

Northumbria University NEWCASTLE

PEAKS OF RESEARCH EXCELLENCE

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This booklet contains QR codes and short links which take you to the Peaks of Research Excellence webpages for further information.



At Northumbria University we have a number of areas where our research is truly outstanding and is shaping knowledge and practice around the world. We call these our Peaks of Research Excellence and they are a vital part of our vibrant research landscape alongside the high quality research undertaken in our academic departments. This booklet presents an overview of our Peaks of Research Excellence and how they respond to the needs of the communities we work with locally, nationally and internationally.

Our Peaks of Research Excellence are focused and cohesive areas of research within our academic departments where we have particular strengths and exemplify the outstanding research being undertaken.

Our Research Landscape



Connecting and working with external partners is a vital part of the research process and we encourage existing and new potential partners to reach out to the Peaks of Research Excellence should they be interested in opportunities to collaborate or engage with existing research programmes.

Professor Louise Bracken

Pro Vice-Chancellor (Research and Knowledge Exchange) Northumbria University



View our Peaks of Excellence northumbria.ac.uk/research



View our Interdisciplinary Research Themes northumbria.ac.uk/research/idrts

THE RESEARCH LANDSCAPE AT NORTHUMBRIA UNIVERSITY

Northumbria University's research landscape comprises four key elements. All of these elements are important and enable us to celebrate, support and communicate the research we undertake in a range of ways, but also support the development of new areas of expertise.

- **Disciplinary research excellence**, undertaken in our Departments and celebrated by our Units of Assessment as part of the Research Excellence Framework exercise.
- Peaks of Research Excellence, cohesive and more narrowly focused groups of researchers that deliver high quality outputs and impact, often securing substantial income. These are self-sustaining, undirected and develop organically, sometimes from IDRTs. The research is mostly externally funded, but the areas identified are supported by Departments or other routes.
- Interdisciplinary Research Themes (IDRTs), communities of research practice which work across Departments and disciplines, enabling rich, collaborative discussions about research from a range of diverse perspectives to generate high quality research.
- **Research strengths,** an inclusive summary of what we do that provides an overview of our research. These areas have strong outputs, impact, income and/or Knowledge Exchange, and include areas of strength especially relevant to regional agendas.

COMPUTERISED SOCIETY & DIGITAL CITIZENS

Northumbria University has one of the largest groupings of Human Computer Interaction (HCI) researchers in the UK, bringing together a collective of experts in interaction design, usability and user experience (UX), social media and social computing, and user-centred approaches to trust, privacy and security.

This Peak of Research Excellence has a track record in delivering outstanding, internationally leading research that generates new understandings of how society and citizens are affected and transformed by our dependence on computing.

Our academics are delivering research to understand societal questions and concerns around how citizens can be digitally empowered to engage with governments, political organisations, healthcare providers and civic authorities on a local and national scale.

We tackle diverse issues affecting health and social care delivery, the accelerated impact of AI on everyday lives, citizen susceptibility to online harms and misinformation, the means to improve individual and community cyberresilience, and the means to provide citizens an equal voice in a digital world.

This, necessarily interdisciplinary, research regularly attracts significant UKRI and EU funding and is routinely conducted in partnership with a huge range of UK and international partners from academia, the public sector, media, business and industry. Find out more

Our Academic Profiles

northumbria.ac.uk/CSDC/profiles



CULTURAL & CREATIVE INDUSTRIES

The Cultural and Creative Industries are among the fastest growing and most innovative sectors in the UK. Our research in this area focuses on the devolution of these industries from the capital into the regions and nations, and the opportunities and challenges this creates for education and skills, health and wellbeing, the environment, civic identity and pride in place.

Focusing on writing, publishing, film and tv, performance, visual art and music, this Peak of Research Excellence unites interdisciplinary academic approaches and cultural policy making, to tackle some of the biggest challenges facing society today.

Northumbria's research has instigated a major shift in strategic thinking and practice among the leading UK publishing houses (including the two largest, Penguin Random House and Hachette), leading to new policies and the creation of 3 new literary development businesses, a parliamentary report and a new £1.3 million UKRI Creative Communities programme. Our researchers work across the creative industries, thinking about devolution, policy, regional growth and talent pipelines, bringing industry and communities together to shape our creative ecologies and economies for the future.

Our established cultural partnerships with BFI, Baltic, New Writing North and TWAM respond to new training and skills needs and produce co-created R&D interventions around key areas of opportunity and challenge in the UK creative economy.

Find out more northumbria.ac.uk/CCI

Our Academic Profiles

BALTIC CENTRE FOR CONTEMPORA

northumbria.ac.uk/CCI/profiles



ENERGY MATERIALS & SYSTEMS



Renewable Energy Northeast Universities

The World faces an unprecedented challenge in getting to net zero carbon emissions by 2050. Our energy materials and systems research draws on fundamental physics, chemistry, biology and engineering to develop new ways to generate and store renewable energy in order to help deliver a cleaner and greener future.

Northumbria specialises in new materials for energy and energy systems. This includes converting sunlight to electricity using new implementations of photovoltaics, and the conversion of carbon dioxide from greenhouse gas to sustainable products. We also focus on the integration of energy technologies such as batteries and electric vehicles in the whole energy system, to deliver tangible carbon dioxide savings.

As well as helping the net zero mission, we aim to help create highly-skilled jobs, both in the North East and nationally, via the innovations that happen in our labs.

Collaboration is key to our success, and we work with a range of partners, from industry heavyweights like Shell, Siemens, Airbus and Arup to other universities, governments and many small to medium enterprises.

Together with Newcastle and Durham universities, Northumbria University also leads a doctoral training programme in renewable energy, ReNU. This £5.5M programme is jointly accredited by the Institute of Physics and the Royal Society of Chemistry and will train the next generation of innovators in clean energy. The majority of our research grant awards are from UKRI via the Engineering and Physical Sciences Research Council (EPSRC) but we have also received funding from the British Council, the European Union and directly from Industry.



MICROBIAL BIOTECHNOLOGY

Our academics working in microbial biotechnology explore and exploit microbial systems to develop transformative solutions for a more economically and environmentally sustainable society.

This Peak of Research Excellence is dedicated to developing novel technologies which will significantly contribute to global sustainability by using microbial biotechnology to reduce carbon emissions and recycle waste products.

Northumbria's research in microbial biotechnology brings together academia and businesses to tackle global challenges. Our researchers are working at the frontier of development in biotechnologies for; renewable energy, the circular economy, building materials, hydrogen and sustainable fuels, carbon removal, capture and storage, agriculture and food.

We work in close collaboration with a range of industrial partners including Procter and Gamble, the Royal Air Force and Johnson Matthey, as well as other universities and organisations. We have received over £11.6 million in funding in the Microbial Biotechnology area.

Find out more

Our Academic Profiles

northumbria.ac.uk/microbial/profiles



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MICROBIOME EXPLORATION

The information that is carried on DNA as genes, expressed and translated to offer a specific function, from microbes to human, from health to disease, all illustrates the complexity of our biological landscape and our understanding of life.

Multiomics is a field that uses technologies that can offer a snapshot in time of any biological system, offering 'big data' that allows us to begin to understand this complexity; DNA sequence (genomics), gene expression (transcriptomics), proteins and their function (proteomics) and the ensuing metabolism (metabolomics). We overlay this data to offer the highest resolution essential to understand our environment, health, our microbial world, and those microbes related to disease.

At Northumbria, we formed an integral part of the UK's pandemic response as part of COG-UK and as a UKHSA DNA sequencing resilience site. Over this 2 year period we sequenced over 100,000 SARS-COV-2 genomes in our specialist facility NU-OMICS. As part of this project computer programmes were developed to support quality assurance of sequencing data and a novel computer programme SPEAR which can help predict the virulence of new variants directly from raw sequencing data.

NU-OMICS has supported projects with several large companies that utilise microbiome data. These companies include but are not limited to: Proctor & Gamble, Reckitt Benckiser, GSK, Pepsico and Pukka herbs.

Find out more

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northumbria.ac.uk/microbiome

Our Academic Profiles

northumbria.ac.uk/microbiome/profiles



SOLAR & SPACE PHYSICS

Our Solar and Space Physics researchers work to understand the physics of the Sun, the solar-terrestrial connection, and all aspects of space physics.

We have a particular focus around space weather and satellite technology – to better protect and utilise humanity's use of space – including hosting a state-of-the-art Space Technology Laboratory and training the next-generation of space-related engineers.

Space Weather

The Sun is the powerhouse of our solar system and its daily variability can have profound consequences for Earth. Space weather is the name given to the impact of events - like solar flares or coronal mass ejections - on our technologically-advanced society.

This impact can be both beautiful, like the Northern lights, or extremely detrimental such as damaging satellites or increasing radiation that is harmful to aircrew and astronauts. Adverse space weather can also have a significant economic impact, for example communications blackouts, disruption to aviation, and satellite damage.

Space weather is featured on the UK National Risk Register of Civil Emergencies. Our research is improving space weather forecasts and we work in partnership with the dedicated Met Office Space Weather Operations Centre.

Image of the Sun's outer atmosphere, the corona, adapted from Morton, Weberg & McLaughlin, 2019, Nature Astronomy, 3, 223

Satellite Communications

Space-related-instrument development drives forward the national capability of UK-based satellite communications and advances the camera-technology sector. This hardware and instrument development is of great benefit to the future of small-satellite missions. We already work with multiple space-related-hardware industrial partners via our UK Space Agency funded projects, e.g., Lockheed Martin and the Ministry of Defence for laser communications, e2E for space electronics, and EnduroSat for CubeSats.

Our Space Research community

Our Solar and Space researchers demonstrate international leadership across advanced numerical modelling, mathematical theory, observations of solar and space plasma, data intensive science, and space-related hardware.

We collaborate extensively with partners including UKRI, the UK Space Agency, the European Space Agency, the UK Met Office, and over 40 industrial partners.

Find out more

northumbria.ac.uk/solar-and-space

Our Academic Profiles

northumbria.ac.uk/solar-and-space/profiles



THE FUTURE OF ICE ON EARTH

The Future of Ice on Earth focuses on research into ice sheets and glaciers on a global scale, observing, modelling, and predicting future ice loss from all glaciated areas in a warming world.

Ongoing ice loss is already having large societal impacts, both locally and globally. The rate of loss of land ice, sea ice, and permafrost has rapidly increased over the last few decades, representing the clearest planet-wide response to human induced global warming. Our researchers are working to understand the causes of ongoing changes in Antarctica, Greenland and alpine areas, as well as assessing future changes and resulting impacts on human environments worldwide.

Addressing these challenges involves advancing our understanding of external and internal processes connected to the dynamics of glacier flow and interactions with the ocean and atmosphere. We develop ice-flow and ice-ocean models, which underpin research activities at several UK Universities and worldwide, and use these to simulate the future of the Antarctic and Greenland Ice Sheets and their interactions with the climate system. We aim to provide much improved assessments of the Future of Ice on Earth and assist policy makers in planning and developing mitigation measures. This research will ultimately help us plan for, adapt to and reduce the sea level impacts of climate change globally.

As arguably the world's leading group in the studies of the interactions between ice sheets and oceans, we work collaboratively with other leading international groups and are involved in all key large European and US-UK collaboration projects involving the future of the large ice sheets.

We hold grants of over £6.6million from NSFgeo, NERC, EU and other funding sources.

Find out more

northumbria.ac.uk/future-of-ice

Our Academic Profiles

northumbria.ac.uk/future-of-ice/profiles

Travels across Rutford Ice Stream, Antarctica, with Ellsworth Mountains in the background. Source: G. Hilmar Gudmundsson



VOLUNTEERING, HUMANITARIAN CRISES & DEVELOPMENT

Volunteers play critical roles globally in meeting the challenges of poverty, inequality and the climate emergency, and are often the first responders to humanitarian crises and disasters.

They can often offer solidarity, advocate and organise for change, but not all volunteers are treated equally, and some face risks that others are protected from.

International volunteers often receive the most attention when it comes to volunteering in humanitarian and development contexts. But they are far outnumbered by local and national volunteers, who are often first on the scene in a crisis, as well as being critical to longer term development activities.



Understanding the roles diverse volunteers play in meeting critical global challenges can help ensure that volunteers are not exploited, that their local and expert knowledge is recognised, and that the potential of volunteering for making a difference is realised in different contexts and for all volunteers.

Northumbria academics are creating a world-leading hub of research expertise, knowledge exchange and learning on volunteering in humanitarian crises and development contexts.

We work in partnership with leading global volunteering organisations, such as the International Federation of Red Cross and Red Crescent Societies and the INGO VSO, to design and deliver work together that creates new understanding and changes policy and practice. We also work closely with academics across the world, building networks and connections and promoting new voices in volunteering research.

Our work is supported through significant funding from UK research councils, leading global humanitarian agencies and NGOs in the UK and internationally.

Find out more northumbria.ac.uk/VHCD

Our Academic Profiles

northumbria.ac.uk/VHCD/profiles





Find out more

To discover more or get involved, please contact the Academic Leads via the Peak of Research Excellence webpages:

northumbria.ac.uk/research



northumbria.ac.uk