTICS IN THE PUB See page 36



DISCUSSION
ENERGY & ENVIRONMENT

THE ARUP LECTURE 2015: OLD CITIES, NEW WAYS, PERPETUAL PLACES

How can new materials and new manufacturing, installing and monitoring techniques in design, engineering and construction preserve and enhance a great city like Edinburgh? Graham Dodd and Graham Gedge of the Material Consulting Group within Arup will share a possible cutting-edge future for our city, where important heritage buildings will be preserved and their performance enhanced, and new buildings and infrastructure will be more responsive to their surroundings and have less environmental impact.

8pm | 90 mins
£8/£6/#SciPals students £4
National Museum of Scotland | Auditorium
Supported by

ARUP

Energy and Environment events are supported by E-ON



BRAINWAVES | SPECIAL EVENT

BORN TO DANCE

Dr Peter Lovatt, psychologist and 'Doctor of Dance' at the University of Hertfordshire is back at the Science Festival by popular demand. He has partnered up with Bangor University's dancer-turned-neuroscientist Dr Emily Cross for an on-your-feet investigation of the mechanics of how we read the world when we get on down. Are humans hard-wired to find joy in a jig? Can improvisational dances boost your memory? And what happens in an infant's brain when they see a samba? An energetic exploration of the relationships between movement, cognition and memory: be prepared to polish up your dancing shoes!

8pm | 90 mins
£10/£8/#SciPals students £5
Summerhall | Dissection Room



NUMBERS THAT MATTER | DISCUSSION
BIG SOLUTIONS IN BIG DATA
 Some might say we're drowning in data: we currently generate 2.5 quintillion bytes every day! Capturing 'big data' offers a host of opportunities for understanding our behaviour, but there are complex challenges in analysing, storing, and visualising this information, and social and ethical considerations around our privacy. Join **Prof Vonu Thakuria** from Glasgow University, with **Dr Pippa Wells** of CERN and **David Richardson** and **Prof Sarah Cunningham-Burley** of The University of Edinburgh for a discussion about big data, the solutions it may offer and the problems it may present.

5.30pm | 90 mins

£8/£6/#SciPals students £4

Summerhall | Main Hall



NUMBERS THAT MATTER | DISCUSSION
GEOMETRY: A SECRET WEAPON IN THE FIGHT AGAINST VIRUSES
 Viruses are responsible for a wide range of devastating illnesses, yet therapy options are still limited. Virus particles have a fascinating geometric structure, similar to that of a football. **Prof Reidun Twarock** and her team at the University of York have developed mathematical tools to study the geometric constraints of virus particles, and are working to develop new anti-viral strategies. Join her to find out how geometry can help us understand how viruses form and evolve and why the discovery of an Achilles' heel in virus formation could unlock a new perspective in their prevention.

5.30pm | 90 mins

£8/£6/#SciPals students £4

Summerhall | Red Lecture Theatre

Presented by the International Centre for Mathematical Sciences



READING EXPERIMENT | DISCUSSION
STRANGER THAN FICTION: ILLUMINATING SCIENTIFIC LIVES
 What sparks first lit the curiosity of the great scientists? And which great scientist's life and work first fired your curiosity? Here we explore scientific biography, asking whether it is necessary to know more about scientists than their scientific achievements. Do the rest of their lives matter? Can bad people do good science? Join Scotland's only non-fiction writing group for an illuminating conversation about why scientists become scientists, why biographers write about them and whether any of them can be trusted to tell the truth about their lives.

5.30pm | 1 hour

£8/£6/#SciPals students £4

Summerhall | Anatomy Lecture Theatre

Presented by Stranger Than Fiction



BRAINWAVES | DISCUSSION
EX MACHINA
 Science writer, geneticist and presenter of Radio 4's *Inside Science* **Dr Adam Rutherford** hosts a special screening of Alex Garland's science fiction thriller *Ex Machina*. He will be joined by Professor of Cognitive and Computational Neuroscience and co-founder of the Sackler Centre for Consciousness Science **Prof Anil Seth** for an in-depth Q&A on artificial intelligence, neuroscience and some futurecasting on the possibilities and dangers of man-made consciousness.

6pm | 2.5 hours

£10/£8 | Filmhouse | Screen 2



NUMBERS THAT MATTER | DISCUSSION
SEX BY NUMBERS: THE STATISTICS OF SEXUAL BEHAVIOUR
 The latest Natsal survey of British sexual behaviour suggests that we are becoming more experimental in our sex lives, but there is less of it going on. But given sex (mainly) goes on behind closed doors, collecting reliable statistics of sexual behaviour presents a considerable challenge. **David Spiegelhalter**, Professor of the Public Understanding of Risk at Cambridge University will show how to obtain and use the best possible data to find out more about our sex lives, based on his forthcoming book, *Sex by Numbers*, which accompanies the major Wellcome Collection exhibition *The Institute of Sexology*.

8pm | 1 hour

£8/£6/#SciPals students £4 | Summerhall | Main Hall



DISCUSSION
THE STORY OF THE SHACKLETON EPIC
 In March 2013, scientist and explorer **Tim Jarvis** returned from Antarctica where he led a team of six men to successfully retrace legendary leader **Sir Ernest Shackleton's** 1916 Southern Ocean voyage of survival and the crossing of South Georgia. Here he will give insight into the logistical and motivational intricacies of this larger-than-life expedition, the *Shackleton Epic*, and will combine this account of extraordinary adventure with observations about the Antarctic environment through which both he and Shackleton travelled with stories of his other history-making polar expeditions.

8pm | 90 mins

£8/£6/#SciPals students £4

Summerhall | Red Lecture Theatre



BRAINWAVES | DISCUSSION
BRAIN, MIND, AND CONSCIOUSNESS... BUT WHAT ABOUT THE SOUL?
 Science has been remarkably effective at describing the natural world, including human beings, so how do we think about the 'soul'? A panel from The University of Edinburgh will discuss perspectives on the existence (or non-existence!) of an immaterial soul, one of the toughest questions in scientific and religious discussion, engaging in open and honest conversation with the audience. The panel features **Dr Michael Fuller**, Teaching Fellow in the School of Divinity, **Dr Mark Harris**, Lecturer in Science and Religion, **Sarah Lane**, PhD candidate in Science and Religion and **Dr David Ward**, Lecturer in philosophy of the mind and cognitive science.

8pm | 90 mins

£8/£6/#SciPals students £4

Summerhall | Anatomy Lecture Theatre

Presented by The University of Edinburgh



ALL AGES
SPECIAL EVENT
ENERGY & ENVIRONMENT

WHAT DOES A LOW CARBON FUTURE LOOK LIKE?

A 'technotopia' of smart, interconnected, zero carbon cities?

Communities of low carbon eco-houses built around local control of energy and resources?

Hydrogen-powered, 3D-printed vehicles linked via a nationwide, smart car-share network?

We can't accurately predict the future but with the world's population exceeding 7 billion and carbon emissions set to tip the Earth's temperature to catastrophic levels, we need to seriously rethink the way we live, work and organise our societies.

Visit the Edinburgh Centre for Carbon Innovation (ECCI) for two days of inspiring, future-facing events:

- Poke around the latest electric and hydrogen vehicles in the future vehicle showcase

- Watch thought-provoking films in the bike-powered cinema

- Hear visionary viewpoints from big thinkers in panel debates and talks

- Have your say on our (low carbon) future in an interactive citizen's jury

- Be inspired by carbon based art works from the makers and artists of Art, Space, Nature

ECCI is the UK's leading hub for low carbon ideas, innovation and skills, based in the UK's most sustainably designed historic building. Visit edinburghcentre.org for more details.

FRIDAY

17 APRIL

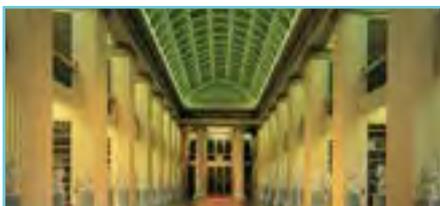
Friday 17 | 5pm–10pm | drop-in

Saturday 18 April | 11am–5pm | Event times vary

Prices vary | Edinburgh Centre for Carbon Innovation

Presented by The University of Edinburgh

Energy and Environment events are supported by E.ON



DISCUSSION
LIGHT & ENLIGHTENMENT

SHOULD YOU TRUST WHAT YOU HEAR ABOUT SCIENCE? AN ENLIGHTENMENT DEBATE: HUME VS REID

One of the famous scholarly disagreements of the Scottish Enlightenment was between Thomas Reid and David Hume on the trustworthiness of what others tell us. Reid argued that trust is an essential part of the human condition, while Hume remained sceptical of the testimony of other people. Should we trust what we're told about science? Dr Alistair Isaac and Dr Alasdair Richmond, both philosophers at The University of Edinburgh, will playfully enact an Enlightenment debate between Reid and Hume, introduced and moderated by Dr Matthew Chrisman.

AGES 18+
SPECIAL EVENT

LATELAB: BEAUTY BY DESIGN

Beauty by Design is an exhibition that questions cultural commonplaces about beauty and body image by linking the renaissance art collections of the Scottish National Portrait Gallery and Scottish National Gallery to contemporary fashion. Speakers will explore the engineering and allure of body-modifying corsetry, the chemistry and brutality of renaissance beauty regimes and the use of fashion as a political canvas raising awareness. Hosted by Mal Burkinshaw, Programme Director for Fashion at Edinburgh College of Art. *LateLab* is a collaboration between Edinburgh International Science Festival and New Media Scotland.

AGES 18+
SPECIAL EVENT
BRAINWAVES

BRAINWAVES CEILIDH

Following last year's sell-out *Science Ceilidh*, join us to celebrate the Science Festival and British Neuroscience Association's *Brainwaves* mini festival with all your favourite dances rejigged with a twist of neuroscience. Collaborating with local researchers and students from The University of Edinburgh, the **Science Ceilidh Band** will be presenting new dances exploring cutting-edge brain research. From releasing neurotransmitters in the *Canadian Brain Dance* to learning more about the ageing brain in the *Gay Ol' Gordon*, curious feet and minds are very welcome! Find out more about the project at scienceceilidh.com/neuroscience

5.30pm | 90 mins

£8/£6/#SciPals students £4

Summerhall | Anatomy Lecture Theatre

Presented by The University of Edinburgh

8pm | 90 mins

£10/£8/#SciPals students £5 | Scottish National Portrait Gallery

Supported by Marks & Clerk

8pm | 2 hours

£10/£8/#SciPals students £5 | Summerhall | Main Hall



A VERY SHORT INTRODUCTION TO... CORAL REEFS

For centuries, coral reefs have been regarded with awe. Their scale is enormous and their ecological value is high, supporting both marine and human life. Today, the vibrancy and diversity of these fascinating ecosystems are under threat from over exploitation and they could face future extinction, unless our conservation efforts are stepped up. In this *Very Short Introduction...* Prof Charles Sheppard from The University of Warwick shares what coral reefs are, how they are formed, how they have evolved, and the biological lessons we can learn from them.

1pm | 1 hour
 £5/#SciPals students £2.50
 Summerhall | Red Lecture Theatre
 Presented by Oxford University Press



SPOTLIGHT ON: SERIOUS GAMES

As gamification is increasingly used in business, healthcare and the arts, join Pam Kato, Professor of Serious Games at Coventry University, to explore how the adoption of game technology is changing our lives for the better.

2pm | 1 hour
 Free (ticket required) | National Museum of Scotland | Auditorium
 Presented by the National Museum of Scotland



EXTREME

From Icarus to Evel Knievel, humanity has always been fascinated by those who live on the edge. But are some of us wired to seek danger and risk? Join behavioural scientist Dr Paul Martin, psychologist and author Dr Emma Barrett and world explorer Tim Jarvis for tales of cave-dwelling scientists, polar perils, starvation, solitude and resilience as we examine the astonishing limits of human endurance.

5.30pm | 90 mins
 £8/£6/#SciPals students £4
 Summerhall | Main Hall
 In association with Oxford University Press



GENES, RACE AND RACISM

The tentative first steps in the science of human genetics in the late nineteenth and early twentieth centuries also gave rise to the principle of eugenics, the notion of producing 'better quality' human beings by eliminating 'undesirable' heritable characteristics. However, human genetics has done more than any other field, academic or otherwise, to demonstrate that the idea of racial superiority or inferiority has no scientific value. Join Professor of Evolutionary Genetics Prof Mark Thomas and science writer and broadcaster Dr Adam Rutherford as they explore the history and future of this contentious scientific field.

5.30pm | 90 mins
 £8/£6/#SciPals students £4
 Summerhall | Red Lecture Theatre



ALEX THROUGH THE LOOKING GLASS

Bestselling author and Edinburgh local Alex Bellos takes us on a journey of mathematical discovery with his signature wit and limitless enthusiasm. As he narrates a series of eye-opening encounters with lively personalities all over the world, Alex demonstrates how numbers have come to be our friends, how fascinating and extremely accessible they are, and how they have changed our world. You'll find out the results of his global survey to find the world's favourite number and hear engaging stories that introduce some complex mathematical concepts.

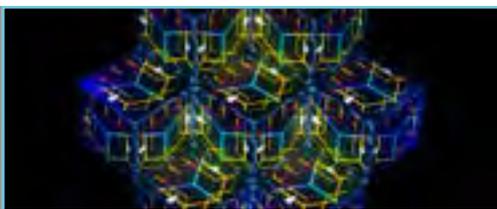
8pm | 1 hour
 £8/£6/#SciPals students £4 | Summerhall | Red Lecture Theatre
 Presented by Bloomsbury Publishing



THE GREAT APE DEBATE

In 2014 a US court case argued that a privately held chimpanzee named Tommy should be granted legal personhood, the latest event in a long-standing debate over the rights of apes, all of which are threatened species. Join Dr Lewis Dean, Dr Catherine Hobaiter and Dr Ben Sachs from University of St Andrews; Dr Clare Cunningham of Abertay University and Dr Suilin Lavelle from The University of Edinburgh for a controversial discussion of primate cognition and behaviour, human and animal rights, the philosophy of science and what we owe our closest evolutionary cousins.

8pm | 90 mins
 £8/£6/#SciPals students £4
 Summerhall | Anatomy Lecture Theatre
 Presented by the Scottish Primate Research Group



FULL SPECTRUM

We invite you to join us as we collaborate with Astrojazz and Adventures in Light to create a very special audio-visual experience at *Full Spectrum*, the Science Festival's first ever club night. Expect experiments with light, sound and structure on a large scale as we bring you a visual spectacular with projection mapping, audio reactive installations and live visuals. Clubbers will be treated to a top class line up of DJs and live acts purveying cutting edge electronic music that will please the mind as much as the feet. Visit sciencefestival.co.uk for more details.

10pm | 5 hours
 £10/£8 | Summerhall | Dissection Room

NUMBERS THAT MATTER | READING EXPERIMENT | DISCUSSION | SPECIAL EVENING | AGES 18+ | LIGHT & ENLIGHTENMENT



11am-5pm WHAT DOES A LOW CARBON FUTURE LOOK LIKE? See page 58



WORKSHOP
DIY MOUSE TAXIDERMY
 Learn the processes and techniques behind basic taxidermy as you skin, prepare, preserve, mount and position a mouse. You'll use miniature accessories to transform your mouse into a fun parody of human life: standing, sitting or sleeping, holding a book or wearing a top hat. Your little mouse is yours to take home for your mantelpiece. *Please note:* the mice used are ethically sourced and bred for reptile feed. Please do not bring any dead animals with you. There will be minimal blood and gore, no dangerous chemicals are used and all animals are disease-free.

2pm | 4 hours
 £60 | Summerhall | Histology Lab
 Presented by Of Corpse Taxidermy



SPECIAL EVENT
GAMECITY: MODERN PLAYING
 Join us for an afternoon of ideas, video, music, debate and play that will celebrate videogaming's place at the heart of our cultural life. As part of this special event to accompany the *Game Masters* exhibition at the National Museum of Scotland you'll have the chance to play the latest demos of innovative games from Scottish developers.

3pm | 90 mins
 £8/£6 | National Museum of Scotland Auditorium
 Presented by the National Museum of Scotland

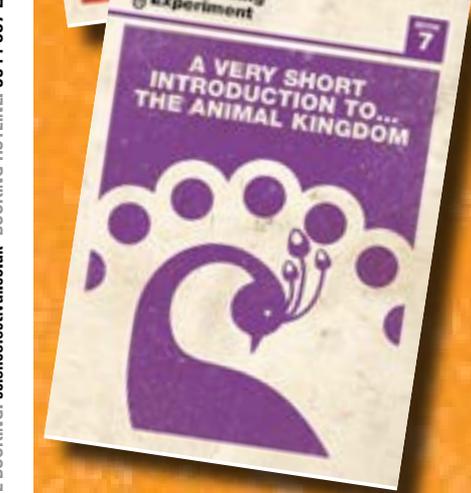
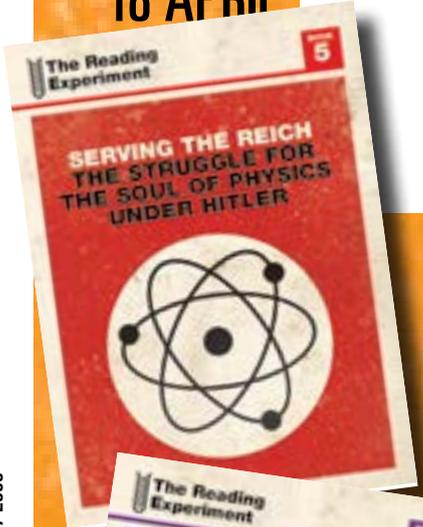
Image: © Harmonix Music Systems, inc. All rights reserved



FILM
THE FACE IN FILM
 Throughout the history of cinema, film makers have used facial deformity to signify negative personality traits, and this is particularly true in war films. Join us for a special showing of the award-winning documentary *The Guinea Pig Club* and explore the real experiences of people with facial deformities in warfare. The screenings will be followed by a Q&A session with **Dr Emily Mayhew**, Historian in Residence, Imperial College London and author of *The Reconstruction of Warriors: Archibald McIndoe*, *the Royal Air Force* and *The Guinea Pig Club*.

7.30pm | 90 mins
 Free (ticket required) | Surgeons' Hall The Symposium Hall
 Presented by the Surgeons' Hall Museum

SATURDAY
18 APRIL

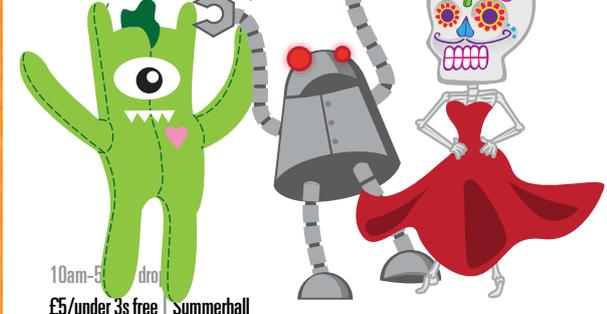


SUNDAY
19 APRIL



ALL AGES
SPECIAL EVENT
Edinburgh Mini Maker Faire

and the whole family will love interacting with robotic puppets, 3D printers, model boats, motorised skateboards, science experiments and even virtual craft worlds.



10am-5pm | drop in
 £5/under 3s free | Summerhall
 Supported by



Edinburgh Mini Maker Faire is independently organised and operated under licence from Maker Media Inc.
Make:
 makezine.com

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

The Reading Experiment

The Reading Experiment returns as part of the 2015 Science Festival to reunite the worlds of science and words. Once again we're working with a host of literary types to bring together an exciting range of events which dive into the creative nexus where these two genres meet.

On top of this we'll be adding more reading lists and recommendations from some of our favourite folk online, so that you can get inspired to start your own reading experiment and delve into science writing in all its forms.

There's a chance to flex your poetry muscles with the return of the 'Sci-Ku' competition. For this year's installment we're asking you to submit entries taking inspiration from 'light and enlightenment'. There are separate categories for primary and secondary age pupils, along with another

one for the rest of us so there are even more chances to shine! Get your thinking cap on and send over your cleverly crafted creations when the competition opens on 21 March.

From the same time you can also head down to Portobello to check out our on-street exhibit the Porty Sci-Box. This fun and funky revamped phonebox hosts a series of mini exhibitions throughout the year. We're taking it over for The Reading Experiment and adding an interactive screen. Head along and tweet us your Sci-Ku to see your words up in lights.

As if that's not enough, we'll also be bringing some lovely literary science out and about around Edinburgh as our mobile bookshelf travels to cafes and bars across the city. Find out more on our website and follow us on twitter for updates.

sciencefestival.co.uk/reading-experiment | [#ReadingExperiment](https://twitter.com/ReadingExperiment)



BRAINWAVES | LIGHT & ENLIGHTENMENT | DISCUSSION

SHINING A LIGHT ON THE BRAIN

Optogenetics is an emerging tool for human brain research, but how does it work, and how can it be used in other medical applications? Could optogenetics change the future of brain disease? Could it be used for mind control and what are the ethical issues around its use? Join host **Prof Polly Arnold** from The University of Edinburgh with inventor of optogenetics **Prof Gero Miesenböck** and **Dr Katie Jennings**, both from Oxford University, and **Dr Alexandre Mourou** of the University Pierre and Marie Curie in Paris, for an enlightening discussion as they talk about how their research is shining light on the brain.

BRAINWAVES | ENERGY & ENVIRONMENT | DISCUSSION

OUR CLIMATE, OUR CULTURE

We may feel we're aware of the ways changing climates affect the world around us, but here we examine how our culture, arts and personal lives are also being affected. Journalist and broadcaster **Gaia Vince** will explore how humans have altered our world beyond recognition; author **Barry Lord** will share his insights into the deep links between sources of energy and the cultural values that they bring with them; and travel writer **Peter Hudson** will share his experiences in Mauritania and the cultural changes that have been forced upon it. Hosted by **Yasmin Sulaiman**, editor of *The List*.

AGES 18+ | SHOW

ARTS & ANATOMY CABARET

Surgeons' Hall Museums' first ever Late featuring a headline talk on *The Sick Rose*, with **Richard Barnett** – a strangely fascinating, often gruesome visual tour through disease in an age before colour photography – anatomy themed music with **Wendy Carle Taylor**, art activities, stand-up comedy and a viewing of *The Inquest* crime scene, which takes you back to 1829 when an unidentified person has been found in Surgeons' Hall Museum, calling the already questionable name of curator Robert Knox into question. Optional dress code: wild waistcoats and outrageous optics.

1pm | 90 mins

£8/£6/#SciPals students £4

National Museum of Scotland | Auditorium

3pm | 90 mins

£8/£6/#SciPals students £4

National Museum of Scotland | Auditorium

In association with Random House, Oxford University Press and AAM Press

Energy and Environment events are supported by E-ON

7.30pm | 3.5 hours

£7.50/£6.50 | Surgeons' Hall | Quincentenary Hall

Presented by the Surgeons' Hall Museum

In association with Thames and Hudson

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

BOOKING INFORMATION

ONLINE

sciencefestival.co.uk

PHONE

0844 557 2686

Thursday 19 February–Friday 3 April:

10.30am–5.30pm (Monday–Friday)

11am–5pm (Saturday)

Saturday 4 April–Sunday 19 April:

8.30am–6pm (Monday–Saturday)

11am–4pm (Sunday)

IN PERSON

Edinburgh Festival Fringe Shop

180 High Street, Edinburgh, EH1 1QS

10.30am–5.30pm (Monday–Friday)

11am–5pm (Saturday)

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 are 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! Lets be #SciPals – you can get half price tickets for most of our adult events. See full information on p.31 (#SciPals is supported by Siemens).

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 on the venue section of our website. If you have special access requirements or need to book wheelchair spaces please call our Box Office on 0844 557 2686.

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. As an incentive, if you present your ticket or travel card at the City Art Centre you'll receive a free gift!

BY BUS

See the venue map on the back page of this programme for bus listings to each of our venues. Please visit lothianbuses.com or call 0131 555 6363 for further information.

BY TRAIN

For train travel in Scotland and tickets, visit scotrail.co.uk For National Rail enquiries, see nationalrail.co.uk or call 08457 48 49 50.

BY BIKE

Plan your journey at cyclestreets.net.

BY CAR

There are multi-storey car parks and metered parking around the city centre. Keep in mind that many of our venues are easily accessible on foot or by public transport. Please consider the environment when planning your travel to and from our events.

TOURIST INFORMATION

Further information on Edinburgh and the surrounding area, along with accommodation listings and online booking, is available at visitscotland.com.



LET'S GO GREENER TOGETHER.
GREENERSCOTLAND.ORG

WANTED: PIONEERS FOR FUSELAB GO

PLAN FOR THE FUTURE OF LIFE ON
A NEW PLANET IN AN OUT-OF-THIS WORLD
LEARNING EXPERIENCE FOR 15–18 YEAR OLDS!

COMING TO A LOCATION NEAR YOU
IN SUMMER 2015:

EDINBURGH – 6/7, 8/9 AND 11/12 JUNE

GREENOCK – 15/16 JUNE

INVERNESS – 18/19 JUNE

ABERDEEN – 22/23 AND 25/26 JUNE

DUNDEE – 29/30 JUNE

GLASGOW – 4/5 AND 6/7 JULY

FIND OUT MORE AND APPLY ONLINE:
SCIENCEFESTIVAL.CO.UK/FUSELAB

EDINBURGH INTERNATIONAL
science festival

fuselab^{GO}

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Fuselab was developed with support from the Scottish Government's Edinburgh Festivals Expo Fund

EDINBURGH INTERNATIONAL SCIENCE FESTIVAL

Edinburgh International Science Festival is a high profile and dynamic educational charity. 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.



Edinburgh is the world's Festival City with events happening all year round. Visit edinburghfestivalcity.com for news and images from Edinburgh's twelve major festivals, plus festival history, information on the city and tips on planning your visit.

Imaginate Festival
11–17 May 2015
imagine.org.uk

Edinburgh International Film Festival
17–28 June 2015
edfilmfest.org.uk

Edinburgh Jazz and Blues Festival
17–26 July 2015
edinburghjazzfestival.com

Edinburgh Art Festival
30 July–30 August 2015
edinburghartfestival.com

Royal Edinburgh Military Tattoo
7–29 August 2015
edintattoo.co.uk

Edinburgh International Festival
7–31 August 2015
eif.co.uk

Edinburgh Festival Fringe
7–31 August 2015
edfringe.com

Edinburgh International Book Festival
15–31 August 2015
edbookfest.co.uk

Edinburgh Mela
29–30 August 2015
edinburgh-mela.co.uk

Scottish International Storytelling Festival
23 October–1 November 2015
scottishstorytellingcentre.co.uk

Edinburgh's Hogmanay
30 December 2015–1 January 2016
edinburghshogmanay.com

Edinburgh International Science Festival
26 March–10 April 2016
sciencefestival.co.uk

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Siân Bevan
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Edinburgh International Science Festival also employs around 150 additional staff to deliver its projects throughout the year.

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