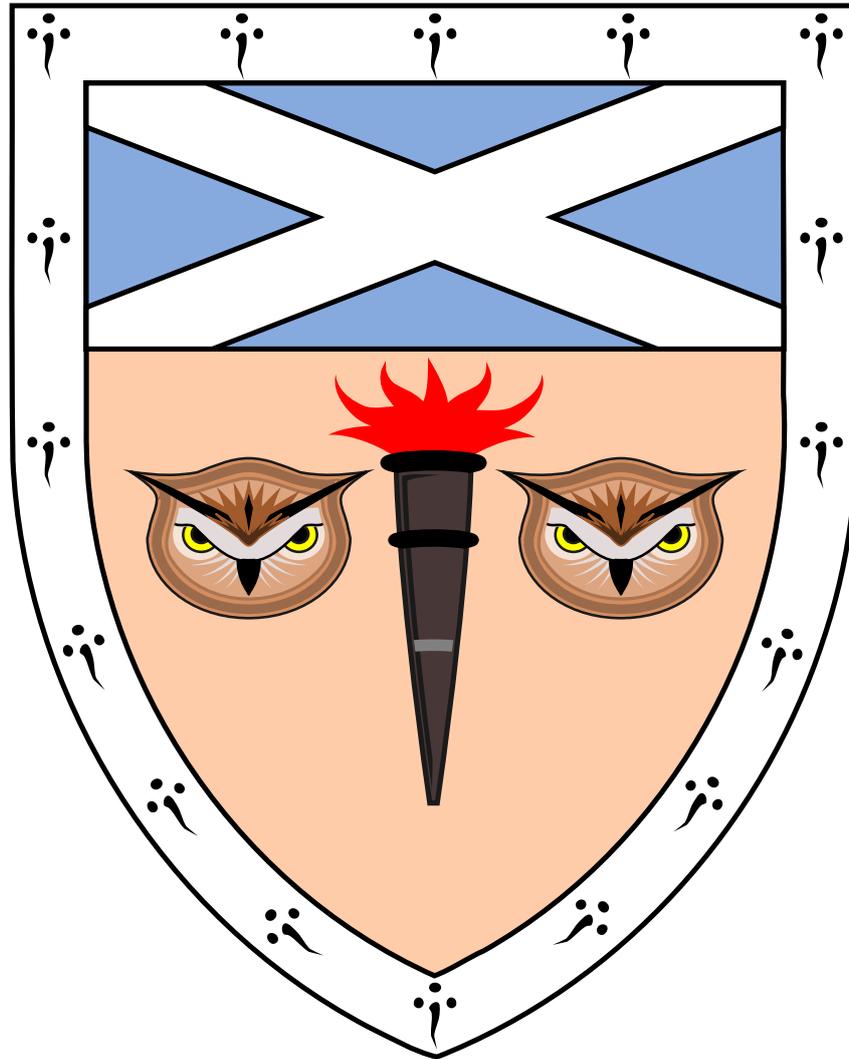


The Royal Scottish Society of Arts

Showcasing Scotland's Science, Technology and Innovation

198th Session

2018-2019



Patron: Her Majesty the Queen

Established 1821 - Incorporated by Royal Charter 1841

Registered Scottish Charity SC015549

The Royal Scottish Society of Arts

Showcasing Scotland's Science, Technology and Innovation

The Royal Scottish Society of Arts was founded in 1821 as 'The Society for the Encouragement of the Useful Arts in Scotland' and incorporated by Royal Charter in 1841. It was concerned with the fields that we would now describe as science, technology, engineering and manufacture, but which were then known as the useful arts, as opposed to the fine arts.

Today the Society aims to showcase Scotland's Science, Technology and Innovation, mainly through a monthly lecture programme, excursions, promotion of Honorary Fellows, and the award of medals.

The lecture programme is given by excellent public speakers, who are distinguished in their fields of study, and the topics cover a wide range of scientific and technical issues, all pertinent to the Scotland in which we live today.

Fellowship of the Society is open to all with an interest in science and its place in society who would like to attend our meetings. Fellows of the Society are entitled to use the letters FRSSA after their names. Applications for Fellowship must be supported by at least one Fellow of the Society to whom the applicant is personally known.

More information about applying for Fellowship is available at our meetings. Please introduce yourself to the President, Secretary or one of the members of the Society's Council at a meeting for further details.

Dr Alison Morrison-Low
president@rssa.org.uk

Mr Peter Jones
secretary@rssa.org.uk
23 Queen's Crescent
Edinburgh EH9 2BB

Mr Graham Rule
treasurer@rssa.org.uk

Honorary Fellows

The Society's Rules allow for the election of up to 10 people "*Distinguished in the Science of the Applied Arts*" as Honorary Fellows. Current Honorary Fellows are:

Professor John Brown OBE BSc PhD DSc FInstP FRAS FRSE, Astronomer Royal for Scotland
Professor Peter Higgs CH BSc MSc PhD FInstP FRSE FRS
Professor Sir James Hough OBE FRS
Professor Anne Glover CBE FRSE FASM
Professor Malcolm Longair CBE FRS FRSE
Professor Stephen Salter MBE FRSE

The shield shown on the front page is from the Society's full 'coat of arms' as described by the Lord Lyon King of Arms: "Or, between two eagle owls heads affrontée proper a torch Sable paleways enflamed Gules, on a chief Azure a saltire Argent, all within a bordure Ermine". The shield has a white border with black marks representing ermine fur. The upper part has a white (or silver) diagonal cross on a blue background. Below that the main body of the shield is yellow (or gold) with two forward-facing eagle owl heads on either side of an upright black torch with red flames.

The Society has recently commissioned the local illustrator Sandy Mackenzie <sandiloquent@gmail.com> to create the computer file based on the description and original painting from the Lord Lyon.

Between a rock and a hard place: the critical role that Early Cenozoic events had in shaping the UK geology, shale gas reserves and carbon storage sites

**Professor John Underhill BSc PhD FGS FRSE
Chief Scientist & Shell Chair of Exploration
Geoscience, Academic Director of the NERC Centre
for Doctoral Training (CDT) in Oil & Gas
Heriot Watt University, Edinburgh**



**In the Augustine United Church
41 George IV Bridge
Edinburgh, EH1 1EL
On Monday 17th September 2018, at 7pm**

A cursory look at the geological map shows the UK has been significantly uplifted and tilted to the east. The subsequent opening of the Atlantic Ocean caused further deformation resulting from buckling against the stable tectonic interior of continental Europe.

These events profoundly affected many of the basins of sedimentary rock that make up the British Isles — including those considered to contain large shale resources and where carbon dioxide injection is proposed. Although it is generally assumed shale gas extraction would work if exploration drilling went ahead, little attention has been paid to whether the country's geology is suitable for shale oil and gas production. The effects of this same uplift reached into the North Sea where they have importance for saline aquifers that form potential carbon storage sites. This talk will cover some of the fundamental geological uncertainties which need to be considered by the UK when considering carbon storage and shale gas extraction as viable solutions.

John gained his first degree in Geology at Bristol University in 1982. He was awarded a PhD from the University of Wales, Cardiff in 1985; the subject of his BP-sponsored thesis being: 'Neogene and Quaternary Tectonics and Sedimentation in Western Greece'.

John worked for Shell in The Hague and London as an exploration geoscientist. He was appointed as lecturer in the Grant Institute of Geology (as it was then) in 1989 before becoming Professor of Stratigraphy in 1998.

John moved across to Heriot-Watt University in August 2013 and became the Shell Professor of Exploration Geoscience later the same year. He was promoted to the role of University Chief Scientist in January 2017.

John leads the Natural Environmental Research Council (NERC) Centre for Doctoral Training (CDT) in Oil and Gas, a £11 Million partnership of Universities, Research Centres and companies.

John was elected to the Board of the European Association of Geoscientists & Engineers (EAGE) in 2009, an organisation that he led as their President in 2011-12. In 2012. He was awarded the Geological Society's Petroleum Group's top award, The Silver Medal and the Edinburgh Geological Society's Clough Medal. The American Association of Petroleum Geologists (AAPG) bestowed their prestigious Distinguished Educator Award to John at their Annual Meeting in Pittsburgh in May 2013. John was awarded the Lyell Medal for 2016 by the Geological Society.

A Chemical Imbalance - an easier problem to solve for nuclear waste than for women in STEM?

**Professor Polly L Arnold OBE FRS FRSE FRSC
Crum Brown Chair of Chemistry
University of Edinburgh**

**In the Augustine United Church
41 George IV Bridge
Edinburgh, EH1 1EL
On Monday 29th October 2018, at 7pm**



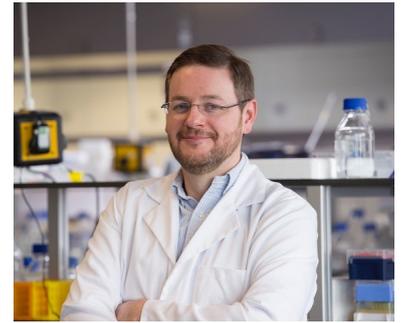
The subtleties of structure and bonding in compounds of uranium and its neighbours in the f-block are still poorly-understood. A fundamental understanding is needed to develop environmentally cleaner ways to extract technology-critical rare earth metals, and for the safe, long-term handling of our nuclear waste legacies. Drawing on our research to make exotic new molecules, this lecture will explore what chemistry can teach us about these complicated but important metals. Outside the laboratory, there is another economically important imbalance in science: the talent pipeline still leaks female scientists and engineers at a disproportionately high rate, with the cost to the UK economy estimated as £2 billion per annum. The University of Edinburgh's female scientists started their campaign for equality with street riots in the 1870s, and today Edinburgh's School of Chemistry has been recognised for its excellence in equality and diversity actions. I made the film 'A Chemical Imbalance' as a call to action to improve equality of opportunity in STEM, and will take a look at how we're doing.

Polly obtained degrees from Oxford and Sussex and was a Fulbright postdoctoral fellow at MIT before returning to a UK lectureship in 1999. Her research focuses on the design and synthesis of highly reactive f-block complexes that can activate inert small molecules such as carbon oxides and hydrocarbons, and that can provide fundamental information on structure and bonding. She was awarded the Lord Kelvin Medal, the RSE's senior physical science prize in 2017. Polly is an active advocate for inclusion and diversity in STEM, and was awarded an OBE in 2017 for services to chemistry and women in STEM.

*<http://www.homepages.ed.ac.uk/parnold>
<http://www.chemicalimbalance.ed.ac.uk>
<https://www.bbc.co.uk/programmes/b09trwf0>*

A Pep Talk: Curing the Common Cold

Dr Peter Barlow BSc(Hons) PhD FHEA FRSB
Associate Professor of Immunology and Infection
School of Applied Sciences
Edinburgh Napier University



In the Augustine United Church
41 George IV Bridge
Edinburgh, EH1 1EL
On Monday 26th November 2018, at 7pm

A cure for the common cold has eluded scientists for more than half a century. For many people, catching a cold can be an innocuous annoyance, but for those individuals with existing lung diseases such as asthma, a cold can be extremely dangerous. Despite extensive scientific investigation, there is still no vaccine or treatment for rhinovirus, the primary cause of the common cold.

In this talk, Dr Peter Barlow will give an overview of the work that has taken place over the past 50 years in terms of finding a cure for the common cold. In addition, he will highlight recent exciting developments in this area, including how molecules found in the human immune system could hold the key to solving the tricky problem that this virus poses.

Dr Peter Barlow's interests lie in studying the human immune system with a view to developing new therapeutics for lung infections, like influenza and rhinovirus (a cause of the common cold). Prior to his post at Edinburgh Napier, he previously worked in the Centre for Inflammation Research at the University of Edinburgh, and in the Centers for Disease Control & Prevention in Atlanta.

Peter is passionate about public engagement with science and is a Media Spokesperson for the British Society for Immunology. His work has been profiled on BBC News, Sky News, ITV News, BBC Countryfile Diaries, BBC Radio, NPR, and in many national and international newspapers.

<http://www.barlowlab.com>

<https://www.napier.ac.uk/people/peter-barlow>

<https://www.bbc.co.uk/news/uk-scotland-edinburgh-east-fife-40800941>

<https://www.scotsman.com/news/health-fears-as-traffic-fumes-shown-to-damage-immune-system-1-4535077>

<http://kpcw.org/post/cool-science-radio-dr-peter-barlow-cure-common-cold>

Finding planets around other stars

Professor Ken Rice PhD FRAS
Professor of Computational Astrophysics
Institute for Astronomy, University of Edinburgh

In the Augustine United Church
41 George IV Bridge
Edinburgh, EH1 1EL
On Monday 28th January 2019, at 7pm

Just over 20 years ago, we didn't know of any planets outside our Solar System. We now know of almost 4000, and the discovery of new ones continues apace. These planets are known as extrasolar planets, or exoplanets. I will discuss how we find them, what we know about them, and the prospects for the future of this exciting research area. In particular, when can we expect to detect an exoplanet that might have conditions suitable for life?



I started my research career at the University of KwaZulu-Natal, in South Africa. I did a PhD in physics and spent time working for the South African National Antarctic Programme. I then had postdoctoral positions at the University of Delaware, and the University of St Andrews, before taking up a faculty position at the University of California, Riverside. I moved to the University of Edinburgh at the beginning of 2006 and now hold a Personal Chair in Computational Astrophysics.

<http://www.roe.ac.uk/~wkmr>

A fourth Industrial Revolution - the transition to an electric society

Hon Adam Bruce WS
Global Head of Corporate Affairs
Mainstream Renewable Power



In the Augustine United Church
41 George IV Bridge
Edinburgh, EH1 1EL
On Monday 25th February 2019, at 7pm

The “we have done it like this for a century” value chain in developed electricity markets will be turned upside down within the next 10-20 years. UBS

In this lecture Adam will examine the three forces that are driving extraordinary change in the global energy sector, and impelling the world towards an electric future. Less about energy production and more about the advance of technology, the world is undergoing a fourth Industrial Revolution which is turning “business as usual” on its head. Electricity utilities across the world are caught in a “death spiral” as they struggle to compete as new technology changes customer demand.

Adam will discuss how future energy policies can be realised, based on technology and engineering currently available and what is likely to be the direction of travel resolving some of the supply, storage and distribution issues utilising new energy technologies.

If, as a former Saudi oil minister said, the stone age didn’t end because we ran out of stone, so the oil age won’t end because we run out of oil, what comes next?

Formerly a solicitor with UK law firm McGrigors, where he was Director of Public Policy, Adam has worked in the global electricity sector since 2006, first with Airtricity, where he was CEO of its UK business, and latterly as Head of Corporate Affairs for Mainstream Renewable Power. In 2012 he was appointed by the UK and Scottish governments to chair the Offshore Wind Programme Board, and is a former Chairman of RenewableUK.

Adam is a Trustee of National Museums Scotland, and sits on the Development Board of Oxford University's Maths, Physics and Life Sciences Division. In 2012 he was appointed Marchmont Herald at the Lyon Court, having served as Unicorn Pursuivant since 2008.

More than Lighthouses

Commodore Mike Bullock
Chief Executive
Northern Lighthouse Board

In the Augustine United Church
41 George IV Bridge
Edinburgh, EH1 1EL
On Monday 25th March 2019, at 7pm



The Northern Lighthouse Board (NLB) has been providing Marine Aids to Navigation in Scottish and Manx waters for over two centuries, protecting lives, property and the environment. The presentation aims to set out the governance, role and function of the modern service while paying due regard to the organisation's origins and heritage.

Mike Bullock joined NLB in April 2014 as Chief Executive after 34 years' service in the Royal Navy. He served in six ships and submarines. His shore appointments included the British Defence Staff Washington DC, NATO Headquarters in Northwood London, Ministry of Defence Whitehall and as a liaison officer embedded with the US Joint Staff in the Pentagon. His final appointment was in Navy Command Headquarters, Portsmouth where he had responsibility for Logistics and Infrastructure for the Royal Navy, Royal Marines and Royal Fleet Auxiliary. He is a graduate of the Royal College of Defence Studies.

<https://www.nlb.org.uk/>

The human genome - its scientific and societal impact

**Professor Tim Aitman MB ChB FRCP FMedSci FRSB FRSE
Professor of Molecular Pathology and Genetics;
Director, Centre for Genomic & Experimental
Medicine, Institute of Genetics and Molecular
Medicine, Clinical Director, Edinburgh Genomics,
University of Edinburgh;
and Honorary Consultant Physician, NHS Lothian**



**In the Augustine United Church
41 George IV Bridge
Edinburgh, EH1 1EL
On Monday 29th April 2019, at 7pm**

The first human draft sequence of the human genome was completed in 2001, a project taking 15 years and costing three billion dollars. An individual's human genome can now be sequenced in a few days at a cost of less than a thousand dollars. This lecture will consider the utility of this capability in genome sequencing to advance scientific knowledge and healthcare and will discuss whether society has fully understood and adapted to the power and opportunities of this technological revolution.

Professor Tim Aitman is the Director of the Centre for Genomic and Experimental Medicine within the MRC Institute of Genetics and Molecular Medicine. He is Professor of Molecular Pathology and Genetics at the University of Edinburgh, Clinical Director of the whole genome sequencing facility in Edinburgh Genomics and Consultant Physician in NHS Lothian. He is a Fellow of the Royal Society of Edinburgh, the Royal College of Physicians, the Academy of Medical Sciences, and the Society of Biology and co-PI of the Scottish Genomes Partnership, a nationally important collaboration with the NHS and Genomics England. He was the Specialist Advisor for the 2009 House of Lords Inquiry in Genomic Medicine.

Professor Aitman's research uses genome technology and information to elucidate the genetic basis of both common and rare human disorders, aiming to use this information to diagnose and stratify human disease, and to move such advances towards routine healthcare.

<http://www.cgem.ed.ac.uk/research/people/tim-aitman>
<http://www.scottishgenomespartnership.org>
<https://genomics.ed.ac.uk/about-us/profile-tim-aitman>

Annual General Meeting

**The Society's AGM will be held in the Augustine United Church
41 George IV Bridge
Edinburgh, EH1 1EL
On Monday 3rd June 2019, at 7pm**

The President, Dr Alison Morrison-Low, will be in the Chair.

Agenda

1. To record apologies for absence
2. Minutes of the AGM held on Monday 4th June 2018
3. Presentation of the Annual Report of the Council for the 11 months ended 31st August 2018
4. President's Report of the 198th Session of the Society
5. Election of Officers
6. A.O.R.B

Only Fellows of the Society may participate in this part of the evening's proceedings.

Following the Annual General Meeting, there will be a short talk to the society. Details will be published later.

The evening will conclude with a reception with a light buffet, wine and soft drinks to which all Fellows and their guests are warmly invited.

The Engineering Science Prize (formerly the Technological Studies Prize) and Bronze Medal

The Society has presented awards and medals since its earliest days. More recently it has instituted a prize of a medal and a book token for the best student in the SCE Higher examination that the Council believe most closely matches the objects of the Society. From 2012 this was the examination in Technological Studies and from 2016 the Engineering Science syllabus. The presentation is made at the *Science and the Parliament* at which similar awards are made from the Royal Society of Chemistry, the Institute of Physics, and the Society of Biology, which takes place annually in November at Our Dynamic Earth.

Prizewinners

Technological Studies Prize

| | | |
|------|-------------------|----------------------------|
| 2012 | Euan Walker | Marr College, Troon |
| 2013 | Catriona Sinclair | George Watson's College |
| 2014 | Suzie Neave | George Watson's College |
| 2015 | Michael Hain | Hutchesons' Grammar School |

Engineering Science Prize

| | | |
|------|-----------------|--------------------------|
| 2016 | Scott Bennie | Bishopbriggs Academy |
| 2017 | Agnijo Banerjee | Grove Academy, Dundee |
| 2017 | Calum McHugh | Lornshell Academy, Alloa |
| 2017 | Hanming Liang | Boroughmuir High School |
| 2017 | Aidan Poon | George Watson's College |

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President

Dr Alison Morrison-Low DPhil FSA FSAScot
president@rssa.org.uk

Vice-Presidents

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Professor James D Floyd BSc MSc PhD CGeol FGS FSAScot OSTJ

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Professor Ian Robson BSc PhD FRAS FinstP CPhys
Dr Peredur Williams MSc PhD

Secretary

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