Science Council

Workforce Skills
Conference 2023
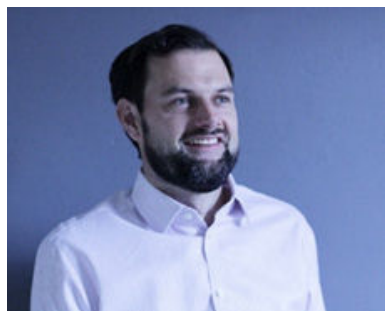## Report

Forward by Adam Donnan, Science Council Board Chair

Over the past three years the Science Council has been developing a programme of policy work, bringing together its diverse membership of 35 professional bodies and learned societies, enabling greater collaboration across our community, and better enabling us to speak with one voice to policymakers on issues of pan-scientific interest.

The UK's research and innovation (R&I) workforce is highly talented and is a tremendous national asset. Yet, we know that we face a number of challenges in realising the government's ambitions – over the coming years, the UK R&I workforce will require more researchers, innovators, technicians and professionals in rapidly-evolving sectors, with ever-changing skills needs.

The Workforce Skills Conference enabled the science, research and innovation community to come together and consider how effectively our current policies are working to meet the UK's skills challenges, to consider what more can be done, and the role our community can play in strengthening policy in this area.

This report captures the discussions held at the conference, providing valuable insights into the range of topics covered, and signposts the fantastic work taking place across our community.

The Science Council is grateful to all its member organisations and other partners who contributed to the agenda of the conference and making it into a such a useful day. Further thanks are due to UKRI for their sponsorship of the event and the Institute of Physics for hosting the conference.

About this report

This report summarises the discussions which took place at the Science Council's Workforce Skills Conference on the 19th October 2023. Each session of the conference forms a section in this report, comprised of a write up of the session, and then a further reading section, which provides an outline of the various reports and programmes referenced in the sessions. Recordings of each session can be found on our YouTube channel or through our website.

Contents

Keynote: Professor Dame Angela McLean, UK Government Chief Scientific Adviser
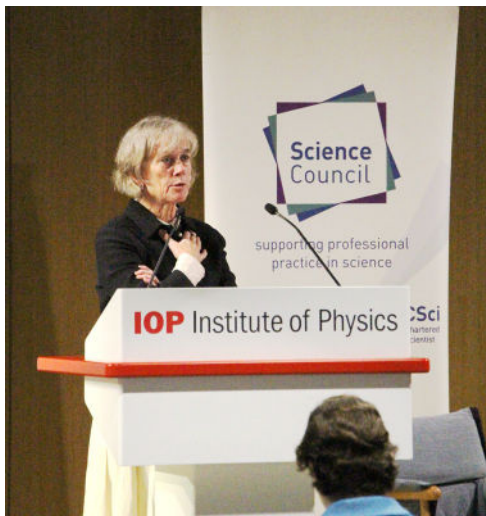
Opening the conference with her keynote address, Professor McLean spoke about her role championing science and engineering inside government, and ensuring policies are informed by the best scientific evidence.

She reminded delegates of the government's ambition for the UK to be a science and technology superpower by 2030 – describing this as a move from a country renowned for generating scientific ideas, to an economy where new ideas and discoveries are embedded across industry. She emphasised that a highly-skilled science workforce is a core element for reaching this ambition.

Professor McLean spoke of three priorities within this effort:

1. to bring more people into the country's science workforce,

2. to build scientific literacy at all levels, including within the Civil Service, and

3. to ensure that the science workforce is diverse.

She outlined a cross-Whitehall approach to the government's Science and Technology Framework: skills-building work is led by the Department for Education, working closely with departments such as the Home Office, Cabinet Office and Department for Science, Innovation & Technology.

Addressing delegates' questions, she underlined the need for a holistic overview of the skills gap across the sector – calling for the scientific community to work together to develop this evidence.

Further reading

The Government's approach is outlined in more detail in the UK Science and Technology Framework (2023)[1].

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1   https://www.gov.uk/government/publications/uk-science-and-technology-framework

Plenary 1: What are we doing now?

Chair: Professor Della Freeth, Chief Executive, Science Council

Panel members:
- Debbie Johnson, Head of Innovation Talent and Skills, Innovate UK
- Dr Joe Marshall, CEO, National Centre for Universities and Business (NCUB)
- Dr Kelly Vere MBE, University Director of Skills and Strategy, University of Nottingham

This session gave an overview of current work across the sector to equip the UK's science workforce with the skills they need for the future.

Debbie Johnson began the session by speaking about Innovate UK's work on the Innovation Skills Framework, developed with the Institute for Apprenticeships and Technical Education (IfATE). This piece of work set out to identify the skills associated with innovation, to help education providers understand what's needed and may currently be missing in the workforce: skills like creativity, critical thinking and self-reflection.

She described the High Value Manufacturing Catapult's Skills Value Chain approach, which aims to prepare the workforce for emerging technologies by embedding the skills needed to meet their demands. She highlighted the example of the Electric Revolution Skills Hub, which provides access to training and development to upskill the electrification workforce.

Dr Joe Marshall spoke about NCUB's role bridging the gap between universities and business leaders to ensure graduates have the skills needed for the 'grand challenges' that define our era of rapid change. He stressed the need for scientists to equip themselves with extra skills, for people to be supported to develop collaborative skills, and for lifelong learning to allow people to retrain and develop as jobs change in the future.

He emphasised employer-led schemes, such as the Degree Apprenticeships model, as best practice and signalled a need for these schemes to be scaled up. However, he warned that underprivileged groups must not be left behind by this process.

Dr Kelly Vere reminded delegates of the vital contributions technical staff make to new discoveries and the student experience within Higher Education. She highlighted the Technician Commitment, which works to address the lack of visibility and recognition these team members often experience.

She outlined the work of the TALENT Commission, which worked with people across the sector to develop a series of recommendations on the role of technicians. One of these recommendations – the development of the UK Institute for Technical Skills and Strategy has since been taken forward, with the Institute having launched in August 2023. This initiative aims to enable people to fulfil their potential and help the UK become a global leader in science and engineering.

During the session's discussion, delegates highlighted:

- The potential for 'alternative' routes to help the workforce become more diverse. With mainstream career pathways deemed high-risk for many under-represented groups, apprenticeships should be given the same status and viewed as an accepted way into science.

- The possibility of institutions rethinking job descriptions for specific roles, including considering whether requirements for applicants to hold a PhD are really necessary.

- A need for entrepreneurial as well as innovation skills, and the validity of alternative career paths besides becoming a principal investigator.

- The potential for moving away from traditional organisational hierarchies towards a 'domain expert' model – and the value of 'soft' skills such as questioning, listening and collaboration.

Further reading

The Government's approach to innovation is set out in the UK Innovation Strategy (2021)[2], comprised of four pillars:
- Unleashing business
- People
- Institutions and places
- Missions and technologies

IfATE's innovation strategy (2023)[3] was developed using Innovation Skills Framework (2023)[4] produced by the Innovation Caucus on behalf of Innovate UK. The strategy has three principles:
- to achieve dynamism and stability;

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2   https://www.gov.uk/government/publications/uk-innovation-strategy-leading-the-future-by-creating-it
3   https://www.instituteforapprenticeships.org/about/operational-plans/innovation-strategy/
4   https://innovationcaucus.co.uk/app/uploads/2023/05/Innovation-Skills-Framework-V5-Updated-July-2023.pdf

- to make data-informed, employer-led decisions;
- to lead by example and play our part in the system.

The High Value Manufacturing Catapult's Skills Value Chain[5] is an approach that connects workforce development with the wider innovation ecosystem, leveraging the technological know-how of Centres of Innovation (like the HVM Catapult) to build an industrial skills base fit for the future.

The TALENT Commission Report (2022)[6] was a landmark report, gathering strategic insights into the UK's technical workforce in higher education and research. The report recommended the creation of the UK Institute for Technical Skills and Strategy (ITSS)[7] which was established in 2023 with funding from Research England. The Institute seeks to foster integration, promotes international leadership and strengthens industry connections to ensure the long-term sustainability of technical skills and careers.

The Technician Commitment[8] is a university and research institution initiative whose signatories pledge action to tackle the key challenges affecting their technical staff in the areas of visibility, recognition, career development and sustainability. The ITSS has now taken over hosting the Technician Commitment from the Science Council.

5   https://hvm.catapult.org.uk/case-study/the-skills-value-chain/
6   https://www.mitalent.ac.uk/thetalentcommission
7   https://itss.org.uk/
8   https://www.techniciancommitment.org.uk/

Breakout 1a: Understanding the evidence base

Chair: Professor Robert Massey, Deputy Executive Director, Royal Astronomical Society & Science Council Policy Forum Co-Chair

Panel members:
- Dr Camilla d'Angelo, Policy Officer, Campaign for Science and Engineering (CaSE)
- Tony McBride, Director of Policy, Institute of Physics (IOP)
- Tanya Sheridan, Head of Policy and Evidence, Royal Society of Chemistry (RSC)

This session looked at current evidence on skills gaps within the workforce, and recommendations for addressing them.

Dr Camilla d'Angelo gave an overview of CaSE's Skills Opportunity report, which gathered views from the R&D sector on the challenges and possible solutions. The report calls for government to co-ordinate and support an integrated skills system, joining up different areas of policy. It recommends:

1. Further work to understand the skills gap.
2. More support for different routes into careers, such as workplace training.
3. Greater support for, and awareness of, regional talent and innovation.
4. Measures to attract international talent and support international collaboration.

Dr d'Angelo emphasised the importance of greater diversity and inclusion to underpin these efforts, with a need to address barriers in education, skills provision and training.

Tony McBride discussed evidence of growing demand for physics skills that underpin jobs and industry across the UK and Ireland. Despite this, research for the IOP's Paradigm Shift project shows that skills shortages have already put the brakes on innovation: 2 in 3 businesses report having suspended or delayed R&D activities as a result.

He also highlighted research into some of the challenges in this area, including the financial pressures apprentices face and a lack of women entering the sector. The IOP's Limit Less campaign was launched to help young people better understand all that can be achieved through physics – or to who can take part in it – by confronting stereotypes and showing physics as a rewarding choice that opens doors to inclusive, welcoming careers.

Tanya Sheridan presented the RSC's research on the chemistry workforce, including data from its annual Pay and Reward survey. The findings revealed the variety of industries UK chemists work in, and the broad range of transferrable skills they hold. These include complex problem-solving, critical thinking, co-ordination and troubleshooting. Many are also seeking to develop leadership, networking and influencing skills, indicating a desire to move up in their careers.

The RSC's Digital Futures report highlights the growing importance of digital skills, while research into the chemistry curriculum shows both students and employers are seeking sustainability skills. The RSC has ongoing work to further explore the skills the chemistry workforce might need in the future, with results expected next year.

Several proposals emerged from the discussion, including:

- The need for lifelong learning and solutions that focus on the existing workforce as well as young people – with 80% of the 2030 workforce already in employment.

- The need to support more organisations, particularly smaller businesses, to bring on apprentices and invest in learning and development.

- Better support for schools to provide good careers guidance, with a broader view of science careers and the different routes into them.

- The need for positive workplace cultures that welcome people from all backgrounds, with support for people facing specific challenges such as family caring roles.

- The need for institutions to expand their outreach to lower socio-economic groups, and for schemes such as the RSC's Missing Elements Grants Scheme, which provides funding to tackle the under-representation of Black chemists.

Further reading

CASE's report The Skills Opportunity: Building a more innovative UK (2023)[9], sets out some of the challenges for education and skills provision across the UK and makes a number of recommendations for government to support high-quality education and skills provision to build a more research and innovation intensive economy.

The Institute of Physics has produced a number of reports in recent years including:

- Physics and the Economy (2022)[10] which highlights the huge contribution physics makes to society, with the UK Physics sector accounting for 10% of total UK employment in 2019.

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9   https://www.sciencecampaign.org.uk/analysis-and-publications/detail/the-skills-opportunity/
10   https://www.iop.org/strategy/productivity-programme/physics-and-economy

- Paradigm Shift (2021)[11] which found that 91% of physics innovators agreed that R&D/innovation is a strategic priority with 63% of physics innovators expecting their R&D/innovation spending to increase over the next five years.
- Unlocking the potential of physics skills in the UK and Ireland (2022)[12] which found that there is significant unmet demand for physics skills exists, with a substantial number of job roles requiring skills in physics available at any one time.
- Support young people to change the world (2020)[13] commissioned part of the IoP's Limit Less campaign which includes surveys of parents, carers and young people, as well as other stories of lived experience, provides insights as to how to increase the number of young people from underrepresented groups in our society who do physics from age 16.

The Royal Society of Chemistry has similarly added to the evidence base with the following:

- Chemistry's Contribution (2020)[14] which estimated that in 2019 there were 275,000 chemistry using jobs in the UK and that chemistry using professionals generated around £87bn in economic output, alongside an estimated £3.2bn to the Exchequer through tax and National Insurance contributions.
- The Pay and Reward Report [2021][15] which surveyed 4,298 RSC members to provide insights on the chemistry workforce.
- The Digital Futures report (2020)[16] which considers how skills needs are changing in light of emerging digital technologies.
- The Missing Elements report (2022)[17] which shone a light on racism and ethnic inequalities in the chemical sciences, particularly how few students who identify as black progress beyond undergraduate.

11   https://www.iop.org/sites/default/files/2021-10/Paradigm-Shift-physics-innovation-final-oct-2021.pdf
12   https://www.iop.org/sites/default/files/2022-01/IOP-unlocking-the-potential-of-physics-skills.pdf
13   https://www.iop.org/sites/default/files/2020-11/IOP-Limit-Less-report-2020-Nov.pdf
14   https://www.camecon.com/what/our-work/chemistrys-contribution-workforce-trends-and-economic-impact/
15   https://www.rsc.org/news-events/articles/2021/dec/pay-and-reward-report-2021/
16   https://www.rsc.org/policy-evidence-campaigns/discovery-research-and-innovation/discovery-research-innovation-reports-surveys-campaigns/digital-futures/
17   https://www.rsc.org/policy-evidence-campaigns/inclusion-diversity/surveys-reports-campaigns/racial-and-ethnic-inequalities-in-the-chemical-sciences/

Breakout 1b: Professional registration for a trusted and professional scientific workforce

Chair: Dr Duncan Broughton CSci, Head of Profession: Chemistry and Materials, Atomic Weapons Establishment Plc (AWE)

Panel members:
- Rob Bradley, Professional Registration Manager, Institute of Water
- Dave Stone CSci, Chief Scientist, Joint Nature Conservation Committee (JNCC)
- Dr Julia Wilson, Associate Director, Wellcome Sanger Institute

This session explored the benefits of professional registration for the scientific workforce, and its role in developing skills and engendering trust.

Rob Bradley reflected on his own non-traditional route into science, attending university as a mature student and developing knowledge and skills through volunteering and paid roles before joining the water sector. He explained how registration and CPD training had allowed him to better articulate his skills and gain credibility with his peers.

He discussed the role of professional registration at the Institute of Water and across the wider sector, which relies on a resilient workforce of people who can adapt to change. Registration covers different levels from technician through to chartership, and is an important part of building public trust. Alongside programmes such as mentoring, registration is seen as a way of supporting the workforce: helping people to grow their skills and progress their careers.

Dave Stone picked up the theme of trust, speaking about the importance of CPD and professional registration for JNCC's profile as a trusted and credible organisation. He outlined how this trust is vital for the JNCC to have an impact, both with the independent advice it gives to government ministers and in its global work on multilateral environmental agreements.

Stone pointed to registration as a marker of quality, integrity and an ethical approach – and he stressed the need for lifelong learning in order to keep abreast of changes in the industry, and the importance of senior leaders modelling this for the wider workforce.

Dr Julia Wilson described the Wellcome Sanger Institute's journey towards professional registration, which began when it joined the Technician Commitment. With a dedicated role focused on its activities under the Commitment, the Institute now has a Professional Registration Working Group led by the technical community. This co-ordinates coaching, mentoring and decisions about routes to registration.

She highlighted the importance of registration in supporting staff retention in a competitive market,

and in showing the integrity of the science produced at the Sanger Institute, where roughly half of the workforce are technicians or technical experts. She outlined the role these staff have in supporting the training and development of PhD students and post-doctoral researchers.

During the discussion, delegates focused on:

- The importance of non-traditional routes into the STEM workforce, including the benefits of apprenticeships both for inclusion, and for bringing in experience and perspectives that add value to an organisation's work.

- A need for more support for small and medium enterprises to take on apprentices.

- The need for better ways of reaching people who are not traditionally interested in science, and for young people to see themselves and a range of role models working in science.

- The benefits of professional registration in helping people to move between companies and sectors, and the need to overcome barriers that can prevent people becoming registered – particularly a lack of time for scientists juggling competing demands.

Further reading

The Wellcome Sanger Institute is a signatory of the Technician Commitment and has put in place an action plan[18] for 2021-2024 which outlines how it is working to meet the commitment's requirements.

The Institute of Water's mentoring programme[19] is designed to provide its members with personalised guidance, support, and professional development opportunities. Many professional bodies amongst the Science Council's membership run similar schemes or programmes for supporting continuous professional development of their members, which often include pathways to professional registration.

Professional Registration with the Science Council

The Science Council offers professional registration[20] through our licensed bodies for scientists, technicians and science teachers, across four registers, CSci, RSci, RSciTech and CSciTeach. Professional registration provides a framework for the workforce: investing and rewarding the high standards of scientific staff at all levels, helping to build trust in the practice of science.

Registered professional scientist and technicians are recognised for their competence, ability and integrity and serving the public interest. They are committed to keeping their skills and knowledge up to date through continuing professional development (CPD).

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18   https://www.sanger.ac.uk/about/careers/technician-commitment/
19   https://instituteofwater.org.uk/mentoring/
20   https://sciencecouncil.org/professional-registration/

Chartered Scientist (CSci)

Chartered Scientists demonstrate effective leadership, using their specialist knowledge and broader scientific understanding to develop and improve the application of science and technology by scoping, planning and managing multifaceted projects.

Registered Scientist (RSci)

Registered Scientists apply their skills and knowledge whilst working autonomously and have the ability to resolve problems and identify, review and select appropriate techniques, procedures and methods.

Registered Science Technician (RSciTech)

Registered Science Technicians work with minimal supervision in technical roles, delivering essential scientific services and support within laboratories, schools and universities, hospitals and in many other workplaces.

Chartered Science Teacher (CSciTeach)

Chartered Science Teachers combine their scientific knowledge and understanding with the skills and expertise required for the practice and advancement of science teaching and learning.

Breakout 2a: AI and the STEM workforce

Chair: Professor Andy Smith, BASES & Science Council Policy Forum Co-Chair

Panel members:
- Joysy John MBE, EdTech Adviser and Innovation Consultant
- Nimmi Patel, Head of Skills, Talent and Diversity, techUK
- Dr Erin Young, Research Fellow, Public Policy, The Alan Turing Institute

This session focused on the opportunities presented by artificial intelligence (AI), and its implications for the future workforce.

Joysy John MBE shared an optimistic vision for the future, arguing that we have a collective responsibility to maximise the benefits and reduce the risks of AI. She suggested that AI will enhance the need for human skills such as creativity and ideation, collaboration, and critical thinking as evidenced by the World Economic Forum's *The Future of Jobs Report 2023*.

She highlighted the need to embed digital skills and computing by:

- firstly integrating STEM and humanities to promote data literacy, foster creativity and enable innovation,
- secondly, getting students to discuss ethical and social implications,
- and finally, preparing students by working on real-world problems, encouraging innovation and entrepreneurship.

She stressed the need for lifelong learning to keep pace with changes, through resources like the Digital Futures programme.

Nimmi Patel spoke about techUK's report, Making AI Work for Britain, which found some UK businesses lack capacity and funds to leverage AI's potential for productivity growth, with small businesses particularly affected. The report proposes:

- introducing support for training,
- further work to anticipate future needs, and
- support for lifelong learning.

AI has the potential to help address some of these challenges, by identifying skills gaps to help prioritise different types of training. There is a need for good management practices and principles to guide the ethical use of AI in the workplace, and for an inclusive, human-centric focus for the tech for good agenda.

Dr Erin Young picked up this theme, outlining the Alan Turing Institute's research to map the gender gap in the AI industry, where women are vastly outnumbered by men, and more likely to hold roles with lower status. The Institute's Rebalancing Innovation report showed female-founded AI startups won just 2% of all venture capital funding deals in the UK in the last decade, with the average deal capital being six times lower for women.

Dr Young argued that this balance must be redressed to ensure AI is not controlled by one privileged group with specific biases and preferences. She emphasised the need for organisations to be more inclusive – and warned against putting the onus on under-represented groups to be the agents of change.

During the discussion, delegates drew out suggestions that included:

- The need to integrate relevant and practical content on AI, digital literacy and critical thinking into the school curriculum as part of overall learning, not just as a standalone subject.

- The potential for the UK to learn from best practice worldwide, such as Singapore's strategy for reskilling the workforce.

- A need for the broader science community to play an active part in setting the AI agenda, and for the current workforce and wider public to have a basic understanding of the technology to enable them to be part of the debate.

Further reading

The Future of Jobs Report 2023[21] produced by the World Economic Forum considers how jobs and skills will evolve over the next five years. 2023 marked the fourth edition of the series, analysing employer expectations to provide new insights on how socio-economic and technology trends will shape the workplace of the future.

techUK's Making AI work for Britain (2023)[22] report spotlighted nine actions for the UK government to support people and businesses to take advantage of AI in the workplace. The report notes that while the UK is ranked highly in 'AI readiness', the speed and effectiveness of AI adoption is likely to be patchy. The Government therefore needs to strengthen its actions to support digital adoption across the economy.

The Alan Turing Institute's report Where are the Women? Mapping the gender job gap in AI (2021)[23] charts women's participation in data science and AI in the UK and other countries. The report found extensive disparities between women and men in skills, status, pay,

21   https://www.weforum.org/publications/the-future-of-jobs-report-2023/
22   https://www.techuk.org/resource/making-ai-work-for-britain.html
23   https://www.turing.ac.uk/news/publications/report-where-are-women-mapping-gender-job-gap-ai

seniority, industry, job, attrition and educational background and called for effective policy responses if society is to reap the benefits of technological advances. This was followed by Rebalancing Innovation: Women, AI & Venture Capital in the UK (2023)[24] which looks at gender diversity in AI-focused venture capital (VC) investment over the last decade. This report found that despite the recent surge in the number of companies set up by women, access to venture capital funding remains more difficult for female founders.

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24   https://www.turing.ac.uk/news/publications/rebalancing-innovation

Breakout 2b: Skills for a sustainable world: transition, place and provision

Chair: Professor Liz Price, Professor of Environmental Education, Manchester Metropolitan University

Panel members:
- Professor Sian Davies-Vollum, incoming Chair, University Geoscience UK – and The Geological Society of London
- Jérôme Nessi, Senior Manager in Electrification and Power Transmission, Aker Solutions
- Joseph Lewis, Policy Lead, Institution of Environmental Sciences

This session examined the skills needed to create a more sustainable future, ways to deliver those skills and the wider benefits of doing so.

Professor Sian Davies-Vollum explored the role geoscience has in sustainability, working across a range of disciplines and with a variety of skills from core science skills to complex decision-making. She highlighted a skills gap stemming from a decline in the number of people taking A levels and degrees related to geoscience, and a lack of representation from black and other ethnic minority groups.

She outlined several programmes designed to improve perceptions of geoscience, including community and school outreach, and resources provided for schoolteachers including non-specialists. With a Degree Apprenticeship standard newly-approved for geoscientists, she showed how this model could increase diversity, with apprenticeships tending to recruit more students from working-class and BAME backgrounds, and more people with vocational qualifications.

Jérôme Nessi described decarbonisation efforts within the energy sector and the transition from oil and gas to renewables, in particular offshore wind, with a need for a meshed offshore grid to harness this technology.

He pointed to a need for new skills for such projects to be successful – not only people with technical and R&D skills, but also those skilled in project management, regulation and policy, feasibility studies and health and safety. And he underlined a need for international scientists who are open-minded about working in new industries.

Joseph Lewis outlined a 'systems approach' model whereby interconnected natural systems that impact events such as flooding are themselves affected by climate change – with climate change in turn driven by socio-economic systems. He identified skills as a 'key leverage point' for creating a just transition and levelling up local economies.

He argued for a need to build aspirations within communities of what sustainability should look like, and for communities to carry out skills audits to determine the skills they need for the future. He cited case studies such as the transition from oil and gas to a renewables-focused economy in Alberta, Canada, the community-owned Fordhall Organic Farm in Shropshire, and the Scottish Government's Future Skills Action Plan.

Several themes emerged during the discussion, including:

- The innately multi-disciplinary nature of sustainability science.

- The importance of organisations with a central role in communities, from universities to national parks, to be part of developing the skills their specific communities need.

- The potential for the government's sustainability and climate change strategy to engage schools and ensure STEM subjects are valued from an early age.

- The challenge of providing diverse role models with a lack of diversity in senior leadership positions, and the potential for early-career researchers to help inspire more people from different backgrounds to pursue science.

- The need for young people to have opportunities to experience different environments through work placements, and for the sector to show how sustainability jobs align with people's values.

Further reading

Some examples of schemes to address educational challenges in geosciences include Teach Earth[25] run by University Geoscience UK, GeoBus[26] run by the Universities of St Andrews and University College London and Geoscience for the Future[27] is not-for-profit initiative set up in 2020 to communicate the links between Geoscience and sustainability. The EQUATOR project[28] is a collaboration between professional bodies, grassroots organisations, academic institutions and the public sector, to develop evidence-based interventions targeting barriers to ethnic minority participation and retention in geography, earth science and environmental science postgraduate research.

Scotland's Future Skills: Action Plan (2021)[29] sets out how the Scottish Government is working to deliver on recommendations made by the earlier Enterprise and Skills Board: strategic plan (2018)[30] and seeks to:
- Increase system agility and employer responsiveness;
- Enhance access to upskilling and retraining opportunities;
- Ensure sustainability across the skill system; and
- Accelerate the implementation of the learner journey review.

The Institution of Environmental Sciences' Transforming the planet: Our vision for the future of environmental science (2023)[31] sets out their vision on the future of environmental science, produced at the conclusion of a year-long horizon scanning project. The document contains a significant chapter on skills, which sets out how the range of enabling skills support the effective translation of environmental science into action.

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25   https://earth-science.org.uk/teach-earth/
26   https://geobus.org.uk/
27   https://geoscienceforthefuture.com/
28   https://equatorresearchgroup.wordpress.com/
29   https://www.gov.scot/publications/scotlands-future-skills-action-plan/
30   https://www.gov.scot/publications/working-collaboratively-better-scotland/
31   https://www.the-ies.org/resources/transforming-planet-vision-environmental-science

Breakout 3a: Supporting cross-sector mobility

Chair: Professor Catherine Ross, Chief Scientific Officer, Scottish Government; Science Council Trustee

Panel members:
- Frances Burstow, Director of Talent and Skills, UKRI
- Danni Croucher, Policy Lead for Skills and Talent, NCUB
- Dr Jane Williams, Deputy Director, GO-Science

This session explored the benefits of cross-sector working, and ways to support people to move between sectors during their careers.

Frances Burstow highlighted the importance of cross-sector mobility for a dynamic, creative and joined-up research and innovation sector. She spoke about some of the initiatives supported by UKRI to encourage and support mobility, including:

- Support for individual researchers, through personal awards and fellowships and the promotion of different career paths, skills training and placement opportunities.

- Support within UKRI's wider investment portfolio, through initiatives like PROSPER and C-DICE, supporting post-doctoral researchers to think differently about their careers.

- Policy and advocacy work, including changes made to REF 2028 to encourage and incentivise mobility.

She pointed to a need to further develop understanding of what works, and specific challenges where mobility appears to be more difficult – for example, for mid-career researchers and post-doctoral researchers.

Danni Croucher talked about the Researcher Career Mobility Taskforce, which convened university and business leaders to explore ways of removing barriers to cross-sector collaboration. The taskforce found benefits from cross-sector working that ranged from improved diversity of thought and access to cutting-edge knowledge, to the development of new skills and networks that stay with researchers across their careers. Yet the UK lags behind other countries, with barriers including:

- A lack of reward and acknowledgement, with expertise not always recognised in other sectors.

- Low awareness among researchers about available opportunities, with particular implications for equality, diversity and inclusion.

- Perceptions that mobility is high-risk, meaning people in under-represented groups may be excluded.

Jane Williams reflected on her own experience of moving between academia, industry and government, highlighting the value of this career pathway while acknowledging the challenges of 'starting again' in a new sector.

She outlined initiatives Government Science and Engineering (GSE) works on to promote cross-sector working, including:

- The STEM Futures scheme, which facilitates mentoring, shadowing and training in areas such as AI.

- The Royal Society Pairing Scheme, which pairs policymakers and scientists to learn from each other.

- The GSE Careers Framework, which showcases the range of careers available and supports line managers to recruit in a more diverse way.

Other 'exchange' schemes within specific government departments also encourage cross-sector collaboration between policymakers and scientists.

During the discussion, delegates reflected on:

- The potential to learn from other countries to apply best practice within the UK. While there has been little formal evaluation of many cross-sector mobility schemes, insights from the Researcher Career Mobility Taskforce suggest long-running schemes are better able to recruit and have more impact.

- The need to support scientists to be aware of their transferrable skills, and to articulate these to potential employers in new sectors.

- The importance of tackling bias that can prevent under-represented groups not only from moving between sectors, but from moving up within their sector. Delegates agreed that the lack of security associated with changing roles, particularly for short-term posts, is an extra barrier to equality, diversity and inclusion.

- The role professional bodies can play in fostering cross-sector discussions and collaboration.

Further reading

The report of NCUB's Researcher Career Mobility Taskforce, Pathways to Success (2023)[32] shows that when researchers' careers span across sector boundaries, the impact of their work improves, facilitating innovation. The report makes a number of recommendations on how unlock the full capability of the workforce, to drive skills, develop partnerships and networks, and enable growth.

The European Commission's MORE3 study (2017)[33] provides considerable data and analysis concerning mobility patterns and career paths of researchers from across the EU (the UK was a member state at the time).

In 2019, Research England funded PROSPER[34], led by the University of Liverpool, to develop a new and holistic model for postdoc career development. Its model and resources are now freely available to Higher Education Institutions up and down the country. The impact of the prosper was evaluated[35] in 2023.

GSE's Career Framework (2021)[36] explains the technical skills, knowledge and experience required to be an effective scientist or engineer in government, and is a useful tool for understanding the transferability of those skills.

GSE also supports STEM Futures[37], a partnership of organisations across industry, academia, and the public sector to facilitate knowledge exchange in STEM. UKRI's Future Leaders Fellowship Scheme[38] aims to develop the next wave of world-class research and innovation leaders in academia and business by supporting talented people with funding over four years to tackle ambitious and challenging research and innovation to develop their careers. The Centre for Postdoctoral Development in Infrastructure Cities and Energy (C-DICE[39]) provides industrial secondments as part of a postdoctoral development programme which leverages the capability of 18 leading UK universities.

Similarly, schemes such as the Royal Society Pairing Scheme[40] and UKRI's Policy Internship Scheme[41] equip researchers with insights into how research outputs can be harnessed to shape public policy.

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32   https://www.ncub.co.uk/insight/pathways-to-success/
33   https://op.europa.eu/en/publication-detail/-/publication/4681ae98-3ba0-11e8-b5fe-01aa75ed71a1/language-en
34   https://prosper.liverpool.ac.uk/
35   https://prosper.liverpool.ac.uk/wp-content/uploads/2024/02/Prosper-Cohort-2_Evaluation-Report.pdf
36   https://assets.publishing.service.gov.uk/media/61a605f2e90e07043d677dd0/gse-career-framework-v2.pdf
37   https://www.gov.uk/government/news/stem-futures-programme
38   https://www.ukri.org/what-we-do/developing-people-and-skills/future-leaders-fellowships/
39   https://www.cdice.ac.uk/
40   https://royalsociety.org/grants-schemes-awards/pairing-scheme/
41   https://www.ukri.org/apply-for-funding/studentships-and-doctoral-training/get-training-and-development-to-support-your-doctorate/ukri-policy-internships/

Breakout 3b: How technical education can meet current and future workforce needs

Chair: Dr Hilary Jeffreys CSci, Chair of Registration Authority, Science Council

Panel members:

- Sam Callear, Deputy Director, Policy and New Concepts, Institute for Apprenticeships and Technical Education (IfATE)
- Cerian Ayres, National Head of Technical Education, Education and Training Foundation (ETF)
- Daniel Sandford-Smith, Director of Education Programmes, Gatsby Charitable Foundation

This session looked at current approaches to technical education, and examined different ways to equip the science workforce with the technical skills it will need in future.

Sam Callear introduced IfATE's approach to technical education, with its strategy designed to address four key issues:

1. Its work with employers to define the skills needed by their workforces, which underpin its occupational standards and the wider technical education landscape.

2. Its emphasis on providing a range of qualifications that cater for learners at different stages of their lives and careers.

3. Its Occupational Maps, which show how these qualifications interact and help people understand how they could take their careers in different directions.

4. Its three-step process for keeping pace with changing needs, including 'rapid response' short courses, sharing insight on emerging skills needs with the wider sector, and updating occupational standards to reflect these skills in the longer term.

Cerian Ayres pointed to quality education for all as one of the United Nation's 17 Sustainable Development Goals, stressing its importance for improving people's life chances, and for wider goals such as reducing inequality and building infrastructure. She called for existing strategies and policies, such the UK government's Climate Change Strategy and its Science and Technology Framework, to be better joined up.

She made a case for teachers and trainers to be better connected with industry, to help them understand new innovations and inform their teaching, citing WorldSkills UK's Ingredients for Success report. And she pointed to a need for a 'two-way street' of teachers working with employers to achieve this, with a collaborative system that supports teachers to update their knowledge and access industry-standard technology.

Daniel Sandford-Smith talked about the vital role technicians play in translating abstract scientific ideas into reality, and their importance to the 'development' side of R&D. He challenged traditional ideas about 'parity of esteem' between technical education and academia – arguing that they should not be seen as alternative routes to the same destination, but as routes to equally valued roles needing different skills.

He outlined approaches in other countries that could offer inspiration, including the Swiss model of apprenticeships for 15-18-year-olds, where young people are not committed to a fixed end goal. And he highlighted that good technical education should start with understanding what skills employers need to take on new technologies, but should also include employees' voices.

During the discussion, delegates highlighted:

- Potential ways to engage employers in technical education, including relationship-building, involving them in course design, and peer support for employers to learn from each other.

- The need to support employers to identify the skills they may need in the future.

- The different resources available for people to grasp the breadth of qualifications that exist, and the potential to improve these for different audiences.

Further reading

IfATE's occupational maps[42] are designed to help anyone who has an interest or is working in technical education to understand the options to train and progress in their careers, show how occupations at different levels link together and, provide workforce and career planning information, including likely salaries.

Worldskills UK's Ingredients for Success (2023)[43] report presents an exploration of excellent practice in teaching, learning and assessment in the further education and skills sector in the UK. The report found that investing in and developing staff, including providing opportunities to undertake high-quality CPD and engaging employers in developing a relevant curriculum, support the embedding of excellence.

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42   https://occupational-maps.instituteforapprenticeships.org/
43   https://www.worldskillsuk.org/insights/ingredients-for-success/

Plenary 2: The need for a multi-disciplinary approach

Chair: Adam Donnan, Chief Executive, Institution of Environmental Sciences & Chair, Science Council

Panel members:

- Professor Christina Boswell FBA, Vice President for Public Policy, British Academy
- Tim McLachlan, Chief Executive, Institute of Food Science and Technology
- Dr Shaun Holmes, Senior Policy Adviser, Royal Academy of Engineering (RAE)

The final session of the day looked at ways of encouraging multi-disciplinary working, and the cross-pollination that happens when people from different sectors work together.

Christina Boswell introduced the concept of SHAPE (Social Sciences, Humanities and Arts for People and the Economic/Environment): an acronym adopted as a counterpart to STEM. She highlighted evidence that SHAPE and STEM graduates do equally well in the UK labour market, and pointed to areas where skills from both are needed, such as business, economy and finance, and government.

She outlined a University of Edinburgh project that aims to integrate SHAPE thinking into research on new technologies in health and care, climate and sustainability, and data and AI. Whereas SHAPE experts have traditionally been brought in at the end of such projects, in this pilot, SHAPE and STEM researchers are 'matched' to collaborate throughout the development phases.

Tim McLachlan highlighted a need for more scientists across all sectors, arguing that sectors must complement each other rather than compete for the same STEM graduates.

He proposed a recipe for inspiring young people to choose STEM careers, by:

- Inspiring them with content designed to draw them in, using platforms aimed at young people, such as TikTok.

- Being upfront about the salaries they may expect, and showing the various directions a STEM career could take them in.

- Giving them the science knowledge and skills they need to succeed, while showing them how these skills can be transferred between different areas.

Shaun Holmes detailed the RAE's Engineer 2030 programme, which aims to identify the skills engineers will need to meet the global challenges of the next decade. He outlined the results of a review of existing studies on engineering sector skills, which revealed four major themes:

1. Emerging technologies such as sustainable technology and the move to digital working.

2. Rapid change and the need for engineers to be adaptable in an ever-more complex landscape.

3. Productivity, and the need for entrepreneurship and business skills.

4. Global responsibility, and the need to consider areas such as ethics, diversity, and sustainability.

He argued that each of these themes require interdisciplinary thinking, with engineers needing to either develop new skills themselves, or work with specialists in other areas.

In the discussion, a range of solutions to encourage multi-disciplinary working were put forward, including:

- Practical incentives such as grant funding requirements, REF requirements, placement exchanges and interdisciplinary PhD programmes.

- Individuals seeking out ways to expose themselves to people and ideas from other disciplines, e.g. through journals, conferences and other networking opportunities.

- CPD training on multi-disciplinary working, and senior leaders and professional bodies modelling collaboration by working across disciplines.

- Changes to the education system, with young people required to maintain certain disciplines throughout their education, rather than specialising early.

Delegates acknowledged that multi-disciplinary working takes resources: researchers need a solid basis in their own specialism, and a culture that promotes and enables collaboration.

Further reading

The British Academy has produced a number of publications which provide evidence for the tangible benefits of skills developed in the arts, humanities and social sciences to the UK workforce, economy and society. These include The Right Skills (2017)[44] and Qualified for the Future (2020)[45] reports and SHAPE Skills at Work (2022)[46], which is a collection of 12 case studies that bring to life the many ways in which SHAPE skills are utilised across the economy, showcasing the careers and successes of a broad collection of SHAPE graduates.

The importance of interdisciplinarity is reflected in the Academy's Connected Knowledge campaign[47] dedicated to celebrating how interdisciplinary research and learning shapes the world – especially when STEM and SHAPE (Social Sciences, Humanities and the Arts for People and the Economy) subjects come together.

Engineer 2030[48] is the Royal Academy of Engineering's flagship policy project to redefine engineering skills for the 21st century with the goal of developing a world-leading and truly inclusive engineering workforce.

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44   https://www.thebritishacademy.ac.uk/publications/flagship-skills-right-skills-arts-humanities-social-sciences/
45   https://www.thebritishacademy.ac.uk/publications/skills-qualified-future-quantifying-demand-arts-humanities-social-science/
46   https://www.thebritishacademy.ac.uk/publications/shape-skills-at-work/
47   https://www.thebritishacademy.ac.uk/connected-knowledge/
48   https://nepc.raeng.org.uk/engineers-2030

Acknowledgements

The Science Council is grateful to all the speakers and others who contributed to the success of the conference. We would also like to thank our member organisations who provided insights essential to ensuring the relevance of the conference and most especially the Institute of Physics for generously hosting us on the day. We are also grateful to UKRI for providing funding and further insights to help shape the conference.

Many of the Science Council team helped deliver the conference, with special thanks to:

Ryan Mercer	Senior Policy Officer
Liz Gill	Events Officer
Tom Cheek	Apprenticeship Programme Manager
Peigu Zhao	Marketing and Communications Officer

Thanks also to Kirsty Marais (www.kirstymaraiscopywriting.com) for capturing the discussions at the conference and summarising them for use in this report.

About the Science Council

The Science Council is a membership organisation made up of 35 professional bodies across a diverse range of science disciplines. As an umbrella organisation, the Science Council provides member bodies with a forum for collaboration and to amplify the collective voice of the science community.

The Science Council is developing its role as the collective voice of our diverse membership on issues of pan-scientific concern. By becoming a more visible, supportive, and influential presence across the sector, we serve as a conduit between the membership as a whole and policymakers. Using our convening power, we bring together Members to identify policy positions on which there is broad interest and consensus and communicate these to policymakers as a common view of the science community. In policy areas where there is a divergence of opinion across the membership, we provide trusted fora for discussion and knowledge exchange.

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Institution of Chemical Engineers (IChemE)
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Royal Society of Biology (RSB)
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Society for Cosmetic Scientists (SCS)
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