



GW4 ALLIANCE
OUR VISION FOR
RESEARCH AND
INNOVATION

GW4

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GW4 ALLIANCE

The GW4 Alliance brings together four of the most research-intensive and ambitious universities in the UK; the universities of Bath, Bristol, Cardiff and Exeter. From the creative arts to the physical sciences, the GW4 Alliance has world-leading scholarship, infrastructure and expertise across multiple areas and disciplines. The universities anchor the regional economy through income, employment, knowledge exchange and collaborations with business. Together, we have the research and innovation capacity, capability and motivation to deliver cross-sectoral partnerships and solve global challenges. We have the scale to respond to major policy developments such as Brexit, continue to attract global talent through doctoral training and work in partnership with industry to drive innovation and globally competitive research and development.

OUR MISSION

There is a growing need to combine expertise from multiple disciplines to tackle the most vital research challenges facing the world today. This brings new opportunities for collaboration, rather than competition, between universities and external partners.

The fundamental role of the GW4 Alliance is to build research capacity, at scale, to tackle these challenges and provide a rich environment in which to develop the researchers of tomorrow.

We will address the productivity challenge through building a highly skilled workforce and working with industry partners to deliver research-led solutions to real-world problems.

Our mission is to push back the frontiers of knowledge through pioneering, collaborative endeavours to drive innovation and economic growth across our region and beyond.

GW4 VISION 2025

By 2025, the GW4 Alliance will be celebrated as an essential part of the national science and knowledge exchange ecosystem with an international reputation for the quality, breadth and impact of its research.

We will fulfil this vision by harnessing the creativity of our staff and students, to transform the way we carry out research between our institutions. Specifically, we will:

- Develop new knowledge that changes lives and society.
- Deliver globally competitive research.
- Foster new talent for the world stage.
- Forge new and stronger relationships with commercial, non-profit, academic, healthcare and government organisations.
- Build on the region's strong entrepreneurial spirit and SME sector, to drive economic growth throughout the supply chain and attract global inward investment.

FOUNDING MEMBER OF THE GREAT WEST TASKFORCE FOR SCIENCE AND INNOVATION

The South West England and South East Wales Science and Innovation Audit, part of the first wave of Audits commissioned by the UK Government, brought together higher education institutions, major businesses (such as Oracle and Airbus), Local Enterprise Partnerships and the Welsh Government to produce the definitive evaluation of our region's research and industry strengths. This work has now matured into the Great West Taskforce for Science and Innovation, which was established to provide a unified voice for science and innovation in the South West England and South East Wales region. This is led by the GW4 Alliance. Its purpose is to drive strategic development of the regional research and enterprise environment respond to major policy developments such as the Industrial Strategy and raise the profile of the region's science and innovation ecosystem, and, where appropriate, drive forward science and innovation collaborations. The relationships forged and strengthened by the Great West Taskforce ensure that our region can make the UK a global leader in Advanced Engineering and Digital Innovation.

REGIONAL ASSETS

Today's Great West is home to the UK's largest aerospace sector and pioneering automotive, nuclear and marine renewables industries. Our region is synonymous with digital innovation, and our tech clusters generate £2.1 billion GVA and over 50,000 jobs. The Great West is a global powerhouse in microelectronics, with growth potential as world's first compound semiconductor cluster. We are making the UK a global leader in smart communities, digital health and environmental science. The Great West is also home to more climate expertise than any other area worldwide. Our region is home to leading-edge expertise in the life sciences, characterised by recognised centres of excellence in areas such as neuroscience and imaging, AMR and population health. The UK's first nuclear power station for a generation, based in our region, will generate over 25,000 jobs.

THE BIRTHPLACE OF INNOVATION

Isambard Kingdom Brunel secured the Great West's place in history as the birthplace of innovation. We are the proud inheritors of this legacy and our hyper-connected, smart and specialist region continues to produce innovative solutions to global challenges. One of these solutions is a GW4 supercomputer, developed in partnership with Cray Inc and the Met Office, which can select the optimum technology for any scientific problem, saving scientists time and money. It is fitting that this world-first, problem-solving supercomputer is known as Isambard.

GW4 VALUES

The GW4 Alliance is committed to core values in all its activities:

- We are adventurous, opportunistic and fundamentally creative.
- We are collaborative, achieving strength through knowledge-sharing.
- We empower colleagues to be resourceful and ambitious.
- We maximise the impact of all our endeavours.

As individual universities, we make a substantial contribution to the global knowledge economy. When combined as the GW4 Alliance, we can create new opportunities for scholarship, collaboration and innovation at an unprecedented scale. It is the mechanisms we use to create and capitalise on these opportunities that are at the heart of our strategy.

FACTS AND FIGURES

- The GW4 Alliance has a combined turnover of over £1.8bn.
- Our universities employ over 8,000 academic staff, and train over 23,000 postgraduate students.
- Together we have the highest combined REF 2014 evaluation of any regional university alliance, and all GW4 universities feature in the top 30 of Times Higher Education's REF 2014 rankings.

WHAT MAKES US DIFFERENT?

Collaboration sits at the very heart of the GW4 Alliance. This is what makes us greater than the sum of our parts. Some examples of our multi-faceted collaborative work include:

- The scale of our doctoral training offer demonstrates unprecedented co-operation between universities. We have the largest collaborative doctoral training portfolio of any regional university alliance, with over 30 combined training entities contributing to our region's highly skilled workforce.
- We have catalysed over 70 collaborative research communities tackling vital challenges of the future, from producing biofuels from algae to harnessing quantum technology to secure personal finances. Our communities achieve real-world impact.
- Together we share over 1,700 items of cutting-edge equipment and a treasure trove of rare archive materials, which enables our researchers to deliver pioneering research that competes on the global stage. This includes world-class, large-scale facilities, such as the GW4 Facility for High-Resolution Electron Cryo-Microscopy.

GW4 RESEARCH FOUNDATIONS

The GW4 Alliance is ideally placed to address societal and economic challenges through our emphasis on interdisciplinary research, collaboration and knowledge transfer at scale. These challenges will evolve and change with time. Our approach is based on a fundamental belief in excellence, cooperation, integration and partnership. We will be driven by a focus on ambition, quality and distinctiveness.

Our vision is to be internationally acclaimed as the UK's leading research alliance, and a partner of choice for collaborative research and innovation. The GW4 Alliance will harness our universities' complementary, interdisciplinary expertise and partnership networks to drive innovation in the global economy.

AEROSPACE AND ADVANCED ENGINEERING



The GW4 region is home to a high concentration of advanced engineering enterprises, from global businesses such as Airbus to thriving SMEs. The region is making the UK's automotive industry a global leader in developing new technologies for ultra-low emission vehicles. These strengths, built over decades, have resulted in a rich landscape of collaboration and a wealth of opportunity to enhance capabilities in the industrial value chain.

High value engineering design and system integration capability is the key to success of the GW4 region and sustainability of long term manufacturing competitiveness¹. We recognise that there are significant opportunities to both create and share knowledge, for example, in low carbon propulsion systems and lightweight structures for cars and planes, and share skills across sectors to build resilience as the world embraces cloud computing and the Internet of Things.

We have world-class academic strengths in, for example, design, simulation, modelling and visualisation, as well as in real-world evaluation to derive the optimal commercial benefit. The new £60m Institute for Advanced Automotive Propulsion Systems (IAAPs) will be a global centre of excellence, delivering transformational research and innovation into advanced propulsion systems. The region is home to the National Composites Centre (NCC), which has been designated as a High Value Manufacturing Catapult Centre by the UK Government. and has been successful in securing a £149m investment to establish a National Composite Materials Centre (NCMC). The NCC specialises in new composites structures for aerospace and advanced engineering applications. In aerospace and advanced engineering, the region leads in the design and manufacture of new composite materials, lightning protection, wing aerodynamics, aerospace supply chains, and systems efficiency of the whole vehicle powertrain (engine, transmission and control).

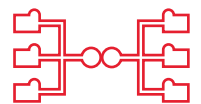
¹ <http://gw4.ac.uk/sww-sia>



NEW ENERGY SYSTEMS

The GW4 Alliance is ideally positioned to drive development of new energy generation and distribution technologies, enabling the UK to achieve a globally competitive advantage. We have a world-class research community spanning earth and environmental sciences, chemistry and engineering, accompanied by a unique set of geographical and industrial assets. These include the South West peninsula coastline, the Severn estuary and associated tidal lagoons, the Hinckley Point nuclear power generation and associated GW4 research clusters.

The GW4 Alliance has demonstrable research excellence in new energies, from marine renewables, to emerging opportunities in nuclear and tidal sectors. We also specialise in biofuels and broader energy storage; materials, devices, modelling and simulation; energy networks, infrastructure and smart grids. The potential synergies across disciplines are substantial; much of our expertise can be applied across a range of energy and other technologies. Complemented by regional strengths in digital technology capability, we can truly harness the research potential and drive a step-change in new energy generation and technologies.



NEXT GENERATION MICROELECTRONICS

Next generation microelectronics is a burgeoning GW4 pillar of research excellence of substantial economic importance. We will drive innovation both within the field and across industrial sectors, through the development of enabling technologies.

We have a strong track-record in growing, processing and characterising electronic devices. The region is home to the largest silicon design cluster outside of the USA and the national Compound Semiconductor Applications Catapult. These are foundations of the world's first cluster dedicated to compound semiconductors. The GW4 Alliance has cutting-edge research across photonics, wireless, sensors, compound semiconductors and quantum engineering. GW4 research communities have strengths in materials science, semiconductor growth and fabrication, chip architecture and design, integration and the development of next generation technologies. These hardware activities are complemented by research into device design, verification, validation and high-performance computing.

RESILIENCE, ENVIRONMENT AND SUSTAINABILITY



The GW4 Alliance hosts extensive and internationally excellent academic communities and assets in resilience, environment and sustainability research. We have globally recognised research strengths in earth systems science, climate modelling, environmental sciences, sustainable chemical technologies, and sustainability. GW4 capability is complemented by the presence of over a quarter of the UK's major environmental research organisations in the region, including the internationally renowned Met Office in Exeter and the Plymouth-based marine institutes, plus sustainable industries around Swindon.

Excellence, intensity and complementarity exist in sustainable energy, sustainable materials and manufacturing, water systems engineering, food security, climate change, environment and environmental risk, and associated sustainability policy research. GW4 can address the global challenges of climate change and sustainable technologies and innovation by tackling risks from natural hazards such as floods and protecting the resilience of socio-economic systems. The GW4 Alliance has a huge opportunity to lead the development of new technologies and innovation that will be required to live sustainably in the future.

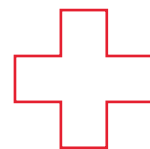


CREATIVE AND CULTURAL ECONOMY

The creative industries sector is the fastest growing sector of the UK economy. From a UNESCO World Heritage City and a plethora of National Trust, English Heritage and CADW properties, to BBC Wales, the BBC Natural History Unit and Aardman Animations, to flourishing innovation and incubation spaces, the GW4 region is home to a wealth of creative and cultural assets². By bringing together our world-class arts and humanities researchers with people working in the creative industries and cultural heritage sectors, together with our technological expertise, for example, in digital content and user experiences, we will foster economic growth in the GW4 region and beyond. The potential to generate new economic benefit, while at the same time promoting social inclusion, cultural diversity and human development, is immense.

The GW4 Alliance is leading the UK in driving development of creative and cultural economy clusters. From our individual Fellows of the British Academy, to the breadth and depth of expertise in medical humanities, policy, modern British history, politics, and digital entertainment, GW4 researchers are an essential source of new ideas and practices to drive innovation in the creative and cultural economy. The GW4 Alliance, building on the legacy of large collaborative projects like AHRC REACT is continuing to develop innovative ways of working, new models of co-production and technologies to promote greater knowledge exchange across the arts and humanities, heritage and the creative economy sectors.

² <http://technation.techcityuk.com>



LIVING WELL

The GW4 Alliance partners with seven research active NHS Trusts across two health systems. We host three medical schools, two dental schools, and one veterinary school. Our research is carried out in collaboration with clinical partners and networks, global research centres, and healthcare and pharmaceutical organisations, utilising extensive and complementary facilities. We have strengths and expertise in neurosciences and mental health imaging, sports and exercise science, infection and immunity, fundamental bioscience, and population health.

We have the research power and collaborative networks to generate knowledge which will substantially contribute to the global society living well. Huge opportunities exist to better use data and technology to improve health ('digital health'), transform the quality and reduce the cost of health and care services. The potential to drive the UK's contribution to tackling global issues, for example in antimicrobial resistance, dementia and cancer, is considerable.



DIGITAL INNOVATION

Underpinning all our themes is digital innovation. We will harness the power of data and digital technologies and the interaction between people and technology for socio-economic impact.

As a region, we have taken a leading role in developing the digital technologies that have transformed our lives over the last 20 years. We will continue to maximise the impact of data and digital technologies through strong established partnerships with global businesses, SMEs and universities. The high-tech digital excellence in, for example, microelectronics, Artificial Intelligence, wireless, data analytics, autonomous systems, vision, remote sensing, satellite applications, cloud computing, quantum engineering, cyber security and virtual reality forms the basis of high growth digital opportunities. These are complemented by world-scale industries in digital health, digital creative industries, smart cities and communities, distributed smart energy and environmental resilience³.

³ <http://technation.techcityuk.com>

TAKING ACTION TOGETHER

Building GW4 Research Communities

The GW4 Alliance will be identified as the UK's leading university cluster with truly world-class research. Rooted in deep collaboration, we will bring together talented individuals to increase research power and enhance the impact of each constituent university. Integral to the success of the GW4 Alliance will be our ability to act flexibly, quickly and responsively to both internal and external influences. Together, we will drive collaborative research that addresses societal needs.

Actions

- We will foster GW4 communities at a scale that would be impossible for any single research-intensive university.
- We will invest funds to build globally competitive research networks.
- We will forge strong relationships in the UK and internationally with partners in universities, industry, healthcare and the wider community to maximise opportunities to create impact and address the productivity challenge.
- We will support research that is relevant, ground-breaking and meets the needs of global society.
- We will establish a cadre of GW4 Ambassadors to be advocates of the Alliance.
- We will pursue initiatives to develop world-leading research infrastructure, coalescing new communities through sharing new technologies and resources.
- We will invest in and share world-class equipment, facilities and assets that will enable our researchers and partners to make concept-changing breakthroughs in science and innovation.
- We will establish processes so that we can make rapid, informed decisions to drive forward the mission of the GW4 Alliance.

CASE STUDY: BRIDGING THE GAP TO GALVANISE THE CREATIVE AND CULTURAL INDUSTRIES

The GW4 Alliance is building on a rich legacy of collaboration in the creative and cultural industries across the Great West to develop new mechanisms of working between academia and industry, funded by the AHRC. Researchers will work with organisations including the BBC, British Museum, National Trust, English Heritage and CADW, as well as SMEs and local authorities to refine innovative methods of co-production and test new technologies to benefit creative industries across the UK. This work will build on existing initiatives to galvanise our creative industries, such as Creative Cardiff, and on major urban developments, such as Bristol's Temple Quarter Enterprise Zone. The creative and cultural economy of the Great West is rightly renowned, and our work will connect academic, industry and government partners to drive economic growth and provide a national exemplar model of collaboration.

CASE STUDY: HIGH RESOLUTION ELECTRON CRYO-MICROSCOPY – DEVELOPING COLLABORATIVE COMMUNITIES THROUGH SHARED EQUIPMENT

The GW4 Alliance has established a dedicated microscopy facility for structural biology, following an award from the Wellcome Trust. The Cryo-EM facility will become part of a world-leading suite of microscopy and analysis tools, co-funded by the GW4 Alliance. This landmark collaborative investment will bring GW4 researchers together to make new discoveries in biochemistry, catalysed by shared access to a globally competitive facility.

BUILDING A HIGHLY SKILLED, COLLABORATIVE WORKFORCE

The GW4 Alliance is a beacon of excellence in collaborative doctoral and clinical training, based on our unparalleled breadth in hosting externally-funded programmes. We intend to capitalise on this to build the best cohort-based PhD training in the UK. We deliver early career researcher development of the highest quality. The signature of GW4 doctoral training and academic development will be excellence, richness and diversity, coupled with compelling programmes of personal and professional development for our workforce. GW4 postgraduates will be the most able, collaborative and employable in the world. They will be recognised for their skills and ability to impact the fields of industry, health, society and culture.

Actions

- We will continue to expand and evolve our doctoral training portfolio.
- We will attract global talent to strengthen our region's workforce.
- We will redefine the doctoral training environment through innovative engagement of academic, student and professional service staff.
- We will provide development opportunities to equip early career researchers to be the interdisciplinary research leaders of the future.
- We will enhance our training and development provision delivered in collaboration with external partners to address the Industrial Strategy's skills agenda.

CASE STUDY: DOCTORAL STUDENTS JOIN INDUSTRY PARTNERS TO TACKLE GLOBAL CHALLENGES

The Water Informatics Science and Engineering Centre for Doctoral Training, funded by the EPSRC, brings together the collective expertise of our four universities to train engineers and scientists with the skills, knowledge and confidence to tackle today's evolving issues and future challenges in water informatics. An important part of the programme is providing doctoral students with real world experience of industry, building a pipeline of talent to join the workforce. The format offers mutual benefit, as students gain technical skills and industry acumen, and "support the economic, environmental and social strategies of business with their cutting edge bespoke research" (John Baynard, Chair of WISE Advisory Board). Through placements and industry days, WISE CDT works with a diverse range of organisations involved in water informatics, including Arup, IBM, Welsh Water, South West Water, Toshiba and more.

All staff across our institutions, irrespective of role, have a part to play to help the GW4 Alliance deliver its mission. The mission is, indeed, underpinned by colleagues working together to share best practice and develop the tools, resources and skills needed to work across disciplines and deliver research excellence across the whole GW4 partnership.

Actions

- We will develop novel training approaches and share best practice in training and staff development across the Alliance and beyond.
- We will empower staff at all levels to encourage growth in collaborative endeavours.
- We will design and implement consistent processes which are efficient, and effectively support and encourage collaboration.
- We will continue to invest in the technology and assets needed to support knowledge transfer at scale.

BUILDING CONNECTIONS

Research and innovation undertaken by the GW4 Alliance tackles some of society's most vital challenges and thereby informs policy at national and international levels. The collaborative endeavours of the GW4 Alliance enable us to engage with key decision makers to benefit our universities and region more broadly. By engaging with stakeholders and harnessing the creativity and specialist expertise of colleagues, we will provide thought leaders and strengthen our networks of influence and strategic partnerships.

Actions

- We will broaden and deepen collaborations with commercial, non-profit, academic, healthcare and government organisations to drive up productivity and wealth creation.
- We will strengthen our involvement in advising governments and industries on key policy areas such as science and innovation, health, and the arts using strategic relationships, and create opportunities to showcase the region to key decision-makers.
- We will be proactive in promoting place-based innovation and case studies from our work.
- We will deliver a wide range of events and activities, and will continue to be ambitious in our use of digital technology to ensure that GW4 research reaches a wide and varied audience nationally and globally.

WHAT WILL SUCCESS LOOK LIKE?

Key to our success will be teamwork and true collaboration.

- We will have a strong pipeline of collaborative research initiatives. Our success will be reflected in an increased number of strategic research collaborations, outstanding provision of shared infrastructure, and major consortium relationships with external partners.
- We will have tackled the productivity challenge and promote economic growth across our region through our world-leading workforce and research solutions.
- We will have talented researchers emerging from our extensive doctoral training programmes. Our post-doctoral support will encourage their continued development.
- Our professional services staff will be empowered, to share best practice and feel part of a thriving research culture across the GW4 Alliance.
- We will have influence as a regional Alliance with policy-makers and funders.
- We will have a distinctive profile and an increased international presence.
- We will have had demonstrable impact through a sustained delivery of our collective ambition.

“Universities bring together the brightest minds, freedom of enquiry and vital resources...

They engage with the outside world, with business and industry, with local communities, cities and regions, and the world at large. They exchange a heady mix of staff and ideas, collaboration and competition.”

Sir Mark Walport, CEO of UKRI