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THE MAGAZINE OF SCOTLAND'S NATIONAL ACADEMY

SKILLS FOR THE FUTURE

Douglas Morrison believes we need greater flexibility in tertiary education pathways to ensure learners are developing industry-relevant competencies

ALSO IN THIS ISSUE:

New Fellows | RSE in Lewis and Harris | James Hutton tercentenary | Union Chain Bridge restoration

Welcome to the Spring 2024 edition of *ReSourcE*. In this edition, we explore the future of education in Scotland as our primary focus. Learning, in all its forms, transcends boundaries and embraces every stage of life, and as Scotland's National Academy, the RSE recognises the pivotal role of education in shaping our collective future.

Within these pages, you will delve into diverse facets of education transformation: the imperative of interdisciplinary learning and collaboration in shaping the future; the hurdles in bridging socioeconomic disparities in education; the evolution of early learning and childcare in unlocking every child's potential; the need to foster greater ethical literacy within Scottish schools; the role of outdoor education in addressing the climate emergency; the future of data collection on children; the unprecedented challenges confronting the college sector, and more.

Contributors from the RSE Fellowship, Young Academy of Scotland, and beyond, provide valuable insights into addressing significant issues and exploring innovative strategies and emerging challenges that are reshaping the landscape of Scottish education.

As we navigate the complex terrain of education and skills, it's imperative to recognise the interconnectedness of the system, spanning from early years to lifelong learning. In navigating these challenges, the RSE stands as a beacon of multidisciplinary expertise and, through our Education Committee, is well-placed to steer Scotland toward a future where education serves as both a catalyst for personal achievement and a cornerstone of our nation's prosperity.

As always, we welcome your feedback and ideas for future editions. Share your thoughts by emailing us at comms@theRSE.org.uk

Professor Sir John Ball FRS PRSE
President, RSE

ON THE COVER:
Douglas Morrison, Deputy Chief Executive Officer at Built Environment – Smarter Transformation; Chair of South Lanarkshire College, YAS and RSE Education Committee member

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RSE report calls for a radical rethink of tree planting in Scotland

The RSE has published a report on the environmental and social impacts of public subsidies for the forestry sector in Scotland.

The report makes a series of recommendations for how public financial support for tree planting in Scotland can be reorganised to better serve Scotland's people, environment, forestry industry, and public purse.

Professor Ian Wall FRSE, who chaired the group compiling the report, said: "The health of the population, and the health of the planet, is reliant on a robust, biologically diverse environment. The role of trees – the right trees in the right place – in improving biodiversity, carbon-capture, and wellbeing in both urban and rural environments cannot be overstated.

"That is why the main recommendation of the report is that subsidies for commercial forestry, which are poorer at delivering these needs, should be redirected to long-term, mixed native tree planting and other benefits."

The report concludes that commercial conifer forestry, which benefits from 100% tax relief, no longer needs public subsidies that distort the market, reflected in the rapid increase in the price of land for tree planting, and that the money should be redirected to maximise the common good.

To read the report, visit bit.ly/RSEtreeplanting

RSE STRENGTHENS TIES WITH TAIWAN'S NSTC

Signifying a joint aspiration to promote and strengthen scientific cooperation between Scotland and Taiwan, the RSE signed a refreshed Memorandum of Understanding (MoU) with the National Science and Technology Council, Taiwan (NSTC), on Friday 22 March in Taipei.

The RSE and the NSTC – formerly the Ministry of Science and Technology, Taiwan – first entered a formal agreement in November 2001. The signing of this renewed MoU will build on the alliance established and the activities delivered through the previous agreement.

Signed by RSE Vice President, International, Professor Mona Siddiqui FRSE, and Deputy Minister of NSTC, Dr Yi-Juang Chern, the agreement sets out the commitment to fund academic exchanges between the two countries through International Bilateral Visits, International Joint Projects, and joint activity to promote research of importance for the scholarly communities in Scotland and Taiwan.

Professor Siddiqui commented: "The RSE is delighted to be formalising its partnership with the NSTC. Developing strategic affiliations is at the heart of the RSE's international work to ensure we engage with opportunities across the globe to showcase the best of Scottish research, drive international networks, and address global challenges. The signing of this MoU aligns with the RSE's core mission to make knowledge useful and compounds the mutual goal of both our institutions to further international research collaboration."

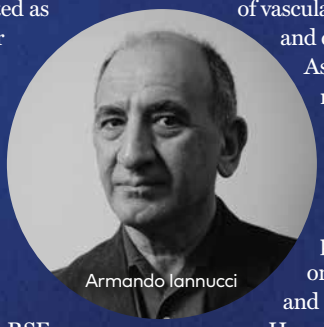
RSE-NSTC MoU signing with Professor Mona Siddiqui (left) and Dr Yi-Juang Chern (right)

Speaking at the ceremony, Deputy Minister Chern emphasised that the renewal of the MoU will enhance the partnership between Taiwan and Scotland in science and technology cooperation, with future endeavours involving more and deeper interchange activities. In addressing global challenges, she believed that, collectively, both sides could solve several important global issues for a better future for Taiwan and for Scotland.

Eminent cultural and scientific figures named as RSE Fellows

The RSE has announced this year's cohort of new Fellows. Nominated for their individual excellence in a wide range of fields such as physics, chemistry, informatics, literature, law, social sciences, and business, 57 individuals will be joining the 1,800 current Fellows of the RSE, Scotland's National Academy.

Armando Iannucci was elected as an Honorary Fellow, known for award-winning satirical films and programmes such as *The Death of Stalin* and *The Thick of It*. He is Vice President of the Royal Television Society and takes an active interest in political issues and the functioning of democracy.


Armando Iannucci

He said: "I am thrilled to be elected to the Fellowship of the RSE; this is confirmation from the champions of the highest standards of academic and cultural excellence in Scotland that writing jokes is an honourable pursuit.

"This recognition will spur me on to make more people laugh louder, longer, and harder than ever before, and will remind me at all times that it's as equally important to make people think as well as laugh. I promise to do my best."

He was elected alongside one other Honorary Fellow, health and social care expert and Chair of both the Royal College of Physicians and Dementia UK, Professor David Croisdale-Appleby.

Broadcaster and journalist Sally Magnusson was also elected for her charity work and her own dementia charity Playlist for Life.

Sally Magnusson

She said: "It's a tremendous honour to be elected as a Fellow. The RSE has a centuries-old history as Scotland's National Academy and I'm proud to belong to it. I look forward to playing my part in its longstanding mission to deploy knowledge for public good."

Professor Jason Gill, Professor of Cardiometabolic Health at the University of Glasgow, was elected for his major contributions to the prevention and management of vascular, metabolic, and chronic diseases.

Professor Jason Gill

As well as influencing national health guidelines, he has contributed to the communication of these public health issues with a range of television programmes, broadcasts on BBC1, BBC2, ITV, and Channel 4.

He said: "The broad and multi-disciplinary nature of the Society has never been more important, given the complex nature of the challenges facing society which increasingly require solutions involving collaboration across disciplines and sectors.

"My own work exploring how physical activity, diet and excess body weight affect health, why these effects are different in different people, and how to target and support effective long-term health behaviour change provides a key example of the need for multi-disciplinary collaboration between biological, medical, and social scientists working together with external stakeholders to develop effective solutions. I am honoured to have been elected."

Professor Elham Kashefi

Professor Elham Kashefi of the University of Edinburgh and Chief Scientist at the UK National Quantum Computing Centre (NQCC) is a world-leader in her field.

Among a raft of achievements, she developed the world's first method for secure cloud quantum computing. She called her election "a thrilling opportunity".

She said: "Scottish universities have pioneered all aspects of quantum technologies for the last few decades. Only last year, we opened Quantum Software Lab (QSL) in partnership with NQCC, making Edinburgh one of the quantum capitals of the world. As the director of the QSL and NQCC Chief Scientist, I'm delighted to have the opportunity to utilise the RSE's platform to bring the quantum wave beyond our academic circles, influencing policymakers. Our rich innovative ecosystem in Scotland will ensure everyone is aware and ready for this mind-blowing new emerging technology."

President of the RSE, Professor Sir John Ball PRSE, said: "It is an immense honour to extend a warm welcome to each of our distinguished new Fellows.

"Individually, they embody exceptional dedication and accomplishment spanning multiple sectors and disciplines. Collectively, they demonstrate a profound commitment and determination to make meaningful contributions through their endeavours.

"From groundbreaking research that redefines our understanding to the creative pursuits that inspire and enrich our cultural landscape, the RSE proudly embraces the brightest minds, leveraging their unique expertise and perspectives for the betterment of society.

"As Scotland's National Academy, we remain committed to mobilising a diverse array of expertise to confront society's most pressing challenges, and I am certain that our new Fellows will prove invaluable assets to the RSE."

The full list of new Fellows can be found on the RSE website: bit.ly/RSEnewfellows24

> "THIS RECOGNITION WILL SPUR ME ON TO MAKE MORE PEOPLE LAUGH LOUDER, LONGER, AND HARDER THAN EVER BEFORE, AND WILL REMIND ME AT ALL TIMES THAT IT'S AS EQUALLY IMPORTANT TO MAKE PEOPLE THINK AS WELL AS LAUGH. I PROMISE TO DO MY BEST"

The future of education in Scotland

Scotland has a proud history of high-quality education and training recognised worldwide. It has prepared our people for successful futures enabling the development of our economy through the changes of the 20th century. However, we cannot rest on our laurels. Education systems around the world are reforming and Scotland must do the same or risk falling behind.

The pace of economic and social change will continue to accelerate dramatically, and the current programme of reform is attempting to ensure our educational and skills system continues to deliver the relevant knowledge and skills to support Scotland's future success while enabling individuals to achieve their full potential.

Recently, there have been multiple reviews of education and reports published. In the school sector, they have centred around assessment and qualifications,[1] resulting in around 130 recommendations for reform. Economic and environmental policy documents[2] from across the Scottish Government also include recommendations for the skills and learning agenda.

However, there appears to be no overall strategy or policy that links these recommendations – often seeming disconnected or even in conflict with one another – with little practical action taken. In the face of calls for clarity and action from educational experts and from the sector, further consultations and engagements have continued rather than decision and action.

The recent debate in parliament and the survey of school and college teachers commissioned by the Scottish Government following the Independent Review of Qualifications and Assessment[1] only serves to highlight that a consensus on reform does not exist. There was no consensus as to whether or when to adopt the recommendations, and no detailed indication of the government's plans for providing clarity on the way forward or an action plan.

The education and skills system is a continuum, stretching from the early years to lifelong learning. It supports initial learning, reskilling, and upskilling at all life stages. Learning occurs in nurseries, schools, colleges, universities, training, workplaces, and in many other domains. Changes introduced to one aspect of this intricate whole can have profound and sometimes unintended impacts on other parts of the system.

Dr Janet Brown

As we move into the second quarter of the 21st century, it is critical that the Scottish education and skills system delivers for learners and for Scotland. We need an overarching, long-term vision that is developed into an achievable policy with measurable impact and which recognises the interdependency of the system and enables it to be flexible and responsive.

Experience has shown us that achieving consensus on the purpose of education is easier said than done. In its last review of the Curriculum for Excellence,[3] the Organisation for Economic Co-operation and Development (OECD) noted that education is heavily politicised in Scotland and suggested that it has tended to revert to structural reforms in place of the deeper and often more impactful cultural reform that is most needed to improve outcomes. If current progress is any indication, such cultural reform remains far off.

The time has come to reconsider how society defines success for the system. National rhetoric often focuses on traditional qualifications and the university pipeline, continuing to overlook – or undervalue – alternative forms of learning and attainment such as apprenticeships and wider achievement awards.

Recognising the importance of the education and skills system and the place that it holds in the wider economic, social, and environmental policy agenda, the RSE Education Committee remains focused on several key priorities: promoting early years education; engaging with the Scottish Government's reform agenda; sparking dialogue on the future of Scottish education; and assessing the coherence of existing policies and emerging recommendations across the education reform landscape and other policies. Furthermore, by promoting parity of esteem across a diversity of pathways, Scotland can ensure that learners are directed towards destinations that align with both their individual interests and the broader needs of the economy.

The RSE with its independence and multidisciplinary expertise is well-placed to engage with this challenge and explore what Scotland needs from its education, skills and assessment system, and how it's best delivered. To find out more about our work on education and skills, visit the RSE website: bit.ly/RSEeducationcommittee

Dr Janet Brown FRSE, Non-Executive Director, Edinburgh Science Ltd; RSE Education Committee Convener

References

[1] Scottish Government reviews – education: bit.ly/SGrevedskills

[2] Scottish Government reviews – economy and environment: bit.ly/SGrevedskills

[3] Scotland's Curriculum for Excellence, OECD: bit.ly/OECDcurrexc

Embracing competence:

Scotland's tertiary system in a changing world

I am a proud product of the Scottish education system. Having left school at 15 to pursue a career in the Royal Navy, I returned to Scotland with my Naval qualifications unrecognised and my employment options restricted. I was fortunate to secure an apprenticeship as a stonemason and began my learning journey at Glasgow College of Building and Printing, now City of Glasgow College, where I was supported by highly skilled lecturers with industry relevant expertise and a keen awareness of good educational practice.

Having completed my apprenticeship, I secured a lecturing role at the College and went on to become qualified as a teacher in further education at the University of Dundee. I subsequently enrolled in a business degree at Glasgow Caledonian University, followed by a master's degree in technology enhanced learning at the University of Strathclyde – supported throughout by exceptional lecturers, supervisors, and support services.

While my journey is by no means unique, I have the unusual privilege of having engaged with Scotland's education system from a multitude of perspectives – as an apprentice, an educator and lifelong learner, and latterly as Deputy Chief Executive Officer at Built Environment – Smarter Transformation and recently appointed Chair of South Lanarkshire College.

My appreciation for Scotland's tertiary education sector remains undimmed although I now see a sector at an inflection point, struggling to maintain pace with an ever-evolving landscape, burdened by systemic challenges relating to fiscal restraints, diminishing student places and support services, policy uncertainty, and an increasingly cluttered and competitive operating environment.

Tension and misalignment between our educational and economic policies has created an environment in which we fluctuate between knowledge and skills focused economic models. The 'parity of esteem' between further and higher education continues to polarise and reinforces the public perception of 'good' and 'compromise' pathways. Societally, we value linear models of education, from school, to university, to employment, over lifelong flexible models, and gear our young people to value professional qualifications over vocational and technical equivalents.

However, as we experience industrial shifts towards the integration of robotics, artificial intelligence, and machine learning alongside the decentralisation and democratisation of knowledge, perhaps it is time that we consider placing 'competence' – the combination of knowledge, skills, behaviours, and experiences – at the heart of our policy development.

I propose we position competence as a national utility, managing and investing in the supply and demand of skilled labour in line with our socio-economic policy objectives. This requires greater flexibility and funding models which are geared towards supporting our tertiary institutes to deliver a greater variety of programme types, specifically reducing full-time provision, and boosting part-time, short course, and micro credentialled learning opportunities.

In our response to a confluence of generational crisis and opportunity relating to climate change, energy security, geopolitical instability, and technological revolution, we need to further embrace interdisciplinary learning as an alternative to occupationally siloed pathways. We need to empower learners to have greater flexibility in pathways aligned with emergent opportunity to ensure they are developing industry-relevant competencies that will enhance their employability and wider contribution to society.

Our tertiary institutes have been conceptualised as civic anchors and rightly so. We need to ensure, however, that the systemic challenges faced by the sector do not result in an anchoring effect on our socio-economic and environmental ambitions.

I believe an effective, adequately resourced tertiary education sector is the backbone of a well-functioning economy. The abundance of policy reviews and planned reforms led recently by the Scottish Government has created an environment of uncertainty for the sector and we desperately need to find a clear way forward to enable colleges and universities to collaboratively develop multi-year investment plans, engage in longer-term co-designed curriculum pathways, and demonstrate greater fiscal autonomy.

My ask, therefore, of those responsible for policy development, is to place competence at the heart of our policy objectives by prioritising interdisciplinary learning alongside more flexible and customisable pathways. I believe that ensuring greater connectivity throughout our tertiary provision will enable current and future generations to experience the lifelong engagement I have had the privilege to enjoy and will ensure that Scotland is well equipped to embrace the challenges and opportunities ahead.

Douglas Morrison, Deputy Chief Executive Officer at Built Environment – Smarter Transformation; Chair of South Lanarkshire College, Young Academy of Scotland and RSE Education Committee member

Douglas Morrison

Reimagining education: Embracing interdisciplinary learning

In the 20th century, Scotland took pride in the breadth, diversity, and quality of its education system. Yet despite the launch of Curriculum for Excellence in 2004, secondary school curricula and qualifications have remained stubbornly subject-driven.

Young learners make subject and qualifications choices around age 14 – a very young age to be making important decisions that influence long-term learning pathways and outcomes. Meanwhile the world is changing profoundly. The global challenges of the 21st century – health and wellbeing, climate change, food production, clean energy, conflict, migration, AI, and challenges to democracy and truth itself – all transcend the traditional subject boundaries around which our education system has been constructed and sustained through subject-led qualifications.

A rebalancing towards much greater breadth of learning and skills development is required. However, breadth should not entail studying more subjects but should focus on exploring the connections between subjects. Interdisciplinary and cross-curricular learning (IDL) is a way of learning in which learners draw on knowledge, understanding, and skills from two or more subjects to solve a problem or advance our understanding of a concept or idea that extends beyond the scope of any one subject.

IDL is not yet widely implemented in the Scottish qualifications, yet is one of the 'four contexts for learning' of Curriculum for Excellence and a key component of the Scottish Diploma of Achievement proposed in the Hayward Committee's recent review,[1] which was strongly endorsed by the RSE Education Committee. Knowing how to learn, and motivating learners to want to learn, are becoming as important as what they learn.

The RSE has worked to explore, understand and articulate IDL to teachers and educators – in schools and across the education system, through its landmark 2019 conference[2] and advice papers. A key development from the conference, supported by teacher delegates, has been an online IDL support website[3] and forum for teachers and educators. This provides a wider and deeper understanding of IDL through a series of blog posts and the sharing of practical interdisciplinary classroom resources and ideas connecting knowledge and understanding across a range of levels and curriculum areas.

Education serves multiple purposes: supporting the economy; preparing individuals for employment; and enhancing their understanding of the world and their role within it. However, the jobs for which our education system prepares young learners may not even exist by the time they enter the workforce. Higher education focuses more on educating students, creating, sharing knowledge, and developing subject-specific skills. This creates a tension. While many jobs continue to value specialist knowledge, understanding and training, an overwhelming majority (>86%) of large employers (Institute of Student Employers) now say they no longer require higher education graduates with specific subject specialisms, while 96% of graduates said they had changed careers by age 24.[4] Instead, employers increasingly prioritise transferable skills and attributes, breadth of knowledge and experience, adaptability, cross-disciplinary thinking, and interpersonal skills – all skills that can be transferred from one role to another across employment sectors.

> "96% OF GRADUATES SAID THEY HAD CHANGED CAREERS BY AGE 24"

Professor Colin Graham

The UK's newest university, the London Interdisciplinary School (lis.ac.uk), has a problem-led curriculum, 'teaching undergraduates, graduates, and professionals how to tackle complex, real-world problems by applying knowledge and skills from a range of disciplines,' and embracing science, humanities, and the arts. Other universities are now developing broadly interdisciplinary curricula or requiring a proportion of their undergraduate teaching to take the form of interdisciplinary modules to broaden the mindsets of students entering higher education.

Interdisciplinary learning typically involves collaborative working towards shared goals, as widely practiced in the workplace. 'Collaboration' was the leading 'word cloud' word selected by delegates at the RSE's 2019 IDL conference. Yet most of our secondary and higher education and qualifications remain focused on individual achievements. Collaboration requires a major culture shift in education and in learner mindsets. The systemic development of more interdisciplinary and collaborative approaches to learning would make a major contribution to the development of 'job-ready' students and graduates.

Professor Colin Graham FRSE,
Senior Honorary Professorial Fellow,
The University of Edinburgh; RSE Education Committee member

References

[1] It's Our Future – Independent Review of Qualifications and Assessment: bit.ly/SGqualreview

[2] Interdisciplinary learning: Creative thinking for a complex world: bit.ly/RSEIDLconf

[3] idlnetwork.substack.com

[4] The link between study and life is broken. We can do better, University World News: bit.ly/UWNstudyandlife

Nurturing Scotland's early learning: challenges and change

It is increasingly acknowledged that early learning and childcare (ELC) serves as the bedrock for a child's future success, fostering their development and laying the foundation for lifelong learning.

In Scotland, as the landscape of ELC evolves, both families and service providers are confronted with a myriad of challenges alongside promising opportunities. From political aspirations towards growing access to services while juggling the inevitable budget and workforce implications, the sector stands at a critical juncture, requiring strategic foresight and collaborative efforts to navigate the complexities ahead.

One of the foremost challenges facing Scottish ELC is the squeezing of the system from both ends – as increased access to services for children aged from birth to three years goes head-to-head with increasing numbers of families choosing to use their new legal right to defer their child's entry to primary school for a year, perhaps drifting slowly towards a change in the age at which our children start formal schooling. This demographic shift places strain on existing facilities and necessitates innovative approaches to accommodate the growing demands while maintaining ambitious quality standards.

Crucial to success is the availability of a highly qualified and dedicated workforce. While strides have been made in enhancing qualification levels and professional development opportunities, disparities in terms and conditions persist between the public sector and other providers. Addressing these inequities will help to foster a more cohesive and inclusive ELC system but solutions are not without cost. While inequities exist, however, Scotland may continue to struggle with attracting the high-calibre workforce in the numbers it needs. Chicken or egg? Which comes first?

Heather Douglas

Equity also extends to meeting the needs of children with additional requirements, including those with disabilities or developmental delays. As the level of children's needs rises, the sector must prioritise inclusivity and accessibility, fostering environments that support every child's unique journey towards learning and growth, but this needs targeted investment in training, resources and specialised support services to ensure no child is left behind.

Looking towards the future, the integration of artificial intelligence, for example, presents both challenges and opportunities for the Scottish ELC landscape, just as it does for the rest of education. While AI-driven technologies hold potential to enhance personalised learning experiences and streamline administrative processes, they also raise concerns about data privacy, algorithmic bias and the human touch in early childhood education. The challenge will be to harness the capability of AI while safeguarding the wellbeing of our youngest learners.

In the face of these multifaceted challenges, Scottish ELC could seize the transformative opportunities to reshape the future of early education. By fostering collaboration across the sector, investing in workforce development, prioritising equity and inclusion, and embracing emerging technologies with caution and foresight, Scotland can cultivate a vibrant ELC system that fully nurtures the holistic development of every child.

As Scotland aspires to becoming the best place for every child to grow up, it must continue in its commitment to prioritising early learning and childcare as a cornerstone of education, social and economic development. By addressing current challenges with innovation, collaboration and a true commitment to equity, we can lay the groundwork for a brighter future where every child has the opportunity to reach their full potential.

Heather Douglas, Head of Early Learning & Childcare, Glasgow City Council; RSE Education Committee member

Shining a light on island communities

The RSE's Islands – past, present, and future event series puts the complex stories of Scotland's island communities in the spotlight – looking back, taking stock, and imagining the future

With each instalment taking place in a different island community and live-streamed to ensure the widest possible reach, the RSE aims to support networks of learning and knowledge sharing in the islands as well as Scotland as a whole.

The first event in the series, *Islands – past*, took place on Skye in spring 2023, looking backwards to explore the exciting and complex history of the Scottish islands.

In March this year, the University of Highlands and Islands (UHI) hosted *Islands – present*, held on Lewis and Harris, examining present opportunities and challenges facing and shaping the Scottish islands.

Led by Professor Chris Whatley FRSE and Professor Des Thompson FRSE, the event aimed to put issues facing the islands, and islanders, front and centre. What are the situations facing different island communities currently, and how has the past influenced the current state of affairs?

Professor Chris Whatley

Historian Professor Whatley challenged the idea that the Scottish islands were on the periphery of the country and its affairs – rather they are the first glimpse of Scotland for any travellers arriving by air, and in the past were the equivalent of the 'maritime M1'. Looked at on a traditional map, Professor Whatley explained, the islands are on the fringe and, in the case of Shetland, often boxed out and moved to suit the page. However, whether in eras past or in the present day, if one simply looks at them from a different point of approach, their importance is plain to see.

Among talks from a range of speakers from varying backgrounds, the audience heard about successful community land ownership projects on Harris and how these have led to an increase in the populations there; a study – conducted from space – of the changing fortunes of peatlands across Scotland; an in-depth look at ways to use nature to overcome the climate-nature crisis; and a wide-ranging view of issues facing crofters and crofting.

Professor Whatley said: "The *Islands – present* event was all that we hoped it would be and followed on seamlessly from the previous event held in Skye last year. There was genuine engagement between RSE Fellows, our UHI partners, and a range of passionate and enormously well-informed speakers from the island communities. As a relationship building event, and an exercise in sharing vital information, it was an immense success."

The weekend began with astronomer Dr Anne-Marie Weijmans of the University of St Andrews presenting her talk on the secret lives of galaxies at Stornoway Library. The following day, Dr Weijmans attended Sir E Scott School in Tarbert, Harris, to give primary school children a talk about the nature of the cosmos.

From exploring the night sky to a fascinating range of talks, *Islands – present* provided a great opportunity to share research and connect

From there, the proceedings moved to the UHI campus in Stornoway. With a focus on community ownership of land on the Scottish islands, Dr Rona Campbell of Highlands and Islands Enterprise, David Cameron of the North Harris Trust, and Agnes Rennie of the Galson Estate Trust gave an overview of the study, practice and impact of community land ownership.

Dr Campbell explained that, as a result of the Covid-19 pandemic, a new understanding of community resilience had been found. She added that according to her study, for some community trusts, community land ownership was a good model for local development.

David Cameron then gave an overview of the successes of community ownership of North Harris. He explained that 63% of land in the Outer Hebrides is in community ownership, and 70% of the population now live on that land. He outlined the success of the West and North Harris Trusts, and how prioritising social housing, business units, renewable energy projects, and the natural and cultural heritage of the area, helped to raise the population. The story in North Harris is very similar, following a community purchase of the area in 2003.

Dr Anne-Marie Weijmans giving a talk at Sir E Scott School in Tarbert, Harris

Agnes Rennie spoke of her role in the Galson Estate Trust, the successes that community ownership has brought to the area in the north of Lewis, and the need for government to take the lead to improve the prospects for similar projects.

With a focus on the natural world, Professor Josephine Pemberton FRSE presented her study of Soay sheep on St Kilda and David Maclennan of NatureScot gave a talk on using nature to help meet the challenge of the climate/nature crisis.

Professor Roxane Andersen of the UHI presented her study into the health of peat bogs in Scotland, which had been conducted using satellite imagery. She has constructed a detailed map to track the health and resilience of peat bogs in Scotland over time. Professor Andersen opened by explaining that northern peatlands store roughly one third of the Earth's soil carbon, so tracking their size and condition is vital.

She explained that peat has a porous and elastic quality, meaning it can respond to changes in water and gas content. This is known as 'bog breathing'. Her study uses satellite imaging to detect small changes in the surface motion of peatlands – timing, amplitude, regularity, shape – to then understand how stable and healthy these areas are. Ultimately, the study has proved successful in predicting 'bog bursts', caused in short by over-saturation, several months in advance, and studying how peat bogs respond to periods of drought.

Professor Thompson FRSE said: "We had a great range of exceptional presentations reflecting cutting-edge research undertaken or planned on the islands. The event uniquely combined social, political, economic, and scientific perspectives. The almost 40 years' study of Soay sheep on St Kilda is revolutionising our understanding of evolution and genetics, ageing, and parasite infection in a natural setting."

The event was not only held in person at UHI's Stornoway campus but streamed live and recorded for an audience up and down the country. Whether the subject at hand dealt with hard scientific studies in the case of peatlands or Soay sheep, or wider reaching social issues impacting the islands such as repopulation and crofting, the audience was engaged and involved in each of the issues raised.

You can watch the recording of the weekend's *Islands – present* stream on the RSE's YouTube channel: youtube.com/TheRoyalSocietyofEdinburgh

The RSE's third event, *Islands – future*, is set to take place on Orkney in June.

James Hutton: A timeless legacy

2026 will mark the tercentenary of RSE founding Fellow and the father of modern geology

The founding of the Royal Society of Edinburgh (RSE) in 1783 was the product of a clash of huge egos, fierce academic rivalry, and political infighting. It was typical of James Hutton that he took no part in the conflict – and possibly was unaware that it was happening at all. He lived quietly, outside the universities, and apparently took no interest in politics.

Yet the RSE gave Hutton – the subject of my biography *James Hutton, The Genius of Time*[1] – a position at the centre of the intellectual life of Enlightenment Edinburgh and a platform from which to launch his ideas and expose them to critical scrutiny. He became a founding Fellow, joined the RSE Council, and was one of the first to read a paper at its meetings.

James Hutton (1726–1797) by Sir Henry Raeburn ©Scottish National Portrait Gallery

Hutton deserves a place among the titans of the Enlightenment. He is revered among geologists as the man who formulated the basic theory on which the modern discipline is based, yet compared to his close friends Adam Smith and James Watt he is hardly known at all to non-specialists.

The tercentenary of his birth in 2026 will give an opportunity to try to restore the balance. That year will also mark 250 years since the publication of Adam Smith's *The Wealth of Nations* and the death of the philosopher David Hume. There are moves to persuade the Scottish Government to name 2026 as the year of Enlightenment with Hutton, Smith, and Hume as its central characters.

Had the RSE not been formed we might know a lot less about Hutton's work and our view of the development of the Earth might have been different. He was an active member for the rest of his life but his influence persisted long after his death. Over the next half-century, the RSE became a bastion of support for Hutton's theories against sustained attacks from men with much higher academic standing than he possessed.

By 1783 Hutton was in his late fifties and could be considered a dilettante. He had used the comfortable income his father had left him to dabble in areas that took his interest for a period. He had been a trainee lawyer, a doctor, a farmer, a scientist, and a businessman. He co-founded a successful industrial chemicals factory and was on the board of management of the Forth & Clyde canal.

He was known as a wit and an amusing dinner companion who was interested in everything – but unlike his close friend the chemist Joseph Black, he had made no major discovery and unlike James Watt he had invented nothing of consequence.

Yet over the remaining 14 years of his life, he published not only his seminal *Theory of the Earth*, but numerous scientific papers which included a theory of rain, a dissertation on language and a description of infrared radiation five years before Sir William Herschel described the same phenomena to the Royal Society of London.

Hutton's *Theory of the Earth* was a simple and elegant explanation of how the world had been and continues to be shaped, although his ponderous and discursive writing style sometimes clouded his arguments.

Rocks were formed in strata on the ocean floor from the shells and bones of sea creatures, compressed by the weight

Siccar Point, Berwickshire, where James Hutton observed the angular unconformity of the point – providing Hutton with conclusive proof of the uniformitarian theory of geological development

Ray Perman

of the water above. Gradually this rock was expanded by the heat at the centre of the earth, until it was pushed above the surface of the waters to form land, hills, and mountains. These would be broken down by temperature, wind, and rain and washed into streams and rivers, eventually reaching the sea as tiny grains, where tides would deposit them on the seabed for the process to begin again.

This circular process, he believed, had happened time and time again and continued to constantly reshape the earth.

Hutton was careful not to put an age on the earth, but conscious also that the process he described would need an unimaginable length of time. But, he added, time was not a constraint – it was infinite.

His most famous phrase, "we find no vestige of a beginning, no prospect of an end", meant just that: he had not sought to describe how the earth started, nor how it would end. However, it did not prevent him from being wilfully misinterpreted by his critics, who made veiled threats of atheism against him, saying that by asserting the earth was eternal (which he never did) he was denying the act of creation and therefore the existence of God.

Hutton was not an atheist; he acknowledged God as the instigator but challenged conventional orthodoxy, which clung to the biblical narratives of the seven days of creation and Noah's flood. From biblical sources it had been calculated that the globe was less than 6,000 years old, an impossibly short period for the processes Hutton believed formed the planet.

Although he expanded the *Theory of the Earth*, adding proofs and illustrations, it was not his largest work. *An Investigation of the Principles of Knowledge, and of the Progress of Reason, from Sense to Science and Philosophy*, published in 1794 in three volumes totalling over 2,000 pages, announced its highly ambitious intention in the first sentence of the preface – to "investigate the nature or progress of human understanding".

It was not well received. According to the philosopher Peter Jones: 'The silence which greeted the publication of the metaphysical treatise was, and has remained, almost complete.' It did, however, devote a chapter to an explanation of natural selection in animals, more than 60 years before Charles Darwin published *On the Origin of Species*.

It is unlikely that Darwin had read Hutton's vast tome, but Hutton was a friend of Darwin's grandfather, Erasmus Darwin, who had also written about the evolution of animals, and it is possible that the two men had discussed it when Hutton stayed with Erasmus at his home in Lichfield, or afterwards in their long correspondence.

Erasmus died before Charles Darwin was born, but it is probable that he knew of his grandfather's interest in the subject and had read his books and poetry. Other writers had also discussed natural selection, and the selective breeding of crops and farm animals was well established. Darwin was also influenced by Charles Lyell's *Principles of Geology*, which itself owned much to Hutton's *Theory of the Earth*.

Hutton's last few years were marred by a painfully debilitating illness, yet it did not stop him from working or greeting his friends with humour. At the time of his death in 1797, he was writing a treatise on agriculture. The handwritten manuscript is now owned by the RSE, kept in the National Library of Scotland, and is being prepared for publication by Professor Alan Werritty FRSE. More than 200 years after its intended date of publication, it promises to give us new insights into the mind of this remarkable, but under-appreciated scientist.

Ray Perman FRSE, author, former journalist, former Chairman of the James Hutton Institute

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Understanding bullying: are the definitions useful?

How would you define bullying? You might have some ideas about the behaviours that you believe constitute bullying. They might involve physical interaction (a hit, a kick, or a punch) or name calling. You might also include social isolation or ostracism as a form of bullying. A quick search of the literature will tell you that all these behaviours feature in definitions of bullying used in schools, colleges, universities, and places of work. However, the recording and measurement of bullying is complex.

Professor Ian Rivers

Is it enough that one person believes that the behaviour of another is both unwarranted and aggressive in intent? What if the behaviour is unintentional or has been misinterpreted in some way? A kick, a slap, a punch or a name called out in front of others is, one might think, irrefutable evidence. However, these behaviours can also be responses to the incessant torment meted out by others – torment that can go unnoticed.

When it comes to more covert forms of intimidation, there are those who convey intent to cause harm clearly and unambiguously. In his autobiography entitled *Reflections of a Rock Lobster*,[1] gay activist Aaron Fricke recalls one incident in a science class where a fellow student looked at him in a way that was described as petrifying, in fact he described the look as, "an uninterrupted gaze that could melt steel." When I began my own research on homophobic bullying, I asked whether participants had been frightened by a look or stare at school.

I expected few to respond, but it turned out to be one of the most significant factors in school absenteeism.

After 30 years of research on bullying behaviour, I still tussle with the utility of definitions and the ways in which we describe such behaviour. Early definitions spoke of wilful or deliberate acts of aggression, which were systematic or repeated, and where there was an imbalance of power.[2] Yet the questions we asked never really provided the evidence we needed to show intent or indeed a pattern of repetition underpinned by a toxic relationship among two or more people. We need to understand the dynamics of the relationships in play.

Within schools, bullying continues to be an issue. In the United States, I was a member of the expert panel tasked with creating a federal definition of bullying.

In the absence of federal legislation, we offered a definition where repetition was no longer a central characteristic. Unfortunately, state legislatures continue to employ definitions that infer it. Alabama, for example, describes bullying as "a continuous pattern of intentional behavior," while Nebraska states that it is "any ongoing pattern of physical, verbal, or electronic abuse."

In Scotland, we have a national approach to anti-bullying[3] and a definition that acknowledges the central role relationships and loss of personal agency play in defining bullying: "Bullying is both behaviour and impact; the impact is on a person's capacity to feel in control of themselves... Bullying takes place in the context of relationships; it is behaviour that can make people feel hurt, threatened, frightened, and left out. This behaviour happens face-to-face and online."

Impact, loss of agency, and relationships sum up what we should be measuring, and how to measure it efficiently and effectively is a challenge.

Professor Ian Rivers FRSE, Associate Principal & Executive Dean, Faculty of Humanities and Social Sciences, University of Strathclyde; RSE Education Committee member

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Creativity, Strategy, Collaboration:

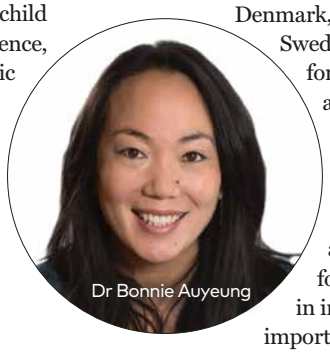
The future of data collection on children in Scotland

How do unforeseen events like illness, exposure to pollution, and high stress levels during pregnancy affect a baby's life course? My research looks at how this relatively short period of time is so pivotal for our futures. It is a fascinating area but challenging to study. Inviting pregnant women to participate in a long-term research programme whilst their children grow requires a lot of investment and takes a long time. To address these challenges, we have to be creative, we have to be strategic, but most importantly, we have to work together – to *collaborate*.

As a small, well-integrated country with globally significant research institutions, Scotland is well placed to lead in bringing different disciplines together to give our children the best possible start in life. In practice, however, this work often means linking information collected in very different settings to help us build a coherent picture of how an input in one domain can influence an output some years later in a different one.

In recent research including Glasgow City Education Services, Public Health Scotland, and academic partners, we have brought together data on health, social and educational outcomes to map the development of over 56,000 children from the prenatal period through to early adolescence.[1] This exciting study is aiming to uncover more about how our earliest days could affect a lifetime of development.

We were also recently awarded with major funding to study the impact of COVID-19 Health Impact on Long-term Child Development in Scotland[2] (CHILDS). Here we will look at how Covid-19 infection during pregnancy could affect child development up to five years hence, as well as how changes in public safety and social distancing affected care and outcomes for all Scottish children born during the same period.


Dr Bonnie Auyeung

Aside from their main objectives, such studies create rich and integrated datasets to support improved child development for future generations. They are also good at capturing individuals who would not normally take part in research, as they rely on data collected routinely by healthcare and education professionals (but always anonymised).

However, such data-based methods have their challenges. Data often do not easily link together, may not provide enough information on key aspects of children's lives such as home and social environments, and may not be consistently recorded using the same protocols. The RSE Education Committee has called for "more systematic, integrated, and robust data gathering to adequately capture the full breadth of learning and attainment, from formal qualifications to more qualitative markers of 'personal development'". Scotland has an important opportunity to redefine what it considers success by selecting parameters that are good predictors of later outcomes. For instance, children's self-control skills (also called self-regulation/cognitive control) are one of the best predictors of academic achievement, risk-taking in adolescence, health, earnings, public safety, and a slower aging process.[3]

There are some great examples from Denmark,[4] Finland,[5] Norway,[6] and Sweden,[7] where robust processes for data management and anonymisation on a national level provide an opportunity to do research at scale into human development. Such an approach can provide a platform for strategic forward thinking, investment in infrastructure and most importantly, *collaboration* between the wide range of education and health-related agencies who need to work together to improve outcomes for everyone.

Dr Bonnie Auyeung, Reader and Chancellor's Fellow, The University of Edinburgh; RSE Education Committee member

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Empowering minds

Fostering ethical literacy in Scottish schools

What does it mean to be ethically literate in today's world, and how does this intersect with science, technology, engineering and mathematics (STEM) education? In a society increasingly driven by technology, science, and data, ethics are relevant for all, and should not be restricted to those focusing on the sciences. Against this backdrop, it is vital that we equip young people with the skills to enable them to engage with complex and difficult issues with no clear-cut answers, to help them build resilience around addressing subjects that may be emotionally challenging, and to help them deal with differences of opinion and contrasting world views in a productive way.

How can material on ethics be effectively delivered in the classroom? With a significant shortfall of teachers in most STEM subjects across Scotland and huge time pressures on teachers, it will be extremely challenging to find the capacity to deliver this material in schools. Teachers need time for developing expertise in these areas and for fitting it into busy curricula. In primary schools, a low level of STEM education in primary teachers may make developing expertise hard.

Further pivotal questions emerge – how can school-based education support young people to engage positively with social media and to engage in a critical and informed way with what they are being exposed to on those platforms? How can we introduce ethics at an early stage in education, before young people are too entrenched in social media?

Over the last year, the Learned Societies' Group on Scottish STEM Education, under the stewardship of the RSE, has been exploring the challenges of teaching ethics in school. In modern life, ethical questions abound, and it is vital that the citizens of the future possess the skills to navigate this effectively. However, this is no easy feat. Currently, the inclusion of ethics in primary and high school curricula in Scotland is sporadic and inconsistent, presenting numerous challenges that make it difficult to deliver.

Dr Fiona McNeill

In June 2023, we held a workshop on the ethics of knowledge in the curriculum with around 40 attendees, including young people, teachers, representatives of government bodies and higher and further education, and others with a stake in education. There were keynote talks followed by roundtable discussions which focused on issues such as how, in a world of seemingly endless information, we can understand what it means for that information to be trusted, and what an ethically-driven curriculum would look like.

A further roundtable discussion then road-tested the draft report's key findings with representatives from the Scottish Parliament, those leading the reform agenda, and beyond, to consider how ethical literacy could be better embedded in the Scottish curriculum, including scaling up existing good practice. The final report is due to be published this spring.

As the report will highlight, we are still a long way from implementing a solution to this issue and there remain more questions than answers. However, even the framing of these questions is a significant step forward to developing workable plans to improve the ethical literacy of Scotland's young people.

We intend to continue working with key stakeholders and engaging in the ongoing reviews of the education system to ensure the Scottish education system can equip young people with the tools to engage effectively and confidently with the modern world.

Dr Fiona McNeill FRSE, Reader in Computer Science Education, The University of Edinburgh

The Learned Societies' Group on Scottish STEM Education was established in 2012 over concerns about major reforms in the delivery of STEM education in Scottish schools. To find out more about the group's work, visit the RSE website: bit.ly/RSELSG

Addressing socio-economic gaps in educational outcomes

The impact of poverty on the educational outcomes of children and young people in Scotland remains intractable. Disparities in outcomes emerge even before children start formal schooling and persist throughout various stages of compulsory and post-compulsory education. The existing inequality in outcomes is expected to increase owing to the scarring effect of school closures coupled with the post-pandemic economic crisis. Although the lockdown adversely affected all children, it had a more severe impact on children whose families faced economic hardship. An example of this impact is the notable decline in school attendance, with disparities evident across different socio-economic backgrounds.

Professor Edward Susu

Addressing the inequality in educational outcomes is an issue that has captured the attention of the government, political parties, policy makers, schools, and other key stakeholders over the past decade. There is a widespread acknowledgement at the national level that this issue requires urgent attention, although the approaches to addressing it vary among different groups. The government, education authorities and schools have implemented several policy and practice initiatives during this period. Examples include the Attainment Scotland Fund, expansion of free school meals for a greater number of children, and increased state-funded early years education. Additionally, broader policies such as the Scottish child payment were introduced to reduce the levels of child poverty.

Despite these efforts, recent data indicate that there has been relatively modest progress in narrowing the socio-economic gap in educational outcomes. To make greater progress, we must address some of the significant and complex issues that have received little attention.

First, the pathways from poverty to academic achievement are complex. However, there is limited research evidence on the key factors to guide policy and practice interventions. As a result, we need to intensify our efforts to identify these key mechanisms. This is crucial in informing which policy and practice interventions will produce the best outcomes, recognising that not all interventions will lead to improved achievement. For example, our recent research reveals that school attendance has a significant impact on academic success. Therefore, the rise in absenteeism following the pandemic deserves considerable attention as a pathway to reducing the inequality gap in educational outcomes.

Second, there is a pressing need for clarity and renewed emphasis on educational achievement as the primary desired outcome. The concept of the 'achievement gap' has evolved in policy discussions over time, taking on various interpretations. It is now encompassed by terms such as school attendance, engagement, wellbeing, and so forth. While these outcomes are important in their own right, they serve as pathways to improving achievement rather than constituting academic achievement itself. This lack of clarity can obscure our understanding of precisely what we are striving to achieve. If the objective is to improve attainment for children and young people experiencing socio-economic challenges, then the desired outcome must be clearly defined to enable us to determine whether interventions are yielding the intended results.

Third, there is a notable absence of robust evidence regarding the effectiveness of current policy interventions. Without such evidence, we rely on hope that interventions are making the desired impact. There is also a risk these interventions may inadvertently lead to unintended consequences than exacerbate rather than alleviate inequalities in outcomes. The recent introduction of an evaluation plan for the Attainment Scotland Fund represents a positive step forward. However, future policy and practice interventions should incorporate evaluation from the outset to ensure that we learn lessons and adjust interventions if required.

Finally, we need to address poverty, which serves as the underlying cause of disparities in educational outcomes. While schools and the education system can play an important role in mitigating inequalities in achievement, they cannot resolve the persistent levels of child poverty in Scotland. Addressing this issue will be essential in narrowing the gap between poverty and achievement.

Professor Edward Sosu, Deputy Head of School (Research), Strathclyde Institute of Education, University of Strathclyde; member of the RSE Education Committee

Nature's classroom:

Tackling the climate and nature crises through Scottish schools

Long before the recent reviews of Scottish schooling, the Scottish Government established an advisory group to make recommendations on how sustainability could become part of school-life. This led to the Learning for Sustainability (LfS) policy guidance in 2012, which was subsequently integrated with the UN Sustainable Development Goals in 2016. The recommendations were accepted by a range of ministers in successive governments, and essentially commit to a 'whole school approach',[1] with LfS being an entitlement of all learners, and a professional responsibility of all education professionals including teachers.

Professor Peter Higgins

The concept, unlike other national approaches, weaves together education for sustainable development, global citizenship, and outdoor learning. In recent years, the significance of the nature emergency and importance of social justice have been integrated in the concept. Learning for sustainability is research-informed, widely recognised as a leading international approach and is currently being adopted by a range of European nations.

The inclusion of outdoor learning is not evident in other national contexts we are aware of, but our research beginning in 2011 along with other international studies indicate its significance as an experiential approach to help learners to respect and value nature and understand its role in supporting climate stability. Education outdoors has long been a feature of Scottish education in school grounds, locally and at residential centres, and lends itself to practical, innovative interdisciplinary pedagogies. Further, recent evidence has shown how remarkably effective taking learners outside the classroom is for academic learning in most disciplines, as well as their physical and mental health and wellbeing. The latter became much more evident through studies at the time of Covid-19 and subsequently.[2]

The current Programme for Government commits the Scottish Government to implementing a 'strengthened learning for sustainability action plan and as part of this ensure that all young people have the opportunity to learn about the causes and effects of climate change, the role we can all play in preventing it, and the importance of climate justice.' In the action plan, a key focus is on ensuring that every 'age 3–18 place of education' becomes a 'sustainable learning setting' by 2030. However, the challenge is significant. There is a need to adapt the school estate and procurement practices to embed and demonstrate sustainability, weave appropriate content across an already crowded curriculum, provide significant focused career-long professional learning for the teaching profession, and ensure LfS is a core element of pre-service teacher education.

Learning for sustainability sets out to develop the values, attitudes, knowledge, skills, and confidence to build a socially-just, sustainable, and equitable society, but equally importantly, it is about ensuring learners in our schools are confident in holding policy makers, educators, and all other relevant actors in society to account.

Recent studies of young people's views on the future of education in Scotland showed they wanted to see an urgent response to the climate and nature emergencies and expect LfS to be a meaningful feature throughout their school life. It is imperative that we do not consider our young people as 'citizens in waiting' and we heed their call. Not to do so is a gross indulgence – sending a message that the problems caused by ours and previous generations can be left to theirs and future generations to address.

Professor Peter Higgins PFHEA FRGS FRSE, Professor of Outdoor, Environmental & Sustainability Education, The University of Edinburgh; Director United Nations Regional Centre of Expertise in Education for Sustainable Development (Scotland)

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Grounding global aspirations: The view from elite world schools

I challenge you to show me a parent without aspirations for their child. Of course, you will struggle. Yet the wealth and diversity of family ambitions alone remain insufficient to tackle the uncertainty and uneven possibilities for young people. Although aspirations exist, social inequalities persist. In spite of increasing access to information, technologies, travel, and education, in our globalising world social inequalities not only remain, but are evolving.

How to make sense of social inequalities and how we might act in relation to them, are central questions that have driven my career over the past 20 years. For context, that career began as a teacher in Scotland in the late 90s. My first teaching posts were in Glasgow and Greenock. While there I was schooled by my first head teacher, boss and mentor, Isabel Lind OBE. She ensured her school bucked the sticky trends long associated with poverty. Areas with multiple indicators of deprivation such as Inverclyde remain popular for measuring societal inequity.

When I seek to understand inequalities, I look the other way. I look towards those who pursue and define new forms of advantage. I study elites.

> "I HOPE MY RESEARCH PREPARES THEM TO RECOGNISE THAT INEQUALITIES DON'T SIMPLY EXIST BUT ARE ACTIVELY CREATED"

My work explores the creation of World Schools for children aged 3-18, most recently in Beijing and New York. I identify them as a new category of institution that caters to the aspirations of the newly super-rich. The very existence of World Schools is a pragmatic response to their circumstances; for families unable or unwilling to attend established elite schools in those cities.

Dr Jen Kirkwood

At first glance, World Schools promote a cosmopolitan education valuing bilingual fluency and cultural diversity – aspects that hold varied meaning for the families. But driving the commitment to global citizenship in these highly resourced and fee-paying schools is the pressing parental aspiration – their child's trajectory to world-class universities. For the global nouveau riche, being wealthy is not sufficient. Institutional associations and credentials are paramount. Their worth as well as their wealth needs cultivation.

A key aim of my research is to show privilege is made, not innate. Although elites typically present themselves with effortless ease, the work involved in reaching that position is often hidden. Being present during the start-up period of these World Schools made the processes visible.

Families and schools felt their position was precarious. The day-to-day choices, perceptions, and anxieties I witnessed provide an insight to the fears and hopes of parents and students. Parents lament: "I want them to struggle, but not too much…" Raising elite offspring is not smooth and effortless.

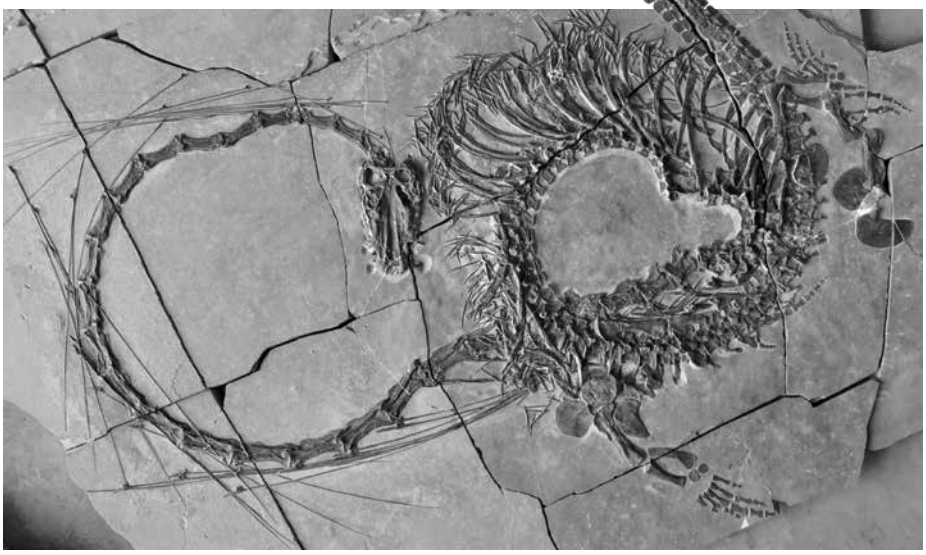
A cosmopolitan narrative paves their way. Narratives of worthy students were constructed, refined, performed, and promoted. When the time came for university applications, relationships were forged between schools and select world-class universities. As the culminating product of several years' work and investment, establishing pathways to the world's most exclusive and prestigious universities satisfied the subsequent intake of fee-paying families to the World Schools.

To many, global citizenship evokes aspirations for unity and equality. Ultimately, a new cosmopolitan calibre of applicant is hitting the desk of university admissions offices, supported by a new calibre of schools.

Working with student teachers preparing to enter the profession, I hope my research prepares them to recognise that inequalities don't simply exist but are actively created.

Dr Jen Kirkwood, Lecturer in Sociology of Education, Moray House School of Education and Sport, University of Edinburgh; Young Academy of Scotland member

240-million-year-old 'Chinese Dragon' revealed in RSE journal



As reported across global media, from the BBC and CNN to *The Huffington Post* and *Yahoo News*, an international team of scientists have described new fossils of *Dinocephalosaurus orientalis* – a five-metre-long aquatic reptile from the Triassic period of China, dating to around 240 million years old. The reptile was originally identified in 2003, but the discovery of additional specimens has allowed scientists to depict the bizarre long-necked creature in full for the very first time.

With 32 separate neck vertebrae *Dinocephalosaurus orientalis* had an extraordinarily long neck that draws comparison with the neck of *Tanystropheus hydroides*, another strange marine reptile from the Middle Triassic of both Europe and China.

Both reptiles were of similar size and have several features of the skull in common, including a fish-trap type of dentition. However, *Dinocephalosaurus* is unique in possessing many more vertebrae both in the neck and in the torso, giving the animal a much more snake-like appearance.

The reptile was clearly very well adapted to an oceanic lifestyle, as indicated by the flippered limbs and exquisitely preserved fishes in its stomach region. Despite superficial similarities, *Dinocephalosaurus* was not closely related to the famous long-necked plesiosaurs that only evolved around 40 million years later and which were the inspiration for the Loch Ness Monster. The fossils were discovered in Guizhou province, southern China.

Dr Nick Fraser FRSE, Keeper of Natural Sciences at National Museums Scotland, said: "This discovery allows us to see this remarkable long-necked animal in full for the very first time. It is yet one more example of the weird and wonderful world of the Triassic that continues to baffle palaeontologists. We are certain that it will capture imaginations across the globe due to its striking appearance, reminiscent of the long and snake-like, mythical Chinese Dragon."

Researchers from Scotland, Germany, America and China studied the fossil over the course of 10 years at the Institute of Vertebrate Palaeontology and Palaeoanthropology, Beijing, part of the Chinese Academy of Sciences.

Professor Li Chun, from the Institute of Vertebrate Palaeontology and Palaeoanthropology, said: "This has been an international effort. Working together with colleagues from the United States of America, the United Kingdom and Europe, we used newly discovered specimens housed at the Chinese Academy of Sciences to build on our existing knowledge of this animal. Among all of the extraordinary finds we have made in the Triassic of Guizhou province, *Dinocephalosaurus* probably stands out as the most remarkable."

Dr Stephan Spiekman, a postdoctoral researcher based at the Stuttgart State Museum of Natural History, said: "As an early-career researcher, it has been an incredible experience to contribute to these significant findings. We hope that our future research will help us understand more about the evolution of this group of animals, and particularly how the elongate neck functioned."

The paper describing the animal is published in full in the academic journal *Earth and Environmental Science: Transactions of the Royal Society of Edinburgh* – forming the entirety of this recent volume. More than 190 global media outlets covered the story. The journal was first published in 1788.

THE COST OF BEING A WOMAN

The cost-of-living crisis emerges as yet another pressing challenge disproportionately affecting women. Like the pandemic, it serves to amplify the entrenched structural disparities experienced by women, rendering them vulnerable to its impacts. This jeopardises progress in advancing economic and social equality for women and sending it into reverse.

For International Women's Day 2024, the RSE and Young Academy of Scotland brought together a panel of experts from academia and practice to dissect this challenging topic. They explored the historical context of systemic inequalities that persist today, and some solutions required to address the imbalance, from workplaces to the law.

This discussion was inspired by the RSE's recent policy advice paper to the UK Parliament's Women and Equalities Committee inquiry examining the impact of the cost-of-living crisis on women. You can watch the panel discussion and read the report on the RSE website: **bit.ly/RSEintlwomensday**

A panel of experts from academia and practice came together at the RSE to discuss systemic inequalities disadvantaging women

Academy of Medical Sciences elects RSE Fellow as President

Professor Andrew Morris CBE FRSE FMedSci has been elected as the next President of the Academy of Medical Sciences, succeeding Professor Dame Anne Johnson DBE PMedSci.

He is Professor of Medicine and Vice Principal of Data Science at the University of Edinburgh and, since 2017, has been the inaugural Director of Health Data Research UK (HDR UK), the national institute of health data science. Prior to this, he was Dean of Medicine at the University of Dundee and Chief Scientist at the Scottish Government Health Directorate.

Under his leadership, HDR UK works in partnership with the NHS, industry, charities, and universities to realise the potential of the UK's wealth of health data in life-changing research. A landmark early in 2024 saw the first research study of health records for the whole population of 67 million people across all four UK nations.

On his appointment, Professor Morris said: "The Academy of Medical Sciences is the pre-eminent UK authority and a dynamic and influential force in biomedical and health research. It's a great honour to be taking on the role of President of this influential institution at a time of great change and opportunity.

"We are living through the most rapid technological and scientific revolution in the whole of human history. This fusion of biology with physical sciences, social sciences, and computational sciences requires a re-envisioned approach to biomedical and health research. The Academy Fellowship of outstanding scientists is uniquely positioned to seize the opportunity to lead medical science into the future.

"It is important that the Academy becomes a trusted voice in the ethical and responsible application of artificial intelligence, digital technologies, and interdisciplinary science to address global health challenges with integrity and foresight. We need to continue to support the next generation of world-leading scientists and show how excellence in science can power improved NHS and social care services. Importantly, this work must be underpinned by a new era of inclusivity, where patients and the public work alongside the Fellowship to play an active role in shaping the future of medical science, championing equality, diversity, and inclusion at every turn."

Professor Morris was presented with the RSE Royal Medal in November 2023 for exceptional contributions to advancing health data science in Scotland and internationally.

The unbroken chain of history

Ten years ago, an historic landmark in British engineering history was deteriorating, and an uncertain future lay in store.

Ten years on and the Union Chain Bridge over the River Tweed is fully restored, able to carry vehicular traffic, and serves as a living monument to the engineering ingenuity of a Fellow of the RSE, Captain Samuel Brown FRSE.

Professor Roland Paxton FRSE was one of the many people who saw the significance of the Union Bridge and set about securing its future. RSE Fellows and various groups including the Friends of the Union Chain Bridge saw to it that the landmark would be preserved.

Built in 1820 and designed by Captain Samuel Brown FRSE, it enjoys legendary status in engineering circles – the first in a continuing line of 'bridges of suspension' with the longest-ever spans.

"It took long-span bridge design into a totally new era, and this is why I wanted to get it saved," Professor Paxton explained. Owing to the elegance of the design, and the solid construction, around half of the original ironwork was preserved. He added: "Basically, all he did was sling 12 chains from two supports, and it is that simple."

The design was so successful that on the day of the official opening of the bridge in 1820, people swarmed the bridge deck after Captain Brown had demonstrated it himself. The estimated combined weight was some 47 tonnes.

Not only did the design prove successful on the day, but the design and the work to make it a reality had made such an impression as to attract the likes of Robert Stevenson, George Buchanan, and John Leslie – all RSE Fellows. It had garnered attention years before the Institute of Civil Engineers began publishing papers, with the RSE providing the forum for innovations like it.

The original structure took only 12 months to lay down, however, the restoration project took three years to complete. Professor Paxton said: "They ran into all sorts of problems because they discovered that a lot of the material was not up to modern standards, but nevertheless they still finished up with about half of the original ironwork. It is not just a 'look-alike' bridge, people are still crossing partly on the original ironwork."

The bridge, spanning the River Tweed between Fishwick in the Scottish Borders and Horncliffe in Northumberland, England, had been registered as 'at risk' by both Historic Environment Scotland and Historic England.

When it was completed in 1820 it was the longest span vehicle-carrying suspension bridge in the world, with a span of 437 feet. Prior to that, the standard bridge building technique had been to use stone, with piers at regular intervals along the bridge's length. Captain Brown's design was to change that,

Professor Roland Paxton at the restored Union Chain Bridge over the River Tweed

and that legacy has carried on. Professor Paxton added: "It was absolutely on the ball, and it has done nothing but get bigger and bigger and bigger ever since, and Union Bridge was the first large iron suspension bridge that carried traffic, of modern times."

As the longest spanning bridge when it was built in 1820, countless suspension bridges around the world – many of which are famous in their own right – can trace their roots to the Union Bridge, among them the Golden Gate Bridge in San Francisco, the Brooklyn Bridge in New York, and the Strait of Messina Bridge connecting Sicily with the Italian Peninsula, the construction of which is set to begin this summer. When completed, its longest span will be some 10,800 feet.

The vital linchpin in Scotland's education ecosystem

Scotland's college sector is on the brink, says City of Glasgow College CEO Paul Little

In well over three decades in the college sector, I have rarely known a tougher period. Public finances across the UK – and especially so in Scotland – are extremely stretched. The combined impact of unprecedented real-term funding cuts, recent high inflation and running costs, exacerbated by spiralling pay demands, mean that colleges now have to work exponentially harder to protect student learning, support the wellbeing and livelihoods of our staff, and act as civic anchors for metropolitan, regional, and island economies.

We are also tackling chronic and acute skill shortages, particularly among struggling small and medium-sized enterprises and those economic sectors still blighted from Brexit and the pandemic. As tertiary institutions, colleges play a unique role in safeguarding multiple lifeline pathways for many learners into both college and university education. They provide crucial support for the disadvantaged many rather than the enabled few.

But now, in a period of economic turmoil and compromised by a loss of autonomy, the cessation of borrowing powers to renew our digital infrastructure and estates, and unable to retain year-end surpluses, colleges limp along with characteristic stoicism. They have been ill-served by the lingering inertia of historical funding settlements into which are baked the bifurcated hierarchy of Scottish post-school learning. An ambitious new tertiary system is being held back by protecting a financially unsustainable status quo.

I fear Scotland is sleepwalking into a vocationally light future, an underpowered skills system unable to respond to the next crisis or the opportunities afforded by a renaissance in shipbuilding, green ports, or the transition to net zero.

Previous funding cuts have led to the dismantling of adult learning, teaching training colleges, City & Guilds craft qualifications, and night school. What's now at stake is the permanent loss of specialist, professional education courses and significant chunks of practical hands-on learning as apprenticeship training slowly declines.

Funding choices have funding consequences. Encouraged by the Scottish Government, colleges are thinking the unthinkable, planning reduced intakes and fewer learner choices. Meanwhile, college trustees are asked to make impossible choices between offsetting core funding with the loss of valuable teaching expertise.

Having had more than their fair share of reform for over a decade, colleges have systematically pared away their management structures. With payroll costs accounting for over three quarters of overall college expenditure, we are being forced into teaching cuts. As the Cumberford-Little report identified in 2020, there are alarming disparities in the historical funding settlements for schools and universities compared with those for colleges[1]. If Scotland continues with lopsided reform of its tertiary funding and tertiary institutions, one can only conclude that vocational education is being deprioritised.

In a much-contracted college sector, who will step up to tackle future economic downturns, to upskill and reskill at pace, to plug skills gaps and prevent skills shortages, and to reprioritise STEM education and lifetime learning? Will there be sufficient guardians of those ladders of opportunity and those lifeline pathways?

The Institute for Public Policy Research (IPPR) social value report on City of Glasgow College proved we are at the forefront of tackling child poverty, while Fraser of Allander's economic impact report spelt out our £6 billion contribution to the Scottish economy over the long-term. Meanwhile, the global excellence benchmarking council, EFQM, ranked our college as a '7-Diamond' organisation for global excellence and innovation, with the highest marks ever for any educational institution in their 40-year history. Most recently, the college secured the Queen's Anniversary Prize in 2023 – the highest award conferred on a tertiary sector institution – for life-saving research into oxygen depletion in enclosed spaces on-board ships.

As Scotland's largest and most successful college, we are asking for fewer strings, fewer separate pots of (reduced) funding and for an equitable share of core tertiary funding, befitting our contribution to Scotland.

References

[1] Cumberford-Little Report, City of Glasgow College & Edinburgh College: bit.ly/cumblittlereport

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