



KNOWLEDGE MADE USEFUL

RSE SCHOOLS

SCHOOL TALKS PROGRAMME

2018/19

RSE@ SCHOOLS TALKS

A series of FREE talks for schools across Scotland.

The Royal Society of Edinburgh (RSE) is pleased to launch the 2018/19 series of talks and lectures for schools across Scotland. RSE@ Schools talks are FREE to schools and available at any point during the school year.

SPEAKERS

All of our talks are by experts, keen to enthuse and excite students from P6 to S6, on a wide range of subjects from biology, astronomy and physics to literature, culture and the arts.

Many of our speakers are willing to work with teachers to tailor their talks to fit with class curriculums and for different age groups and class sizes.

In this programme you will get a flavour of some of the speakers we have available, along with their lecture topics. If, however, there is a particular topic that you would like to cover, just get in touch and we will endeavour to find a speaker to suit.

FREE TO SCHOOLS

The talks are FREE to schools. The RSE will cover all speakers' costs, including travel and accommodation. All the school needs to provide is a venue for the talk and, of course, the audience! Teachers are also asked to supervise the students during talks and provide some feedback afterwards.

SCOTS AND ENGLISH: YOUR LANGUAGE, YOUR HISTORY

Professor Jeremy Smith FRSE

Scots is at the heart of many current debates on language and identity in present-day Scotland. But is Scots a language, or is it a dialect of English? What is the difference between Scots and Scottish Standard English? Is there one form of Scots or many? Where did Scots come from? These are some of the questions addressed in this talk.

DEE DUM, DEE DUM: HOW POETRY WORKS

Professor Jeremy Smith FRSE

Why is poetry different from prose? This workshop is concerned in particular with the study of patterns in verse, and ranges from the study of metre, onomatopoeia and phonaesthesia to issues of typographical presentation (as manifested in concrete poetry). We will be working with a set of poems presented in facsimiles dating (roughly) from their time of composition, ranging in date from the Anglo-Saxon period to the present day.

SPELLINGS AND SOUNDS

Professor Jeremy Smith FRSE

Have you ever wondered why some people rhyme *good* and *food*, while others don't? Why does *meat* rhyme with *meet*, but *great* with *mate*? Have you ever wondered why *sight*, *site* and *cite* sound the same, but are spelt differently? Why is the letter 'y' pronounced differently in *yacht*, *fly* and *jolly*? Why don't people rhyme *plough* and *tough*? Why has *ghost* got an 'h' but *go* hasn't? And is it really possible to pronounce *ghoti* as ...? Well, let's not give the game away. In this talk, we will find out whether English spelling really is as inefficient as is often claimed, and how – and why – it ended up the way it is.

ART MEETS SCIENCE: SCIENCE MEETS ART

Professor Roy Burdon FRSE

Since the Renaissance, artists and scientists have progressively understood the complex structure of the world as shaped by the steady increase in reliable scientific knowledge. Many of the activities of both artists and scientists have been directed towards making sense of it at a personal level, and although there are differences in the creative processes involved, there have been many areas of interaction. Artists, scientists and technologists are all passionate people who seek to create what did not previously exist. They all call upon their imaginations, but also rely on aesthetic criteria of beauty and elegance to guide their work. The momentous scientific and artistic developments over the last 500 years will be highlighted, with examples of how diverse artists and scientists have shared interests and insights, particularly where science has informed art and art has informed science.

HOW DO WE SEE PAINTINGS?

Professor Roy Burdon FRSE

The talk asks why do we do art in the first place? Is it something embedded in our evolutionary past, possibly relating to beauty and survival, or is it all in the mind? Brain function certainly plays a role in the perception of visual images and illusion in paintings. The talk then explores how we contend with the interrelationships of lines, shapes, space, depth, texture, perspective, proportion and colour using various paintings as examples. Finally our appreciation of different 'abstract' art works with their dots, zigzags, squares, splashes of colour, spirals and geometric shapes is considered in relation to the phenomena of 'phosphene' and 'fractal' based images.

LIGHT AND COLOUR: UNWEAVING THE RAINBOW FOR ART

Professor Roy Burdon FRSE

The use of colour as a basic element of art and its perception in paintings will be explored. The nature of various pigments used in relation to light will be examined as well as the wide range of pigment sources available. The different types of paint employed and their stability together with suitable painting surfaces will also be considered. These aspects will be followed by a brief overview of the differing ways in which some notable artists have experimented with colour and light over the ages; e.g., the symbolic use of colour; shadows, light and shade; the expressive use of primary and complementary colours; colour and light themselves as both form and subject.

THE INVENTION OF COLOUR

Professor Roy Burdon FRSE

How have new colours and paints for artists been discovered?

Beginning with the ancients with only a few pigments at their disposal, this talk outlines the history of inventions and developments from medieval and Renaissance times to the present day, that have resulted in the plethora of paints now available to the modern painter. This is coupled with an insight into the way in which these discoveries have influenced the work of artists through the ages as well as the ongoing issues of conservation and art forgery.

THE SUFFERING GENE

Professor Roy Burdon FRSE

With an introduction to the nature of genes and their function, this talk explores the impact on our genes from various factors in modern society. As well as epigenetic outcomes these include direct effects of toxic industrial and agricultural chemicals, excessive sunlight, nuclear and other forms of radiation (from mobile phones and electricity transmission systems), atmospheric pollutants and food contaminants, as well as nutritional deprivation. Also explained are the means whereby our bodies defend themselves from such adversities and what happens when these defences are overwhelmed.

The talk concludes with a discussion of preventative strategies and lifestyle choices, together with the potential of 'genetic engineering' approaches to issues of environmental 'clean-up'.

THE GREAT BRITISH BRAIN OFF

Dr Alan Gow

As people grow older, many report that their mental faculties go off the boil! But everyone experiences these changes differently: some people stay as sharp in later life as they were in midlife, while others experience declines in their thinking skills that affects their quality of life and ability to live independently. In the Great British Brain Off, 'head' chef Dr Alan Gow considers the recipe for the perfect brain, and what the latest research suggests people might do if they feel their grey matter needs some extra spice. All your questions will be put into the mix as we explore the ingredients that might protect or harm the brain as it ages.

BRAIN TRAINING ON TRIAL

Dr Alan Gow

Many people spend their hard-earned cash on games promising to protect their thinking skills as they get older. Maybe you know some examples of those brain games and want to know if and how they work. Then let's put brain training on trial. Be our prosecution, defence and jury as we examine the claims that brain training games protect your brain. Hear the evidence for and against their claims. As you question the evidence, what will your verdict be: brain training, guilty or not guilty?

ANTARCTICA: YOU CAN GO FAR WITH PHYSICS

Ms Alison McLure

The Antarctic is a remarkable continent – remote, hostile and uninhabited. Yet it is of key importance to our understanding of how the world works. For the early explorers, Antarctica was the ultimate survival contest. For scientists, it remains a place of intellectual challenge. Find out what kind of science is carried out in the Antarctic. Meet a physicist and meteorologist and find out how a physics degree took her to Antarctica and what life there was like.

THE SCIENCE AND ART OF WEATHER FORECASTING

Ms Alison McLure

The weather affects us all and is a particularly British obsession. Find out from a meteorologist how weather forecasts are prepared and the art involved in presenting them. This talk can cover any aspects of weather the teacher wishes to cover.

ARCTIC ISLANDS OF SCIENCE

Ms Alison McLure

Svalbard, far to Norway's Arctic north, is an island group with glaciers, fjords, reindeer and seabirds and also scientific research. Alison McLure, back from her second scientific expedition, shows images of landscape and wildlife in a sometimes bleak yet breathtakingly beautiful setting. Also, find out what science projects are carried out in such a far-flung place.

PHYSICS OF MOUNTAIN RESCUE

Ms Alison McLure

Mountain Rescue Teams go out in all weathers, at any time of the day to try to save people. Find out the physics behind these endeavours, how physics allows teams to perform amazing rescues and how to use physics to avoid calling out mountain rescue. This talk supports some of the experiences and outcomes for forces, electricity and waves. Alison is a member of Tayside Mountain Rescue Team.

WHAT GOES UP

Dr Patrick Harkness

We are used to the idea of gravity simply attracting objects towards the Earth, but it also has some rather surprising effects in space. Gravitational forces are at least partially responsible for the Earth's ocean tides, volcanism on Jupiter's moons, and the stability of Saturn's spectacular ring system. In fact, we can even exploit gravitational forces to accelerate spacecraft away from the Sun through manoeuvres called gravitational slingshots. This talk, with some accessible demonstrations involving bouncing 'planets', will show how all these different effects arise from one single relationship proposed by Isaac Newton many hundreds of years ago.

LISTENING TO EINSTEIN'S UNIVERSE: THE DISCOVERY OF GRAVITATIONAL WAVES

Professor Martin Hendry MBE FRSE

On September 14th 2015 two giant laser interferometers known as LIGO, the most sensitive scientific instruments ever built, detected gravitational waves from the merger of a pair of massive black holes more than a billion light years from the Earth. Join Professor Martin Hendry as he recounts the inside story of this remarkable discovery – hailed by many as the scientific breakthrough of the century. Learn about the amazing technology behind the LIGO detectors, which can measure the signatures of spacetime ripples less than a million millionth the width of a human hair, and explore the exciting future that lies ahead for gravitational-wave astronomy as we open an entirely new window on the Universe.

EXPLORING THE DARK SIDE OF THE UNIVERSE

Professor Martin Hendry MBE FRSE

We live in a very strange Universe in which less than 5% of all the matter and energy exists in the form of atoms while the other 95% comprises “dark matter” and “dark energy” – the exact nature of which is one of the biggest unanswered mysteries in science. Join Professor Martin Hendry on a whistle-stop tour through nearly fourteen billion years of cosmic history and explore the very latest theories of the Big Bang.

WHY ARE WE HERE?

Professor Martin Hendry MBE FRSE

Modern cosmology provides some startling answers to the question “why are we here?” Not only have we learned that our Universe is expanding but the expansion appears to be accelerating – driven by a mysterious “dark energy” which challenges our ideas about gravity and the very nature of space and time. Moreover our runaway Universe is rather delicately balanced: small changes in the laws of nature would result in a very different Cosmos most likely unsuitable for life like us. Join Professor Martin Hendry as he explores the very latest theories of the Cosmos and what they might mean for the existence of life in the universe.

2020 VISION: THE FUTURE OF ASTRONOMICAL TELESCOPES

Professor Martin Hendry MBE FRSE

Our view of the Universe is set to change dramatically over the next decade, as major new ground-based and space-based telescopes begin operating across the electromagnetic spectrum and beyond. Join Professor Martin Hendry as he surveys the amazing engineering and enormous scientific potential of the next generation of telescopes, and previews some of the biggest questions that astronomers might be tackling throughout the 2020s and beyond.

CAPTAIN COOK AND THE COSMIC YARDSTICK

Professor Martin Hendry MBE FRSE

In June 2012 the world witnessed a transit of Venus, when for a few brief hours the planet appeared to cross the Sun's disk. This extremely rare astronomical event (the next transit is in 2117!) has an illustrious history: in 1769 a transit of Venus, observed by astronomers across the world, helped us to make the first precise determination of the distance from the Earth to the Sun. Join Professor Martin Hendry as he charts the story of how we measured this cosmic yardstick, and how it could help us to capture the scale of the Universe.

RIPPLES OF GRAVITY, FLASHES OF LIGHT: THE DAWN OF MULTIMESSENGER ASTRONOMY

Professor Martin Hendry MBE FRSE

The first ever direct detection of gravitational waves in 2015, from the collision of two massive black holes more than a billion light years away, has been widely hailed as the biggest scientific breakthrough of the decade and led to the award of the 2017 Nobel Prize for Physics. August 2017 then saw another spectacular discovery – as for the first time gravitational waves and light were detected from the same cosmic source: a pair of colliding neutron stars 130 million light years away. Join LIGO scientist Professor Martin Hendry as he explores the amazing technology behind the detection of gravitational waves, and what their discovery might soon tell us about some of the biggest unsolved mysteries in physics and astronomy.

DID WE REALLY LAND ON THE MOON?

Professor Martin Hendry MBE FRSE

Nearly 50 years after Apollo 11 there are a surprising number of theories around – in books, documentary programmes and the internet – that Neil Armstrong's famous "One small step" was an elaborate hoax, filmed in secret here on Earth. Conspiracy theorists point to a range of "evidence" to support their claim, including waving flags, strange shadows, no stars in the sky and deadly solar radiation. In this talk, using real Apollo video footage and a series of simple practical demonstrations, Martin Hendry takes a closer look at the science behind "moon hoax" claims, and asks whether we really did land on the Moon.

THE SCIENCE OF STAR WARS

Professor Martin Hendry MBE FRSE

Since 1977 generations of moviegoers have marvelled at the *Star Wars* Universe. But how much real science is up there on the big screen? Could we ever travel to other planets, crossing the vast distances between star systems using shortcuts through hyperspace? What kinds of alien worlds might exist in our Universe, and could they bear life forms that resemble the creatures found in *Star Wars*? Could a Jedi Knight really fight with a light sabre? Could the Death Star really blow up a planet? In this lecture astrophysicist and life-long *Star Wars* fan Professor Martin Hendry explores the science of *Star Wars* and feels the force!

BLACK HOLES AND WHITE RABBITS

Professor John Brown FRSE

Black holes are among the most bizarre objects in the Universe, possibly even related to how the Universe began. This talk explains what the term means, discusses how and where they form, how we detect them, and illustrates many of their weird properties and effects using the speaker's skills as a semi-pro magician.

STRUCTURE OF THE UNIVERSE: A MATTER OF SOME GRAVITY

Professor John Brown FRSE

On large scales, gravity is a major controlling force on almost every aspect of the Cosmos, from slowing its cosmological expansion and governing galactic rotation and planetary orbits down to enabling life itself by retaining our atmosphere and keeping the Sun hot. The nature of these processes and of gravity itself will be explained; in some case illustrated by magic effects.

WE ARE MADE OF STAR STUFF OR WHO PUTS THE IRON IN IRN BRU

Professor John Brown FRSE

Soon after the Big Bang the only elements in the Universe were hydrogen and helium so how come we, our planet and our food and drink, etc., all contain heavy elements? By explaining the physics of how stars form, shine and evolve and eventually die, we show that they are the source of the heavy elements and that we are indeed made of star stuff.

COMETS AS COSMIC PROBES AND AS BRINGERS OF LIFE AND DEATH

Professor John Brown FRSE

Comet nuclei are among the smallest objects studied by astronomers, but near the Sun they develop into beautiful extended awe-inspiring apparitions thought to be both a bringer of and a threat to life. Study of them encompasses a huge range of scientific disciplines and has recently been extended to include the use of comets as probes of our Sun and other stars. This talk gives an overview of these multifaceted objects, including their recent study by space probes.

SOME DAYS IN THE LIFE OF AN ASTRONOMER ROYAL

Professor John Brown FRSE

The speaker became fascinated by astronomy at around age 10 and went on to become 10th Astronomer Royal for Scotland. In this talk he recounts aspects and anecdotes of his life story as a means of conveying what astronomy is and the fascination and beauty of what astronomers (novices, amateurs and professionals alike) see out there. He also talks about how astronomy interfaces with other sciences and with the arts, including magic which is a hobby of his, and how to get into astronomy.

GREAT SCOTTISH ASTRONOMERS IN HISTORY AND THEIR MODERN WORLD HERITAGE

Professor John Brown FRSE

As in many areas of life, Scotland today punches far above its weight in the worlds of astronomy and space science and engineering. This talk discusses some of the major contributions to astronomy made by Scots throughout history, including James Gregory, Thomas Henderson (first to measure the distance to a star) and James Clerk Maxwell, and how they helped lay the foundations of modern astronomy; some Scotland-connected highlights of which are also presented.

WHAT IS SCIENCE, WHAT IS NOT SCIENCE AND WHAT SCIENCE IS NOT

Professor John Brown FRSE

Science and technology lie at the heart of almost every aspect of modern day-to-day life, but the nature of science is poorly understood by many, as are its huge strengths and also its limitations. This talk aims to spell out clearly what the scientific method is and where its boundaries lie, contrasting disproof with proof, and discussing science in relation to religious belief (including atheism) and to world trends in anti-science and to unproven (but not necessarily untrue or disprovable) beliefs masquerading under the misnomer of scientific theories. It also addresses the roles of belief and subjectivity in science and sources of uncertainty (experimental, quantum, chaos, numerical) in 'scientific' data making even some scientific theories untestable.

OPEN Q&A SESSION: ASK THE ASTRONOMER ROYAL ABOUT ASTRONOMY AND SPACE

Professor John Brown FRSE

The title speaks for itself – the speaker will do his best to answer any astro/space-related questions – from how to make or buy a telescope or how to get into astronomy, to how things out there work and how we find out.

THE PHYSICS OF RAINBOWS

Dr Giles Hammond

Rainbows are beautiful natural phenomena; they are seen when it is both raining and the Sun is out. But why do we see the colours in a rainbow, and why do all rainbows show the same colouring in the primary and secondary bows?

This talk will discuss how light is split up into its constituent colours, and how these colours are separated in the raindrop. We will further explore why rainbows are circular, why they have no end and why the colours in the primary and secondary bow are interchanged.

THE DARK SIDE OF THE UNIVERSE

Dr Giles Hammond

In this talk we will explore the mysteries of the Universe. Building from the concepts of measuring the distance to faint galaxies and the Doppler shift of light, we will look in detail at the current observations that indicate that over 95% of Universe is made up of a strange form of matter called Dark Matter and Dark Energy. The ultimate fate of the Universe will also be discussed, including current observations that suggest the expansion rate is accelerating, and its implications for our understanding of cosmology and particle physics.

GRAVITATIONAL WAVES

Dr Giles Hammond

The Laser Interferometer Gravitational Wave Observatory (LIGO) comprises two detectors located in Hanford, WA and Livingston LA. These detectors are 4km-long Fabry-Perot Michelson interferometers and are the most sensitive length-measuring devices in the world. They are able to sense a change equivalent to 1/1000th the diameter of a proton over their 4km baseline.

This talk describes the technology development necessary to realise the LIGO detectors, and also describes the gravitational wave signals that have been observed from binary black hole systems. The talk also provides insight into the astrophysics which can be gained from these “dark systems”, only observable by listening to the Universe.

SPACE SPINOFFS, ORBITS, AND CUBESATS

Dr Pam Anderson

This talk provides details about the reasons we go into Space, the information we can glean from Space exploration and its uses and benefits. This includes a discussion of Space spin-offs and the everyday, often unexpected, items we use that have stemmed from Space. The use of small satellites, known as CubeSats, and the different types of orbit to gain information are also discussed. The talk aims to showcase the importance of Space exploration to our life on Earth and the upcoming opportunities for pupils in the Space industry in the UK.

MATHS

BIG IS BEAUTIFUL

Professor Adam McBride OBE FRSE

This talk might be described as an excursion into the world of very large numbers. More precisely, we shall meet some rather large positive integers, which have cropped up recently in a variety of mathematical problems. Magic Squares, Sudoku, secret codes and a dodgy chip all make an appearance.

MATHS IS BEST

Professor Adam McBride OBE FRSE

The last 40 years have been a Golden Age for Mathematics. Old problems have finally been solved after hundreds of years, whilst many new areas have sprung up in response to the needs of other disciplines. The subject can reasonably be described as the language of modern business, engineering, science and technology (BEST). This talk will try to justify this claim, but will also include results that are simply elegant and beautiful. No specialist knowledge is required.

Professor McBride can adapt both talks to suit differing age groups.

POP, BANG, WHIZZ? HOW DO VOLCANOES ERUPT?

Dr Kate Saunders

This is an hour-long interactive workshop thinking about what volcanoes are, what happens inside a volcano and how do volcanoes erupt? The workshop involves several hands-on experiments for the children to take part in, so they can learn first-hand how volcanoes work. We can either finish by talking about the nearest volcanic rocks to the school or volcanism globally.

VOLCANO EMERGENCY MANAGEMENT

Dr Kate Saunders

This is a hands-on activity thinking about the hazards associated with an active volcano and the potential emergency management response for the local community. The session starts by considering the hazards of active volcanoes and then the class is split into three groups representing the scientists, emergency management team, government, and local community. Each group is given a pack of information and they work together to solve the problems before the volcano erupts. This activity not only highlights the science but also the social, economic and political aspects of living close to an active volcano.

PARASITES AND PERFORMANCE: HOW WORMS DAMAGE AFRICAN CHILDREN

Dr Francisca Mutapi

Find out about a parasitic worm as ancient as Egyptian mummies and as sly as a fox, which affect billions of people worldwide. Although these parasites occur in mostly poor areas in the developing world, you will hear about some very famous British people who have been infected by these parasites during their recent visits to Africa. Discover how they affect all aspects of children's health, ranging from diminishing the children's ability to concentrate in class or perform during school tests and physical activities, to the detrimental effects on the function of their bladders and livers. This talk will explain how we are treating millions of children in Africa who are affected by these parasites and what differences it is making to their health and school performance.

SCIENCE: IT'S A PEOPLE THING: A DISCUSSION WORKSHOP FOR GIRLS

Ms Alison McLure

This workshop was piloted at the Big Bang Science Fair in London in March 2013. The girls discussed myths and facts about girls and women in STEM (Science, Technology, Engineering & Maths) careers, and came up with ideas on how to make a lasting difference. The Institute of Physics has worked in partnership with WISE and Intel to create this workshop, designed to inspire girls about the STEM subjects where they are under-represented, such as physics and computer science. It shows them how these subjects connect with issues that girls care about and their importance as a gateway into a wide range of interesting jobs and careers. The workshop uses role models to facilitate small group discussion and explore gender stereotyping in a comfortable and safe environment.

APPLICATION FORM 2018/19

To invite one of the RSE@ Schools Speakers to your school, please complete the form and return to:

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