

Wales has huge potential to be a world-leading science nation

This week, we're marking British Science Week 2023, a 10-day celebration of science. We're raising awareness of the importance of science and its impact on our daily lives, showcasing the diversity of science, technology, engineering, and mathematics (STEM), and engaging people in hands-on activities, events, and discussions.

There is a shortage of scientists and engineers in the UK. Firms are crying out for STEM skills at every level. British Science Week offers us a great opportunity to inspire people of all ages and backgrounds to engage with science and encourage young people to consider a career in STEM.

Why science, technology, engineering, or mathematics? There are hugely exciting and well-paid opportunities for young people in STEM. This requires studying science at school, and then progressing either through apprentice routes or graduate routes. Encouraging young people from lower-income backgrounds to gain qualifications in science, is one of the most effective routes to social mobility, self-prosperity, and community well-being.

Working in science offers the opportunity to travel abroad, learn about other cultures, and collaborate with scientists around the world. Scientific research is an international endeavour, and the only effective way of tackling global challenges important to many young people – poverty, climate change, sustainable energy, food security, healthcare, and biodiversity loss.

As Professor of Chemistry at Durham University and a Fellow of the Royal Society, I've worked in the field of surface science

and nanotechnology. Designing functionalised surfaces forms the basis of a multi-billion-dollar global industry. For example, the cleanliness of smart phones, the resistance of biomedical devices to bacteria, the speed of computer hard disks, and even the wear of car brake pads – all are governed by their surface chemistry.

The research group I lead is focused on inventing novel functional surfaces for commercial applications and helping to alleviate poverty in low-income countries. This has involved developing solutions to help deliver clean drinking water, water harvesting, and low-cost healthcare. Three start-up companies have been set up to commercialise patented research from my laboratory.

I was inspired to come to Wales because I think, as a small country, we have huge potential to lead the world in developing sustainable technologies for the benefit of all humankind.

As the new Chief Scientific Adviser for Wales, my role is about maximising the contribution science makes to the lives of the people in Wales by providing expert leadership in the development of science and research policy. I want to support Wales' universities to benefit society and beyond, as I've done with my own research.

As the head of the science profession in Wales, I also have a key role in championing the role of high-quality science advice for Welsh Ministers as they develop and deliver policies that bring prosperity and wellbeing to our communities.

Wales faces a diverse range of environmental, economic, social and health-related challenges which are not unique to Wales; they are shared and often global. These challenges will demand an increasingly collaborative approach, between nations and sectors (including government, academia, third sector,

business and industry) and Wales has an important contribution to make. Collaboration must be effective, with shared risk and shared reward.

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No country, sector, institution, or company can do everything. Therefore, as for all nations, Wales must decide how to target its resources and effort for maximum positive effect, both in terms of the inhabitants of Wales (human, animal, and plant) and the wider global community. The Welsh Government's recently launched *Innovation Strategy* seeks to address all these aspects.

Decisions will be required – and many of these will involve difficult choices between competing options and demands. Good decisions require a sound understanding and evidence of the research, development, and innovation landscape, within Wales and the wider context of the global system in which Wales is embedded.

The challenges will be associated with opportunities for Wales to make a positive impact, and to consolidate its position as a trusted and valued partner. Recent work by Elsevier demonstrates Wales' aptitude for collaboration, and this collaboration is associated with above world-average scientific research citations.

Key to success will be ensuring opportunities emerging from world-leading fundamental scientific research are translated into impactful real-world solutions. This requires a focus on driving the development of new discoveries up the technology readiness levels (TRLs) so the benefits such discoveries can bring are genuinely realised for all.

In short, this means developing innovative ideas; taking those ideas out of the laboratory and commercialising them and ensuring they're available for people to use to benefit their day-to-day lives.

To help deliver the Welsh Government's five priorities for RD&I, which were set by the First Minister of Wales in 2021, I have set four early priorities which will fuel the ambition for Wales to be truly world-leading in science and innovation:

1. Developing the scientists of tomorrow through STEM enrichment by fostering opportunities for all children to engage in STEM activities.
2. Strengthening foundations for excellence in Welsh STEM research
3. Attracting and retaining world-leading scientists
4. Encouraging opportunities in effective collaboration in applied science to provide Welsh scientists with the skills necessary to enable progression along the TRLs in research, development, and innovation.

Science has a pivotal role to play for the benefit of all in society if these challenges are to be successfully met.

Our unique Well-Being of Future Generations (Wales) Act continues to receive international recognition and acclaim. Science has a genuine, and pivotal, contribution to realising the aspirations in this landmark Act, not just in Wales but to the benefit of the wider global community.

I very much look forward to working with colleagues across government, business, industry, schools, and academia to

deliver our ambitions.

Professor Jas Pal Badyal FRS is the new chief scientific adviser for Wales