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resource

The Newsletter of Scotland's National Academy

Image by Gary Baker

Members of the Young Engineers and Science Club took part in this year's Science and the Parliament event at Dynamic Earth Edinburgh in November.
Read more on pages 10 & 11.

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20th Anniversary of Enterprise Fellowships

What's on in Inverness?

Inquiry into Scotland's Energy Future

The Royal Society of Edinburgh
KNOWLEDGE MADE USEFUL

Celebrating 20 years of Enterprise Fellowships

At an event held at The Hub in Edinburgh on Wednesday 15 November 2017, the RSE hosted a gathering to celebrate 20 years of Scottish Enterprise-supported RSE Enterprise Fellowships. Over these 20 years, the scheme has grown to become a highly respected and effective means of developing entrepreneurial talents and excellent business ideas. This event was a celebration of its many achievements and the impetus it has given to help remarkable people turn great ideas into successful businesses.

The audience and speakers were welcomed by Professor Jocelyn Bell Burnell, President of the Royal Society of Edinburgh. She said the fellowships represent a collaboration between the RSE and bodies including: Scottish Enterprise (SE); the Natural Environment Research Council (NERC); the Science and Technology Facilities Council (STFC); the UK quantum technology programme (QUANTIC); and the Biotechnology and Biological Sciences Research Council (BBSRC). SE has funded over 150 Fellowships and made a total investment of £13m. This has had a dramatic impact, with Enterprise Fellows winning £90m in follow-on investment.

Professor Bell Burnell said the programme has been highly successful and that it is important to the Scottish economy that Fellows get the opportunity to develop their ideas.

She then introduced John Swinney MSP, Deputy First Minister of Scotland and Cabinet Secretary for Education and Skills, who gave a key-note speech, *Unlocking Ambition.*

The day continued with presentations from several former RSE Enterprise Fellows and participants from when the programme began in 1997, including a number of RSE Fellows who have acted as mentors to Enterprise Fellows.

The day concluded with an after-dinner speech given by Professor Sir Jim McDonald FRSE, Principal and Vice-Chancellor of the University of Strathclyde, and the Vote of Thanks was offered by Edward Cunningham, Chair of the RSE Enterprise Fellowship Scheme.

Professor Bell Burnell and John Swinney MSP are pictured with Anne Fraser, RSE Research Awards Manager and Edward Cunningham CBE FRSE, Chair of the RSE Enterprise Fellowship Scheme, both of whom were involved when the scheme started 20 years ago.

At the beginning, in 1997, there were just four Scottish Enterprise-supported Fellowships awarded. Now the scheme has grown to allow two cohorts of Enterprise Fellows per year, which enables aspiring entrepreneurs to access the programme at the right time so that they can capitalise on being 'first to market' if appropriate. Year-on-year growth in applications continues, with 2016 and 2017 seeing the largest number of Enterprise Fellows going through the scheme.

On average, there are now 16 Fellows per year, going through the programme across all funders and all science and technology sectors.

RSE Enterprise Fellowships are awarded to individuals seeking to commercialise innovative ideas resulting from academic research in the arena of science and technology. The objective of the programme is to support innovators' transitions into successful entrepreneurs with viable commercial companies. The Fellowships enable individuals to advance the commercial potential of existing research or technology-based ideas, while supporting the Fellows with a year's salary, business training, business development funding and access to mentors, business experts and professional advisers.

Encouragingly, the female-to-male ratio of applicants to the scheme is strong, with 41% of Enterprise Fellows in the last five years being female.

Hailing from diverse disciplines, the companies created also cover a broad spectrum of sectors; from real-time 3D audio technology to English language education apps; wearable golf performance tracking technology to sustainable skis for the free-ride market.

Since 1997, Scottish Enterprise has supported 158 Enterprise Fellows, representing an investment of over £13.4M, with an average cost per Fellow of £85,000. STFC joined the scheme in 2002 and BBSRC in 2005. NERC joined the programme in 2016, with a pilot scheme to support five Enterprise Fellows working within NERC's remit of terrestrial, marine, freshwater, science-based archaeology, atmospheric and polar sciences, and Earth observation.

Scottish Enterprise-supported Enterprise Fellows have been hosted by 17 Universities and Research Institutes across Scotland.

Eleanor Mitchell, Director of Entrepreneurial Growth, Grant Appraisal and Management at Scottish Enterprise, commented: "Scottish Enterprise is delighted to have worked with the RSE over the past 20 years in developing and delivering the Enterprise Fellowship programme. This has enabled the creation of at least 96 new technology- and engineering-based companies and reflects Scottish Enterprise's ongoing commitment to supporting entrepreneurs to optimally exploit the wealth of opportunities that arise from Scotland's inherent strengths in technology and engineering."

Photographs by Gary Doak Photography

This splendid celebratory event championed the successes of those awarded these prestigious Fellowships and highlighted the vitality of Scotland's research sector and the huge contribution that the commercialisation of academic research makes to Scotland's economy.

There has never been a better time to start up or spin out a company in Scotland. With such a strong record of success, the RSE's Enterprise Fellowship Scheme grows in popularity, allowing aspiring entrepreneurs to take those important first steps toward building a thriving business, while supporting the growth of Scotland's economy and the nation's great tradition for nurturing innovation. The RSE looks forward to seeing the strength of the competition for these prestigious Fellowships grow and grow.

For full details about the Enterprise Fellowship Scheme, visit the website at: www.rse.org.uk/awards/enterprise-fellowships/

RSE @ Inverness

Since 2008, the RSE's flagship Outreach Programme, *RSE @*, has delivered thought-provoking and inspirational events across Scotland, including: Arbroath; Dumfries and Galloway; Lochaber; and the Scottish Borders. The latest in the series, RSE @ Inverness, was launched at Eden Court Theatre, Inverness, at the end of September 2017.

Setting the scene for the two-year programme, the *Ask the Experts* launch was an entertaining and educational day of interactive displays and short talks, offering attendees of all ages the opportunity to meet scientists, authors and language experts.

Topics ranged from marine science to health and wellbeing; geology to astrophysics; and storytelling to forensic chemistry. RSE President, Professor Jocelyn Bell Burnell, delivered a fascinating talk detailing how the Big Bang and stars in our Galaxy are integral to human life. BBC Presenter and geologist, Professor Iain Stewart, spoke on the subject of *Unnatural Disasters* and Professor Martin Hendry FRSE described the recent scientific discovery of gravitational waves. Professor Jeremy Smith FRSE discussed the history of the Scots language and children's author, Lari Don, entertained children and adults alike with her tales of myth, legend and adventure.

"We took our four-year-old along to the event. We were so impressed by the quality of the demos and the time spent on producing them. He had an amazing time and is now desperate to be a scientist AND a fireman."

Interactive displays from UHI's Centre for Health Science, Cromarty Lighthouse Station, the Institute of Physics, University of Dundee's Centre for Anatomy and Human Identification and the University of Glasgow allowed attendees to make new and intriguing discoveries and ask the experts questions on a vast range of topics.

Following the successful launch, further public events have taken place, including: family activities at the Highland Wildlife Park; public talks by the Scottish Parliament's Presiding Officer, Rt Hon Ken Macintosh; events in conjunction with the University of the Highlands and Islands' Centre for Health Science and ex-Commonwealth cyclist, Roddy Riddle; and the RSE's Public Engagement Awards at Culloden Academy.

Professor Niamh Nic Daéid FRSE (left), Director of Research at the Centre for Anatomy and Human Identification, University of Dundee, engages with adults and young people at the launch.

'Captive' audiences enjoy learning at the Highland Wildlife Park (located within the Cairngorm National Park).

The summary report of the events that constituted the RSE @ Inverness launch is available at:

bit.ly/RSEatInvernessLaunch

Summary reports of all events in the Programme will be posted on the 'past events' page on the RSE website at:

www.rse.org.uk/events/past/

Coming soon to RSE @ Inverness

The focus of future events will be on both historical and contemporary themes; all relevant to the Inverness region.

Don't miss the dramatic revelation .....

Currently known to readers and TV audiences as the grandfather of Jamie Fraser, lead character in the 'Outlander' series, Lord Lovat ('*The Old Fox*'), a notorious 18th-Century clan chief, was beheaded in London for supporting Bonnie Prince Charlie. However, for centuries, there has been debate as to whether or not it is his remains that lie in the family's mausoleum near Inverness. Scientists, led by Professor Dame Sue Black OBE FRSE, have undertaken a careful examination of these remains (recently reported on *Reporting Scotland*) and Professor Black will reveal their findings at an event on Thursday 18 January 2018 at the Kingsmill Hotel, Inverness.

The coffin which may – or may not – hold the remains of the 'Old Fox' .....

On Saturday 3 February, we bring you a full-day event (10 am–4 pm) at Inverness Town House on the theme of *Dino Digs and Monster Myths*. Our invited speakers will consider how myths, legends and scientific enquiry have combined to fascinate and inspire our ancient ancestors through to current generations.

To secure your place on these intriguing events and for details of more coming events, visit:
www.rse.org.uk/events/rse-at/

In addition to the Public Events, the RSE @ Inverness Schools Programme will offer pupils opportunities to receive free curriculum-linked school talks, motivating their learning and providing them with a unique insight into academic life and research. All talks are delivered by experts in their fields, who volunteer their time and are keen to enthuse students from P6 to S6 on a wide range of topics; such as high-performance computing, gravitational waves, crime and punishment in 19th-Century literature, and much more.

Recent event feedback has been encouraging and supportive and we look forward to developing a strong relationship with the Inverness community through the delivery of the RSE @ Inverness Outreach Programme.

For more information, or if you are interested in contributing a school talk or public lecture to either programme, please contact:
Kate Kennedy, RSE Outreach Officer
kkennedy@theRSE.org.uk

The RSE Young Academy of Scotland

Dinner at the RSE

On the evening of Thursday 23 November, the Young Academy of Scotland (YAS) hosted its first joint RSE Fellows and Young Academy membership event, a dinner held at the RSE, on the topic of sustainability. Invitations were extended to both current and Emeritus YAS members, as well as Fellows of the RSE.

Five attendees were invited to present on *Sustainability* in pecha-kucha-style format [20 power-point slides lasting 20 seconds each, giving a total presentation time of 6 minutes and 40 seconds each]. This style of presenting forces presenters to be quick and snappy with their presentation and allows for a greater number of presentations on different topics in a short period. For each of these five individuals, it was the first time presenting in this style. The talks ran throughout the dinner, aiming to stimulate and aid discussion throughout the evening.

Speakers and topics for the evening were:

- Professor Bernadette O'Rourke (member of the YAS since 2013) on linguistic sustainability and the link to biodiversity;
- Professor Malcolm Horner FRSE on transportation and urban development;
- Professor Eileen Wall (member of the YAS since 2014) on livestock and genetic improvement;
- Professor Alistair Borthwick FRSE on China's Yellow River;
- Professor Roger Crofts CBE FRSE, who concluded the evening and spoke about the potential of both YAS and the RSE to make a real impact on sustainability issues in Scotland.

The combination of both RSE Fellows and YAS members as speakers allowed for interactive and meaningful discussion, as well as the celebration of past achievements, current projects and potential future work. The pecha-kucha format proved an interesting take on dinner talks and discussion, and hopefully has inspired many of the attendees to use it again in the future.

"I found the diverse evening very interesting and the pecha-kucha talks well presented. I also thoroughly enjoyed speaking with a number of YAS members and hope more opportunities will be found to bring interested YAS members into the RSE and the Fellowship"

www.youngacademyofscotland.org.uk

The Young Academy of Scotland Needs YOU!

The Young Academy of Scotland (YAS) fosters interdisciplinary activities among emerging leaders from the sciences and humanities, the professions, the arts, business and civil society.

We are now launching our next round of recruitment, and look forward to receiving applications from able and innovative young entrepreneurs, professionals and academics, keen to develop a coherent and influential voice, and to address the most challenging issues facing society in Scotland and beyond.

There are many reasons why people might wish to join the Young Academy of Scotland. Many YAS members benefit from developing interdisciplinary, collaborative projects with other members, both inside and outside the academy, and YAS members collaborate to produce independent, evidence-based and non-party-political advice papers for policy makers.

The deadline for applications is **Wednesday 14 February 2018.**

Find out more about YAS and how to apply at: **www.youngacademyofscotland.org.uk/**

Follow on twitter for regular updates on activities: **www.twitter.com/YoungAcademySco**

Brexit Observatory Case Studies

Since May 2017, YAS has been collecting case studies from individuals involved in research, innovation and further/higher education, based in Scotland, about the impact of the Brexit vote on their work. The YAS has recently released a preliminary report from these case studies, and the findings showcase several key themes and trends within the case studies: uncertainty over the status of EU non-UK citizens' rights to live and work in the UK; concerns over anti-immigration rhetoric; and loss of access to EU research funding.

The case studies and report have received wide attention on social media, and were mentioned by Willie Rennie MSP during a Holyrood debate in October.

The YAS is still actively collecting case studies, and you can submit one online at: **www.surveymonkey.co.uk/r/CSXHDK9**

Read the full report at **https://goo.gl/4MJoCp**

International Relations | Taiwan

RSE/MOST Workshop 2017
Big Data: Methodologies and Applications

The RSE and the Ministry of Science and Technology, Taiwan (MOST), have a formal agreement, established to support research collaborations between Scotland and Taiwan. Under the terms of this agreement, the RSE and MOST organised a workshop in October 2017 in Taiwan on the topic of *Big Data: Methodologies and Applications*.

The October workshop took place in Hsinchu during the week commencing 23 October. A delegation of ten participants, led by Professor Marian Scott OBE, RSE Vice-President (International), travelled from Scotland to Taiwan for the workshop.

Workshop participants presented their work in the area of big data in social, industrial and biomedical applications and had time to discuss potential collaboration with colleagues in Taiwan.

The workshop included lab visits to: the Microelectronics and Information Research Center at National Chiao Tung University; the National Center for High-Performance Computing; and the Industrial Technology Research Institute (ITRI).

Founded in 1973, ITRI is a non-profit R&D organisation engaging in applied technology research and technical services, aiming to innovate a better future for society. Since its inception, ITRI has incubated more than 240 startups and spinoffs, helping underpin Taiwan's industrial development.

Meetings were also held during the visit with the British Office Taipei, Scottish Development International (SDI) and MOST.

Following the workshop, the RSE and MOST launched a call for joint projects on the topic of *Big Data: Methodologies and Applications*. The deadline for applications from Scottish applicants is 5 pm on 23 January 2018. Visit this page and go to 'additional information':

www.rse.org.uk/awards/international-exchange-programme-rse-most-joint-projects/

Participants can also apply to the ongoing bilateral exchange programme with the MOST for visits of one–four weeks (deadlines for this programme are quarterly).

www.rse.org.uk/awards/international-exchange-programme-rse-most-joint-projects/

International Relations | China

RSE/NSFC Annual Workshop 2017
Synthetic Biology

The RSE and the National Natural Science Foundation of China (NSFC) have a formal agreement, established to support research collaborations between Scotland and China. Under the terms of this agreement, the RSE and NSFC organise an annual workshop on a topic of interest to both countries.

During the week of 5 November, the 2017 event took place in Tianjin and Beijing, on the subject of *Synthetic Biology*. As part of this, the local organisers, the Tianjin Institute of Industrial Biotechnology, Chinese Academy of Sciences (TIB), hosted a very productive two-day workshop.

TIB is committed to establishing a national innovation system for industrial biotechnology and to linking research and industry. Workshop participants were allowed time to present their work in this area, discuss with the other participants and explore opportunities for collaboration.

Based on the discussions that took place during the workshop, the RSE and NSFC have set up a Joint Project Scheme to support two-year research projects in this subject area. Further information will be published shortly (under additional information) at: **www.rse.org.uk/awards/international-exchange-programme-rse-nsfc-joint-projects/**

Later in the week, the delegation visited the Nutrition and Health Research Institute (NHRI), part of the China National Cereals, Oils and Foodstuffs Corporation (COFCO), where presentations were facilitated and discussions held around international collaborations.

COFCO NHRI is a core R&D institution carrying out R&D innovation on: processing and application technology; food innovation; biotechnology; animal nutrition and feed; nutrition and metabolism; food quality and safety, including consumer insight; and relevant market research.

To find out more about all of the RSE's global collaborations, visit:

www.rse.org.uk/international/

For information about funding for joint projects and our international exchange programmes, visit:

bit.ly/RSE_International_Funding

Science and the Parliament 2017

Science and the Parliament was held again this year at Dynamic Earth in Edinburgh. Organised by the Royal Society of Chemistry (RSC), with extensive support from RSE Fellows and staff, this annual event involves speakers, delegates and exhibitors from across the scientific and engineering communities, along with ministers and parliamentarians. The topic under discussion this year was *Science, Innovation and the Economy* and, as in previous years, a large audience gathered to listen to the experts and participate in the discussions.

The first session was chaired by RSE General Secretary, Professor Alan Alexander OBE (pictured right), who set out the theme of the day before introducing the Deputy Presiding Officer of the Scottish Parliament, Linda Fabiani MSP (below, centre), who gave a welcome on behalf of the Parliament and expressed her thanks to the RSC for its continued commitment to holding the event, now in its 17th year. She reflected how important and useful MSPs find the event, which was demonstrated by the fact that there were eight MSPs, representing all parties, on the speaking list, including two Government Ministers.

Photographs by Gary Baker

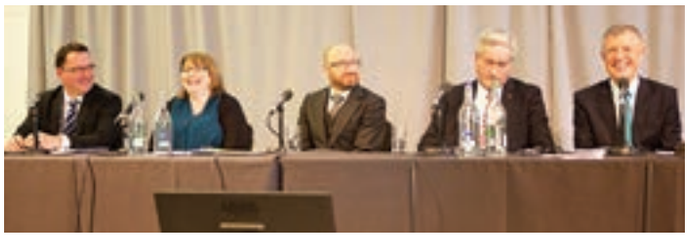
Professor Dame Carol Robinson, President-Elect of the RSC (above right), gave the first main speech. She observed that the RSC has long links with Scotland, dating from its first President, Thomas Graham, and maintained to the present day through leading figures such as one of her recent predecessors, Professor Lesley Yellowlees CBE FRSE, who was the first female President of the RSC. Professor Robinson reflected on some recent research breakthroughs in Scotland, including work on crystalline solids at Heriot-Watt University.

RSE President, Dame Jocelyn Bell Burnell (above left),commented on the role of women in science, advising the conference that the RSE is about to undertake further work on this, following on from its 2012 Report, *Women in STEM*. She noted that progress has been made in the academic sector, most of the universities having now received Athena Swan awards; but much more still needs to be done, both to allow women to fulfil their potential and for the benefit of society through not losing talented scientists.

The main ministerial speech was delivered by Jamie Hepburn MSP, Minister for Employability and Training (below), who recognised the importance of the scientific and engineering sectors to the Scottish economy. He highlighted several of the initiatives that the Scottish Government has been pursuing to stimulate science, including the Innovation Centres and the recent STEM Education Strategy, as well as the series of measures that the Government intends to pursue to support the economy more generally, including the Scottish National Investment Bank.

There followed a panel session involving (above, l–r): Dr Jano van Hemert of Optos; Royal Society Vice-President Alex Halliday; Dr Jo Reynolds of the RSC; and RSE Vice-President Iain Gray CBE. Iain stressed the need to ensure that the strength of the research base in Scotland is translated into economic benefit. He also expressed concern about whether Scotland has sufficiently influenced thinking on the UK Government Industrial Strategy. Jo called for progress towards the target of raising overall R & D investment to 3% of GDP, including utilising the Industrial Strategy Challenge Funds. Alex, while agreeing on the need to raise R & D investment, also stressed the need to tackle skills gaps to create the right conditions for R & D. Jano observed that the low percentage of large companies contributes to the low level of business R&D and that Scotland needs to address this, which will require an uplift in risk capital and entrepreneurship to enable more companies to scale up.

The second panel session was chaired by Ken MacDonald, BBC Science Correspondent, (above) and comprised MSPs from across the five parties represented in Parliament (below, l–r): Dean Lockhart (Conservative); Clare Adamson (SNP); Patrick Harvie (Greens); Iain Gray (Labour); and Willie Rennie (Lib Dem). Topics that the MSPs were asked to comment upon by the audience included: the RSE Young Academy study on the impact of Brexit on researchers; whether the UK Government had a mandate to leave the single market and customs union; the shortage of STEM teachers in several subjects in schools; and how scientists should communicate with the public.



The third panel was from the perspective of industry and was chaired by RSE Fellow Professor Polly Arnold OBE (below) and included Professor Iain Wall FRSE (below right) and Alistair Cameron of Scotmas and Chemical Sciences Scotland. Alistair welcomed the UK Government Industrial Strategy and also explained how Chemical Sciences Scotland provides a voice to the Scottish Government on behalf of the industry, including in areas such as the need to develop interdisciplinary learning and improve on the commercialisation of the excellent university research in the UK. Iain focused on the long-standing low level of business expenditure on Research & Development, particularly in Scotland. He suggested that to improve commercialisation and internationalisation, the focus should be on areas with the potential to access a global market.

The event concluded with the awarding of prizes to the highest-achieving school students in SQA Highers and Advanced Highers across all of the main scientific disciplines, by Scottish Government Minister Shirley-Anne Somerville (right). Pictured below: (l–r) Treeve Willcock, Peebles High School, who won the Higher Chemistry, Physics and Human Biology prizes; Ivan Kapelyukh, High School Dundee, for Physics Advanced Higher; and Iona Phillips, Craigmount High School, for Higher Physics and Biology.

Scotland's Energy Future

In June 2017, the RSE launched a major Inquiry into Scotland's Energy Future. This long-term project is being undertaken by a Committee bringing together a wealth of expertise across a broad range of areas, including energy sources, engineering, technology, law, regulation, climate change, social sciences, industry and public services.

The remit of the Inquiry is to:

- review critically the current forecasts of energy demand in Scotland and the influences on it
- examine how that demand may be met, assessing the feasibility and security of the range of possible sources of supply;
- take account of the environmental imperative to reduce carbon emissions and associated political commitments;
- consider the moral and ethical implications of the various options open to Scotland; how and where energy resources are developed, the way in which we use them, and the level of responsibility we have as a nation for the energy we consume.

During the launch event, held at the RSE, the Committee also published a call for evidence, asking stakeholders to respond to 15 questions across a number of areas. While the deadline for submissions closed in late autumn, interested parties wishing to contribute evidence are still encouraged to contact the Secretariat. All submissions received so far have been published on the Inquiry website.

Throughout Winter and Spring 2017/18, the RSE will be holding a series of public engagement events across Scotland, in order to gather the views and experiences of communities on the energy issues affecting them at both local and national levels. The first such event took place in Dumfries on 8 November, with others planned for Inverness, Aberdeen, Edinburgh, Glasgow and Shetland.

Work on the Inquiry, including follow-up meetings and roundtable discussions with industry, government, third sector groups and other interested stakeholders, will continue throughout early-to-mid 2018, with the Committee's final report expected to be published in Autumn 2018.

Further information on the Inquiry can be found at: **www.rse.org.uk/EnergyInquiry**

Members of the Inquiry Committee pictured at the launch event:

(l-r) Professor Gavin Little;
Professor Simon Harley FRSE;
Sir Muir Russell FRSE (Chair);
Professor Rebecca Lunn FRSE (Deputy Chair);
Professor Gareth Harrison;
Professor John Underhill FRSE.

The other Committee members who were unable to attend the launch are:

Professor Stephen McArthur;
Professor Peter Smith FRSE;
Professor Karen Turner; and
Professor Janette Webb.

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