

ISSUE 63 - SPRING 2020

RSE *The Royal Society
of Edinburgh*
KNOWLEDGE MADE USEFUL

ReSource

THE NEWSLETTER OF SCOTLAND'S NATIONAL ACADEMY



PAINTING A NEW FUTURE

The RSE Young Academy of Scotland's At Risk Academic
Refugees initiative – portraits on display

KNOWLEDGE MADE USEFUL

Focus must be on the future

The RSE recently wrote to John Swinney, Cabinet Secretary for Education and Skills, to express support for the Scottish Government's commissioning of an independent review of the senior phase of Curriculum for Excellence (CfE) and the role that the RSE Education Committee can play in this.

The RSE advised that the review must be focused on the future and avoid re-running previous reports and reviews. It noted that the scope of the partners includes several groupings that have been deeply embedded in the implementation of CfE and that this needs to be balanced with an independent presence on the review panel.



It said that, whilst there has been widespread support for the aims and ambitions of CfE, there has been significant and ongoing concern about the delivery and implementation of the programme itself and suggested the delivery aspect of this needs to be reviewed.

The letter concluded with the recommendation to look beyond the school system to engage with colleges, universities and employers, recognising that college and university partners are not only an increasingly important provider of senior phase pathways, but also play a very important role in influencing senior phase provision.



We are pleased to present Issue 63 of the RSE newsletter, *ReSourceE*, highlighting some of the work in which the RSE is currently engaged.

The RSE was founded in 1783, a time of discovery and invention, and we are proud to continue to support new ideas and innovation through our Enterprise Fellowship programme. We always thought that the programme was fantastic but were delighted with the findings of an independent evaluation which evidences the huge contribution the programme is making to Scotland's economy.

As with so much of our work, the Enterprise Fellowship programme relies heavily on the contributions of our Fellows who give of their time freely across the breadth of the RSE's work. This includes providing expert advice to decision makers in areas as diverse as Scotland's energy future and developments in artificial intelligence, both of which are covered in this edition.

We believe knowledge is only useful when it is shared and in this issue you can read more about some of our recent public engagement. This includes details of a stimulating joint discussion event with the Foundation for Science and Technology (FST) on the industrial use of drones, about which you can read more in a piece by FST's CEO Gavin Costigan on page 9. I'd also like to thank Professors Stephen Lawrie and Myrna Weissman for their *Last word?* opinion piece on schizophrenia and depression.

Finally, following its successful stint at the RSE in Edinburgh, our *Women in Science in Scotland* exhibition is now 'on the road': follow its progress on page 3.

I hope you enjoy our magazine and, as always, please do let us know what you think.

Dr Rebekah Widdowfield
Chief Executive, RSE



ON THE COVER:
Dr Alaa Hamdon,
Lecturer in Structural
Geology, Mosul
University, painted by
I.D. Campbell.
Full story on page 15.

Bank framework is crucial

It is over two years since the Scottish Government published the initial plans for the establishment of the Scottish National Investment Bank (the Bank). The legislative Bill to establish the Bank was unanimously passed by the Scottish Parliament on 21 January 2020, a development broadly welcomed by the RSE. The proposal to establish the Bank has been a prominent area of activity for the RSE, facilitated through its Economy and Enterprise Committee which brings together experience and expertise across academia, business and the public sector. This contribution has included submitting written and oral evidence to Scottish Government and Parliamentary consultations, as well as hosting roundtable discussions and meetings with government officials and parliamentarians.

Following the passing of the Bill, attention now turns to the development of the Bank's Strategic Framework. This will act as the main instrument governing the relationship between Scottish Ministers and the Bank; providing information on the Bank's plans and strategies and the financial parameters and obligations under which it will operate. The framework will be key to ensuring the operational success of the Bank and our work has

presented several key messages that the framework should consider:

- The RSE supports the mission-oriented approach of the Bank, including the focus on Scotland's transition to net-zero carbon emissions.
- In order to build capacity, it is important that the Bank adopts missions on a phased basis. This will help focus the funding available and enable the Scottish Government to monitor and evaluate mission-oriented funding, developing experience over time.
- The Bank will be crucial in helping to address the need for longer-term investment into Scotland's small- and medium-sized enterprises (SMEs) and to improve Scotland's relative innovation performance. As an early aim, the Bank should seek to raise awareness of capital availability, both of its own and from other sources, to help stimulate demand from SMEs.
- Crucially, the RSE believes that the framework must make clear how the operational independence of the Bank will be secured, including clarifying the role of the proposed external Advisory Group, and how the Bank will align with the enterprise and skills agencies.

The RSE will continue to engage with the Scottish Government amongst others on the development of the Strategic Framework.



Mitchell Library



Edinburgh Airport

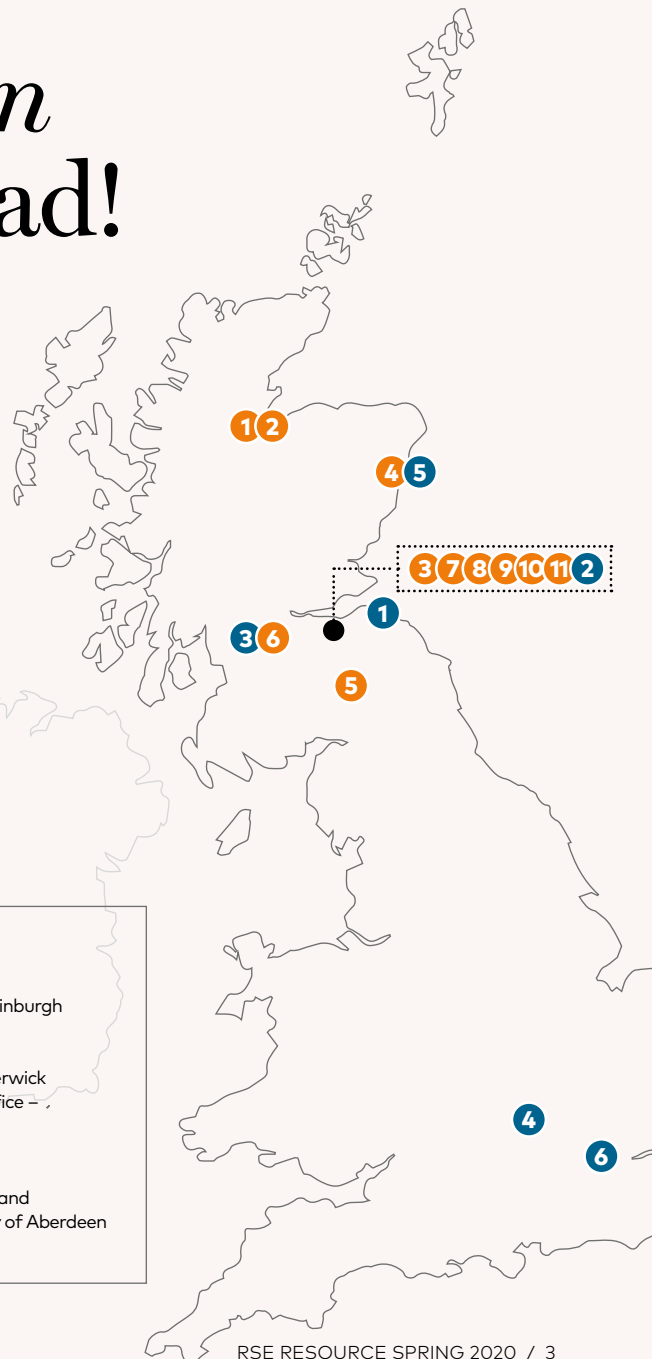
Women in Science in Scotland hits the road!

Portraits of Scotland's leading female scientists are on a UK tour to encourage more women into a career in science

The hugely popular *Women in Science in Scotland* photographic exhibition continues to be seen by audiences around the country. Featuring the work of freelance photographer Ian Georgeson, it celebrates 26 RSE Fellows from across a wide range of scientific disciplines, all of whom are pioneers and leaders in their respective fields. The main exhibition left its home

at the RSE to move to the Mitchell Library in Glasgow in early January and is on show there until March. In collaboration with Edinburgh Airport, a version of the exhibition was installed at the beginning of the festive period until the end of January and was seen by hundreds of thousands of passengers.

The 'pop-up' version of the exhibition also proved popular with audiences at various events, festivals and conferences around Scotland last year and has several bookings already for 2020.



WOMEN IN SCIENCE IN SCOTLAND EXHIBITION AUDIENCES:

2019

- 1 Belladrum Festival – Inverness
- 2 Fascinating Futures event – Eden Court, Inverness
- 3 Festival of Politics – Scottish Parliament
- 4 SNP Conference – Aberdeen
- 5 STEM Hub Borders College – Hawick
- 6 VisNet Collaboration Event – Women's Library, Glasgow
- 7 Festival of Physics – Dynamic Earth, Edinburgh
- 8 Festival of Research – Heriot-Watt University, Edinburgh
- 9 Science and the Parliament – Dynamic Earth

- 10 Edinburgh Airport
- 11 RSE Main Office George Street, Edinburgh

2020 PLANS

- 1 Scottish Seabird Centre – North Berwick
- 2 RBS Headquarters and Central Office – Edinburgh
- 3 Mitchell Library – Glasgow
- 4 Somerville College – Oxford
- 5 Public Communications of Science and Technology Conference – University of Aberdeen
- 6 The Caledonian Club – London

Prestigious medals for pioneering scientists and researchers in Scotland

Awards recognise the impressive contributions and achievements by experts in their fields of study

The RSE plays a key role in inspiring and supporting talent. As part of that, the RSE awards a number of medals to eminent scientists and researchers in recognition of their contributions and achievements in their selected fields of study.

The recipients for 2019/20 are:

The RSE Sir Thomas Makdougall Brisbane Medal:

Dr Martin Lavery (University of Glasgow) for his outstanding contribution to photonics, working on a diverse range of ongoing experiments, including free-space optical communications and underwater optical communications.

The RSE Lord Kelvin Medal: Professor David Manlove (University of Glasgow) for his outstanding contribution to computing science, whose pioneering work in matching algorithms and software has enabled a significant increase in living kidney transplants, thereby improving public health.

The RSE Dr Patrick Neill Medal (joint recipients):

Dr Joe Marsh (University of Edinburgh) for his outstanding research in human genetics, which is key to the success of personalised and precision medicine; and Dr Ferry Melchels (Heriot-Watt University) for his outstanding contribution to the field of biomaterials and tissue engineering.

The RSE Sir Walter Scott Medal:

Professor Kathryn Rudy FRSE (University of St Andrews) for her outstanding contribution to art history, where her capacity for lateral thinking has meant she has been able to examine a large corpus of manuscripts in ways unexplored by previous scholars.

Speaking of the medals, RSE President Professor Dame Anne Glover said: “My congratulations to the medallists who are all uniquely pushing the boundaries of knowledge and expertise. This list confirms to me yet again what an academic powerhouse Scotland is and how proud we should be that such an impressive pool of talent chooses to base its research here.”

The recipients will be presented with their medals at the RSE’s *Celebrating Research and Innovation* event on 16 September.

Fellows honoured



Congratulations to the following RSE Fellows recognised in Her Majesty The Queen’s New Year’s Honours list

CBE:

- Dr Andrew **TAYLOR** FRS, Lately Executive Director of National Laboratories, Science and Technology Facilities Council (pictured on left). For services to Science and Technology.

OBE:

- Lesley **KNOX**, Lately Chair, V&A Dundee (pictured second left). For services to Culture.
- Philip **LONG**, Director, V&A Dundee (pictured middle). For services to Heritage and Culture.
- Professor Sheila **McLEAN**, Professor Emerita of Law and Ethics in Medicine, University of Glasgow (pictured second from right). For services to Health and Education.
- Professor Helen **SANG**, Head of Division, Functional Genetics and Development, The Roslin Institute (pictured on right). For services to Food Security and Bioscience for Health.



“The RSE Sir Thomas Makdougall Brisbane Medal is an incredibly prestigious award and I’m very grateful to the committee for their recognition of my work.”

DR MARTIN LAVERY, UNIVERSITY OF GLASGOW



“... it is recognition not just of my work, but of all the people who have worked with me on algorithms for kidney exchange. This includes colleagues at the University of Glasgow who have worked with me since 2007, as well as the excellent team at NHS Blood and Transplant who are directly involved with the UK Living Kidney Sharing Scheme.”

PROFESSOR DAVID MANLOVE, UNIVERSITY OF GLASGOW



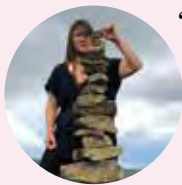
“It’s a great honour for me to receive the Patrick Neill medal – it’s a reflection of the fantastic research environment provided by the MRC Human Genetics Unit and the University of Edinburgh that has allowed me to do this research.”

DR JOE MARSH, UNIVERSITY OF EDINBURGH



“I’m honoured to receive this prestigious medal. It not only celebrates my research career thus far, but also acknowledges the importance of the young field of biofabrication for the life sciences.”

DR FERRY MELCHELS, HERIOT-WATT UNIVERSITY



“None of this work has taken place in a vacuum and I am so grateful to everyone who has nurtured my work: funders; librarians; cataloguers; editors; publishers; the University of St Andrews, for its generous leave enabling me to hike, think and write; and, of course, my friends, colleagues and students in Scotland and beyond.”

PROFESSOR KATHRYN RUDY FRSE, UNIVERSITY OF ST ANDREWS

Celebrating former RSE Fellows

Since it gained its Royal Charter in 1783, the RSE has enjoyed a rich legacy from its Fellowship of individuals, all “eminently distinguished in their subjects”. From that time, well-known figures such as Joseph Black, Walter Scott, Benjamin Franklin, James Clerk Maxwell and James Watt, to name but a few, have been granted the status of RSE Fellow.

The RSE wishes to remember and celebrate some of its past Fellows and to highlight some of the great achievements of these leading scientists and thinkers, who may not be as well known but whose contributions to their fields was significant.

Dr Sheina Marshall

(20 April 1896–7 April 1977)

A major figure in British biological oceanography and one of the first women to be made a Fellow of the RSE



To mark 2020 as Scotland’s *Year of Coasts and Waters*, we are celebrating

Dr Sheina Marshall OBE FRS, who was an authority figure on marine science and one of the first female Fellows of the RSE.

Born in 1896, Dr Marshall played a crucial role in medical research during World War II. Originally from the Isle of Bute, she graduated with a Bachelor of Science with honours from the University of Glasgow in 1919 before going on to hold a Carnegie Fellowship.

Dr Marshall took a role at the Marine Biological Station in Millport in 1922, where she worked for the entirety of her career. It was here that a 40-year collaboration began with oceanographer Andrew Picken Orr FRSE: their work together made major contributions to the modern understanding of marine ecosystems.

Her research investigated the different ways to obtain agar – which was required to produce vaccines – by scouring the shores for seaweed. It could take up to 30 hours to collect enough seaweed for a single pound of agar. Drs Marshall and Orr identified a strand of seaweed, *False Irish Moss*, as the best local source, which prior to the war, had been imported from Japan. Thanks to this understanding of the *False Irish Moss*, Marshall was able to identify sources of agar from many British beaches.

In 1949, she was among the first five women to be elected a Fellow of the RSE. In 1961, she was also appointed a Fellow of the Royal Society and awarded the Order of the British Empire in 1966. In 1971, Dr Marshall was recipient of the RSE’s Neill Prize.

In the business of solid growth

The RSE Enterprise Fellowship programme has created many jobs and generated significant wealth for both the Scottish and UK economies ... and it's back for 2020

In October 2019, the RSE published the findings of an evaluation and economic impact assessment – commissioned from BiGGAR Economics – of the RSE Enterprise Fellowship programme, which had been running for over 22 years. The results were impressive. They showed that the programme has: added almost £170 million to annual global GVA, including £77 million in Scotland; led to the creation of more than 3,000 jobs, nearly half (1,395) of which are in Scotland; and established more than 200 businesses.

In terms of return on investment, for every £1 invested, the programme is estimated to have generated almost £10 for the UK economy and £6 for the Scottish economy.

The study also found that the businesses created by Enterprise Fellows were more sustainable than the average, with more than 81% of businesses still operating

beyond five years, comparing positively to the average survival rates for start-ups and spin-outs of around 45% making it into their fifth year.

In addition to significant economic impact, the Enterprise Fellowship programme has been a catalyst for the commercialisation of research and the development of new products and services bringing huge value to society. Successful ideas developed include: safety systems for the oil and gas industry; new therapies for the most aggressive and life-shortening cancers; and ethical biotechnology methods for the toxicity testing of new drugs.

BiGGAR Economics predicts the annual economic impact of the Enterprise Fellowship will continue to grow, as more Enterprise Fellowships are completed and existing Enterprise Fellows continue to expand their businesses.

The next cohort of Enterprise Fellows will begin in April 2020.

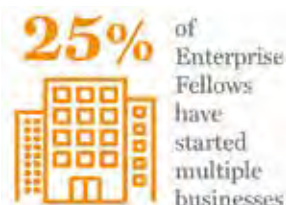
Details of how to apply for future programmes can be found at: www.rse.org.uk/awards/enterprise-fellowships

The report is available on the RSE website at: bit.ly/RSE-Ent-Fells-EconomicAssessment

Do you have an innovative science or tech-based business idea but need help accelerating your project?

The RSE Enterprise Fellowship offers a tailored, equity-free support package of funding and training worth up to £90,000. For the 12-month duration of the award, this includes a salary, hosting by a UK university or research institute, business training, up to £10,000 of business support funding, mentoring from RSE affiliated mentors and partners in the business community and membership to the RSE's Entrepreneurs' Club, which hosts regular business networking events.

Details of how to apply for future programmes can be found at: www.rse.org.uk/awards/enterprise-fellowships/ Calls for applications are twice per year in Spring and Autumn. The next deadline is 5pm, 3 April 2020.



Unleashing the potential

→ OPINION PIECE

Professor Andy Porter, Vice-President Business, RSE and former Enterprise Fellow

"I'll be honest and say that when I read the evaluation report and saw what some of those who have participated in the RSE Enterprise Fellowship Scheme had to say, I actually found it quite emotional. Not only do our Enterprise Fellows generate huge impact commercially, but for many of them, and here I speak from personal experience, being an Enterprise Fellow has been a pivotal moment in their lives.

"When you consider that 81% of the businesses created by our Enterprise Fellows are still operating beyond five years compared to the average survival rate of 45%, it demonstrates that, not only is the programme excellent at identifying talented and emerging entrepreneurs but also it is testament to the quality of financial, business and technical support that the RSE provides.

"What is not mentioned, but to my mind is equally as valid, is that around a quarter of these Fellows have gone on to become serial entrepreneurs and founded multiple successful businesses. The RSE Enterprise Fellowship programme not only recognises potential but also unleashes it and allows it to flourish, bringing commercial and societal benefits too."



→ CASE STUDY

Caroline Barelle
Co-founder, CEO & CSO, Elasmogen Ltd

Caroline Barelle was awarded a Scottish Enterprise and BBSRC co-supported RSE Enterprise Fellowship in 2015 to enable her to spin-out a new biotech company – Elasmogen – from the University of Aberdeen.

Elasmogen is an award-winning, next generation, therapeutic biologics company that develops soloMERS to help treat autoimmune, inflammatory diseases and cancer. Elasmogen's soloMERS – based on a protein found in sharks – are said to offer a cheaper and less invasive treatment than traditional antibodies. Simple, stable and small, the company reports that its drugs, under laboratory conditions, are ten times more potent than existing therapies on the market.

Speaking about her Enterprise

Fellowship experience, Caroline said: "I didn't know about legals, employing people, how you get investment, how you spin a company out, how you put a board together. The Enterprise Fellowship gave me the framework and the support system to go through the process. It helped make a conversion, from talking science to pitching science."

Over the year-long Fellowship, Caroline established her team, accrued significant supporting data for the product, outlined a product pipeline and developed a robust IP protected portfolio to cover the platform, the production process and the product.

Elasmogen has now grown to eight employees, secured partnerships and licensing deals and attracted investment – after a £2 million boost in January 2020, to the tune of over £7 million – to progress towards clinical trials.

Friends of the RSE Corporate Partners

Aberdeen Standard
Investments

ARUP

optos

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BT

Canon



scdi Scottish Council
for Development
and Industry

SHEPHERD+ WEDDERBURN

The RSE is grateful to its corporate members for their ongoing support. Together, we will continue to explore areas of mutual interest and benefit. From business innovation and policy to supporting entrepreneurs and international links, the RSE is strengthened by its engagement with businesses.

Find out more, visit
www.rse.org.uk/support-us

OPEN DOORS, OPEN MINDS

The RSE Autumn/Winter programme offered a variety of talks and events on a fascinating range of subjects

Doors Open Day

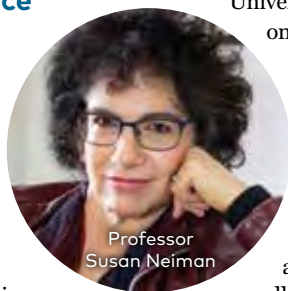
The RSE participated in Edinburgh's Doors Open Day in September and welcomed almost 600 people through the doors of its historic premises where they could discover more about the building and the history of the RSE.

Intergenerational justice

The RSE annual joint event with the Royal Institute of Philosophy involved Professor Susan Neiman, Director of the Einstein Forum, delivering a lecture on intergenerational justice. In her lecture, she explored and acknowledged the shameful actions of past generations, seeking to understand and, where possible, find something in their actions to respect.

Periodic Table

The RSE participated in the 150th-birthday celebrations of the Periodic Table, last year being the International Year of the Periodic



Professor Susan Neiman

Table, with a joint event at the RSE with the University of St Andrews, involving hands-on chemistry activities, engaging public talks and a primary schools' poster competition.

Several displays were on show on the day: the oldest known printed periodic table wall chart (facsimile) published in 1885, brought to St Andrews in 1888 and found in the University six years ago; the world's only macramé periodic table, made by crafter Jane Stewart, which consists of 200,000 knots and took 350 hours to complete; a new version of the periodic table released by the European Chemical Society, highlighting element scarcity and vulnerability; and a unique collection of stamps featuring 270 famous scientists from the collection of Richard Squires, a retired former science teacher at Trinity High School in Edinburgh.

Evidence of the inspiration that the periodic table has been to art could be heard in the performances from the St Andrews New Music Ensemble playing Nicole

Murphy's *Surface Bound* and Robin Haigh's *Hydrogen, helium etcetera*; both pieces commissioned through an international competition.

Hamish Henderson

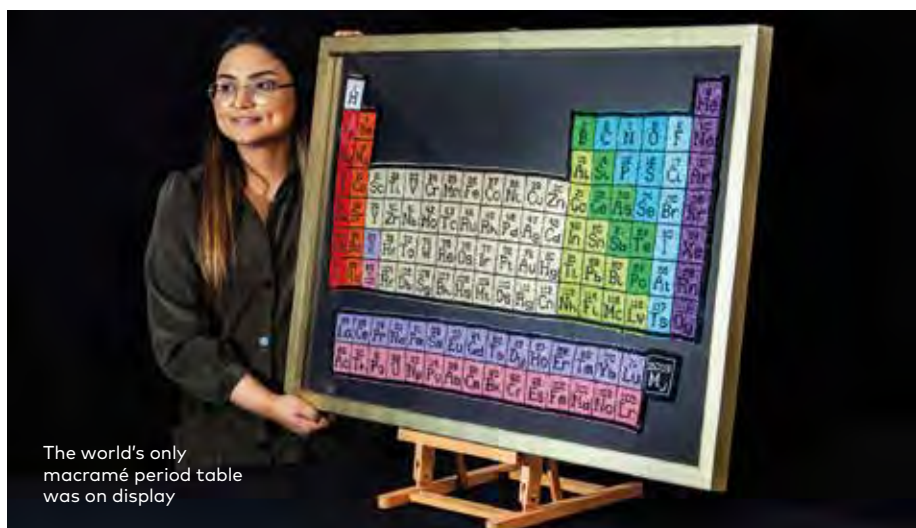
The centenary of the birth of Hamish Henderson, the Scottish poet, songwriter, intellectual and soldier, was marked with an illustrated lecture from Professor Fred Freeman of the Royal Conservatoire of Scotland, drawing upon musical examples from the singing of John Morran, a pre-eminent singer of the Scottish folk movement, and the lecturer's own moving recitations.

Festival of Politics

The RSE also had a presence at the Festival of Politics in the Scottish Parliament where RSE Fellows Professors Niamh Nic Daeid, Raffaella Ocone and Joanna Wardlaw joined Christine Graham MSP to share their personal stories of working in STEM careers, the impact of technology, how attitudes between generations have changed, the importance of school curriculum, and the need for public engagement. In addition, Peter McColl, Head of Futures and Policy at Snook and member of the RSE Young Academy of Scotland, joined a panel to discuss *The Scottish Parliament at Twenty*, which set out the challenges facing the Parliament over the next 20 years.

Drones

Finally, a joint discussion event with the Foundation for Science and Technology (FST) on the Industrial Use of Drones rounded up events for the year, with speakers from industry, academia and law giving their views on how to maximise developments in this area while mitigating the potential negative effects of drones, such as safety, privacy and noise (see article on right).



The world's only macramé period table was on display

The industrial use of drones

→ OPINION PIECE

Gavin Costigan, Chief Executive, The Foundation for Science and Technology, talks about some of the issues of using drones that require consideration

To an outsider, it seems as if unmanned aerial vehicles (UAVs), or more commonly, drones, get a bad press. From disrupting Gatwick Airport, attacking oil installations in Saudi Arabia or dropping drugs into prisons, there's a lot of focus on the negative. And that's without the worry of a well-known parcel delivery company potentially filling the skies with noisy buzzing, or people snooping on another's privacy. But drones are already saving lives, making infrastructures safer and saving money for companies across the UK, and there's a whole new industrial sector developing, offering drone services, software and analysis. The technology is changing rapidly, and in this space, the regulatory environment needs to develop too, securing benefits that drones can bring whilst tackling issues of safety, security, privacy and noise.

This challenge led the Foundation for Science and Technology (FST) and the RSE to organise two

discussion events, one in London and the other in Edinburgh, on the industrial use of drones. Those events explored the overall commercial opportunity offered by drones, and their use in particular sectors – from inspecting oil tankers at sea, to checking levels of radiation at Chernobyl. Jobs that would previously take a week could be completed in two hours, and the level of cost was sufficiently low that areas of minor damage that would previously have been discovered once leading to a precautionary shut down, could now be inspected on multiple occasions to monitor changes – keeping open facilities at significant savings in money.

Future regulation will probably need systems to monitor where all drones are, or at least those above a certain weight, with additional safeguards when flying 'Beyond Visual Line of Sight'. Pilots will need to be licensed, and cities will have a great say in where, when and how their lower level airspace can be used. As with all technologies, malicious use is more than possible, but there is a balance to be made, and the opportunities are huge. Drones are here to stay: the challenge is to regulate such that this is overwhelmingly a good thing.



Gavin Costigan



Upcoming events

→ RSE AFTER HOURS

Part of the Edinburgh Science Festival, event focusing on artificial intelligence; incorporating talks, exhibits and discussions.

Wednesday 15 April

RSE: 6–9 pm

→ RSE SPRING LECTURE

The Future of Foreign

Policy with

Baroness

Catherine

Ashton

(pictured)

Monday 27 April

RSE: 6–7.30 pm



→ RSE ANNUAL JOINT LECTURE WITH THE ROYAL ACADEMY OF ENGINEERING

Bringing Space Down to Earth

Monday 4 May

RSE: 6–7.30 pm

→ GREYFRIAR'S KIRK CELEBRATIONS FOR ITS 400TH ANNIVERSARY

Great Questions lead to

Great Works – a

day of lectures

and discussions.

Details and

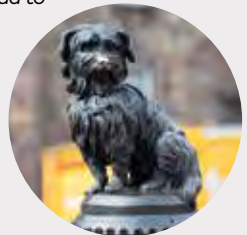
ticket booking at

bit.ly/37GVLAX

Saturday 6 June

Greyfriars Kirk:

1–4.30 pm



→ PUBLIC LECTURE

The Enlightenment in the 21st

Century with Professor Anthony

Pagden

Thursday 11 June

RSE: 6–8 pm

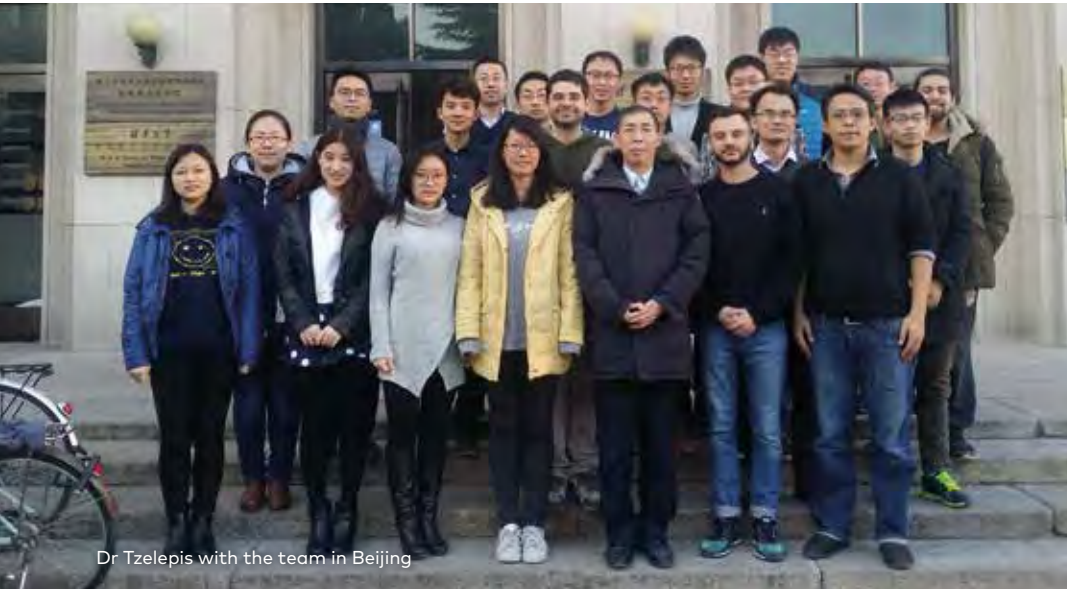
→ RSE SUMMER PROGRAMME

Curious – part of the Edinburgh Festival Fringe.

Friday 7 August–Monday 31 August

RSE

Full details of all of these events will be on the RSE website in due course.



Dr Tzelepis with the team in Beijing



Dr Tzelepis in the lab

An inspirational journey of discovery to China

RSE funding, through a John Moyes Lessells Travel Scholarship Award, helped researcher travel to university in Beijing with a world-leading team of experts and broadened his professional horizons

Dr Dimitrios Tzelepis is a Post-Doctoral Researcher in Electrical Engineering at the University of Strathclyde, specialising in power system protection, automation and control, with emphasis given to the challenges associated with renewable energy sources entering the electricity grid.

In 2016, Dr Tzelepis was a recipient of an RSE Lessells Travel Scholarship, enabling him to travel to Tsinghua University in Beijing, where he worked with a group of world-leading experts in the field of power system protection, automation and control.

He said: “The UK’s electricity grids are transforming to accommodate the nation’s vision for a decarbonised energy sector. I’m highly motivated to contribute in my own way towards making existing energy systems more accessible



Dr Tzelepis

and environmentally friendly through my work and research in electrical engineering.

“By definition, engineering is the application of mathematics, science, empirical evidence and knowledge into real life applications. Receiving funding from the RSE enabled me to travel to Tsinghua University in China where the university’s facilities allowed me to develop, exploit and test novel and advanced protection systems for future distribution and transmission networks.

“Tsinghua University’s laboratory facilities and general research strengths in the areas of power system protection, monitoring and fault location, together

with expertise in travelling waves, have had a lasting impact on my research.

Working with globally recognised experts in the field has enhanced my own professional development. Ultimately, I came away from my time at Tsinghua University as a better engineer and researcher and my academic profile has grown internationally



Tsinghua University

thanks to the opportunity to co-author publications with recognised experts in my field.

“Receiving the travel scholarship has also fostered a strong collaborative partnership between the University of Strathclyde and Tsinghua University. Following my visit, the two institutions have planned a series of joint activities, including co-supervision of PhD students, organising conferences and workshops, participating in joint bids and publication of papers in prestigious journals.”

Visit bit.ly/Lessells for details of how to apply for a John Moyes Lessells Travel Scholarship.

Scholarship has genuine star quality

Astronomy student tells how research scheme has inspired her to build a career in academia rather than industry

The RSE Cormack Vacation Scholarship scheme enables undergraduate students studying astronomy to carry out a research project of their choice at a Scottish university. The current round is open until 27 March 2020.

One of last year's recipients of a scholarship, Federica Chiti, talks of her experience and how it has made a difference to her life.

"Three years ago, I decided to leave Italy to cultivate my passion for astrophysics and joined the Magnetohydrodynamic Group at the University of Dundee to investigate the effect of electric current on magnetic field structures in the solar corona.

"I applied for a Cormack Vacation Scholarship in 2019 and was successful and spent six weeks in the summer last year tasting the life of a researcher and all the challenges that come with it. I learnt that research is all

about curiosity to investigate what is unknown; creativity to come up with new solutions; and grit to keep working even when all your ideas seem to lead you to a dead end.

"The scholarship allowed me to work on a code that finds magnetic null points, the points in space where the magnetic field vanishes and which are believed to be the proxies for magnetic reconnection and magnetic energy dissipation in the sun and the earth's magnetosphere.

"Under supervision, the code I have developed finds the null points associated with any magnetic field model, not just the one associated with the sun. It's been a learning process and I think I have learnt more from all of my mistakes whilst building the code, than reviewing it when it was correctly implemented. For example, at the beginning, the code wasn't giving me the results I expected, and I started asking myself whether I was being too slow. A chat with my supervisor helped me realise

that when it comes to research, we can never predict how things will go so there is no wrong or right pace. Most of the time, it will be hard to find the right solution to a problem at the first try, but I have learnt that this does not mean we shouldn't take risks, such as choosing alternative and unconventional routes.

"Thanks to the Cormack Vacation Scholarship, I am now determined to enter a PhD course to obtain more profound knowledge of a specific astrophysics field once I conclude my BSc in Physics with Astrophysics at Dundee.

"It has definitely helped me realise that I really enjoy the research environment, therefore I am keen to build a career in academia rather than industry".

Visit bit.ly/Cormack for details of how to apply for a Cormack Vacation Scholarship. The current deadline is Friday 27 March.



Federica Chiti

We can all play a part in stopping exploitation

Professor Alison Phipps OBE FAcSS FRSE says that individuals have the power to tackle modern slavery and they can do this by following a beginner's checklist of positive actions

The RSE, together with the Royal Society, British Academy, the Academy of Medical Sciences and the Royal Academy of Engineering, assists scientists and scholars around the world who are subjected to severe repression solely for non-violently exercising their rights, as given by the Universal Declaration of Human Rights through the International Human Rights Network.

In December 2019, to mark International Migrants Day, the RSE jointly hosted the launch of a Special Issue of *Anti-Trafficking Review* – an academic journal that promotes a human rights-based approach to anti-trafficking. This Issue was coordinated by Dr Kiril Sharapov, who explains more in his article, *The truth behind modern slavery* on page 13.

RSE Fellow Professor Alison Phipps OBE, UNESCO Chair in Refugee Integration through Languages and the Arts, University of Glasgow, writes about human-trafficking and what we as individuals can do to address it.

What to do when Awareness isn't Enough: a Beginner's Checklist

Awareness raising is often a strategy of governments and international NGOs in the pursuit of justice.

In the context of environmentalism, for example, we've seen David Attenborough's intervention shift both awareness and

practice around plastics, while, with the publication of the photograph of Aylan Kurdi in 2015, the world-wide Refugees Welcome Movement was born. In both these cases, awareness also led to some action and some reported changes in social attitudes. It's not nothing. But 'awareness raising' is also the subject of much justified scholarly critique.

Often awareness raising is exploitative and top-down, speaking for those who have been enmeshed in exploitation or conflict, rather than listening, and enabling people to articulate their own stories. Awareness raising is often dressed up in logos, leaflets and

adverts, making assumptions about literacy and trust which are erroneous. With anti-trafficking and modern slavery, where both are part of the invisible supply chains of cheap consumer products and of the marketing industry, the use of awareness raising to tackle the illegal trades and trafficking is, at best, problematic and, at worst, an attempt to use 'the master's tools to dismantle the house.'

However, while critical analysis pointing to examples of exploitative or incongruent strategies for awareness raising is important, what can we – as individuals – do to help address the problems of anti-trafficking and modern slavery? My beginner's checklist of things to do goes a bit like this:

- Don't buy goods from corporations and suppliers who are part of the modern slavery chain. There is information on this in the public domain, from resources such as Ethical Consumer, and many others.
- Consider fundraising or donating to organisations which pay a fair wage; buy fairly traded products and support Fair Trade Fortnight.
- Join organisations working to protect, through legislation and poverty reduction, those who may end up in trafficking or modern slavery. Work with trade unions to increase support for workers and unionising of workplaces world-wide.
- Contact MPs and APPGs to press for further legislation on provenance, not least in the post-Brexit trade deal contexts.
- Join or follow Human Rights organisations pressing for stronger workers' rights – such as the International Labour Movement, Amnesty International and Human Rights Watch, but also be informed about the more complex areas of work than simply 'raising awareness'.
- Think historically. Consider how the history of slavery has evolved and the different ways the state and the private sphere have interacted. Don't believe that we ended up where we are today by accident. What decisions have been taken and how might we learn to make better ones.
- As individuals, pressure organisations and businesses to ensure their procurement processes are not promoting or encouraging trafficking activities.





The truth behind modern slavery

Dr Kiril Sharapov, Associate Professor, Edinburgh Napier University, provides his personal views and research overview below.

“In March 2020, the Modern Slavery Act, designed to combat ‘modern slavery’ in the UK will mark its fifth anniversary. The Act has been criticised for advancing a simplistic crime reduction approach to anti-trafficking: once all ‘criminals’ are identified, prosecuted and imprisoned, and all victims are ‘rescued’, the problem of ‘modern slavery’ should go away.

“The 13th issue of *Anti-Trafficking Review*, launched at the RSE, focuses on the role of public awareness in combating trafficking. ‘Victims’ in such discussions are, in most cases, assumed to be naïve and uninformed ‘women and children’ duped by cunning criminals, rather than people who exercise individual agency – even if severely constrained by conflicts, violence, environmental degradation, poverty – to move across or within national borders knowing that such decisions may result in heavy restrictions on their freedom.

“My own research suggests that for the general public in countries to which people are trafficked, awareness of human trafficking does not result in a sense of reality in which the exploitation of other people is visible in their everyday lives and this needs challenging.

“Although every aspect of our daily life links us to the hardships and poverty of people in other parts of the world and/or in a factory or a farm nearby, we fail to imagine the reality of our current situation and act upon it as citizen-consumers rather than consumer-citizens.”

TOGETHER IN TAIWAN

Workshop in Taipei allowed team from Scotland to share ideas with their counterparts on global climatic and environmental change

In October 2019, the RSE and Ministry of Science and Technology (MOST) jointly funded a workshop in Taipei, to allow experts from Scotland and across Taiwan to meet and share their considerable experience in the social science dimensions of global challenges. The focus in particular was on global climatic and environmental change.

The delegation lead, Professor Chris Philo FRSE, School of Geographical and Earth Sciences, University of Glasgow, reflects below on his experience and the importance of these international collaborations funded by Scotland’s National Academy.

Reflections on a Taiwan Workshop

“I was delighted and honoured to be invited to lead a delegation of academics from Scotland to participate in and present to a workshop as part of emerging relations between the RSE and the Ministry of Science and Technology (MOST) in Taiwan.

“The proposed subject of the workshop was *Global Challenges* and, upon learning that my Taiwanese counterpart was to be Professor Jinn-Yuh Hsu (National Taiwan University), an economic geographer, I felt empowered to suggest an agenda to him that would explore social-scientific dimensions of environmentally-driven global challenges, as well as responding to certain shared features in respect of both Taiwan and Scotland. The upshot was a workshop addressing four themes: ‘resilient economies’; ‘resilient seas/coasts’; ‘climate/environmental change, migration and refugees’; and ‘climate/environmental change and mental health’.

“Such a diverse range of topics required a diverse team in terms of disciplinary backgrounds, institutional bases and other characteristics, and we managed to assemble



The entrance to National Taiwan University



From left: Dr Kiril Sharapov; Dr Katharina Kaesehage; Professor Chris Philo; Professor Marcel Jaspars; Dr Kate Botterill; Dr Paula Duffy; Dr Helen Trail; Alan Salonika and Professor Tahseen Jafry

what turned out to be a wonderfully inspiring group of people. We flew out – well aware of the problematic nature of flying long-haul to an event where climate change was centralised – and spent three full, exceptionally intense days in workshops or visiting local university facilities and staff. It was ‘full on’, but team members retained their full engagement and worked extremely well together to consistently reach across to the interests, insights, methods and findings of their Taiwanese counterparts. It was exciting and stimulating to learn about what research was being undertaken in Taiwan and we learned much from each others’ presentations, formal discussions and more informal interactions. Two or three possibilities for future collaborations emerged, prompting applications to the RSE–MOST Joint Projects Scheme, as well as plans for possible follow-up events in the future.

“Finally, let me just personally thank the participants from Scotland: Dr Kiril Sharapov (Napier University); Dr Katharina Kaesehage (University of Edinburgh); Professor Marcel Jaspars FRSE (University of Aberdeen) Dr Kate Botterill and Dr Helen Trail (both University of Glasgow); Dr Paula Duffy (University of St Andrews); and Professor Tahseen Jafry (Glasgow Caledonian University).

“And very special thanks must also go to RSE International Relations Manager Alan Salonika for his consummate organisational, diplomatic and linguistic skills, and for his calmness when tracing lost valuables and, more broadly, ‘herding cats’”.

The RSE has been busy liaising with politicians, providing expert advice on important policy issues such as energy, artificial intelligence and sustainability

Creating positive energy

The Scottish Parliament's Economy, Energy and Fair Work Committee is carrying out a three-part energy inquiry, linked to the RSE's *Scotland's Energy Future* report. A special session of the Scottish Parliament Committee was held in December 2019 and focused on the inquiry's recommendations, with RSE Inquiry Committee members Professor Rebecca Lunn



Deputy Chair Professor
Rebecca Lunn
MBE FRSE

FRSE, Professor John Underhill FRSE, Professor Gareth Harrison and Professor Gavin Little briefing MSPs on the conclusions of the report and the major challenges Scotland faces. Other issues discussed included financing for new technologies, increasing energy efficiency standards, and gaining public buy-in for decisions made on energy policy.



The SNP Conference event was well attended

Fringe benefits at conference

Throughout autumn 2019, the RSE was represented by members of the policy team at each of the main UK political party conferences. It piloted a fringe event at the SNP Conference in Aberdeen in October on the RSE's report into *Scotland's Energy Future*, which was published in June 2019.

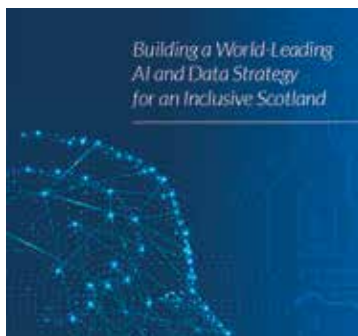
The panel comprised: Paul Wheelhouse MSP (Scottish Government Minister for Energy); Professor Gavin Little (Environmental and Public Law, University of Stirling and RSE Energy Inquiry Member); Professor Raffaella Ocone FRSE (Chair of Chemical Engineering, Heriot-Watt University); and Hazel Gulliver (Director of Engagement, Scottish Power); and was chaired by Sir George Reid FRSE, former Presiding Officer at the Scottish Parliament.

Discussion at the full-to-capacity event was around how to address the competing issues of the energy 'quadrilemma': climate change; affordability; energy security; and publicly acceptable, economically sustainable and just energy policy. There was also discussion of the RSE's call for the establishment of an independent expert advisory commission on energy policy.

Developing an Artificial Intelligence Strategy for Scotland

In September, the RSE hosted an event at which Kate Forbes MSP, Minister for Public Finance and Digital Economy, set out the Scottish Government's plans for developing Scotland's first AI Strategy. In doing so, the Scottish Government accepted the key recommendation which was made in a joint report, *Building a World-Leading AI and Data Strategy for an Inclusive Scotland*, by the RSE, the Scottish Council for Development and Industry, ScotlandIS and BT Scotland. Harnessing its multidisciplinary expertise, the RSE

plans to continue its engagement in this area and will look to shape the development of the AI strategy. As part of this, we will host a series of AI-themed talks and workshops in this year's Edinburgh Science Festival in April, as well as organising policy-related roundtables.



Dynamic Earth

Sustainability is the focus of Dynamic event

The RSE was well represented at last year's Science and the Parliament event at Dynamic Earth in November. The annual event, into its 19th year, is organised by the Royal Society of Chemistry on behalf of Scotland's STEM community. The theme for the event was sustainability and RSE Fellows involved included Professor Lesley Yellowlees, who chaired the event; Professor Sheila Rowan, Chief Scientific Adviser for Scotland, who

delivered the keynote speech; Professor David Cole-Hamilton and Professor Elise Cartmell, who both spoke on *Waste and Elements in Danger*; Professor Mandy Maclean, RSE Vice-President, who chaired a panel session that discussed what is needed to Build a Sustainable Science Workforce; and Professor Colin Graham, who contributed to this session by providing an overview of the interdisciplinary learning developments he has been leading, on behalf of RSE.

Both the RSE and Young Academy of Scotland hosted exhibition stands, enabling RSE staff to engage with attendees.

Pictures of inspiration will hit the road

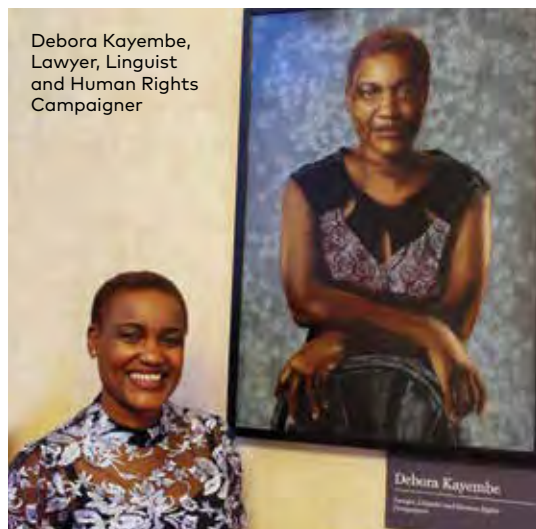
The RSE Young Academy of Scotland (YAS) launched its At-Risk Academic Refugees (ARAR) initiative in 2016, to recognise talented young professionals from Scotland's refugee and displaced migrant communities.

As the first of its kind in the world, this initiative provides encouragement to outstanding members of the refugee and displaced migrant communities to apply to YAS, and offers support with the application process.

In 2019, the RSE commissioned artist I.D. Campbell to produce portraits of the ARAR members as a way of celebrating their involvement with the RSE and to raise their profiles. The portraits went on display at the RSE during the summer events programme in August and will be travelling around Scotland throughout 2020 for a series of events that share the story of the ARAR initiative. Details will be confirmed in the near future.



I.D. Campbell was commissioned to produce portraits of ARAR members



Debora Kayembe, Lawyer, Linguist and Human Rights Campaigner



Mohamed Zahar Al Bakour, PhD Candidate in Biomedical Sciences, University of Aberdeen

YAS ready for the challenge

The RSE Young Academy of Scotland has launched a new strategic plan, which will span 2020–2025. With the aim of utilising its members' diverse skills, knowledge and interests to achieve societal change, the new strategy identifies five Grand Challenges facing society, around which the organisation will focus its work.

These Grand Challenges build on the work YAS has done since it was established

by the RSE in 2011, but also aim to address more recent significant issues. YAS members want to contribute to a society where collective decisions are made, based on evidence and constructive discussion. They want to ensure that Scotland has net-zero carbon emissions before 2045. They want to increase Scotland's positive role in the world, so YAS can share its universal human rights-based approach. YAS wants to end health inequalities, on the basis of

income, gender, sexuality, race, disability, age and sex. YAS will do this by developing its work on improving the experience of death, menstruation, miscarriage, obesity and physical and mental health. And the organisation wants to translate Scotland's excellent curiosity-led research into social and economic impact.

YAS recognises that it won't solve these challenges alone. However, it is committed to reaching out to communities and institutions across Scotland and beyond to work together in tackling these Grand Challenges.



Getting beyond the stigma

In The Last Word?, Fellows raise issues based on their research and experience in their specialist fields. Here, Professor Stephen Lawrie and Professor Myrna Weissman discuss the misunderstanding and stigma of depression and schizophrenia

Depression is one of the most common mental illnesses, with a current prevalence of 5% and lifetime risk of 20%. Schizophrenia and related psychotic disorders affect up to 5% of the population over the average lifetime and are typically the most severe psychiatric disorders. Between them, they account for more disability than heart disease and cancer combined. Depression and schizophrenia begin early in adolescence or young adulthood, impairing the sufferer's ability to effectively participate in everyday occupational and social activities. Such difficulties are exacerbated by all too common misunderstanding, prejudice and discrimination. Societal, health, professional and self stigma can be even more disabling than the conditions themselves.

Substantial progress has been made in elucidating the genetic and environmental causes, and biological associations, of depression and schizophrenia. It is true, however, that the gold standard diagnostic tests remain the use of standard questions about key symptoms.

Antidepressant and antipsychotic drugs reduce symptoms to a clinically significant extent in the majority of those who take them, and if responders carry on taking them, relapse rates are reduced from around 40–50% a year to 10–15%. Cognitive-behavioural therapy and interpersonal therapy are two of the most evidence-based psychotherapies and are similarly effective for depression. Further, combined biomedical and psychosocial therapeutic approaches have additive effects.

The problem is that only a minority of people with depression or schizophrenia actually get treatment and carry on with it.

It also has to be acknowledged that even with effective treatment, some symptoms and disabilities linger and increase the chances of relapse.

There is good evidence that successful treatment of a depressed mother, reducing her depressive symptoms, has positive effects on her school-aged and adolescent children and can be sustained at least for a year after remission. The effect on offspring has been shown in clinical trials, treating depressed mothers with medication or psychotherapy. If a mother's treatment is not successful the children stay the same or even get a little bit worse. The key component seems to be optimally delivered therapy targeting the symptoms of maternal depression.

As the effects of maternal depression are evident early in the offspring, there is need for the earliest possible screening and treatment in pregnancy. In 2019, the U.S. Preventive Task Force on depression in pregnant women found about a 50% reduction in perinatal depression when the women at increased risk were referred to interventions such as psychotherapy and antidepressants.

The take-home message is very clear and strong. Depression is not a person's fault – it is not a moral failing. Schizophrenia has nothing to do with a 'split personality' and is only associated with violence if untreated. The symptoms of a depressive illness are not obscure; those of a psychotic disorder even less so. Both are heritable, disabling illnesses that should not be stigmatised and should be treated. There are excellent treatments which can help reduce and potentially prevent depression, or schizophrenia. Screening is cutting edge and effective early intervention is state of the art. The ultimate goal of prevention is on the horizon.



Professor Stephen Lawrie FRCPsych, FRCP (Edin), FRSE is Professor of Psychiatry & Neuroimaging at the University of Edinburgh and a Consultant Psychiatrist. His research concentrates on using genetic, clinical, neuroimaging and computational approaches to better understand schizophrenia with a view to enhancing the ability to predict and prevent the condition, and to develop treatments to better manage established cases.

Professor Myrna Weissman PhD, an epidemiologist, is the Diane Goldman Kemper Family Professor of Epidemiology and Psychiatry at Columbia University, New York State Psychiatric Institute. Her current research is on the transmission of depression across generations using clinical and biological measures. She has longstanding links with Scotland, advises NHS Lothian on the implementation of interpersonal therapy for depression and other conditions and is on the Scientific Advisory Board of the Institute of Health and Wellbeing at the University of Glasgow. She developed and tested interpersonal psychotherapy with her late husband.



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