

EDINBURGH INTERNATIONAL

science  
festival

25  
YEARS



EDINBURGH INTERNATIONAL  
**SCIENCE FESTIVAL**  
23 MARCH—7 APRIL 2013

ONLINE BOOKING: [sciencefestival.co.uk](http://sciencefestival.co.uk)

BOOKING HOTLINE: 0844 557 2686

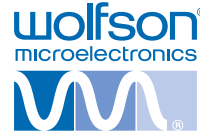
# WITH SPECIAL THANKS TO ALL OUR PARTNERS

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.

## PRINCIPAL FUNDING PARTNERS



## MAJOR FUNDING PARTNERS



## FUNDING PARTNERS



## MAJOR VENUE AND PROGRAMME PARTNERS



## TRUSTS AND FOUNDATIONS

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# SCIENCE FESTIVAL 2013: GET READY FOR THE FUTURE

Welcome to the 25th Edinburgh International Science Festival. We've been bringing sensational science to Edinburgh since 1989, pushing the boundaries of amazing and engaging events and delivering a unique experience year on year.

Join us in 2013 as we celebrate our history and envisage our future through family workshops, thought-provoking discussions, exhibitions, explorations and even big nights out. Check out our Science Festival themes for some highlights and suggestions.

Here's to the next 25!

**25**  
YEARS

## HOW TO BOOK

### ONLINE

[sciencefestival.co.uk](http://sciencefestival.co.uk)

### PHONE

0844 557 2686

31 January–22 March

10am–6pm (Monday–Friday)

11am–5pm (Saturday)

23 March–7 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.

Please note: a handling fee of £1.50 per transaction will apply.

### BOOKING INFORMATION

Book early for some great offers at the **City Art Centre** [p.10] and on **Science Festival Events** [p.23].

### CONCESSIONS

Available for pensioners, the unemployed, disabled persons and their personal assistants, and students unless otherwise stated. Proof of status may be required.

### 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.

### REFUNDS

All Science Festival tickets are non-refundable, except in the case of cancellation.

## HOW TO USE THIS BROCHURE

### SCIENCE FESTIVAL FAMILIES [P.6–21]

Our programme of events and days out suitable for families are listed by venue. To make things easier, we've also included a festival date planner on [p.21]. 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.

### SCIENCE FESTIVAL EVENTS [P.22–45]

Science Festival Events is our programme of discussions, debates, workshops, screenings and nights out with a scientific twist. Listings are arranged by date. Unless otherwise stated, these events are suitable for ages 14+, however where alcohol is served tickets will be restricted to those aged 18+ and proof of age will be required.

### FIND US ONLINE

Find Edinburgh International Science Festival on Facebook and connect with us on Twitter @EdSciFest for festival information and exclusive ticket offers.

# 2013 GET READY FOR THE FUTURE

## SCIENCE FESTIVAL THEMES

WE HAVE HUNDREDS OF EVENTS  
HAPPENING ALL OVER EDINBURGH!  
HERE ARE SOME OF OUR THEMES  
FOR 2013...

3D IN TRU STER  
DIMENSIO





# SCIENCE FESTIVAL THEMES

EVENT PAGE

## FUTURE FOOD



Food is fundamental to life and right now our eating habits are more innovative than ever before. But with urban environments expanding and the world's population increasing, we need to adapt our diets still further to meet the challenges ahead. Join us as we sample the flavour of things to come and put cutting-edge science right on your plate.

For families

*Food Trek* 14

For ages 14+

*Hungry for Change* 31

*Eating Aliens* 35

*Molecular Mastery (18+)* 35

*The Adaptation Diet* 36

*Sensory Dining (18+)* 38

## FUTURE CITIES



Over half the world's population now lives in towns and cities. Take a walk through the urban jungle as we explore the social and environmental challenges presented by the largest wave of urban growth in history. Discover how science and technology can enhance the lives of the city dwellers of the future.

For families

*Cosy Cosy Gameshow* 8

*Manic Monster Hunt* 9

For ages 14+

*The ARUP Lecture* 32

*Edinburgh Rebooted* 33

*Greening the City* 35

*Future of Cycling* 36

*Living Architecture* 42

*Li-fi: Data Through Illumination* 44

## FUTURE CHALLENGES



As the pace of our development sends us hurtling further and faster into the future, how can we reconcile the challenges presented by the gathering pace of our advancement with the need to secure our existing resources? Learn about the research and technologies that are equipping us with the tools to innovate the future of our food, energy and environment.

For families

*Polyfloss Factory* 9

*Street Science* 19

*The Future's Bright* 19

For ages 14+

*The Big Picture: Global Trends in Statistics* 27

*Water, Water Virtually Everywhere* 32

*Our Atomic Future* 35

## FUTURE LIFE



Science and technology are helping us take control of our bodies as never before. We can fix, manipulate, enhance and preserve its functions and appearance, pushing the boundaries between humanity and technology in new and fascinating ways. Explore how these cutting-edge developments are influencing our understanding of our 'selves' and meet some real life examples of body enhancement.

For families

*Visual Eyes* 8

*Edinburgh Mini Maker Faire* 20

For ages 14+

*Understanding Ageing: A Fight to the Death* 31

*Our Wired World* 32

*Stem Cells: A Cure for Blindness?* 32

*Can You Hack It?* 36

*Life DIY* 40

## FUTURE WORLDS



Mankind has an insatiable urge to discover life beyond Earth and there are always new ideas and investigations taking place. Take a pre-flight health check at Latelab on Friday 5 April, sign up for a trip to Mars and explore the science behind the possibility of extra-terrestrial life in a series of events that is out of this world.

For families

*Bio Discoveries* 18

*Intelligent Robots* 18

*Science Live: Explore Your Universe* 20

For ages 14+

*Latelab (18+)* 26

*Stargaze with Mark* 32

*They Came From Outer Space* 40

*Fit For Orbit?* 41

*One-Way Ticket to Mars* 42

## FUTURE PLAY



Human beings have an inbuilt love of games, and innovation has taken our playfulness to an amazing array of new platforms from community gaming, to digital arts and augmented reality. Make the city your playground and unleash your inner child in our events and hands-on workshops that push the boundaries of computer games, music and sport.

For families

*Edinburgh City Sci-Quest* 19

*InMotion* 20

For ages 14+

*Why We Play* 33

*Dirty Electronics: Data Trails* 43

*Play Day* 43



**CITY ART CENTRE**  
**EXCITING**  
**CIRCUITS**  
**SPLATTASTIC**  
**SLIME**  
**MYSTERIOUS**  
**MUMMIES**





**FREE**

**SPEND THE DAY AT THE CITY ART CENTRE**  
Open daily Saturday 23 March–Saturday 6 April (Not Sundays) between 9.30am and 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. A Day Pass allows you access to explore as many events as you like.

## HOW TO BOOK PRE-BOOKING STRONGLY ADVISED

A Day Pass gets you into the City Art Centre to explore as many events as you like. Pre-booking your Day Pass is strongly advised to avoid queues and disappointment.

## VENUE SPONSOR

Wolfson Microelectronics is passionate about science and technology and is thrilled to continue its support of the Science Festival at City Art Centre. Edinburgh-based Wolfson develops ground-breaking HD audio solutions and ultra-low-power audio products for some of the world's highest profile consumer electronic products, with customers including Samsung, Microsoft, RIM and LG. [wolfsonmicro.com](http://wolfsonmicro.com)



## EVENTS FOR YOUNGER CHILDREN AND ALL AGES

### IMAGINATION GARDEN

AGES 3+ **PRE BOOKING ADVISED**



Visit our secret garden and create your own creature. Explore and discover this new and fascinating world.

10am–4pm (half-hourly) • 20 minutes

### STORYTIME TENT

AGES 3+ **PRE BOOKING ADVISED**

Enter a world where music takes you on a journey. Feel the vibrations as you step into the story and discover amazing things.

10am–4pm (half-hourly) • 20 minutes

### NINA AND THE NEURONS



Inspired by experiments from the CBeebies show, *Nina and the Neurons Go Engineering*. Prepare to have fun while you find out more about the science that is all around us.

N.B. Nina will not be present at the workshops.

Presented by:



### WORLD OF BUBBLES

ALL AGES

Step into a wonderful world of bubble magic and prepare to be amazed... Discover the perfect bubble mixture and design your own bubble wands to create some unexpected and jaw-dropping shapes. Catch a beautiful smoke-filled bubble, stand inside a giant bubble and even turn a round bubble square.

### SCIENCE MINI CINEMA

ALL AGES

A series of short films and documentaries from around the world. Sit down, relax and enjoy.

Supported by:



### THE CHAIN REACTOR

ALL AGES



This machine is quite simply a bit bonkers. You'll gasp in awe at this elaborate procession of bizarre knock-on effects.

10am–4pm (hourly) • 10 minutes

### ART ON SHOW

Art-science collaborative ASCUS draws inspiration from our 25th year and future-themed programme to create an interactive and engaging exhibition across the floors of the City Art Centre. Also look out for *Robot Visions* by Richard Firth where we'll be asking you to consider new uses for outdated technology in our ever-changing world.

## EVENTS FOR AGES 5+

### COSY COSY GAMESHOW

AGES 5+



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!

Supported by:



### SPLAT-TASTIC

AGES 5+ **PRE BOOKING ADVISED**



This interactive workshop invites you to get creative with chemistry and design your very own slime. Test its viscosity 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.

10am–4pm (hourly) • 45 minutes

### JUNGLE SAFARI

AGES 5+ **PRE BOOKING ADVISED**



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

10am–4pm (half-hourly) • 45 minutes

Supported by:



### RAMPAGING CHARIOTS RACE

AGES 5+



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

10am–4pm (hourly)

Presented and supported by:



### TIN BOX CAMERA

AGES 5+



Learn how to create and then develop your own picture in our special *Tin Box Camera* workshop and darkroom. Come along and discover how a simple box, lens and a piece of photographic paper can create amazing results!

## EVENTS FOR AGES 7+

### UNWRAPPING THE MUMMY

AGES 7+ **PRE BOOKING ADVISED**



We need an archaeologist – can you help? An Egyptian mummy has been discovered and we need you to enter the ceremonial chamber, unwrap its bandages and find out how the mummy died.

10am–4pm (half hourly) • 45 minutes

### VISUAL-EYES

AGES 7+



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.

10am–4pm (hourly) • 45 minutes

Supported by:



### MINI SCIENTISTS

AGES 7+ **PRE BOOKING ADVISED**

Pick up your notebook, lab coat and safety specs then step into the lab to become a mini scientist. Our team of real life medical researchers will help you create a virus or build a cell then tackle DNA extraction before introducing you to our tanks of stripy zebrafish.

10am–4pm (hourly) • 30–45 minutes

Presented and supported by:



LET'S GO GREENER TOGETHER.  
[GREENERSCOTLAND.ORG](http://GREENERSCOTLAND.ORG)



## MADLAB AND HACKLAB

AGES 7+



MadLab is an interactive electronics workshop with specially designed circuit board kits available for all ages and abilities. Begin by learning the secrets of soldering then use your skills to assemble your very own working electronic gadget.

Get all the family together in the MadLab HackLab where you'll build your own kinetic sculpture. We'll provide the electronics and craft kit; bring your own old toys or gadgets to create a truly unique family machine. Teams of 2-3 people, with one experienced MadLabber recommended.

### MadLab

Just drop in • (45-75 minutes) • Kits cost from £3

### HackLab

Saturdays 23 and 30 March, 6 April • 10am and 1.30pm • (Up to 3.5 hours) • £25 per family • pre-booking essential

Circuit boards supplied by Zot Engineering



IndigoVision

Supported by:

## POLYFLOSS FACTORY

AGES 7+



Step into the Polyfloss Factory where we need workers to help out in our plastic reprocessing plant. Loads of the objects we use every day are made from plastic from pens to TVs, furniture to drinks bottles, plastics are used to create all sorts of useful stuff. We'll be sorting out waste plastic, melting it down in our plastic candyfloss machine and creating brand new, funky recycled objects to take home.

10am-4pm (drop in) • 45 minutes

Sponsored by:



## PONGY POTIONS

AGES 7+ **PRE BOOKING ADVISED**

Cook up the stinkiest smells imaginable and design your own sweet-smelling perfume (but please leave your natural stinks at home!) The science of scent is full of surprises – smells can change your emotions, make you feel sick and even make someone fall in love with you.

10am-4pm (hourly) • 45 minutes

## EVENTS FOR AGES 8+

### CSI: CRIME SCENE INVESTIGATION

AGES 8+ **PRE BOOKING ADVISED**



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?

10am-4pm (hourly) • 45 minutes

### MANIC MONSTER HUNT

AGES 8+



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. Watch where you step though, you are being watched.

Supported by:



## ADVENTURE-BOTS AND THE TEMPLE GODS

AGES 8+ **PRE BOOKING ADVISED**

Using a specially designed version of LEGO MINDSTORMS NXT technology, build and program robots, outsmart temple gods, battle deadly snakes and search for hidden treasure. Take part in a robotics adventure like no other.

10am-4pm (hourly) • 45 minutes

Supported by:



### RAMPAGING CHARIOTS WORKSHOP

AGES 8+ **PRE BOOKING ADVISED**

Race a powerful robot round a challenging obstacle course. Once you've seen what a robot is capable of, build 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-4pm (hourly) • 45 minutes

Presented and supported by:



### THE BLOOD BAR

AGES 8+

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.

### ER

AGES 8+ **PRE BOOKING ADVISED**



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.

10am-4pm (hourly) • 45 minutes

Supported by:



## A CLEANER, GREENER FESTIVAL

Please use public transport when visiting the City Art Centre, if you can. Show us your bus or train ticket (or your bike!) when you arrive and receive a Science Festival gift. See pages 47 and 48 for public transport information.

LET'S GO GREENER TOGETHER.  
[GREENERSOTLAND.ORG](http://GREENERSOTLAND.ORG)



### CITY ART CENTRE OPENING HOURS

Saturday 23 March – Saturday 6 April  
 (not Sundays)

9.30am–4.30pm

Allow 4–5 hours for your visit

### DAY PASSES

Adult	£7
Adult concession	£6.50
Child aged 7+	£9
Child aged 3–6	£6.50
Child under 3	FREE
Registered unemployed	£5 (for each family member up to 4 people. ID required)

### FACILITIES

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

### EARLY BIRD BOOKING

**CITY ART CENTRE WEEKENDS**  
 Book before 16 March and get £1 off all children's Day Passes on Saturday 23 March, Saturday 30 March and Saturday 6 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 can be booked in advance. You can reserve up to three workshops per child's Day Pass purchase. Please use the grid below to plan your day.

### 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 (£6.36), adult concessions (£5.90), child aged 7+ (£8.18), child aged 3-6 (£5.90).

*giftaid it*

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
AGES 3+	IMAGINATION GARDEN 20min	■	■	■	■	■	■	■	■	■	■	■	■	■	
	STORYTIME TENT 20min	■	■	■	■	■	■	■	■	■	■	■	■	■	
AGES 5+	SPLAT-TASTIC 45min		■	■	■	■	■	■	■	■	■	■	■	■	
	JUNGLE SAFARI 45min		■	■	■	■	■	■	■	■	■	■	■	■	
AGES 7+	UNWRAPPING THE MUMMY 45min		■	■	■	■	■	■	■	■	■	■	■	■	
	MINI SCIENTISTS 45min		■	■	■	■	■	■	■	■	■	■	■	■	
	PONGY POTIONS 45min		■	■	■	■	■	■	■	■	■	■	■	■	
AGES 8+	ADVENTURE-BOTS 45min		■	■	■	■	■	■	■	■	■	■	■	■	
	ER 45min		■	■	■	■	■	■	■	■	■	■	■	■	
	RAMPAGING CHARIOTS 45min		■	■	■	■	■	■	■	■	■	■	■	■	
	CSI 45min		■	■	■	■	■	■	■	■	■	■	■	■	



# PATTERNS IN NATURE

## ST ANDREW SQUARE

### PATTERNS IN NATURE

#### ALL AGES

Patterns are everywhere in nature – in the ranks of the clouds in the sky, the stripes of an angelfish and the unique allure of snowflakes. But where does this order and regularity come from? What roles do the laws of maths and physics play in creating the myriad of eye-popping formations that colour and pattern our world?

In both living and non-living systems, nature creates the most intriguing patterns from the repetition of just a few simple rules. *Patterns in Nature* celebrates the glorious beauty, symmetry and complexity of this process. Take a walk through some of nature's most stunning visual creations and discover the secrets of how and why these patterns are formed.

Thursday January 31–Sunday 7 April • 8am–6pm  
Free (no ticket required) • St Andrew Square

Curated by Nicola Coultts

With images from:

Kenneth G Libbrecht, Frans Lanting, Glasgow Museums Collection, Jim Anderson, Michael Poliza Photography, NASA, National Geographic Stock, Natural Visions, National Museums Scotland, Nikon Small World Photomicrography Competition, Paisley Museum and Art Galleries, Papadakis, Pelican Cards, Peter Randall-Page, Royal Botanic Garden Edinburgh, Scottish Natural Heritage, Turing's Sunflowers Experiment.

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The Alwaleed Centre

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ESSENTIAL EDINBURGH  
Central Business Improvement District

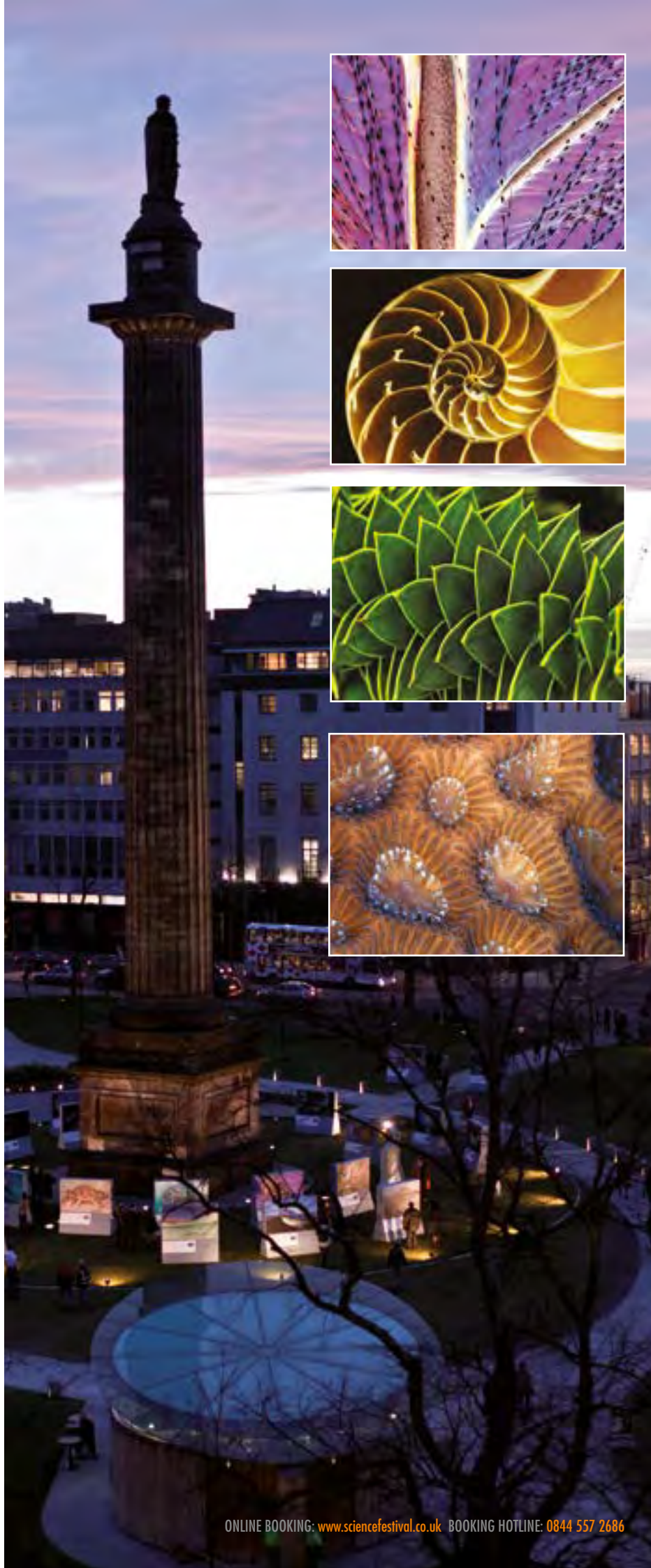
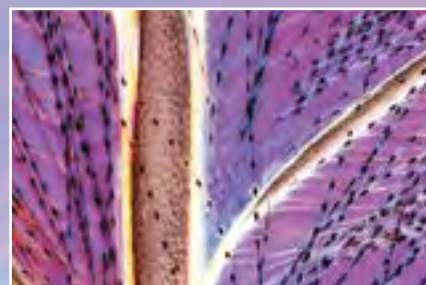
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James E Hayden FBCA RBP/ Nikon Small World 2012  
Photomicrography Competition

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James H Nicholson, Dr Hanian Lang & Dr Sylvia  
Galloway/ Nikon Small World 2012 Photomicrography  
Competition



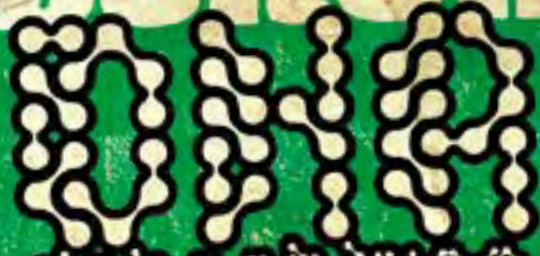


# ROYAL BOTANIC GARDEN EDINBURGH

## JOIN THE EXPEDITION!

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

The Garden is open daily from 10am to 6pm and entry is free. There is an admission fee for the Glasshouses, but you can get in for free with an Expedition Botanic ticket.



### detectives

### EXCITING EXPEDITIONS

### dangerous diseases





# EXPEDITION BOTANICS

AGES 5+



Join Expedition Botanics and experience the adventure of 21st century plant-hunting in Malaysia. From packing for your expedition to identifying your finds, experts will be on hand throughout the Glasshouses and Garden to guide you and help you learn new skills. Supported by Tourism Malaysia.

Open daily Friday 29 March–Sunday 7 April • Drop in from 11am – 5pm • Your expedition will take up to 2 hours • Last entry 3.45pm

## PACK FOR BASE CAMP

Discover how to live with blood-sucking leeches and learn about the equipment you'll need.



## WELCOME TO MALAYSIA

Acclimatise to the heat and humidity and enjoy the hospitality of a Malaysian village before the real work of your expedition begins.



## PLANT DETECTIVES

Track down the mystery Malaysian plant using clues left by the advance party.



## CAREFUL COLLECTIONS

Collect your own seed samples and press your plant specimen to preserve it for the scientists of the future.



## WHAT'S THAT PLANT?

Compare your specimen to some reference samples and see if you can identify what you found.



## GET GROWING

Get your fingers into some compost and pot up seeds to start your own botanical collection at home.



## TICKETS

Expedition Botanics Family Ticket (2 adults and up to 4 children) • £10

Expedition Botanics individual tickets • Adult £5 • Concession £4 • Children aged 5–16 £1.10 • Under 5s and RBGE members FREE

All tickets include entry to the Botanics Glasshouses.

Special membership offer • Enjoy your first 3 months RBGE family membership for free (£31 reduced from £41) if you sign up by direct debit during the Science Festival.

## FUEL UP FOR YOUR EXPEDITION!

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 Malaysian-themed dishes to enjoy in the Gateway Restaurant.



Royal Botanic Garden Edinburgh



**SPECIALIST SKILLS DROP-IN SESSIONS** 11AM–5PM**FORESTRY DNA DETECTIVES**

AGES 5+



Join scientists from Forest Research to help search out answers to some challenges. Whose poo is that, fox or pine marten? And why do we need to know? Why are we analysing the DNA of Black Poplar? What is remarkable about the Corstorphine Sycamore and can you find one nearby?

Friday 29–Saturday 30 March • Free (no ticket required) • Real Life Science Studio, John Hope Gateway

**BIRDS ON EXPEDITION**

AGES 5+

Many of the world's bird species undertake spectacular migrations throughout the year. But why do they migrate, how do they find their way and how do they survive such arduous journeys? Find out more with the RSPB – there's fun and games for the whole family.

Friday 29 March–Monday 1 April and Saturday 6–Sunday 7 April • Free (no ticket required) • Botanics Pond or Gateway Atrium, weather dependent

**DNA DISCOVERY TRAIL**

AGES 5+

Follow the trail, test plant DNA and discover how information found in plant cells can be used to improve crops, maintain biodiversity and even help the police link evidence to crime scenes. With the James Hutton Institute.

Sunday 31 March–Monday 1 April • Free (no ticket required) • Real Life Science Studio, John Hope Gateway

**PESKY PESTS AND DANGEROUS DISEASES**

AGES 5+

Researchers from SRUC, Scotland's Rural College, are constantly searching for ways to detect and fight pests and diseases that threaten plants and animals. Join their pioneering scientists to find out more about SRUC's work and see if you have what it takes to be a 'disease discoverer'.

Tuesday 2–Wednesday 3 April • Free (no ticket required) Real Life Science Studio, John Hope Gateway

**DISEASE EXPLORERS**

AGES 5+



Wanted – budding disease detectives with a sense of adventure for a journey of discovery and fun. Can you help in our quest to keep animals healthy and happy? Join us on an expedition with our scientists as we explore the world of bugs and beasties that can make us and animals sick. With the Moredun Research Institute.

Thursday 4–Friday 5 April • Free (no ticket required) Real Life Science Studio, John Hope Gateway

**FOOD TREK**

AGES 5+

On an expedition you'll need food for energy and water to drink, but can you use your science skills to identify the best things to pack in your rucksack? Join staff from the University of Aberdeen's Rowett Institute to try your hand at some fun food science and discover your survival essentials.

Saturday 6–Sunday 7 April • Free (no ticket required) • Real Life Science Studio, John Hope Gateway

**OTHER FAMILY EVENTS AT THE BOTANICS****TALKING TREES STORYTELLING**

AGES 5+

Join the Talking Trees Storytellers for a wonderful selection of tales of plants and plant-hunters from around the world.

Sunday 31 March and Sunday 7 April • 2pm (45 minutes) • Free (no ticket required) • Palm House

**WALL-E (DISNEY-PIXAR FILM)**

CERTIFICATE U

The year is 2700 and planet Earth has long been uninhabitable. For hundreds of years, robot WALL-E has been collecting precious knick-knacks to stave off boredom. Little does he realise he has recently stumbled on a secret that could rescue Earth and make the ravaged planet safe for humankind once again. Part of the 2013 Puppet Animation Festival.

Tuesday 2–Thursday 4 April • 3pm (1 hour 40 minutes) £3 (door sales will be cash only) • Fletcher Building

**SONGS AT SUNRISE**

AGES 12+

Enjoy an early morning expedition through the Garden, honing your bird identification skills and taking a closer look at some interesting plants with an RSPB expert and an experienced RBGE Garden Guide. Bring your binoculars!

Tuesday 2 April and Saturday 6 April • 7.15am (90 minutes) • £2 (Pre-booking essential) • Meet at West Gate, Arboretum Place

**ALSO AT THE ROYAL BOTANIC GARDEN...**

Don't miss exhibitions and events for adults at the Botanics during the festival see the Science Festival Events section for full details.

**EXHIBITIONS**

*Derek Roberts: Northern Paintings*

*Green Universe: A Microscopic Voyage into the Plant Cell*

*Jalan Jati (Teak Road)*

*Images of a Green Planet*

**EVENING EVENTS**

*Forest to Junk: Tracing the Teak Road*

Sunday 24 March

*Designed by Nature*

Tuesday 26 March

*Stargaze with Mark*

Wednesday 27 March

*Eating Aliens*

Thursday 28 March

**DISCOVERY WALKS**

*Daily Garden Tours*

*Fragers' Breakfasts*

Saturday 30 and Sunday 31 March

**COURSES FOR THE CURIOUS**

*Herbal First Aid*

Sunday 31 March

*Introduction to Plant Identification*

Sunday 7 April





EDINBURGH INTERNATIONAL



# INTERNATIONAL

With 25 years experience in creating high quality and engaging science events, Edinburgh International Science Festival is a world leader in its field. Alongside our core activities in Scotland, we also operate internationally.

Through our Ventures business we work closely with national and international partners to help programme other Science Festivals, provide trained science communicators and tour our entertaining shows and workshops.

[sciencefestival.co.uk/international](http://sciencefestival.co.uk/international)



Images from Beijing Science Festival and Abu Dhabi Science Festival.

Image credits: Augusta Macdonald, Edinburgh International Science Festival and Mica Colace, Abu Dhabi Science Festival

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

**imagine festival**  
6-13 may 2013

**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](http://WWW.IMAGINATE.ORG.UK)

The Festival is produced by **imagine**  
promoting and presenting performing arts for children and young people in Scotland.  
imagine is a company limited by guarantee. Company No. SC19828. Charity No. SC041477.



supported through the Scottish Government's Cultural Facilities Core Fund





National  
Museum of  
Scotland



**PISCES**

ARTIST RESIDENCY 23–29 MARCH  
PISCES 29 MARCH–14 APRIL

World-renowned, New York-based artist, **Jason Hackenwerth** will take up residency in the National Museum of Scotland to create the largest visual spectacle the Science Festival has ever seen.

See the humble balloon transformed as *Pisces* takes over the Grand Gallery. In Greek mythology, Aphrodite, the goddess of love, and her son Eros escaped the fearsome monster Typhon by transforming into a tightly woven spiral of two fish. Inspired by this story and the geometric patterns of nature, experiential artist Jason will create a staggering, spiraled double helix structure, reflecting our interconnected world that stretches from coral to the cosmos.

Installed over several days by Jason and his team, you'll have the chance to watch the process first hand as hundreds of balloons are woven together to build this intricate structure before its grand unveiling.

Look out for details of opportunities to engage with the artist at [sciencefestival.co.uk](http://sciencefestival.co.uk).

You can view *Pisces* in the Grand Gallery at National Museum of Scotland 29 March–14 April • The Museum is open daily from 10am–5pm.

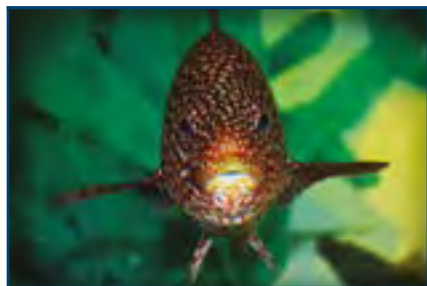




## EXHIBITION

### FUTURE SEAS

ALL AGES



Scotland has one of the longest coastlines in Europe which is home to a variety of important habitats and species. Explore the diversity of marine life and learn about the ways we explore and use the sea in this fascinating, colourful and interactive installation.

Saturday 23 March–Sunday 7 April • 10am–5pm  
Drop in • Free (no ticket required) • National Museum of Scotland Grand Gallery

Presented by the National Museum of Scotland

## ACTIVITIES

### SECRET LIFE OF CORAL

AGES 6+

In the deep waters off the West coast of Scotland lie some of Europe's biggest and most incredible coral reefs. Explore the secret life of coral; discover the amazing creatures that live in its communities and help us build a coral reef by making your very own sea creature in this captivating hands-on space.

Saturday 23 March–Sunday 7 April • 10am–5pm (drop-in)  
45 minutes • Free (no ticket required) • National Museum of Scotland, Hawthorneden Court

Supported by: **marinescotland**



### LAB RATS: ALL AT SEA!

AGES 4-7

Put your mini-scientists through their paces in our messy museum laboratory. Follow our clever museum lab rats on their journey round Scotland's coast and take part in slippery science challenges and sea-themed activities.

Monday 25–Friday 29 March and Monday 1–Friday 5 April  
11am–3pm (hourly, 40 minutes) • Free (limited places sign up in the museum on the day)

Presented by the National Museum of Scotland

### LAB RATS SEA SAFARI TRAIL

AGES 4+

Pick up the Lab Rats Sea Safari Trail and use your nose to navigate your way around the galleries. You'll discover what marine life is making waves in the museum and help our scientists fathom out some very fishy issues!

Monday 25 March–Sunday 7 April • 10am–5pm  
Drop in • Free (no ticket required)

Presented by the National Museum of Scotland

## SHOWS

### MUSIC TO YOUR EARS

AGES 9+

How do we make, record and see sounds? This interactive show reveals everything from the basics of sound to the latest in music technology. Find out what sound is and see what it looks like; learn how we hear it and how our ears can be damaged by loud music. Witness the ultimate hands-free instrument, have fun with voice synthesisers and even hear music played with a blowtorch!

Monday 25 March • 11am and 3pm (1 hour) • £4  
National Museum of Scotland Auditorium

### WHERE'S WALLACE?

AGES 6+



The Victorian naturalist and avid explorer Alfred Russel Wallace came up with an independent, yet very similar, theory of evolution to Charles Darwin's. To mark 100 years since his death, we'll travel to the jungle to locate and sort specimens, discover the biogeography of animals and ask 'Where's Wallace?'

Tuesday 26 March • 11am and 3pm (1 hour) • £4  
National Museum of Scotland Auditorium

Presented by The Linnean Society of London

### INDESTRUCTIBLE ENERGY

AGES 8+

Petrol, ping pong balls, calories and cookies – what do they all have in common? Energy! Join Famelabber **Jamie Gallagher** for some interactive demonstrations as he burns food, bounces balls and generates electricity to show us what energy is and why we can't destroy it.

Thursday 28 March • 11am and 3pm (1 hour) • £4  
National Museum of Scotland Auditorium

### THE MATHS OLYMPICS WITH SIMON PAMPENA

AGES 12+



Team GB take note, past success counts for nothing in the most gruelling test of all – The Maths Olympics! Join Aussie stand-up mathematician **Simon Pampena** for an audiovisual maths workout. This training session with a difference fuses sport, music, comedy and numbers, helping transform potential into the gold medal-winning mathematicians of the future.

Monday 1–Wednesday 3 April • 3pm (45 minutes) • £4  
National Museum of Scotland Auditorium

### DR DEATH AND THE MEDI-EVIL MEDICINE SHOW

AGES 7+

Sneezes, wheezes, sickness and diseases are never welcome, but in the past, some of the treatments could be far worse than the illness itself! Join the time-travelling 'Dr Death', **Simon Watt**, and see if he can cure you in a scientifically and historically accurate pantomime for children and other childish people. Warning: this show promises blood, guts, gore and more!

Thursday 4–Friday 5 April • 3pm (1 hour) • £4 • National Museum of Scotland Auditorium

### SCIENCE OF DR WHO

AGES 7+

Aliens and time machines, cyborgs and Daleks, utopias and killer computers: *Doctor Who* is the longest running sci-fi tv series on the planet. With the iconic series celebrating its 50th Anniversary this year, author **Mark Brake** and rapper **Jon Chase** explore the science themes behind the Doctor: space, time, machine and monster!

Saturday 6 April • 3pm and 7pm (1 hour) • £8/£6 concession • National Museum of Scotland Auditorium

### ROCK THE LAB

Look out for live science happening throughout the Grand Gallery as we debut *Rock the Lab* ahead of a music festival tour this summer. Expect demos, debates and more than a few surprises.

# FAMILY EVENTS FROM THE UNIVERSITY OF EDINBURGH

AT THE NATIONAL MUSEUM OF SCOTLAND

Discover science with real scientists from The University of Edinburgh. Visit the National Museum of Scotland Learning Centre for free, family-friendly drop-in activities, workshops and shows from Saturday 23 March–Saturday 6 April.

Drop-in activities run from 10am–4.30pm daily and are suitable for everyone aged 5+. Find details of free ticketed events below.

## DROP-IN ACTIVITIES

### FINDING HIGGS BOSON

The existence of the Higgs Boson particle was predicted many years ago by The University of Edinburgh's Professor Peter Higgs, and now it looks like scientists may have found it! Come and meet particle physicists and learn about the amazing discoveries that are taking place right now.

Saturday 23 March–Monday 1 April • Level 2

### POP-UP ENGINEERING



Pop-ups may look simple, but they are magical devices based on ingenious engineering mechanisms. Choose your pop-up design and get to work, making flat cardboard shapes spring into exciting 3D models before your very eyes.

Saturday 23–Wednesday 27 March • Level 2

### DISCOVER OUR EARTH



Geoscientists at The University of Edinburgh are leaders in investigating the awesome forces which have shaped our world. Discover how the Earth was formed and find out how science can help us track the changes taking place on our planet as they happen.

Saturday 23–Wednesday 27 March • Level 2



## THE UNIVERSITY of EDINBURGH

### THE ENERGY CHALLENGE

Chemists at The University of Edinburgh are working on new types of renewable energy - join them as they share their discoveries. You'll have the chance to experiment with new technologies including electrochemistry and solar power and find out if you have what it takes to keep the future bright.

Saturday 23–Wednesday 27 March • Level 2

### BIO-DISCOVERIES

Biologists at The University of Edinburgh are investigating everything from how to fight tropical diseases to how butterflies avoid being eaten. Look down the microscope and join them to make some exciting discoveries of your own.

Thursday 28 March–Monday 1 April • Level 2

### THE SCI-FUN ROADSHOW



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

Thursday 28 March–Monday 1 April • Levels 2 and 4

### SECRETS OF SYMMETRY

Our planet is full of beautiful mathematical patterns and symmetries – from man-made buildings to the natural world. Learn how to spot and understand these patterns, then create your own to take home.

Thursday 28 March–Monday 1 April • Level 2

## HUMAN AND ANIMAL MEDICINE



How do scientists keep humans and animals healthy? Take part in hands-on activities with real medical and veterinary scientists from The University of Edinburgh and see their cutting-edge work for yourself – from the work of a vet to the workings of the human heart and much much more.

Tuesday 2–Saturday 6 April • Level 2

## WORKSHOPS

### POWERFUL PATTERNS

AGES 7+

Find out how we can use mathematics to create interesting, intricate and clever patterns. This fun workshop explores the symmetries of shapes, helping you use tiles of all shapes and colours to create your own fantastic designs.

Friday 29–Sunday 31 March • 11am and 2pm (1 hour)  
Free (ticket required) • Level 4

### INTELLIGENT ROBOTS

AGES 9+

The latest humanoid robots really push the boundary between humans and machines, taking new technologies to the limit. Find out how robots are able to interact with people intelligently. You may even get the chance to put your skills to the test in a human versus machine face-off!

Tuesday 2 April–Friday 5 April • 2pm (1 hour) • Free (ticket required) • Level 4

## SHOW

### THE CHEMISTRY SHOW

ALL AGES

How can we make environmentally-friendly cars? Why might a farmer taste a field? And why would someone from Germany know the answer to this question? **Paul Murray** and **Robin Andrews** return with a vibrant chemistry show that's jam-packed full of experiments. Get ready for some new discoveries with bangs, colours, flames and foam.

Saturday 30 March and Monday 1–Thursday 4 April  
11am (45 minutes) • Free (ticket required) • National Museum of Scotland Auditorium



# AROUND EDINBURGH

There's something for everyone, young and old, at the 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. Events are listed alphabetically by venue.

## THE CENTRE LIVINGSTON

### THE FUTURE'S BRIGHT

ALL AGES



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.

Saturday 23 March–Sunday 7 April • 11am–5pm (Allow around 30 minutes to complete all the activities) • Free

Supported by:



## EDINBURGH ZOO

### DUNG DAYS AT THE ZOO

ALL AGES

Make some amazing dung discoveries as you learn more about animal poo at the zoo! Find out what happens to animal dung in the wild and in zoos; unlock the secrets of digestion in animals large and small and use your poo facts to help you identify which animal made which dung.

Monday 25–Thursday 28 March • 11am–3.30pm • Drop in • Free with admission to Edinburgh Zoo

### ENRICHMENT DAY AT THE ZOO

ALL AGES



Enrichment is the way zoos take care of animals to stimulate their natural behaviour and keep them happy. You'll see animals scavenging for food and interacting with their environments as they would in the wild, with keepers on hand to explain more about their behaviour. Make your own enrichment objects and watch the animals interact with what you've created, and join the scavenger hunt to try out enrichment for yourself.

Sunday 7 April • Events happening throughout the day, times vary • Free with admission to Edinburgh Zoo

## AROUND TOWN

### EDINBURGH CITY SCI-QUEST

ALL AGES

Delve into Edinburgh's past, discover hidden scientific treasures and explore the city's most intriguing green and grey spaces in this competitive quest for knowledge. Download the free app, Sci-Quest (available cross-platform and on the web), form a team with friends and family and make your way to your chosen level. You'll need a keen eye and quick wit as you gather clues and solve riddles to progress through the game. Log on to [sciencefestival.co.uk/whats-on/quest](http://sciencefestival.co.uk/whats-on/quest) to track your progress and check out your ranking on our leader board.

Saturday 23 March–Sunday 7 April • 1–2 hours per game level • Free (no ticket required) • Citywide

App developed in association with the Scottish Government Climate Change Division and Edinburgh Outdoors

Supported by:



### GEOWALKS: SHAPING EDINBURGH – PAST, PRESENT AND FUTURE

AGES 7+

Follow the course of the last great ice sheet across Edinburgh and discover the processes, big and small, that shaped the city's landscape. Humans are the big changers now, but behind the scenes natural processes work away and will continue to do so long after we are gone. Find out what Edinburgh might look like in 1000 years, or even a million.

Saturday 30 March, Monday 1, Wednesday 3, Friday 5 and Saturday 6 April • 2pm (2 hours) • £10/£8/£4 under 16 • Meet at the top of Granny's Green Steps, Johnston Terrace

### STREET SCIENCE

ALL AGES



With mind-boggling experiments and dazzling science demos, our busking bikes take street performance to a whole new level. Find out all about the latest developments in Scottish science and witness explosions, weirdness and plenty of mess. Look out for our Street Science team around town up to and during the Science Festival and follow us on Twitter @EdSciFest for real time Street Science updates.

Saturday 16 March–Sunday 7 April • Free

Supported by:



## CAMERA OBSCURA AND WORLD OF ILLUSIONS

### SECRETS OF SCIENCE TRAIL

ALL AGES

Explore our wonderful hands-on illusions. Can you stay on your feet in the Vortex or find your way through the mirror maze? Discover the secret science of our special optical effects. Can you really believe everything you see? Bring your camera and above all, have fun!

Saturday 23 March–Sunday 7 April • 9.30am–8pm • Free with entry to Camera Obscura and World of Illusions, 10% discount with Science Festival brochure

## GEORGE SQUARE THEATRE

### DR BUNHEAD'S POO AND GOO SHOW

AGES 7+



TV scientist, *Brainiac's* Dr Bunhead explores the world of gross, smelly, loud and messy stuff. Discover the science behind fart-powered rockets and flammable shampoo; see the biggest bogey in the world; meet the Ninja Jelly Babies and race the world's fastest chips.

Saturday 23–Sunday 24 March • 11.30am (1 hour)  
£5.50 child/£4.50 adult

Presented by The University of Edinburgh

## NATIONAL MINING MUSEUM SCOTLAND

### EXPLORE THE ENERGY LAB

AGES 8+

Come along and be an engineer for the day! Conduct experiments in our brand new Energy Lab to learn about the different types of energy – light, heat, sound and kinetic. See what happens when you mix vinegar and bicarbonate of soda or drop a weight from a height into a bucket of water.

Monday 25–29 March, 1–5 April • 2pm (90 minutes) • £2 (accompanying parents receive 25% discount on museum admission) • National Mining Museum Scotland

## NATIONAL MUSEUM OF FLIGHT

### FLYING START

AGES 3+

Pilots must be able to talk on the radio, watch the radar and monitor the engines, but how do they do it? Modern aeroplanes are a mass of electronics. How do they keep running in the most extreme of conditions? Come and see our new electricity science show before making a circuit of your own.

Saturday 23 March–Sunday 7 April • 12pm–4pm  
Free with admission to the museum • National Museum of Flight

## OCEAN TERMINAL

### INMOTION

ALL AGES

*InMotion* is a series of interactive exhibits celebrating the science of human movement and performance in sport, technology and dance. This bumper showcase explores everything from comparing the strength and power of your muscles against that of elite athletes to the science and aesthetics of movement.

Saturday 23 March–Sunday 7 April • 11am–5pm • Free

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



## OUR DYNAMIC EARTH

### BEAT THE EXPERT

ALL AGES

Take the challenge to 'beat the experts' at their own game, discover what Scotch Mist has to do with our understanding of the atom and find out about cutting-edge research on space, spectrometry and smashing particles together.

29 March–2 April • 11.30am–4pm (1 hour) • Drop in • Free with admission to Our Dynamic Earth

### OUR DYNAMIC EARTH SCIENCE LIVE: EXPLORE YOUR UNIVERSE

ALL AGES

This exciting, hands-on show uses cutting-edge research by the Science and Technology Facilities Council to let us marvel at the spectacular world of physical science. Using high-tech equipment and experiments you'll explore the world of atoms, learn how light travels, experience materials with unusual properties and discover how we observe our universe.

Saturday 23 March–Sunday 7 April • 11am, 1pm and 3pm  
Free with admission to Our Dynamic Earth

### ONE DAY DIGITAL!

AGES 13+

We all use digital technology, but this is your chance to create it! Choose from a range of workshops (3–5 hours) with industry gurus and learn how to create your own website or app, print in 3D, design a computer game or character, programme or code using a Raspberry Pi computer or build your own gadget. We'll even keep the creative juices flowing with a free lunch. Places are limited, so you must sign up in advance to secure your spot. For information contact Nesta 01382 229 521.

Saturday 30 March • 9.45am–5pm (all day) • Free (ticket required, pre-booking essential)

Presented by Nesta

## SCOTTISH SEABIRD CENTRE

### PROFESSOR EGGHEAD'S JUST IN TIME

AGES 4+

Professor Egghead has discovered giant bird bones outside the Centre and is on the hunt for answers. What did the bones belong to? Why were they there? Can we prove that dinosaurs didn't really die out? Join the professor to find out if there may once have been something even larger than a gannet lurking around North Berwick.

Saturday 23 March–Sunday 7 April • 2pm (1 hour) • Free with admission to the Centre

## SCOTTISH STORYTELLING CENTRE

### EUREKA! ANCIENT GREECE AND ITS BRILLIANT SCIENTIFIC DISCOVERIES

AGES 3+

A celebration of science from ancient Greece! Storyteller and puppeteer **Carolyn Latham** and her friendly little dog invite everyone to travel back in time with them to discover the stories behind the science.

Saturday 23 March • 11am (45 minutes) • £6/£4 concession

## SUMMERHALL

### EDINBURGH MINI MAKER FAIRE

ALL AGES

The Mini Maker Faire is a unique chance for making enthusiasts of all ages and disciplines - from crafters to geeks and artists to engineers - to share their skills and show off their work. You'll find everything from traditional crafts to technological innovation explored through workshops, demonstrations, talks and interactive presentations. [more details see p.45]

Sunday 7 April • 10am–5pm • £2.50

In association with Summerhall

Maker Faire is independently organised and operated under licence from O'Reilly Media.

Supported by: **Make:**  
technology on your time



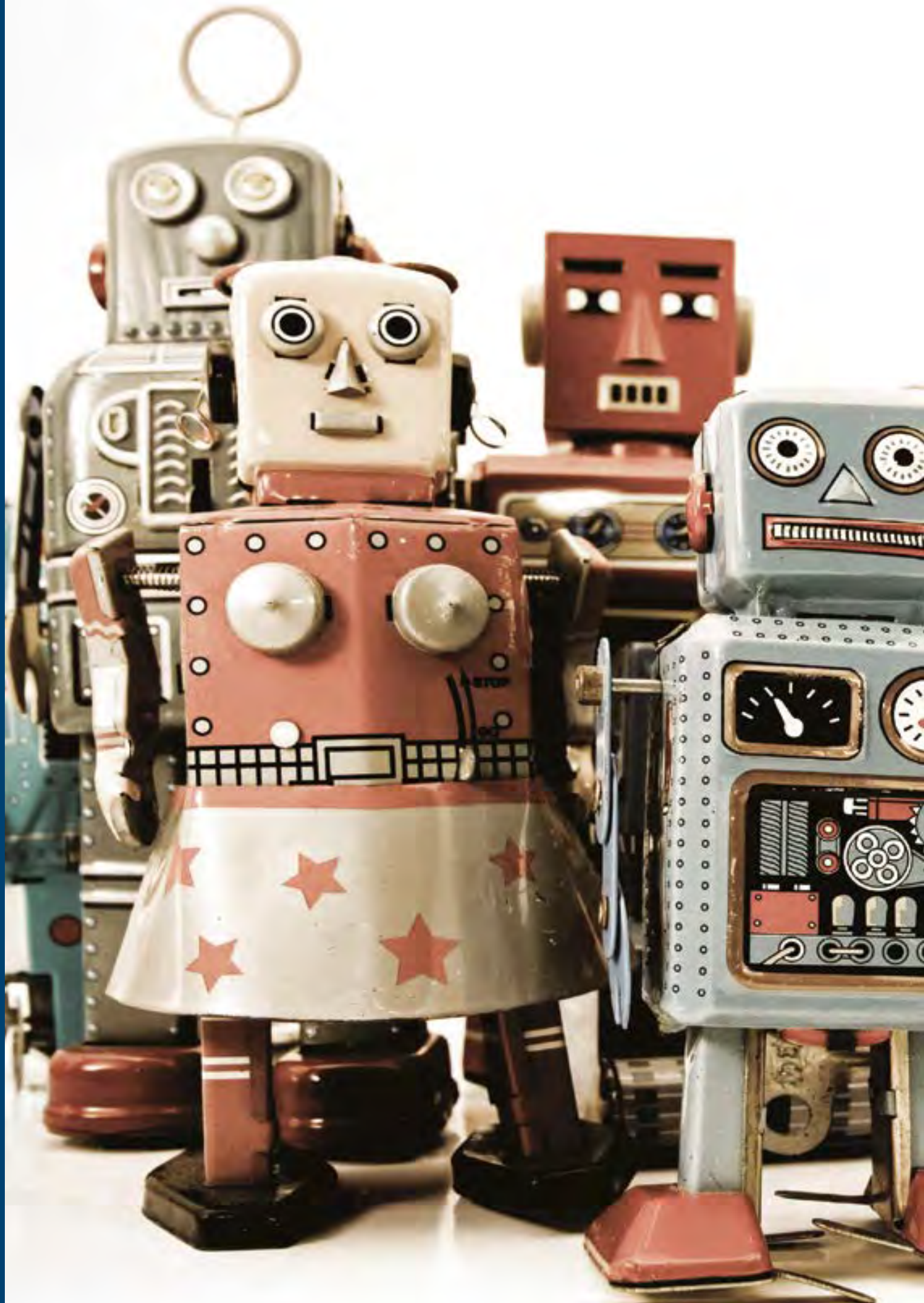


# AT A GLANCE

	FROM JAN 31 THU	MAR 23 SAT	MAR 24 SUN	MAR 25 MON	MAR 26 TUE	MAR 27 WED	MAR 28 THU	MAR 29 FRI	MAR 30 SAT	MAR 31 SUN	APR 1 MON	APR 2 TUE	APR 3 WED	APR 4 THU	APR 5 FRI	APR 6 SAT	APR 7 SUN	
CITY ART CENTRE 9.30am-4.30pm	p6-10																	
ST ANDREW SQUARE 8am-4pm	p11																	
BOTANICS 10am-5pm	p12-14																	
NATIONAL MUSEUM OF SCOTLAND	p15-17																	
THE CENTRE, LIVINGSTON 11am-5pm	p19																	
EDINBURGH ZOO 11am-3.30pm/ALL DAY	p18					DUNG DAYS AT THE ZOO												BRICH- MENT DAY
GEORGE SQUARE THEATRE 11.30am	p18																	
NATIONAL MINING MUSEUM SCOTLAND 2pm	p19																	
NATIONAL MUSEUM OF FLIGHT 12pm-4pm	p19																	
OCEAN TERMINAL 11am-5pm	p19																	
OUR DYNAMIC EARTH 11am, 1pm and 3pm	p19																	
SCOTTISH SEABIRD CENTRE 2pm	p19																	
SCOTTISH STORYTELLING CENTRE 11am	p19																	
SUMMERHALL 10am-5pm																		

image: Turing spirals © John Thurm/thurm.wordpress.com







# SOCIABLE SCIENCE

2013 marks the 25th Edinburgh International Science Festival. In our vibrant programme of Science Festival Events we'll be celebrating our past, enjoying our present and looking forward to a dynamic future.

Come and meet the scientists, artists and philosophers who are addressing the diverse challenges and ideas we face. Hear them in conversation, admire their work and take part in some unique and unexpected interactive challenges.

If you're curious about the world we live in and our place in it, you'll find enlightening and entertaining events perfect for a memorable night out. So why not add science to your social life and discover new worlds of innovation and creativity along the way?

## JOIN THE CONVERSATION

Looking for a break between events or a drink at the end of your evening? Join us at the bar in the Teviot Row Loft Bar at The University of Edinburgh, our **Festival Social Hub** open daily from 5pm. Grab a drink or a coffee and toast the future with some Science Festival faces.

Or join us online. Tweet your comments, questions and feedback #EdSciFest

## EARLY BIRD OFFER

Buy 4 tickets for the Science Festival Events programme and receive a 5th ticket free! Cheapest ticket free, valid for five separate events only.

Book before **Saturday 16 March** to take advantage of this offer. Early Bird tickets must be booked by phone or in person.

## AGE RESTRICTIONS

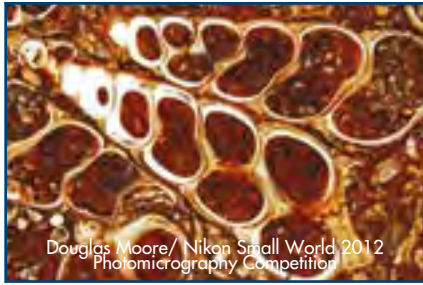
The Science Festival Events programme is designed for visitors aged 14+.

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.

# THROUGHOUT THE FESTIVAL

## PATTERNS IN NATURE

ALL AGES



Patterns are everywhere in nature – in the ranks of the clouds in the sky, the stripes of an angelfish and the unique allure of snowflakes. Our *Patterns in Nature* exhibition celebrates the glorious beauty, symmetry and complexity of this process. Take a walk through some of nature’s most stunning visual creations and discover the secrets of how and why these patterns are formed.

31 January–7 April • 8am–6pm • Free (no ticket required)  
• St Andrew Square

Curated by Nicola Coutts

With images from:

Kenneth G Libbrecht, Frans Lanting, Glasgow Museums Collection, Jim Anderson, Michael Poliza Photography, NASA, National Geographic Stock, Natural Visions, National Museums Scotland, Nikon Small World Photomicrography Competition, Paisley Museum and Art Galleries, Papadakis, Pelican Cards, Peter Randall-Page, Royal Botanic Garden Edinburgh, Scottish Natural Heritage, Turing’s Sunflowers Experiment.

Lead supporter:



Supported by:



THE UNIVERSITY OF EDINBURGH  
The Alwaleed Centre

With thanks to:



## DEREK ROBERTS: NORTHERN PAINTINGS

ALL AGES

A major exhibition of new and recent paintings by Scottish artist Derek Roberts, selected and installed by the artist to take advantage of the wonderful natural light in the seven rooms of Inverleith House.

9–28 February, Tuesday–Sunday, 10am–4.30pm  
1 March–14 April, Tuesday–Sunday, 10am–5.30pm • Free (no ticket required) • Inverleith House, Royal Botanic Garden Edinburgh

Presented by Royal Botanic Garden Edinburgh

## SCOTTISH WOMEN OF SCIENCE: CELEBRATING TRAILBLAZERS FROM OUR PAST

ALL AGES

Celebrate the contributions of some hugely inspirational but little-known female Scottish scientists including astronomer Williamena Fleming, geologist Maria Gordon and herbalist Elizabeth Blackwell as the National Library of Scotland presents an illustration of their lives and work through a selection of publications from the library’s collection. Visit [nls.uk](http://nls.uk) for details of talks accompanying the exhibition.

1 March–30 April • 10am–8pm, Monday–Friday; 10am–5pm, Saturday; 2–5pm, Sunday • Free (no ticket required) • National Library of Scotland

Presented by National Library of Scotland

## GREEN UNIVERSE: A MICROSCOPIC VOYAGE INTO THE PLANT CELL

ALL AGES

This exhibition, taken from the newly published book by Professor Stephen Blackmore, reveals the profound consequences the invention of microscopy has had on our understanding of plants. The images show the minute details of plant structures and cells, revealing in this unseen world the chapters of plant evolution.

2 March–7 April • 10am–6pm • Free (no ticket required)  
• Royal Botanic Garden Edinburgh, Gateway Gallery, John Hope Gateway

Presented by Royal Botanic Garden Edinburgh, in association with Papadakis Publishing

## MARILÈNE OLIVER: CONFUSÃO

ALL AGES

This solo exhibition, the first since the artist’s move to Angola sees Oliver, who for many years has worked with medical imaging data to create sculptures, refining her practice to a series of dark and haunting etchings that juxtapose the digitised body with African traditions and rituals.

16 March–11 May • 10am–6pm, Tuesday–Saturday • Free (no ticket required) • Edinburgh Printmakers, 23 Union Street

Presented by Edinburgh Printmakers

## IMAGES OF A GREEN PLANET

ALL AGES

A selection of prize-winning, large format photographs showing the intense and frequently dramatic beauty of our designed and natural landscapes and the plants, animals and features they contain.

22 March–27 May • 10am–6pm, daily • Free (no ticket required) • Royal Botanic Garden Edinburgh, John Hope Gateway

Presented by Royal Botanic Garden Edinburgh

## JALAN JATI: TEAK ROAD

ALL AGES



Follow, through photography, woodprint, collage and stop-motion animation, the journey of a 1950s teak bed found in a Singapore junk store back to where the original tree may have grown. The exhibition *Jalan Jati* connects cross-cultural natural histories, micro and macro arboreal influences and DNA timber-tracking technology.

22 March–7 July • 10am–6pm, daily • Free (no ticket required) • Royal Botanic Garden Edinburgh, Ground Floor, John Hope Gateway

Presented by Royal Botanic Garden Edinburgh

## THE CLIPPERTON PROJECT: CONFLICT OF INTEREST

This ‘view from the street’ exhibition features work by The Clipperton Project sculptor Charles Engebretsen. Born into a crofting community on the Isle of Lewis, his work examines ideas of isolation and man’s relationship with extreme environments. In this exhibition his sculptures specifically examine conflicts in nature.

The Clipperton Project is an international, multidisciplinary initiative that explores notions of journey and discovery and seeks to engage and empower audiences worldwide.

23 March–6 April. Drop-in events on 23, 30 March and 6 April • View from the street • Free (no ticket required) • Tent Gallery

Presented by ASCUS at the Tent Gallery



**EDINBURGH CITY SCI-QUEST**

ALL AGES

Delve into Edinburgh's past, discover hidden scientific treasures and explore the city's most intriguing green and grey spaces in this competitive quest for knowledge. Download the free app, Sci-Quest (available cross-platform and on the web), form a team with friends and family and make your way to your chosen level. You'll need a keen eye and quick wit as you gather clues and solve riddles to progress through the game. Log on to [sciencefestival.co.uk/whats-on/quest](http://sciencefestival.co.uk/whats-on/quest) to track your progress and check out your ranking on our leader board.

23 March–7 April • 1–2 hours per game level • Free (no ticket required) • Citywide

App developed in association with the Scottish Government Climate Change Division and Edinburgh Outdoors

Supported by:

**PISCES**

ALL AGES

During the Science Festival, world-renowned artist Jason Hackenwerth will create the largest visual spectacle the Science Festival has ever seen. See the humble balloon transformed as *Pisces* takes over the Grand Gallery. In Greek mythology, Aphrodite, the goddess of love, and her son Eros escaped the fearsome monster Typhon by transforming into a tightly woven spiral of two fish. Inspired by this story and the geometric patterns of nature, experiential artist Jason will create a staggering, spiraled double helix structure, reflecting our interconnected world that stretches from coral to the cosmos.

Installed over several days by Jason and his team, you'll have the chance to watch the process as hundreds of balloons are woven together to build this intricate structure before its grand unveiling.

Artist residency 23–9 March • Pisces 29 March–14 April  
10am–5pm • Free • National Museum of Scotland, Grand Gallery

**SUNDAY 17 MARCH****SCIENCE FESTIVAL CHURCH SERVICE**

ALL AGES

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

11.30am (2 hours) • Free (no ticket required) • St Giles' Cathedral

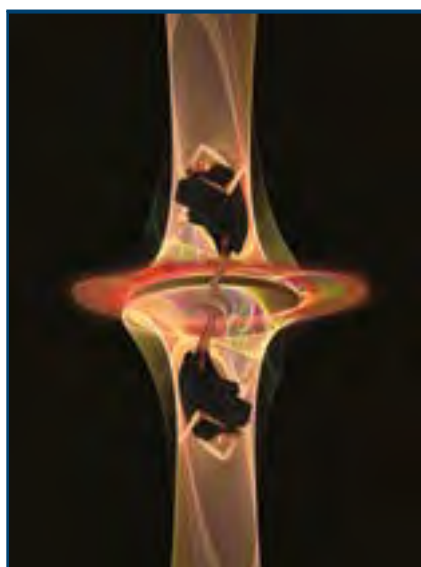
**THURSDAY 21 MARCH****SCIENCE FESTIVAL LATES: OPENING PARTY**

AGES 18+



Fancy a deep jungle safari? Or a shot at keyhole surgery in A&E? Then *Science Festival Lates* is just the ticket as – in honour of the opening of our 25th festival – we open our flagship children's venue to just adults for one night only. Don't miss the chance to try out our four fantastic floors of hands-on activities – we've got blood and eyeballs, monsters and slime, bubbles and rampaging robots. Grab a bottle of Culture#1 – our exclusive Science Festival beer – and join the party!

8pm (3 hours) • £10 • City Art Centre

**SATURDAY 23 MARCH****CHAOS AND CONTINGENCY**

The award-winning **Janis Claxton Dance Company** presents a performance based on the study of emergent mathematical patterns. Watch as patterns evolve and dissolve in the piece, which features an international cast from Scotland and China with music composed by Philip Pinsky. See a different side to dance in this unique art and science collaboration.

23–24 March • 1pm and 3pm • Free (no ticket required)  
National Museum of Scotland, Grand Gallery

Presented by Janis Claxton Dance in association with Edinburgh International Science Festival and the National Museum of Scotland

**COMMUNICATING SCIENCE: HOW CAN WE SHARE IT?**

Science festivals play a key role in communicating science to a wider public and enthusing young people for a career in science and technology. However, many scientists are still reluctant to engage with society as a whole and find it hard to speak in layman's language.

Join **Professor Anne Glover**, Chief Scientific Adviser for the European Commission and formerly for Scotland, as she explores ways to stimulate the debate between scientists and citizens.

12.30pm (90 minutes) • £8/£6 • National Museum of Scotland Auditorium

In association with the European Commission

**SATURDAY SHOWCASE: COLOUR IN TEXTILES**

Come and learn more about colour and textiles in this *Saturday Showcase*. Enjoy a talk on the meaning and history of colour and a hands-on workshop on natural dyes and colour in cotton. There will also be an opportunity to see some striking examples of colour in textiles from the National Museums of Scotland's extensive collections.

1.30pm (2.5 hours) • £8/£6 concession and NMS Members • National Museum of Scotland, Learning Centre Level 4

Presented by the National Museum of Scotland In association with the University of Edinburgh, School of History, Classics and Archaeology and the Colour Experience, Society of Dyers and Colourists, Bradford

**PICTURING YOUR BRAIN**

A growing trend toward MRI brain scanning is revealing a lot more than beautiful images of healthy brains. But how do neurologists decide when treatment is required? And would we all benefit from a brain scanning programme?

Join MRC Senior Clinical Fellow and Consultant Neurologist **Rustam Al-Shahi Salman** for a discussion on the issues as he reveals just how abnormal many of our normal brains really are.

3pm (90 minutes) • £8/£6 • National Museum of Scotland Auditorium

Presented by the Medical Research Council



# SCIENCE GETS CREATIVE...

Following its success in 2012, Inspace will this Festival once again be transformed into Latelab – a creative, social and participatory event space where adults can make, do and interact with art, science and technology. Part installation, part salon, Latelab is the perfect opportunity to meet and mingle with other Festival-goers and speakers, presenting some fascinating events with a unique social twist.

Catch regular Inspace favourites *Electric Bookshop* and *Pecha Kucha* as well as the *Dialogues* festival – an exciting exploration of the latest blends of live music and technology. Back for 2013 is *Gastrolab*, where we'll explore exotic eating, tasting everything from edible flowers to insect mousse; and if you've ever fancied blasting off into space, why not join us for a special pre-flight health check?

No two evenings will be the same so drop by and become part of the experiment!

Visit [inspace.ed.ac.uk](http://inspace.ed.ac.uk) for the full shedule of events and table reservations.

23–24 and 27–31 March and 3–7 April • 7.30pm (2.5 hours) • Free (ticket required) • Inspace

Latelab is a collaboration between the Edinburgh International Science Festival, New Media Scotland and the University of Edinburgh's School of Informatics.

Supported by Marks & Clerk

INSPEACE





## LANDFORMS: AN AUDIENCE WITH CHARLES JENCKS



American writer, architectural theorist, landscape architect and designer **Charles Jencks** is inspired by the patterns of fractals, genetics, chaos theory and waves. Scotland is home to some amazing examples of his work, which reflect significant concepts in contemporary science and maths in beautiful and unusual ways. Join him as he reflects on his inspirations and considers how science can provide the metaphors to create iconic works of art and architecture that will be relevant and meaningful for generations to come.

5.30pm (90 minutes) • £10/£8 • National Museum of Scotland Auditorium

In association with National Museum of Scotland

Supported by:



## THE BIG PICTURE: GLOBAL TRENDS IN STATISTICS

Can global statistics really be interesting, fun and utterly fascinating? **Professor Hans Rosling**, of TED fame, thinks it can. Famous for debunking long-held myths about the third world with his Gapminder software, let him help you challenge your preconceptions about the current state of the world. Statistics can equip us with real insight into the global challenges we face, helping us put in place informed and positive changes in the future.

5.30pm (90 minutes) • £8/£6 • Teviot Row Debating Hall

## LATELAB

Back by popular demand, 2013 sees Inspace again transform into Latelab. See panel opposite for details.

23–31 March and 3–7 April • 7.30pm (2.5 hours) • Free (ticket required) • Inspace

Latelab is a collaboration between the Edinburgh International Science Festival, New Media Scotland and the University of Edinburgh's School of Informatics.

Supported by Marks & Clerk



## PIE IN THE SKY



By 2050, nearly 80% of the earth's population will reside in urban centres but how will we meet their food needs? Vertical farming offers one possible solution, but is it just pie in the sky?

Join the originator of the concept, **Professor Dickson Despommier** of Colombia University New York, in conversation with **Dr Chungui Lu**, Head of the Vertical Farming Team at Nottingham University, for a fascinating look at what vertical farming is, why we need it and how we might use it.

8pm (90 minutes) • £8/£6 • National Museum of Scotland Auditorium

## THE GREAT BIG SCIENCE QUIZ



Everyone loves a good quiz, particularly when the smartest person is on your team. So what happens when all the teams are not only smart but funny too? Welcome to our big fat Science Quiz, run in association with BBC Radio Scotland. Scientists, comedians and presenters including **Richard Wiseman** and **Hermione Cockburn** unite in a battle of wit and wisdom. Which old wives tales have a grain of scientific truth? What unbelievable research is making headlines? Our panellists bring their best improvised scientific songs and generally get their geek on.

8pm (90 minutes) • Free (ticket required) • Teviot Row Debating Hall

In association with:



*The Great Big Science Quiz* will be broadcast on BBC Radio Scotland, Friday 29 March, 1.15pm

## SUNDAY 24 MARCH

### STEM BANKS AND SEED VAULTS: EXTINCTION – THE LAST LINES OF DEFENCE?

Could stem cell technology help endangered animals now reduced to small populations and even bring animals back from extinction? Why is saving seeds and botanical collections far more than just a good idea? **Dr Mike McGrew** from Edinburgh University's Roslin Institute and **Dr Wolfgang Stuppy** of the Millennium Seed Bank at Kew Gardens join **Professor Chris West**, Chief Executive of Edinburgh Zoo, for an evening of inspirational presentations and discussion on what some might consider the last lines of defence against future extinctions.

12.30pm (90 minutes) • £8/£6 • National Museum of Scotland Auditorium

### NATURE'S PATTERNS



In both living and non-living systems, nature creates the most intriguing patterns from the repetition of just a few simple rules. Join sculptor **Peter Randall-Page** in conversation as he explores his obsession with the glorious beauty, symmetry and complexity of nature's pattern-forming tendencies which are celebrated in our exhibition in St Andrew Square.

3pm (90 minutes) • £8/£6 • National Museum of Scotland Auditorium

### GENES, CELLS AND BRAINS: THE PROMETHEAN PROMISES OF THE NEW BIOLOGY

Many extravagant claims have been made for genomics, regenerative medicine and neuroscience. Join the feminist sociologist of science **Hilary Rose** and 2004 Edinburgh medallist, neuroscientist **Steven Rose**, as they unpick the blend of hype, hope and profit through which academic bioscientists have become entrepreneurs, company directors and consultants – even as their own research reveals the conceptual flaws behind their scientific claims.

5.30pm (90 minutes) • £8/£6 • Teviot Row Debating Hall

## EDINBURGH MEDAL ADDRESS: COLLABORATIONS AND COLLISIONS – THE SEARCH FOR THE HIGGS BOSON



In 2012 the world awoke to the news that CERN's Large Hadron Collider had detected the existence of an elusive sub-atomic particle consistent with the Higgs boson, which was first proposed to exist in 1964. Join **Professor Peter Higgs** and **Professor Rolf-Dieter Heuer**, Director General of CERN, as they share their stories of prediction, discovery and collaboration in what promises to be a very special evening.

7pm (60 minutes) • £10/£8 • Signet Library

## FOREST TO JUNK: TRACING THE TEAK ROAD

Is the wood you buy legal and sustainable? Geneticist **Dr Stephen Covers** examines how DNA in wood can be used to locate its source, control illegal logging, look back in evolutionary time and guide reforestation projects. Visual artist **Lucy Davis** will discuss the stories of people, wood and forests that emerged from the grain of a teak bed bought in a Singapore junk shop that became the *Jalan Jati: Teak Road* project, exhibited at the Royal Botanic Garden Edinburgh from 23 March.

7pm (90 minutes) • £8/£6 • John Hope Gateway, Royal Botanic Garden Edinburgh

Presented by Royal Botanic Garden Edinburgh

## ROBIN INCE'S SHOW AND TELL

In this unique take on your favourite bit of school, **Robin Ince** asks his parade of special guests to 'show and tell' their favourite things from the world of science. Join Robin for a series of punchy presentations on everything from moon rock to tarantulas, amethyst to ammonites. With names coming in thick and fast, it promises to be packed with weird and wonderful stories; anything and everything is possible!

8pm (90 minutes) • £10/£8 • National Museum of Scotland Auditorium

## MONDAY 25 MARCH

### FUTURE ARTISTS

Unlock your hidden artistic talent or progress your skills in this special one-off day of anatomy drawing with artist **George Donald**. As well as discovering some of the finer points of this detailed technique, you'll have the chance to explore your artistic future in an artist's talk and discussion that centres on opportunities for further study and careers in drawing.

9am–5pm (8 hours) • £12 • Surgeons' Hall Museum

### RICHARD WISEMAN'S BEGINNERS GUIDE TO... THE BRAIN



What have you always wanted to know but were too afraid to ask? On the back of their success in 2012, **Professor Richard Wiseman's** entertaining and informative beginners' guides are back. First up is the science of the brain, and with one of Britain's leading scientists, neurobiologist **Professor Colin Blakemore**, in the hotseat it promises to be an intriguing and accessible introduction to our most mysterious organ.

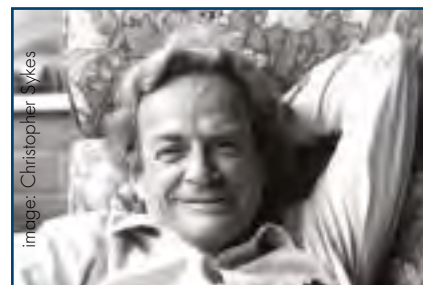
1pm (60 minutes) • £5 • National Museum of Scotland Auditorium

### THE PERILS OF SLEEP

We spend a third of our lives asleep, but are we ever safe when we are at our most vulnerable? Learn the science behind sleep and discover what can go wrong as **Dr Renata Riha** of the Department of Sleep Medicine at the Royal Infirmary of Edinburgh leads a panel of experts in an interactive session that is guaranteed to awaken and enlighten!

5.30pm (90 minutes) • £8/£6 • Teviot Row Debating Hall

### THE FEYNMAN TAPES: THE PLEASURE OF FINDING THINGS OUT



Between 1981 and 1993, award-winning documentary producer **Christopher Sykes** shot three films and one TV series dedicated to the charismatic, Nobel Prize-winning physicist Richard Feynman. Called both magician and buffoon, Feynman is also lauded as a man who could make science accessible and interesting for all. According to comedian **Robin Ince**, we could do worse than to have an automaton Richard Feynman in every school. Join Christopher and Robin for a rare screening of *The Pleasure of Finding Things Out* and some fascinating first-hand insights into a man who inspired countless scientists in the making.

6.15pm (90 minutes) • £10/£8 • Filmhouse  
In association with Filmhouse

### IT IS IMPOSSIBLE TO HAVE A SCIENCE FESTIVAL\*

Twenty five years after Edinburgh launched the first ever science festival, hundreds now take place – from Orkney to New York, from Shanghai to Abu Dhabi. They have had a major impact on public engagement in science, but what is a science festival? How did Edinburgh start? What are festivals for? **Ian Wall**, who invented the Science Festival, will explain its origins, early hopes, successes and failures, leading to a discussion about the future of festivals and concluding with a celebration drink.

\*Professor of Philosophy's statement before Edinburgh International Science Festival launched

6.30pm (90 minutes) • £5 • International Centre for Mathematical Sciences

In association with the International Centre for Mathematical Sciences

### WHAT'S GOING ON IN HIS HEAD?

In 2011, leading science communicator **James Piercy** suffered a traumatic head injury that made this question more pertinent than ever before. Join him as he shares his, at times emotional, journey. Find out just what we know about what is in our heads and the effect of brain damage via tales of the brain's structure, MRI, monitoring and the effects of trauma.

8pm (90 minutes) • £8/£6 • Teviot Row Debating Hall



# FUTURE CITIES



Right now we are undergoing the biggest wave of urban growth in history. In 2008, for the first time ever, more than half of the world's population was living in towns and cities. The cities of the future will have to meet not only the social demands of a burgeoning and densely packed population but the environmental challenges faced by the planet as a whole.

*Future Cities* explores the urban shape of things to come through a series of enlightening events held at the National Museum of Scotland. Discover how cutting-edge architecture and design are incorporating elements from the natural world; find out how city planners are diminishing urban sprawl by taking our green space upwards rather than outwards; and learn how computing could support our lives as we explore the ever-developing interface between people and technology.

## FUTURE CITIES EVENTS

### THE ARUP LECTURE: WHAT MAKES A CITY SMART?

Wednesday 27 March, 8pm [p.32]

### EDINBURGH REBOOTED

Thursday 28 March, 5.30pm [p.33]

### GREENING THE CITY

Friday 29 March, 5.30pm [p.35]

### THE FUTURE OF CYCLING

Saturday 30 March, 12.30pm [p.36]

### LIVING ARCHITECTURE

Saturday 6 April, 12.30pm [p.42]

### LI-FI: DATA THROUGH ILLUMINATION

Sunday 7 April, 3pm [p.44]



EPSRC is pleased to support the *Future Cities* programme which reflects its research in engineering and the physical sciences, helping to develop innovative solutions to technological challenges and create a healthy, productive and sustainable future.

## EPSRC

Engineering and Physical Sciences  
Research Council



# THE EDINBURGH MEDAL

Awarded to men and women of science  
for both their scientific work and their  
wider contribution to society.

The 2013 Edinburgh Medal is awarded to **Professor Peter Higgs** and CERN, the European Organisation for Nuclear Research. Professor Higgs and CERN's Director General, **Professor Rolf-Dieter Heuer**, will deliver the Edinburgh Medal Address on Sunday 24 March (p.28).

In 2012, the world awoke to the news that CERN's Large Hadron Collider had detected an elusive sub-atomic particle consistent with the long-sought Higgs Boson. Edinburgh-based scientist Professor Peter Higgs was among the first to suggest its existence. And now one more mystery of the universe – how elementary particles gain mass – is potentially solved.

Since it was first proposed in 1964, the search for the particle has been the collaborative work of countless scientists. In acknowledgement of the fact that science is a collective endeavour, the Edinburgh Medal, for the first time in its history, is awarded jointly; not only to an inspirational scientist but to the world-class organisation, CERN, who led the quest.

And in the spirit of collaboration, we are pleased to welcome some previous Medal recipients to this year's Festival. Join them as they discuss big ideas from the past, present and future of science and technology in:

*My Dangerous Idea*, Tuesday 26 March, 8pm [p.31].

The Edinburgh Medal is awarded 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 wellbeing of humanity.

## PREVIOUS RECIPIENTS

2012	Dr James Hansen
2011	Professor Carl Djerassi
2010	Sir Alex Jefferies
2009	Professor Jonathan Beckwith
2008	Professor Chris Rapley
2007	Dr Richard Horton
2006	Professor James Lovelock
2005	Professor Colin Blakemore
2004	Professor Steven Rose
2003	Professor Wang Sung
2002	Dr Lise Kingo
2001	Sir John Sulston
2000	Professor Lynn Margulis
1999	Professor Jocelyn Bell Burnell
1998	Sir David Attenborough
1997	Professor Amartya Sen
1996	Professor Richard Levins
1995	Sir John Crofton
1994	Professor Manuel Patarroya
1993	Professor Wangari Maathai
1992	Professor Heinz Wolff
1991	Professor Jane Goodall
1990	Professor Stephen J Gould
1989	Professor Abdus Salam



Photograph copyright Alan Walker, University of Edinburgh.

## TUESDAY 26 MARCH

### CREATING A MONSTER? GEEKS ON FILM



From *Frankenstein* to *Jurassic Park*, Hollywood perennially exploits science and scientists to tell a good story, but is there a psychological reason why those in white coats are cast more often as villains than heroes? Do these portrayals inspire new generations into scientific careers? Using online experiments and film clips, psychiatrist **Dr Raj Persaud** explores how the laboratory looks through a lens and asks whether the experiment has gone awry. Should this monster created from scientific clichés finally be destroyed?

5.30pm (90 minutes) • £8/£6 • National Museum of Scotland Auditorium

### AIR POLLUTION: OUT OF SIGHT, OUT OF MIND



Air pollution is one of the biggest environmental risks to human health and poor air quality contributes to the loss of more lives than road traffic accidents. Through presentations, lively debate and practical demonstrations, the Scottish Environment Protection Agency explores the state of air quality in Scotland, its impact on human health, and what can be done about it.

6pm (90 minutes) • £8/£6 • Teviot Row Dining Room

Presented by the Scottish Environment Protection Agency (SEPA)



## UNDERSTANDING AGEING: A FIGHT TO THE DEATH?

It's said that the only certainties in life are death and taxes, but is this how it will always be? **Dr Aubrey de Grey**, a controversial biomedical gerontologist based in Cambridge, believes medicine will soon be able to keep us youthful indefinitely but his views have been criticised by **Richard Faragher**, Professor of Biological Biogerontology at the University of Brighton. Join them as they discuss the often controversial issues and perceptions surrounding age and illness.

5.30pm (90 minutes) • £8/£6 • Teviot Row Debating Hall

## DESIGNED BY NATURE



Art and design inspired by nature goes back to the dawn of human creativity. Join **Professor Stephen Blackmore**, Queen's Botanist and author of *Green Universe* in conversation with fashion designer **Professor Helen Storey**, who has produced fashion and textile designs based on the first 1000 hours of human life. Using microscopes and lenses, you'll have the chance to explore the microscopic world for yourself.

7pm (90 minutes) • £8/£6 • Royal Botanic Garden Edinburgh, John Hope Gateway

Presented by Royal Botanic Garden Edinburgh, in association with Papadakis Publishing

## EDINBURGH SKEPTICS: AT THE FRINGE OF REASON

AGES 18+



Edinburgh Skeptics bring their highly successful Fringe format to the Science Festival. Each evening a different scientist gives an informal talk on how their work will change our futures, followed by a lively discussion in the bar. Visit [sciencefestival.co.uk](http://sciencefestival.co.uk) for full details.

26–28 March and 2–4 April • 7.30pm (90 minutes)  
Free (donations accepted) • The Banshee Labyrinth

Presented by Edinburgh Skeptics

## HUNGRY FOR CHANGE



The worldwide population is set to reach 9 billion by 2050, but can we sustainably produce enough food to support it, and how will worldwide issues affect local food security in the UK?

Join **Professor Tim Benton** the UK public funders' Champion for Global Food Security and **Professor Howard Davies**, Research Consultant in Food Security and Biotechnology at The James Hutton Institute, as they examine the issues and highlight some of the difficult choices ahead.

8.30pm (90 minutes) • £8/£6 • Teviot Row Dining Room

In association with The James Hutton Institute

## MY DANGEROUS IDEA



The history of science is full of discoveries considered socially, morally, or emotionally dangerous in their time but which later became accepted – think Darwin and Copernicus for starters! But what are today's most dangerous ideas?

Join a selection of previous Edinburgh Medal recipients – including neurobiologist **Professor Colin Blakemore** and UCL's Professor of Climate Science **Professor Chris Rapley** – as they share with you their dangerous ideas in a rare chance to hear from some of the most provocative minds in science.

8pm (90 minutes) • £10/£8 • Teviot Row Debating Hall

## PRINTING THE THIRD DIMENSION

3D printers are currently luxury items for the rich and curious but, in the future, every home could have one. **Professor Lee Cronin**, a chemist from the University of Glasgow believes they could allow us to self-manufacture pharmaceuticals, while companies like Autodesk are already helping you turn your old photos into 3D models and barrister **Simon Bradshaw** is thinking long and hard about the issue of 3D piracy. Join them for a fascinating evening exploring how you might print your future!

8pm (90 minutes) • £8/£6 • National Museum of Scotland Auditorium

## WEDNESDAY 27 MARCH

### BRITISH ECOLOGICAL SOCIETY CENTENARY SYMPOSIUM

The British Ecological Society celebrates its centenary with a public symposium focusing on the amazing diversity of marine life that inhabits our oceans. With BBC Material World's **Quentin Cooper** at the helm, a parade of international experts will cover everything from biological exploration of the deep seas to cold water coral ecosystems, jellyfish blooms and the role of the oceans' carbon in keeping the world green. Visit [sciencefestival.co.uk](http://sciencefestival.co.uk) for full details.

10am–5pm • £27 • National Museum of Scotland Auditorium

Presented by the British Ecological Society in association with the Marine Alliance for Science and Technology for Scotland and the National Museum of Scotland

## FUTURE HEALTHCARE

We tend to think of the future in terms of moving forwards, but if free healthcare was withdrawn from the UK, what would it mean for our advancement? Join us for this interactive workshop and discover specimens of the diseases from the past that could one day come back to haunt us. Please note: the workshop includes an examination of human bone and tissue.

12pm–4pm (drop in) • Free with entrance to the museum  
Surgeons' Hall Museum

Presented by Surgeons' Hall Museum

## DEATH, DRUGS AND DYNAMITE

In a courtroom, the forensics expert carries the heavy responsibility of interpreting and evaluating evidence for the jury. The public's sense of justice and the growing popularity of television crime drama have increased the expectation placed on this scientific discipline. Can science provide all the answers, and are they the right ones? **Professor Alan Jamieson**, Director of the Forensic Institute in Glasgow, in conversation with author and screenwriter **Lin Anderson** (creator of forensic scientist Rhona Macleod), takes an entertaining look at the science of crime and some of the crimes of science.

6pm (90 minutes) • £8/£6 • Teviot Row Dining Room

Presented by the Society of Biology

## OUR WIRED WORLD



The smart phones we now carry contain more computing power than NASA used to send Neil Armstrong to the moon! The IT revolution has had an impact on everything from communication to leisure time to political transformation and our world is now saturated with technology.

Join futurist **Robin Mannings**, author **Lin Anderson** and cyberpsychologist **Jane Guiller** as they explore how the internet, social media and computing are not only shaping our daily lives but adapting our brains – changing how we think, read and remember.

5.30pm (90 minutes) • £8/£6 • Teviot Row Debating Hall

## STEM CELLS: A CURE FOR BLINDNESS?

Retinal degeneration is a leading cause of blindness in the western world. Drug treatments currently available can only slow the disease's progress and are not always successful. **Dr Rachael Pearson**, from University College London, has helped to develop a therapeutic approach that replaces lost cells with functioning ones to restore vision. **Professor Mandy Maclean** joins her to discuss how this research could revolutionise treatment of visual impairment in the future.

5.30pm (90 minutes) • £8/£6 • National Museum of Scotland Auditorium

Presented by The Royal Society

## MASTS MARINE SCIENCE CABARET

AGES 18+

Life is a Marine Science Cabaret! Take your seat for a diverse and engaging evening of short talks and presentations from scientists working across the field of marine science and technology. Ask questions, mingle with speakers and immerse yourself in diverse selections of the latest developments in this fascinating field.

6.45pm (2 hours) • £12/£8 • National Museum of Scotland, Hawthorneden Court

Presented by The Marine Alliance for Science & Technology for Scotland

## STARGAZE WITH MARK



To the beginner, the star-filled night sky can seem mysterious and unfathomable. But that doesn't need to be the case! Fresh from co-hosting *Stargazing LIVE* with Professor Brian Cox, **Mark Thompson**, AKA the people's astronomer and author of the new book *A Down to Earth Guide to the Cosmos* is back with a night that sees the awesome nature of the Cosmos brought down to Earth.

Join Mark and local astronomers for a fascinating and accessible guide to the beauties of the night sky and some top tips on looking up. Try handling a meteorite, witness a comet being made or take a chance (weather permitting!) to do some stargazing yourself.

7pm (2.5 hours) • £8/£6 concessions • Royal Botanic Garden Edinburgh, John Hope Gateway

In association with Royal Botanic Garden Edinburgh, Transworld Publishers, the Royal Observatory and the Edinburgh Astronomy Society

## THE ARUP LECTURE 2013: WHAT MAKES A CITY SMART?



In the 21st century, cities and citizens have the technology to operate as up-to-the-minute systems; yet most cities are still operating on a 20th century model, making decisions based on snapshots and averages rather than the real time, instant information the internet, smartphones, tablets and social media provide. Join ARUP's **Volker Buscher** and **Mark Watts** as they explain how embracing 21st century systems can help local governments to compete, innovate and lead.

8pm (90 minutes) • £8/£6 • National Museum of Scotland Auditorium

Part of the EPSRC 'Future Cities' strand

Supported by:

**ARUP**

## WATER, WATER VIRTUALLY EVERYWHERE



Our water use has increased six times in the past century and with the population growing, there has never been a greater need to manage our resources as efficiently as possible. **Professor Bob Ferrier** chairs a fascinating evening that sees **Dr Ashok Chapagain**, Science Director of the Water Footprint Network, and **Timm Keeritz**, designer of the innovative Virtual Water Project, join **Dr Marc Stutter** and **Professor Paul Younger** to discuss the implications of our water use and reveal the tools we can use to foster a more sustainable approach.

8.30pm (90 minutes) • £8/£6 • Teviot Row Dining Room

In association with The James Hutton Institute



## WHY WE PLAY



Recent research suggests that if you play more, you may age less. The amount and quality of our play affects our hormones, which in turn affect our development and behaviour.

Play devotee and musician **Pat Kane** (of 80s favourites *Hue and Cry*) will be joined by **Patrick Bateson**, Emeritus Professor of Ethology at the University of Cambridge, **Wendy Russell**, Senior Lecturer in Play and Playwork at the University of Gloucestershire and **Alex Fleetwood**, Director of game design studio Hide&Seek Productions, to explore the evolution of play, its impact on the individual and its wider social implications.

8pm (90 minutes) • £10/£8 • Teviot Row Debating Hall

In association with the ESRC Genomics Policy and Research Forum

## THURSDAY 28 MARCH

## RICHARD WISEMAN'S BEGINNER'S GUIDE TO... THE UNIVERSE



Einstein said 'Most of the fundamental ideas of science are essentially simple and may, as a rule, be expressed in a language comprehensible to everyone.' Award-winning author and Cosmology Consultant for *New Scientist*, **Marcus Chown**, agrees. In his second Beginner's Guide for 2013, **Professor Richard Wiseman** puts him, and Einstein, to the test as they explore some important scientific questions as big as the Universe itself!

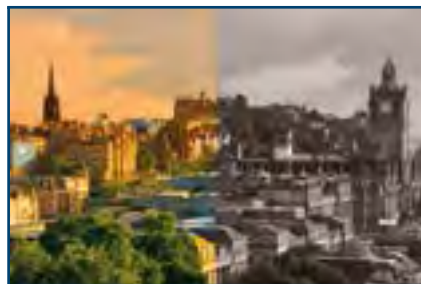
7pm (60 minutes) • £5 • National Museum of Scotland Auditorium

## FUTURE SURGEONS

Are you considering a career in surgery or are you curious to discover what goes on during a day in the life of a surgeon? **Professor Gordon Mackay** will talk about their careers and discuss how they chose their specialisms; show you how they examine pathology specimens and talk you through their working day.

1–3pm • Free (ticket required) • Surgeons' Hall Museum

## EDINBURGH REBOOTED



Edinburgh is a tale of two cities – the unplanned sprawl of the Old Town in contrast with the organised flow of the New Town, which came out of necessity in the face of pollution and overcrowding. So how would we redesign our city to face current and future environmental and social challenges?

Join Chair **Thomas Ermacora** from urban design group Clear Village, with **Professor Sue Roaf** of the International Solar Cities Initiative, **Peter Head** from the Ecological Sequestration Trust and **Eva Schonveld** of the Transition Towns Movement as they envisage the Edinburgh of the future.

5.30pm (90 minutes) • £8/£6 • National Museum of Scotland Auditorium

Part of the EPSRC *Future Cities* strand

Supported by:



## MAKING IT UP



Experiments suggest that improvising can increase our ability to answer questions that have more than one 'right' answer but what are the implications of this research for education and creativity?

In an evening of audience interaction and live performance, psychologist and dancer **Dr Peter Lovatt**, philosopher and creator of the 'mood organ', **Tom Cochrane** and music psychologist and saxophonist **Professor Raymond MacDonald** join forces to investigate the impact of improvisation on the human mind. And yes, they may well be making it up as they go along!

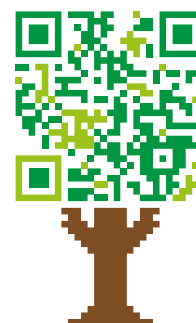
5.30pm (90 minutes) • £8/£6 • Teviot Row Debating Hall

## CREATION: THE ORIGIN AND THE FUTURE OF LIFE

Every living being that has ever existed on Earth owes its life to a single, remarkable event that took place some 4 billion years ago. With characteristic flair and insight, leading science journalist **Adam Rutherford** gathers ground-breaking research from top scientists to take you on a gripping journey of discovery. This is the epic story of life on Earth: what it is, where it came from and how we are about to start it again.

6pm (90 minutes) • £8/£6 • Teviot Row Dining Room

Presented by Penguin Books



LET'S GO GREENER TOGETHER.  
GREENERScotland.org

# DISCOVER THE VISIONS OF TOMORROW, **TODAY!**



Throughout the Science Festival Events programme you'll find talks, workshops and discussions to inspire and challenge you as we're joined by the biggest thinkers and brightest minds exploring the ideas and innovations that could, in the future, become reality.

*Big Ideas* is the forum for some of the UK's most prominent scientists to engage with the public and one another as they discuss how we can all contribute to confronting the challenges we'll face in the near and distant future.

Discover the new ideas in architecture and urban planning that will shape our surroundings; get to grips with global statistics; face the challenges of a burgeoning worldwide population and explore cutting-edge human biology; taste the future of food and sit back and experience the new technologies that are changing how we relax.

You'll find a selection of events to get you started below. Don't forget our Early Bird Offer – buy 4 tickets and receive the 5th free if you book by Saturday 16 March. See [p.23] for full details and terms and conditions.



## **BIG IDEAS EVENTS**

**LANDFORMS:  
AN AUDIENCE WITH CHARLES JENCKS**  
Saturday 23 March, 5.30pm [p.27]

**THE BIG PICTURE:  
GLOBAL TRENDS IN STATISTICS**  
Saturday 23 March, 5.30pm [p.27]

**PIE IN THE SKY**  
Saturday 23 March, 8pm [p.27]

**GENES, CELLS AND BRAINS:  
THE PROMETHEAN PROMISES  
OF THE NEW BIOLOGY**  
Sunday 24 March, 5.30pm [p.27]

**HUNGRY FOR CHANGE**  
Tuesday 26 March, 8.30pm [p.31]

**MY DANGEROUS IDEA**  
Tuesday 26 March, 8pm [p.31]

**WHY WE PLAY**  
Wednesday 27 March, 8pm [p.33]

**THE ADAPTATION DIET**  
Saturday 30 March, 5.30pm [p.36]



## EATING ALIENS



From sika deer to American crayfish, invasive species are upsetting the natural order of ecosystems on land and sea. If the culprits are tasty, could the obvious solution be to eat them? Find out at this very special dinner party, with **Catherine Murdoch**, Policy Officer in Wildlife Management for the Scottish Government and **Stan Whitaker** of Scottish Natural Heritage, chaired by **Dr Ian Edwards** from the Royal Botanic Garden Edinburgh. Join the discussion over a meal of delectable invasive species, prepared by the RBGE's Gateway Restaurant.

7pm (150 minutes) • £35 (includes 3 course meal; see [sciencefestival.co.uk](http://sciencefestival.co.uk) for menu details) • Royal Botanic Garden Edinburgh, Gateway Restaurant

In association with Royal Botanic Garden Edinburgh

## MOLECULAR MASTERY

AGES 18+



Molecular mixology creates cocktails using the scientific equipment and techniques of molecular gastronomy. The result? Greater intensities and varieties of flavour, unexpected flavour combinations and textures, and new ways of presenting drinks.

Join **Professor Andrea Sella** and a top mixologist for an evening of mixology mastery that will show how the art of cocktail-making has become a science. Learn the tricks of the trade that will allow you to experiment at home.

8pm (90 minutes) • £20 (includes drinks) • Teviot Row Debating Hall

## OUR ATOMIC FUTURE?

The Scottish Government has pledged to phase out nuclear power by 2020. However many experts suggest that in the face of an impending energy crisis we should be embracing nuclear energy rather than rejecting it. What is 4th generation nuclear power and could it be the answer to our future energy needs? Or could nuclear fusion be a viable option? Join **Professor Steve Cowley**, Director of the Culham Centre for Fusion Energy, and nuclear fission expert **Professor Tim Abram**, Director of the Centre for Nuclear Energy Technology at the University of Manchester, as they explore the past, present and future of this controversial energy source.

8pm (90 minutes) • £8/£6 • National Museum of Scotland Auditorium

Supported by:



## THE TRUE SELF: WHAT IT IS AND HOW TO FIND IT

Most of us seek a sense of authenticity as we try to understand our 'self', but do we ever attain it? Join **Drs Letitia Slabu**, **Alison Lenton** and **Alex Wood** as they explore the idea of the 'true self'. Discover how science investigates and measures authenticity, whether authenticity differs across cultures and how research findings are challenging common myths associated with our 'selves'.

8.30pm (90 minutes) • £8/£6 • Teviot Row Dining Room

## FRIDAY 29 MARCH 2013

### GREENING THE CITY



Space in the city is at a premium, and green space can sometimes seem like a luxury. But parks, gardens, trees and plants can crop up in some unexpected ways.

Join guerrilla gardener **Richard Reynolds**, **Sarah Brown** from Gorgie City Farm and **Ea O'Neill** from Greenspace Scotland's Pioneer Growing Communities project as they explore some fascinating and novel options for greening our urban environment and the social rewards it can bring.

5.30pm (90 minutes) • £8/£6 • National Museum of Scotland Auditorium

Part of the EPSRC *Future Cities* strand

## WHERE'S YOUR HEAD AT – A NIGHT WITH DR DANCE



Want to know how swing frees up memory and tango triggers creativity? Dying to learn how barn dancing boosts puzzle-solving powers and hardcore rave relates to intimate attraction?

Join **Peter Lovatt**, AKA Dr Dance, for an interactive night of dance and discovery. Whether you're a total novice or a dancefloor enthusiast, you'll pick up some great new moves and discover the fascinating and surprising science behind them.

5.30pm (90 minutes) • £10/£8 • Teviot Row Debating Hall

## LIKE A VIRGIN



Biologist **Aarathi Prasad** explores how other species can achieve reproduction without sex and why evolution hasn't made this an option for humans – yet. Trace the diverse history of mankind's ideas about reproduction, then discover how some cutting-edge laboratories are creating the reproductive technology of tomorrow, including everything from a silicone womb to an egg-fertilising computer chip.

6pm (90 minutes) • £8/£6 • Teviot Row Dining Room

Presented by Oneworld Publications

## CAN YOU HACK IT?

Body hacking to enhance the senses certainly pushes the boundaries between technology and the human body, and this thought-provoking interactive event will reveal how it has moved from the realms of science fiction to science fact.

Meet **Ian Harrison** from the University of Reading who has magnetic implants in his fingertips; body modification specialist **Mac 'Dr Evil' Macarthy**, University of Bath psychologist **Michael Proulx** and **Anders Sandberg** from the Future of Humanity Institute at the University of Oxford as they explore how the brain adapts to alterations to the senses. Plus, try out vOICe, a sensory substitution programme that turns your images into sound.

8pm (90 minutes) • £8/£6 • Teviot Row Debating Hall

## STRANGE ICE



Though you will find it in every refrigerator in the world, water ice is a material so strange that it breaks almost every rule in our textbooks. Yet its very familiarity makes us take it and its properties for granted. The centenary of x-ray diffraction gives **Professor Andrea Sella** the perfect opportunity to take stock of its properties, how it compares with other ices and the way in which water ice may be the canary that warns of a future much less certain than we imagine.

8pm (90 minutes) • £8/£6 • National Museum of Scotland Auditorium

## QUANTUM WEIRDNESS



The science of quantum mechanics underpins much of modern physics. It has applications in technology and predictive theory, but some of the ideas associated with it can seem more like sci-fi than sci-fact. Bestselling popular science writer and fan of quantum weirdness **Marcus Chown** ponders everything from Heisenberg's uncertainty principle to Schrödinger's cat.

8.30pm (90 minutes) • £8/£6 • Teviot Row Dining Room

# SATURDAY 30 MARCH

## FORAGER'S BREAKFAST



Foraging expert and author **Miles Irving** will lead you on a morning walk around the Botanic Garden to identify edible wild plants and offer hints and tips on using foraged foods in cooking. You will then be treated to a breakfast of wild delights at Earthy Canonmills, where Miles will talk about the menu.

Saturday 30 March and Sunday 31 March • 8am (2 hours 30 minutes) • £25 (includes breakfast, pre booking essential) • Meet at East Gate, Royal Botanic Garden Edinburgh, Inverleith Row

## FUTURE OF CYCLING



68% of the UK population never cycle, despite the environmental and health benefits. Discover the innovations taking place right now to make cycling safer, more sustainable and more fun. Join **Dr James Broughton** and **Dr Shpend Gerguri** from the Joining Technology Research Centre at Oxford Brookes University and **Graeme McLean** from Developing Mountain Biking Scotland to find out just how accessible cycling can be. Chaired by **Miles Tight**, Professor of Transport, Energy and Environment at the University of Birmingham.

12.30pm (90 minutes) • £8/£6 • National Museum of Scotland Auditorium

Part of the EPSRC *Future Cities* strand

Supported by:



## FUTURE-PROOF HEALTHCARE

Healthcare is changing – people are living longer, populations are growing and the demand for healthcare is increasing. Not only that, more emphasis is rightly being placed on a holistic approach to treatment that takes into account the diversity of people's lifestyles. With diabetes as an exemplar condition, join a panel of experts as they consider the big issues affecting healthcare from both sides of the fence – patient and practitioner – using case studies and real-life stories to provide a window on to the possible future of our health.

3pm (90 minutes) • £8/£6 • National Museum of Scotland Auditorium

Supported by:



## FROM TEE TO GREEN

Since golf was first played in Scotland centuries ago, the seemingly simple process of hitting a golf ball has become a challenge taken up by millions, but most don't think of it as science in action. Join **Dr Steve Otto**, Director of Research and Testing at the Royal and Ancient, as he explores the physics of impact and seeks to clear up some of the most commonly misunderstood aspects of the game.

5.30pm (90 minutes) • £8/£6 • National Museum of Scotland Auditorium

Presented by the Royal and Ancient

## THE ADAPTATION DIET



Would you tuck into a burger made from synthetic meat? Or consider insects as a snack? In a world of uncertain food security, now could be the time to challenge our taste buds and pre-conceptions and reconsider what we eat.

**Professor Mark Post** from Maastricht University uses stem cells to produce artificial meat, while team Ento proposes insects as a plentiful source of protein. Join them and professional forager **Miles Irving** to hear their ideas and sample the brave and sometimes challenging future of food.

5.30pm (90 minutes) • £10/£8 • Teviot Row Debating Hall



## 2038: THE END OF RELIGION?

How is religion responding to a changing world? Is it in decline? And what, if anything, will take its place? Join this engaging public discussion as we address the issues facing religion today including so-called new atheism and its meaning; alternative belief systems and the impact of organised religion across our lives from education to politics. Featuring The University of Glasgow's **Paul Braterman** and **Keith Gilmour** from Bocclair Academy, the panel will be chaired by **Iain Macwhirter**.

6pm (90 minutes) • £10/£8 • Teviot Row Dining Room

Presented by the Humanist Society of Scotland

## VIKING SCIENCE

Did you know the Vikings were foodies? To celebrate the National Museum of Scotland's latest exhibition, *Vikings!*, vibrant archaeologist **Andrew 'Bones' Jones** will explain how advances in science and technology are helping build a picture of the food and drink culture that was central to their lives. Kitchen remnants, bones and even fossilised poo have all been studied, with detailed results including an authentic recipe for Viking ale, which forager **Miles Irving** has brewed for you to sample.

8pm (90 minutes) • £8/£6 • National Museum of Scotland Auditorium

In association with National Museum of Scotland

## THE FALSE MEMORY ARCHIVE

Do you ever remember things that you know never happened? *The False Memory Archive* project is a psychological experiment examining how we perceive our autobiographical histories and the errors and distortions our brains create. Join the group, led by artist **Alasdair Hopwood**, and confess your own false memory in this fascinating interactive workshop that will form part of the project's unique collaborative video work.

8.30pm (90 minutes) • £8/£6 • Teviot Row Dining Room

## SUNDAY 31 MARCH

### HERBAL FIRST AID

If you hadn't packed your first aid kit, what natural materials could you use to help with healing? Join RBGE's own Diploma in Herbology graduates for a practical afternoon of herbal first aid. Learn how to prepare a herbal first aid box full of healing plant-based remedies and how to apply these while 'out in the field'.

1pm (3 hours) • £20 (pre-booking essential) • Royal Botanic Garden Edinburgh

# SCIENCE FESTIVAL LATES

## SCIENCE FOR THE SOCIABLE

Looking for an inspiring, creative and memorable night out? Look no further than Science Festival Lates as we present a series of light-hearted yet enlightening evening events for the sociable and sci-curious.

From interactive entertainment to parties with a difference, *Science Festival Lates* is your chance to play, laugh, make and do while enjoying some stand-out scientific entertainment.

Bring out the big kid in you at the City Art Centre; pick up some new dance moves; party with Scotland's making and crafting community and discover the hilarious world of stand-up mathematics.

Get a group of friends together, grab a drink and put on your dancing shoes – this is science as you've never seen it before.

## SCIENCE FESTIVAL LATES EVENTS

### OPENING PARTY AT THE CITY ART CENTRE

Thursday 21 March, 8pm [p.25] (ages 18+)

### LATELAB

Programme runs 23–24, 27–31 March and 3–7 April [p.26] (ages 18+)

### WHERE'S YOUR HEAD AT? A NIGHT WITH DR DANCE

Friday 29 March, 5.30pm [p.35]

### ARE YOU GAME?

Monday 1 April, 7pm [p.38]

### UGLY ANIMAL PRESERVATION SOCIETY

Wednesday 3 April, 9pm [p.40] (ages 18+)

### THE FAME ALGORITHM WITH SIMON PAMPENA

Thursday 4 April, 9pm [p.41] (ages 18+)

### ROCKET LOLLY

Saturday 6 April, 9pm [p.44] (ages 18+)

### MINI MAKER FAIRE AFTERPARTY

Sunday 7 April, 8pm [p.45] (ages 18+)

Please note: some events listed are restricted to audiences aged 18+ due to event content and/or venue licencing laws. Identification will be required and Under 18s will not be admitted under any circumstances.

## MONDAY 1 APRIL

### HEALTHY LUNCHES: ZEBRAFISH STRIPES AND SKIN CANCER

Melanoma accounts for 80% of deaths from skin cancer in Scotland, and it's on the rise. Aggressive and resistant to chemotherapies, individuals with metastatic melanoma have a life expectancy of less than one year.

Join **Dr Liz Patton** of the MRC Human Genetics Unit as she explains how her team are using small, striped zebrafish to learn more about how the skin cells that form harmless moles in people can become corrupted to form cancer, what this means for understanding skin cancer and how it could translate into new avenues for therapeutic research.

1pm (60 minutes) • £8/£6 • National Museum of Scotland Auditorium

Presented by the Medical Research Council

### WALKING WITH SCIENTISTS

Discover the scientists who lived and worked in our inspiring European capital in this walking tour of the University district. Hear fascinating stories of Hutton and geology, Hume and philosophy, Maxwell and electromagnetism and the medical exploits of Conan Doyle, Darwin and Lister. Meet compelling characters including Sophia Jex-Blake, Elsie Maud Inglis and James Miranda Barry with actor and local historian **Colin Brown** from **Rebustours.com**.

1 April–7 April • 6pm (2 hours) • £10/£9 • Meet outside Teviot Row Union

Presented by Rebus Tours

### ARE YOU GAME?

Gaming isn't just about sitting on your own in front of a screen. Get social and join us at the Games Hub for an evening of board games inspired by science. Experienced gamers will be on hand to help you thwart an outbreak in *Pandemic*; zap your opponent in *Khet* – a chess-like game with lasers; or satisfy your sci-fi urges as you play *Ascending Empires*.

7pm (3 hours) • £5 • The Games Hub

### SENSORY DINING



Following its tasty success in 2012, *Sensory Dining* is back with some old favourites and new surprises exploring the link between our senses and our taste buds. Comedian and broadcaster **Steve Mould** is joined by scent technician **Erika Duffy** and scientists **Professor Charles Spence**, **Professor Mark Miodownik** and **Dr Julia Simner** for a dining experience that will intrigue and excite your palette. Savour sensuous flavours, smells and textures as you tease out the mysteries of the menu. Dinner will never be the same again!

7pm (3 hours) • £35 (includes a 5 course tasting menu) • Teviot Row Debating Hall

Supported by:



### SCOTTISH SCIENCE AND INNOVATION

Scotland has a strong presence in scientific research, but does not currently translate this knowledge into a profitable, high-tech, industry-based economy. So how would Scottish science respond to independence or so-called 'devo-max'? Would these political changes send us to new heights or see us struggling to maintain our position? Join representatives from science and industry for a highly topical debate around Scotland's scientific future, chaired by BBC Scotland Science Correspondent **Ken MacDonald**.

8.30pm (90 minutes) • £8/£6 • Teviot Row Dining Room

Presented by the Innogen Centre

## TUESDAY 2 APRIL

### HEALTHY LUNCHES: ASPIRIN A DAY?



In 500BC Hippocrates discovered that extract of willow bark could ease aches, pains and fever. Salicylic acid, the active ingredient, was tamed by modern medicine to become aspirin. Recently, researchers have found evidence this compound may have a protective effect against some forms of cancer. **Dr Lesley Stark** of the Medical Research Council Institute of Genetics and Molecular Medicine explains how her team are working to target its powerful effect at cancer cells alone.

1pm (60 minutes) • £8/£6 • National Museum of Scotland Auditorium

Presented by the Medical Research Council

### MEDICINE AND ME

We've sequenced the genome, cloned Dolly and know more about our DNA than ever before, but what does this mean for the future of healthcare? Explore the questions and issues surrounding our relationship with pharmaceuticals and the advent of 'personalised medicine' in this fascinating discussion chaired by Life Technologies' **Peter Silvester**. He will be joined by **Professor Sheila McLean**, Emeritus Professor of Law and Ethics in Medicine at the University of Glasgow; **Professor David Porteous**, Chair of Human Molecular Genetics and Medicine at The University of Edinburgh and **Professor Anna Dominiczak**, the University of Glasgow's Regius Professor of Medicine.

5.30pm (90 minutes) • £8/£6 • National Museum of Scotland Auditorium

Supported by:





## FAITH IN THE FUTURE: THE CHURCH AND OUR ENVIRONMENT

We cannot combat the effects of climate change without altering how we behave. With 2000 years of experience in guiding our faith and behaviour, what role could the church have to play in the future of our environment? **Lesley Riddoch** chairs a fascinating panel discussion with **Professor Michael Northcott** from the University of Edinburgh, **Professor Stephen Reicher** from The University of St Andrews, **Dr Rebekah Widdowfield** from the Scottish Government and **Morag Wilson** from WWF Scotland.

6pm (90 minutes) • £8/£6 • Teviot Row Dining Room

Presented by Eco-Congregation Scotland

## ZOOLOGICAL COLLECTIONS OF THE FUTURE: THE ROLE OF VETS

Vets are vital in maintaining and preserving zoological collections. Edinburgh Zoo vets **Simon Girling** and **Romain Pizzi** explain how technological advances have affected the role and responsibilities of vets and explore how these changes may impact on conservation and breeding within zoos in the future.

7.30pm (90 minutes) • £7/£5 • Edinburgh Zoo Education Centre

Presented by Edinburgh Zoo

## SURVIVING THE NEXT PANDEMIC



How would you control the outbreak of a deadly infectious disease? What would you prioritise – developing a vaccine; isolating the sick; closing borders? In this interactive event using reports from the 2003 SARS outbreak and swine flu pandemic of 2009, **Déirdre Hollingsworth**, an epidemiologist from Warwick University, explains how mathematics recommends that not everyone needs to be vaccinated and why being popular might be detrimental to your health!

8pm (90 minutes) • £8/£6 • National Museum of Scotland Auditorium

In association with the International Centre for Mathematical Sciences.

## THE DARK ARTS OF INNOVATION

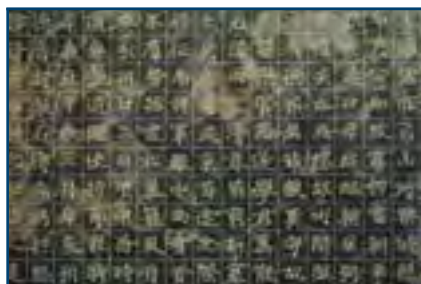
What are the key requirements to engender a culture of innovation and how can they be nurtured, encouraged and successfully exploited in both academic and commercial environments? Join **Vivienne Parry** along with **Gerry Mulligan** from W L Gore and Associates, **Lee Innes** from Moredun Research and **Professor Ann Miller** from Heriot Watt University for a panel discussion exploring the techniques and outcomes of science and industry's latest approaches to innovation.

8.30pm (90 minutes) • £8/£6 • Teviot Row Dining Room

Presented by the Moredun Research Institute

## WEDNESDAY 3 APRIL

### MEDITATIONS AT THE MUSEUM



*'Every object, well-contemplated, opens a new organ in us.'* Goethe

Museums have the power to take us out of ourselves, to inspire our thoughts and remind us of the wonder in the mundane. They are also one of the best tools we have for cutting through the haze of unreal images – advertising, marketing, spin – that constantly vie for our attention. But if museums are such a tonic, why do we so often treat them like a binge, checking off everything we 'should' see and struggling to really connect with much of it? Join mindfulness facilitator **Deepa Patel** and take the time to really look at the contents of the Museum from a truly mindful viewpoint.

12pm and 3pm (50 minutes) • £7/£5 • National Museum of Scotland Learning Centre

In association with the Helen Storey Foundation

## SCIENCE OF THE PEACEFUL MIND

In our fast-paced world it seems increasingly hard to find the time and space to focus on and appreciate what is happening 'in the now'. Associated with a sense of peacefulness and physical relaxation, practitioners of mindfulness have long claimed that it provides cognitive and psychological benefits, but what does science say? Can mindfulness help in the treatment of mental health problems? Can it physically change our brains?

Join mindfulness practitioner **Deepa Patel** and guests including artist and designer **Professor Helen Storey**, neuroscientist **Dusana Dorjee** of Bangor University and clinical neuropsychologist **Niels Detert** as they explore the science behind the peaceful mind.

And for a taster of mindfulness in practice, see *Meditations at the Museum*.

5.30pm (90 minutes) • £8/£6 • National Museum of Scotland Auditorium

In association with the Helen Storey Foundation

## CHOOSING FOOD: PAST, PRESENT AND FUTURE



Since Paleolithic times, when cooking was discovered, the preparation and eating of food has been central to our sense of community and identity. But being able to choose what we eat is only a very recent luxury, still only really available to the developed world. Join a diverse panel of nutritionists, curators, neuroendocrinologists and social scientists to explore the factors influencing our food choices and how they could change in a challenging, and hungry, future.

6pm (90 minutes) • £8/£6 • Teviot Row Dining Room

Presented by The University of Aberdeen Rowett Institute of Nutrition and Health, and Museums

## LIFE DIY



We've made the first synthetic organism; and there is a book about DNA, made from DNA. So what's next? **Alistair Elfick** and **Joyce Tait** from The University of Edinburgh join John Innes from Selex ES and **Philip Boeing** of UCL's 2012 iGEM team who, along with London Hackspace, created the first 'BioBrick' made in a public lab. Discover why the FBI is so interested in the developments affecting 'life' as we know it and how synthetic life can be controlled with electricity.

8pm (90 minutes) • £8/£6 • National Museum of Scotland Auditorium

## UGLY ANIMAL PRESERVATION SOCIETY

AGES 18+



Science communicator **Simon Watt** thinks the panda gets too much attention. He's looking for a mascot to rival the cute and cuddly emblems used by so many organisations and he has assembled a terrific line-up of comedians to help him do it including geek songstress **Helen Arney** and **Punk Science**. Join them as they champion some of Mother Nature's more aesthetically challenged species and vote for your favourite in a comedy night with a conservation twist.

9pm (2 hours) • £10/£8 • Teviot Row Underground

## THURSDAY 4 APRIL

## HEALTHY LUNCHES: CHEST MEDICINE AND THE X-RAY

Medical imaging has come a long way since Roentgen discovered the x-ray in 1895; it has become the backbone of non-invasive diagnosis and management of lung diseases. Two scientists from The University of Edinburgh – **Dr Saeed Mirsadraee** from the School of Clinical Sciences and **Dr Nik Hirani** from the MRC Centre for Inflammation Research – discuss the importance of imaging in chest medicine and offer a glimpse into what its future may hold.

1pm (60 minutes) • £8/£6 • National Museum of Scotland Auditorium

Presented by The University of Edinburgh College of Medicine and Veterinary Medicine

## THEY CAME FROM OUTER SPACE



Astrobiology studies the origin, evolution, distribution and future of life in the whole universe. It addresses whether life beyond Earth exists and whether humans will be able to identify it. Join 'science rapper' **Jon Chase** and author **Mark Brake**, with astrobiologist **Dr Lewis Dartnell** and TV space scientist **Dr Maggie Aderin-Pocock**, as they present an entertaining and insightful introduction to astrobiology and an amusing review of our obsession with aliens.

5.30pm (90 minutes) • £8/£6 • Teviot Row Debating Hall

## E2: THE EDINBURGH ENLIGHTENMENT EXCHANGE: FUTURESOCK



Following last year's successful event, 2013's Enlightenment Exchange once again celebrates thinkers and thinking, but this time with a focus on the future. Forecasting the future is a preoccupation for humans and, many believe, other species. This year's diverse line-up includes theoretical physicist **Dr Charles Wang**, sci-fi author **Justina Robson**, seismologist **Roger Musson** and Financial Mathematician **Dr Timothy Johnson** each offering different approaches to the study and prediction of the future. Join them for an evening of short, sharp presentations as they gaze into their scientific crystal balls.

5.30pm (3 hours) • £10/£8 • National Museum of Scotland Auditorium

Supported by:



## HeLa



In 1951, Henrietta Lacks walked into a hospital in Baltimore with a pain in her abdomen. A sample of her cancer cells, taken without permission, was used as raw material for some of the most important scientific discoveries of the past 100 years. This brand new play, dramatises the personal, scientific and historical milestones that characterised this story, exploring the nature of genes and ongoing issues surrounding human tissue research and ownership in a unique stage collaboration.

4-6 April • 6pm (60 minutes, plus 1hr post show discussion on Saturday 6 April) • £8/£6 concessions • Summerhall

Commissioned by Edinburgh International Science Festival, produced by Iron Oxide, written and performed by Adura Onashile



## IT WASN'T ME IT WAS MY NEURONS

Neuroscientists have discovered that our brains run mainly on chemical and electrical signals. Does this mean we are just machines powered by electricity? And how does this affect our understanding of ourselves if the chemicals in our brains have complete control? **Professor Barry Smith** from the University of London and **Iain Mitchell** QC explore ideas of love, free will and social responsibility in light of some fascinating discoveries in contemporary neuroscience.

6pm (90 minutes) • £8/£6 • Teviot Row Dining Room

Presented by Church of Scotland

## ASTRONOMY'S BRIGHT FUTURE



In an era of space telescopes, giant radio telescope arrays and planetary rovers, we are undoubtedly set to learn much more about our universe and our place in it, but what are the biggest challenges – scientific and political – and opportunities facing international astronomers? Will we understand the nature of dark matter and dark energy? Might we have detected gravity waves? Leading astrophysicist **Professor Jocelyn Bell Burnell** reveals how far we've come over the last 100 years and join her in conversation with **Professor Andy Lawrence** of the Royal Observatory Edinburgh as she shares her thoughts on where we might be going next.

8pm (90 minutes) • £8/£6 • Teviot Row Debating Hall

## FACING A FAT FUTURE



With rates of obesity skyrocketing worldwide, humankind may be on the brink of a crisis. A panel of experts asks how we got here and what the future holds; exploring childhood obesity and cultural changes, obesity-related diseases, hormones, metabolism and the implications of an 'obesity epidemic' that could see our health service bursting at the seams.

8.30pm (90 minutes) • £8/£6 • Teviot Row Dining Room

Presented by The Society of Endocrinology

## THE FAME ALGORITHM WITH SIMON PAMPENA

AGES 18+



What has maths been good for? Physics? Chemistry? Economics? BORING! Stand-up mathematician **Simon Pampena** is here to show you how maths is finally being used for stuff that matters – popularity, entertainment, LOLcats! Join the self-confessed Mathemaniac as he guides through a modern mathematical adventure to the dark side.

9pm (60 minutes) • £10/£8 • Teviot Row Underground

## FRIDAY 5 APRIL

### HEALTHY LUNCHES: UNDERSTANDING CHILDHOOD EPILEPSY

Epilepsy is the most common neurological disorder in childhood; as common as diabetes. But 70% of its causes remain unknown. There has been progress in identifying single gene epilepsies but in the majority of people it seems to arise spontaneously with no family history, suggesting environmental factors could be the cause. **Dr Richard Chin** from The University of Edinburgh leads this interactive lecture on the key questions that are informing current childhood epilepsy research.

1pm (60 minutes) • £8/£6 • National Museum of Scotland Auditorium

Presented by the University of Edinburgh College of Medicine and Veterinary Medicine

### FIT FOR ORBIT?

We know microgravity in space causes bones to demineralise and salts to crystallise in the kidney; and that astronauts are at risk of anaemia, heart damage, blindness and cancer as well as problems with their mental health. **Dr Jeremy Curtis** of the UK Space Agency asks **Dr Kevin Fong** how the health implications of space travel will affect our future aspirations for space tourism, while 'astro-surgeon' **Dr George Pantalos** from the Cardiovascular Innovation Institute at Louisville University explains the tools he has developed to carry out operations in space.

5.30pm (90 minutes) • £8/£6 • National Museum of Scotland Auditorium

### SCOTLAND'S MARINE RENEWABLES: MAKING IT HAPPEN

The awesome power of the sea is embedded in the Scottish psyche, inspiring great art and magnificent engineering. **Professor David Ingram** from The University of Edinburgh and journalist and broadcaster **Lesley Riddoch** host a panel of experts to address the challenges of developing our waters as a renewable energy source and discuss its social and cultural implications.

6pm (90 minutes) • £8/£6 • Teviot Row Dining Room

Presented by The University of Edinburgh

## ONE-WAY TICKET TO MARS



The mystery of the Red Planet is clearing, with images and samples rapidly expanding our knowledge of our planetary sister. **Bas Lansdorp** is the co-founder and General Director of Mars One, the organisation recruiting volunteers for a first attempt at interplanetary migration in 2023. He will be joined in conversation with **Dr Maggie Aderin-Pocock** as they explore the logistics of the mission and what it will take to push the boundaries of space travel even further in the not-too-distant future.

8pm (90 minutes) • £8/£6 • National Museum of Scotland Auditorium

## FESTIVAL OF THE SPOKEN NERD: LIFE, OH LIFE

AGES 18+



Festival of the Spoken Nerd is back with a brand new night of comedy for the insatiably sci-curious. Stand-up mathematician **Matt Parker**, geek songstress **Helen Arney** and experiments guy **Steve Mould** will ask the big questions: Who are we? Where do we come from? And are we nearly there yet? Help investigate everything from australopithecus to Olympic athletes through science, comedy, maths and music in this hilarious variety show with a difference.

[festivalofthespokennerd.com](http://festivalofthespokennerd.com)

8pm (2 hours 15 minutes) • £10/£8 • Teviot Row Debating Hall

## THE POWER OF QUANTUM COMPUTING

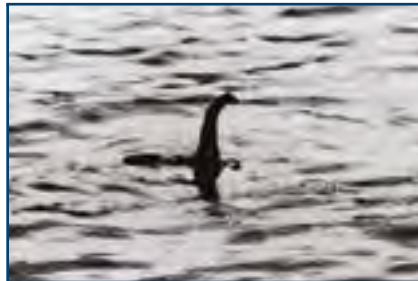
In this Sidney Michaelson Lecture, **Professor Alan Woodward** from The University of Surrey explains how quantum behaviours will one day allow computers to be more powerful than anything we can currently imagine. They could solve problems that are currently impossible, but could they also create new and unexpected problems of their own? Discover the impact these computers could have on our lives and find out how far we are from these machines becoming a reality.

8.30pm (90 minutes) • £8/£6 • Teviot Row Dining Room

Presented by the British Computer Society

## SATURDAY 6 APRIL

### NESSIE 80TH ANNIVERSARY SYMPOSIUM



To celebrate the 80th anniversary of the first modern sighting of the Loch Ness Monster (Nessie) we are proud to offer a one day symposium with world renowned Nessie experts, both pro and con!

Speakers include **Adrian Shine** (Biology of the Loch), **Roland Watson**, **Paul Harrison** and **Tony Harmsworth** (History of sightings), **David Martin-Jones** (Nessie in Film) and **Steuart Campbell**, **Charles Paxton** and **Gordon Rutter** (Evidence). There will also be a panel discussion, buffet lunch and a chance to see what photoshop can make of Nessie!

[www.nessie80.co.uk](http://www.nessie80.co.uk)

11.30am–6pm • £20 (includes buffet lunch) • The Counting House

## THE SECRET OF THE SHOOTING STAR



**Dr Alberta Bravo Tychae** is on the brink of an astounding and important scientific discovery, but needs your help to discover its secret. Become a specialist investigator for the day and let Edinburgh become your playground in this immersive city-wide adventure game. Sign up as a team or an individual to help the Doctor gather clues, solve riddles and find *The Secret of the Shooting Star* in this out of this world adventure. Look up, look down... look out!

10am–5pm (drop-in) • £5 individual/£15 team of up to 5 people • National Museum of Scotland; further instructions will be sent on registration

## LIVING ARCHITECTURE



Architects have always been inspired by nature, but current practice focuses on industrial models where the world is viewed as a machine. *Living Architecture* challenges us to imagine a world which literally incorporates nature into the fabric of our buildings. Learn more about this fascinating approach with **Dr Marcos Cruz**, Director of the Bartlett School of Architecture at UCL.

12.30pm (90 minutes) • £8/£6 • National Museum of Scotland Auditorium

Part of the EPSRC *Future Cities* strand



## THE FALSE MEMORY ARCHIVE: A DISCUSSION

The False Memory Archive project is a psychological experiment examining how we perceive our autobiographical histories and the errors and distortions our brains create. Artist **Alasdair Hopwood**, the archive's creator, and psychologist **Professor Christopher French** invite **Professor Richard Wiseman**, **Dr Caroline Watt** and **Professor Sergio Della Sala** to respond to the archive in a series of presentations, reflecting on the idea of false memories as 'truths' and examining how the creative aspects of autobiographical memory can be objectively identified.

1–4pm • Free (ticket required) • Talbot Rice Gallery

## SATURDAY SHOWCASE: COLLECTIONS INSIGHTS

Join our curators and conservation experts behind the scenes at the National Museums Collection Centre, Granton. When you book, choose between exploring beautiful objects up close with the latest in conservation techniques and analysis, or an afternoon of technology, from early communications to bicycles and discover how we are using photography to bring objects to life.

1.30pm (2.5 hours) • £10/£8 concessions and NMS Members (refreshments included) • National Museum of Scotland Collections Centre, Granton

Presented by the National Museum of Scotland

## DIRTY ELECTRONICS: DATA TRAIL



Build a synth and become part of a collaborative sound-sculpture and performance in this hands-on workshop conceived by Dirty Electronics' **John Richards**. The resulting penny-drop synthesiser will create a unique data trail and sound every time it is played. Take your synth straight home or accept our invitation to play it in the opening performance of Data Trail at Inspace the same evening. Part sculpture, part musical instrument, Data Trail is a unique investigation into our digital lives.

2pm (4 hours) • £25 • Inspace

In association with New Media Scotland and the University of Edinburgh's Informatics Forum

## PLAY DAY



Pop-up events such as flash mobs and geocaching have given rise to a new form of gaming that transforms the city into a playground. Take a light-hearted look at the role of play in society and be the first to spot the gaming trends of the future as you play brand new games including *Ninja*, *Gargoyls* and the outrageously rude *Swordfight* which puts the joystick controls of the Atari 2600 to a new and unique use.

2pm–5pm • Free (drop in) • National Museum of Scotland Grand Gallery

## CROWDSOURCED SCIENCE

The future is not all about technology – society's response to science has a profound impact on our cultural development and understanding. With this in mind we celebrate DIY science culture and the mass participation experiments that allow ordinary people to make extraordinary contributions to our world. Wellcome Trust Engagement fellow **Erinma Ochu** and **Chris Lintott** of *Zooniverse* and *Sky at Night* explain the principles behind their work and show you how to embrace your inner scientist through #citizenscience

5.30pm (90 minutes) • £8/£6 • Teviot Row Debating Hall

## OUT OF THIN AIR: SURVIVING HIGH ALTITUDE

High altitude presents unique challenges for the human body. Reactions can range from mild sickness and confusion to life-threatening conditions affecting the heart, lungs and brain. **Professor A Mark Evans** and **Dominika Dykiert** from The University of Edinburgh, mountaineer **Geordie Stewart** and **Dr Kenneth Baillie** from The Roslin Institute discuss how we adapt to altitude in the short and long term and explore the challenges it presents for climbers, athletes and communities.

5.30pm (90 minutes) • £8/£6 • National Museum of Scotland Auditorium

Presented by The Physiological Society

## SCIENCE AND RELIGION IN THE CLASSROOM

Join **Richard Holloway** for an engaging event in which he talks with physics teacher and author of *The Young Atheist's Handbook*, **Alom Shaha**. How can children brought up in religious families reconcile the alternate 'truths' they are told about the world? What should science teachers say when faced with questions from religious students? And how should schools tackle these differences in the classroom?

6pm (90 minutes) • £8/£6 • Teviot Row Dining Room

## BIO-PUNK

*Bio-Punk: Stories from the Far Side of Research* is a new collection of specially commissioned short stories and commentaries exploring the human issues surrounding bio-medicine. Should medical research have more of a conscience? Or are we too quick to distrust the work of science? This unique presentation and debate will feature readings from award-winning authors **Dilys Rose** and **Justina Robson** and talks from sociologist of science at The University of Edinburgh, **Dr Jane Calvert**, and **Professor Bruce Whitelaw**, Head of Division at Edinburgh's Roslin Institute.

8pm (90 minutes) • £8/£6 • National Museum of Scotland Auditorium

Presented by Comma Press

## THE TOASTER PROJECT



With all the innovation of the 21st Century, can one person build an everyday household appliance from scratch? Royal College of Art graduate **Thomas Thwaites** was determined to find out as he set out to build the most commonplace consumer product there is – the humble toaster. Hear the story of his quest: from the raw materials he sources in the ground to the finished product. Look out for his documentary on Channel 4 later this year.

8pm (90 minutes) • £8/£6 • Teviot Row Debating Hall

Presented by Princeton Architectural Press

## ROCKET LOLLY

AGES 18+



Festival favourites **SpaceDog** and **Project Moonbase** team up once again for a remarkable evening of retro science films, psychonautics and cutting-edge space disco. Enter an intriguing world in which old film footage meets modern robotic instruments, blending vintage infrasonic terrors, nuclear fallout messages and mind-control experiments. A cabaret evening like no other, get ready for a feast of retro-futuristic fun.

9pm (2.5 hours) • £10/£8 • Teviot Row Underground

## SUNDAY 7 APRIL

EDINBURGH MINI MAKER FAIRE



Fuelled by a world of austerity, making stuff is suddenly all the rage, and we're delighted to celebrate this spirit of invention by hosting Scotland's first Mini Maker Faire. Filled with novel gadgets, ingenious inventions, demonstrations, performances and interactive workshops, the Faire lets Scotland's 'makers' take centre stage in a family-friendly showcase of resourcefulness and creativity.

10am-5pm • £2.50 • Summerhall

In association with Summerhall

Maker Faire is independently organised and operated under licence from O'Reilly Media.

Supported by:

**Make:**  
technology on your time



ALBA | CHRISTMAS  
**PROTO-PIC**

## MAXWELL AND THE MOBILE REVOLUTION

Very few of us now leave the house without a mobile phone, but if it weren't for James Clerk Maxwell's vital work over 150 years ago they might not exist.

**Professor Peter Grant** from The University of Edinburgh reflects on Maxwell's legacy and the developments in cellular communication technologies that have allowed our mobile to move from 'bricks' to sleek devices with multi-purpose functionality. **Matt Mills** of startup Aurasma, who make augmented-reality technology for mobile phones, reveals just what the future might look like as increasingly the mobile phone sees and understands information like the human brain.

12.30pm (90 minutes) • £8/£6 • National Museum of Scotland Auditorium

Supported by the James Clerk Maxwell Foundation

## LI-FI: DATA THROUGH ILLUMINATION

We've all heard of wi-fi but what about li-fi? Li-fi is a wireless communication system that uses the optical part of the electro-magnetic spectrum. Join **Professor Harald Haas** of The University of Edinburgh and spin-off company PureVLC as he explores the science behind this new technology that could integrate into existing lighting in our homes and offices, changing the landscape of communication and solving the impending overload of our existing wireless networks.

3pm (90 minutes) • £8/£6 • National Museum of Scotland Auditorium

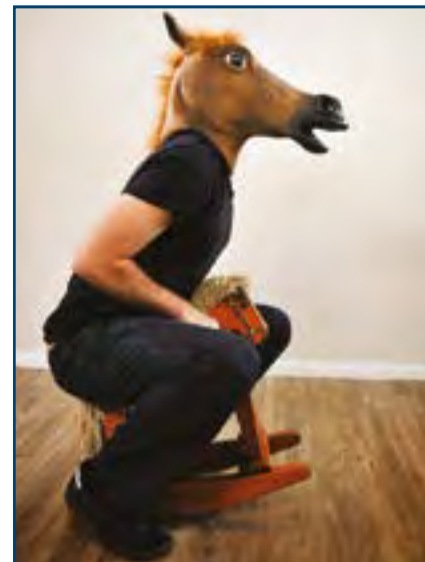
Part of the EPSRC *Future Cities* strand

## INTRODUCTION TO PLANT IDENTIFICATION

Have you ever wanted to identify wildflowers and plants while out for a walk? Let **Phil Lusby**, Head of School of Horticulture at the Royal Botanic Garden Edinburgh be your guide to plant guides as he introduces wildflower keys and shows you how to use them confidently. Includes a copy of the popular Francis Rose UK and Ireland *Wild Flower Key* book.

1pm (3 hours) • £30 (pre-booking essential) • Royal Botanic Garden Edinburgh

## HUMAN HYBRIDS: PERSPECTIVES ON HUMAN-ANIMAL EXCHANGE



Some modern commentators fear emerging scientific technologies that seek to repair and replace the tissues, cells and organs of human bodies could start to blur lines between humans and animals. In this public symposium, scientists from The University of Edinburgh: **Dr Gill Haddow**, **Paul De Souza**, **Dr Calum MacKellar** Director of Research, Scottish Council on Human Bioethics, **Hugh Whittall**, Director of the Nuffield Council of Bioethics join **Dr Shawn Harmon** to examine these fears from a wealth of social and scientific perspectives.

6pm (90 minutes) • £8/£6 • Teviot Row Dining Room



## STEM CELLS: A VISION OF THE FUTURE



Inspiring people of all ages about science, the University of Edinburgh's *Tam Dalyell Prize for Excellence in Engaging the Public with Science Lecture and Award* is in 2013 awarded to **Professor Clare Blackburn** and **Dr Amy Hardie**. Join this year's prize winners for the Award Ceremony and a fascinating presentation exploring the history, biology, hopes and fears of stem cell research, the product of an innovative partnership between a stem cell research scientist and a documentary film director.

Named after Tam Dalyell who was the 47th Rector of the University and a weekly columnist for the *New Scientist* for 36 years, this annual Prize and lecture recognises The University of Edinburgh's outstanding science communicators.

5.30pm (90 minutes) • Free (ticket required) • Playfair Library

Presented by The University of Edinburgh

## MINI MAKER FAIRE AFTERPARTY

AGES 18+

Celebrate Scotland's first ever Mini Maker Faire at the very last event of this year's Festival. Our busy makers will spend the day creating and demonstrating everything from traditional crafts to cutting edge technological innovation at Summerhall. Join them after hours for the ultimate do-it-yourself party; featuring hacked musical instruments, noisy mechanical contraptions, home-baked sounds and mind-boggling visuals in an evening not to be missed.

8pm-late • £10 • Teviot Row Debating Hall

# MAKE



On Sunday 7 April we'll be presenting Scotland's first ever Mini Maker Faire at Summerhall.

This family-friendly day out is the hottest show (and tell) in town, showcasing creativity, invention and resourcefulness and celebrating the Maker movement. Come and see what Scotland's crafters are making and watch them work as they share their skills and inspiration.

The Mini Maker Faire is a chance for makers, enthusiasts, geeks, tinkerers, engineers and artists, young and old, to mingle and to show off their work. You'll find everything from traditional crafts to musical instruments to technological innovation explored through workshops, demonstrations, talks and interactive shows throughout the day.

You can keep track of our Makers and find details of our workshops, demonstrations and talks at [makerfaireedinburgh.com](http://makerfaireedinburgh.com).

The inaugural Maker Faire was held in San Mateo, California in 2006. Since then, the movement's popularity has soared, with community-driven Mini Maker Faires now being held all over the world.

Maker Faire is independently organised and operated under licence from O'Reilly Media.

Edinburgh Mini  
Maker Faire

PROTO-PIG

Make:  
technology on your time



In association with:

SUMMERHALL

ONLINE BOOKING: [www.sciencefestival.co.uk](http://www.sciencefestival.co.uk) BOOKING HOTLINE: 0844 557 2686

# EDINBURGH INTERNATIONAL SCIENCE FESTIVAL

Edinburgh International Science Festival, founded in 1989, is an educational charity that inspires people of all ages and backgrounds to discover the wonder of the world around them. We are best known for organising Edinburgh's annual science festival – the world's first celebration of science and technology, and still one of Europe's largest. Of equal importance, is our international touring partnerships and an education programme that brings science to life in Scottish classrooms throughout the year.

**Charity Number:** SC003790

**Registered Office:** Suite 1, Mitchell House, 5 Mitchell Street, Edinburgh EH6 7BD

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Generation Science Sales

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## PROGRAMME AND CONTENT SUPPORTERS

Many Edinburgh International Science Festival events simply could not happen without the generous in kind support from our many partner organisations and individuals. We'd like to thank them for their support.

**ESSENTIAL EDINBURGH**  
Central Business Improvement District

**FAIRY**

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KARL STORZ – ENDOSKOPE

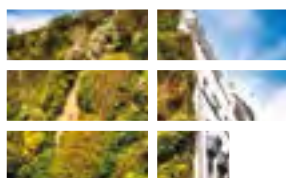
## EDINBURGH INTERNATIONAL SCIENCE FESTIVAL



We would like to thank Generations Science Club members for their support of the 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:

## EDINBURGH FESTIVALS

Edinburgh is the world's Festival city with events happening all year round. Visit [edinburghfestivals.co.uk](http://edinburghfestivals.co.uk) for insider information, listings competitions and news across Edinburgh's Festivals.



**Imaginate Festival**  
6–13 May 2013  
[imagine.org.uk](http://imagine.org.uk)

**Edinburgh International Film Festival**  
19–30 June 2013  
[edfilmfest.org.uk](http://edfilmfest.org.uk)

**Edinburgh Jazz and Blues Festival**  
19–28 July 2013  
[edinburghjazzfestival.com](http://edinburghjazzfestival.com)

**Edinburgh Art Festival**  
1 August–1 September 2013  
[edinburghartfestival.com](http://edinburghartfestival.com)

**Edinburgh Festival Fringe**  
2–26 August 2013  
[edfringe.com](http://edfringe.com)

**Royal Edinburgh Military Tattoo**  
2–24 August 2013  
[edintattoo.co.uk](http://edintattoo.co.uk)

## MEMBERS

**Dugdale Bradley**  
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# Edinburgh Festivals .co.uk

**Edinburgh International Festival**  
9 August–1 September 2013  
[eif.co.uk](http://eif.co.uk)

**Edinburgh International Book Festival**  
10–26 August 2013  
[edbookfest.co.uk](http://edbookfest.co.uk)

**Edinburgh Mela**  
August 2013  
[edinburgh-mela.co.uk](http://edinburgh-mela.co.uk)

**Scottish International Storytelling Festival**  
25 October–3 November 2013  
[scottishstorytellingcentre.co.uk](http://scottishstorytellingcentre.co.uk)

**Edinburgh's Hogmanay**  
30 December 2013–1 January 2014  
[edinburghshogmanay.com](http://edinburghshogmanay.com)

**Edinburgh International Science Festival**  
Saturday 5–Sunday 20 April 2014  
[sciencefestival.co.uk](http://sciencefestival.co.uk)



## 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

LET'S GO GREENER TOGETHER.  
GREENERScotLAND.ORG



## PUBLIC TRANSPORT



Public and shared travel information available from: [travelinescotland.com](http://travelinescotland.com) and 0871 200 22 33, buses [lothianbuses.com](http://lothianbuses.com), trains [scotrail.co.uk](http://scotrail.co.uk), car sharing [gocarshare.com](http://gocarshare.com), cyclists journey planner [edinburgh.cyclestreets.net](http://edinburgh.cyclestreets.net)

## BY BUS

We've teamed up with Lothian Buses to offer information about travel to all of our venues. See the venue map on the back page of this programme for bus listings to each of our venues. Please visit [lothianbuses.com](http://lothianbuses.com) or call 0131 555 6363 for further information.

## BY TRAIN

For train travel in Scotland and tickets, visit [scotrail.co.uk](http://scotrail.co.uk). For National Rail enquiries, see [nationalrail.co.uk](http://nationalrail.co.uk) or call 08457 48 49 50.

## 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. If you are travelling by car, you might want to consider car sharing – [gocarshare.com](http://gocarshare.com)

## TOURIST INFORMATION

Further information on Edinburgh and the surrounding area, along with accommodation listings and online booking, is available at [visitscotland.com](http://visitscotland.com)

Edinburgh

For information about Edinburgh, how to get around and where to stay, visit [edinburgh-inspiringcapital.com](http://edinburgh-inspiringcapital.com)



## ACCESSIBILITY

If you would like a copy of the brochure in a different format – large print; translated; braille or on CD – please contact: [marketing@scifest.co.uk](mailto:marketing@scifest.co.uk) or call 0131 553 0320. (Please note that we may require additional time to produce these materials).

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.

# fuselab

JULY 2013

EDINBURGH INTERNATIONAL  
science  
Festival

Igniting a generation of innovators

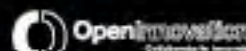
100 HOURS – 80 UNIQUE INDIVIDUALS – 1 IMMERSIVE EXPERIENCE  
ARE YOU READY TO SHAPE THE FUTURE?

GET INVOLVED: [sciencefestival.co.uk/whats-on/fuselab](http://sciencefestival.co.uk/whats-on/fuselab)



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

Supported by



This initiative is BDF-funded through the Inspiring MB NME programme's 'Open Innovation' project – working with business, academia and communities from North West Europe to promote collaborative approaches to innovation. [www.openinnovationproject.eu](http://www.openinnovationproject.eu)



# SCIENCE FESTIVAL VENUES 2013



- 1 **BANSHEE LABYRINTH** (29-35 NIDDRY STREET, EDINBURGH, EH1 1LG) BUS: 3, 5, 7, 8, 14, 29, 30, 31, 33, 35, 37, 45, 49
- 2 **CAMERA OBSCURA** (CASTLEHILL, THE ROYAL MILE, EDINBURGH, EH1 2ND) BUS: 23, 27, 41, 42, 67
- 3 **THE CENTRE, LIVINGSTON** (ALMONDVALE BOULEVARD LIVINGSTON, EH54 6HR) BUS: FIRST BUS SERVICE 21, 22, 27, 28
- 4 **CITY ART CENTRE** - (2 MARKET STREET, EDINBURGH, MIDLOTHIAN EH1 1DE) BUS: 36, 41, 42, 67, 100
- 5 **THE COUNTING HOUSE** (36 WEST NICOLSON STREET, EH8 9DD) BUS: 2, 3, 5, 7, 8, 14, 29, 30, 31, 33, 37, 41, 42, 47, 49, 67
- 6 **EDINBURGH PRINTMAKERS** (23 UNION STREET, EDINBURGH, EH1 3JR) BUS: 1, 4, 5, 7, 8, 10, 11, 12, 14, 15, 16, 19, 22, 25, 26, 34, 44, 45, 49
- 7 **EDINBURGH ZOO** (134 CORSTORPHINE ROAD, EDINBURGH, EH12 6TS) BUS: 12, 26, 31, 100
- 8 **FILMHOUSE** (88 LOTHIAN ROAD, EDINBURGH, EH3 9BZ) BUS: 1, 2, 10, 11, 15, 16, 24, 34, 47
- 9 **THE GAMES HUB** (101 LAURISTON PLACE, EDINBURGH, EH3 9JB) BUS: 23, 27, 35, 45, 47
- 10 **GEORGE SQUARE THEATRE** (30 GEORGE SQUARE, EDINBURGH, EH8 9JJ) BUS: 41, 42, 67
- 11 **INSPACE** (1 CRICHTON STREET, EDINBURGH, EH8 9AB) BUS: 41, 42, 67
- 12 **INTERNATIONAL CENTRE FOR MATHEMATICAL SCIENCES** (15 SOUTH COLLEGE STREET, EDINBURGH, EH8 9AA) BUS: 2, 3, 5, 7, 8, 14, 29, 30, 31, 33, 35, 37, 41, 42, 45, 47, 49, 67
- 13 **NATIONAL LIBRARY OF SCOTLAND** (GEORGE IV BRIDGE, EDINBURGH, EH1 1EV) BUS: 2, 23, 27, 35, 41, 42, 45, 67
- 14 **NATIONAL MINING MUSEUM SCOTLAND** (LADY VICTORIA COLLIERY, NEWTONGRANGE, MIDLOTHIAN, EH22 4QN) BUS: 29, 33, 39
- 15 **NATIONAL MUSEUM OF FLIGHT** (EAST FORTUNE AIRFIELD, EAST LOTHIAN, EH39 5LF) BUS: DON PRENTICE SERVICE 121
- 16 **NATIONAL MUSEUM OF SCOTLAND** (CHAMBERS STREET, EDINBURGH, EH1 1JF) BUS: 2, 23, 27, 35, 41, 42, 45, 47, 67
- 17 **NATIONAL MUSEUM OF SCOTLAND - COLLECTIONS CENTRE** (242 WEST GRANTON ROAD, GRANTON, EDINBURGH, EH5 1JA) BUS: 8, 16, 32
- 18 **OCEAN TERMINAL** (OCEAN DRIVE, LEITH, MIDLOTHIAN EH6 6JJ) BUS: 11, 22, 34, 35, 36
- 19 **OUR DYNAMIC EARTH** (112-116 HOLYROOD ROAD, EDINBURGH, MIDLOTHIAN EH8 8AS) BUS: 35, 36
- 20 **PLAYFAIR LIBRARY** (OLD COLLEGE, UNIVERSITY OF EDINBURGH, SOUTH BRIDGE, EH8 9YL) BUS: 3, 5, 7, 8, 14, 29, 30, 31, 33, 35, 37, 45, 49
- 21 **ROYAL BOTANIC GARDEN EDINBURGH** (INVERLEITH ROW, EH3 5LR) BUS: 8, 23, 27
- 22 **SCOTTISH SEABIRD CENTRE** (THE HARBOUR, NORTH BERWICK, EH39 4SS) BUS: FIRST BUS SERVICE 124, X24
- 23 **SCOTTISH STORYTELLING CENTRE** (A 43-45 HIGH STREET, EDINBURGH, MIDLOTHIAN, EH1 1SR) BUS: 35
- 24 **SIGNET LIBRARY** (PARLIAMENT SQUARE, EH1 1RF) BUS: 3, 5, 7, 8, 14, 23, 27, 29, 30, 31, 33, 35, 37, 41, 42, 45, 49, 67
- 25 **ST ANDREWS SQUARE** (CITY ART CENTRE, EH2 2BD) BUS 1, 3, 4, 10, 11, 12, 15, 16, 19, 22, 25, 26, 29, 30, 31, 33, 34, 36, 37, 41, 42, 44, 100
- 26 **ST GILES CATHEDRAL** (HIGH STREET EDINBURGH, MIDLOTHIAN, EH1 1RE) BUS: 3, 5, 7, 8, 14, 23, 27, 29, 30, 31, 33, 35, 37, 41, 42, 45, 49, 67
- 27 **SUMMERHALL** (1 SUMMERHALL, EDINBURGH, EH9 1PL) BUS: 41, 42, 67
- 28 **SURGEONS HALL MUSEUM** (NICOLSON STREET, EDINBURGH, EH8 9DV) BUS: 2, 3, 5, 7, 8, 14, 29, 30, 31, 33, 37, 41, 42, 47, 49, 67
- 29 **TALBOT RICE GALLERY** (THE UNIVERSITY OF EDINBURGH, OLD COLLEGE, SOUTH BRIDGE, EDINBURGH, EH8 9YL) BUS: 3, 5, 7, 8, 14, 29, 30, 31, 33, 35, 37, 45, 49
- 30 **TENT GALLERY** (EVOLUTION HOUSE, 78 WEST PORT, EDINBURGH, EH1 2LE) BUS: 2, 35
- 31 **TEVIOT ROW** (13 BRISTO SQUARE, EDINBURGH, EH8 9AJ) BUS: 2, 23, 27, 41, 42, 47, 67