ROBERT GORDON UNIVERSITY ABERDEEN

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RESEARCH

PUTTING A FOCUS ON RGU RESEARCH

Growing our globally recognised impactful research

Hear from academics across RGU who are transforming our research

CONTENTS

WELCOME
to issue two of *Research*

In the first issue of *Research*, we announced that over the next ten years, the University intends to build critical mass in areas where it already has established research leadership. This investment will help us to deliver our strategic aim of growing our globally recognised impactful research. The areas we have identified for support include smart data and artificial intelligence, industrial biotechnology, sustainable transport, and built environment visualisation. We will continue to harness the expertise and knowledge of diverse disciplines from across the University, and our effort will target areas where our expertise can make the greatest impact.

Despite some challenges currently facing the higher education sector as a whole, this remains an exciting time for RGU. The following pages are filled with excellent examples of how we are delivering on our ambitions. Featuring insight from over 30 different researchers, the magazine takes a look at some of our key institutional projects, including our work on addressing various aspects of island life in Orkney, growing our smart data research in Mexico, and establishing the National Subsea Centre. We also take a look at our approach to Knowledge Transfer Partnerships, an initiative that is crucial to fostering excellence in interdisciplinary research and knowledge exchange with industry.

We hope you will enjoy spending some time browsing through this second issue of our magazine, gaining valuable insights into how RGU is delivering impact through its research.

Professor John Harper
Principal and Vice Chancellor

Professor Paul Hagan
Vice Principal for Research and Deputy Principal

WORKING TO PROTECT PUBLIC HEALTH

In late 2018, Professor Christine Edwards and Professor Linda Lawton were awarded over £3.5m in funding from UK Research and Innovation to support their work on the detection and elimination of harmful algal toxins.

Responding to a Global Challenges Research Funding (GCRF) call from the Biotechnology and Biological Sciences Research Council (BBSRC), the team proposed developing a scalable bio-based strategy for eliminating cyanotoxins in drinking water in Sri Lanka. Their application was ranked top out of 31 projects submitted for funding. The work is is being undertaken in partnership with the Universities of Sri Jayewardenepura and Peradeniya in Sri Lanka, along with Queen's University Belfast and the University of Edinburgh.

"My work with Linda addresses the challenges presented by a group of organisms known as cyanobacteria (blue-green algae) and their toxins," said Christine. "They produce toxins that have a substantial impact on the quality of drinking water and affect animals and humans. These toxins may be responsible for significant chronic diseases.

"We know that the levels of kidney disease in Sri Lanka have been increasing. The country has invested significant resources in researching water contamination from metals and pesticides, but these have been shown not to be linked to the kidney disease found in the population. Recent research has pointed to significant cell densities of cyanobacteria along with toxin concentrations in excess of World Health Organisation guidelines in wells that supply people with their drinking water. Our project will establish if there is a link between the algal toxins in the well water and the kidney disease found in humans. Our project will also improve the quality of the well water, making it safer for consumption by removing a range of harmful compounds. We will be working with the National Drainage Company in Sri Lanka to apply our work on a larger scale, which could then be useful for improving the health and environment of other developing countries."

"I HOPE WE CAN CONTINUE WORKING ON IMPORTANT PROJECTS LIKE THESE, TO DELIVER HEALTH SOLUTIONS"

In other environmental settings algal toxins accumulate in shellfish. If eaten, the high concentrations of these toxins in the shellfish can pose a serious threat to human health. Shellfish are a valuable commodity for the UK. The shellfish industry employs over 3,000 people and generates revenues of over £40 million every year. To protect public health, acceptable levels of these toxins in seafood – and shellfish in particular – are defined in European Commission directives as part of an official control programme administered by Food Standards Scotland and the Food Standards Agency in the UK. However, substantial increases in seafood consumption, together with the globalisation of the seafood trade, has increased the numbers of people potentially at risk of exposure to these toxins.

"Linda and I have been working in close collaboration with a number of partners on this project, including Queen's University Belfast, the Plymouth Marine Laboratory, Food Standards Scotland, and the Centre for Environment Fisheries & Aquaculture Science," said Christine. "The work is being funded by the BBSRC and Natural Environment Research Council (NERC) under the Aquaculture initiative. It has been exciting, multi-disciplinary work, which I believe will underpin new approaches to food and water safety well beyond the project.

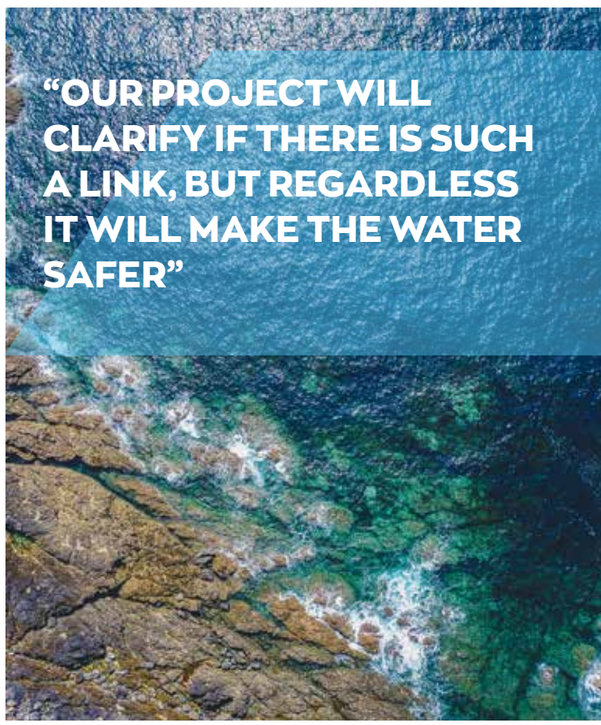
"Our consortium aims to deliver a rapid field test, so that shellfish growers can easily detect and eliminate toxins, directly on site without having to send materials to distant reference laboratories and lose time and money waiting for confirmation of the presence or absence of toxins."

Christine and Linda have also recently been awarded fellowships from the University of Sri Jayewardenepura, in honour of their ongoing work and efforts to help build research capacity, capability and quality in Sri Lanka.

"It is always pleasing to feel that you've achieved something with your work, but there is still much to do and I hope we can continue to make a difference. In fact, a method Linda and I developed back in my postdoctoral days is still seen as the benchmark method for toxin analysis across the world. For years, science has had the knowledge but it has not been applied to deliver a truly lasting impact – that is now changing. I intend to continue working on important projects like these, to deliver health solutions for communities across the globe."

Professor Christine Edwards, School of Pharmacy and Life Sciences

"OUR PROJECT WILL CLARIFY IF THERE IS SUCH A LINK, BUT REGARDLESS IT WILL MAKE THE WATER SAFER"



How it all started

Professor Christine Edwards and Professor Linda Lawton first met at the University of Dundee, when Christine was working as a postdoctoral researcher on algal toxins. The pair established a close research partnership and while Linda came to work at RGU, Christine moved into industry. They kept in contact looking for ways to collaborate. Eventually Christine made the move back into academia, re-establishing the partnership with Linda here at RGU. This allowed them to build on the groundwork they had already laid together in their field and to carry on doing excellent, impactful research.

Responding to global challenges

The Global Challenges Research Fund (GCRF) was established to address some of the challenges faced by developing countries. Currently, six RGU projects are being supported by GCRF throughout 2018-2021.

Sustainable construction, sustainable planning and overcoming barriers to societal and industrial adoption

Professor Richard Laing, Dr Marianthi Leon and Dr David Moore
St Lucia

This work explores the routes, policy, incentives, economic planning, industry, and community engagement which could foster and support the adoption of green practice for a transition to a green economy. Earlier this year, Richard and David visited St Lucia to meet with members of the community. The team met with representatives from planning, housing, and architecture, and discussed the key issues. This was especially useful in the context of future planning and building codes, and will be valuable in the context of planned research and the current PhD study. The group also held an open evening at a local school where the team presented to groups of school children, and later to members of the wider public. These sessions will help to inform future projects.

Intelligent health interventions for self-management of chronic diseases

Professor Nirmalie Wiratunga, Professor Kay Cooper and Dr Stewart Massie
Sri Lanka

As in many parts of the world, state-funded healthcare in Sri Lanka faces ongoing budgetary pressure due to the country's large and increasing population. According to the recent Global Burden of Disease Report, lower back pain, diabetes and depression are all among the top chronic diseases across Asia. These diseases lead to people living with disability for many years. Decision support tools in the form of digital self-management plans and educational content to improve understanding about these conditions are obvious strategies to reduce the need for frequent medical intervention. This project is looking at ways to deliver this intervention using mobile technology that will monitor student attendance and participation, and help them to manage assessment deadlines. The team visited Colombo in 2018 and conducted a number of workshops and meetings with university students, academics, and clinical psychologists to inform the design and development of proposed interventions. The outcome of these highlighted the need for better self-management of anxiety and depression amongst university students.

Borko Lazeski with the mural "National Liberation War", Skopje, c. 1955-56. Copyright Lazeski Family. Private collection.

The cultural heritage of North Macedonia

Dr Jon Blackwood
The Republic of North Macedonia

Adding value to a longer-term relationship being developed with North Macedonia, this body of work addresses issues relating both to the conservation of the rich modernist heritage of the country, and to the promotion of contemporary visual practitioners. To date, this relationship has seen intensive research into the Yugoslav-era painter and muralist Borko Lazeski (1917-93), with the production of an introductory monograph based on extensive and detailed archival research. Following on from this work, this year an exchange has been established with young artists and curators from North Macedonia, whose work was showcased, together with a new publication, at the WorM, Peacock Visual Arts, in Aberdeen as part of this year's Look Again festival.

Ensuring social wellbeing in climate change adaptation through ecosystem management

Dr Leslie Mabon, Dr Natascha Mueller-Hirth and Dr Chris Yuill
Vietnam

This project is focused on the further development of an existing collaboration between RGU's School of Applied Social Studies and the Institute of Human Geography in the Vietnam Academy of Social Sciences. The collaboration seeks to further understand the social dimensions of climate change in coastal communities. Parts of Vietnam's south central provinces and northern Scotland are similar in that they are both: at significant risk from climate change due to their proximity to the sea. These fragile ecosystems require careful management to ensure they can function as a crucial 'last line of defence' for coastal communities, and home to citizens who are socially and economically marginalised within their own nations. This means that there is significant potential for mutual learning between Scotland and Vietnam in the area of environmental management and social policy for climate change adaptation.

Safe drinking water and health

Dr Radhakrishna Prabhu
India

Dr Radhakrishna Prabhu is exploring the development of a stand-alone water treatment system which can be used in India's rural communities. In these communities, it is common to find discharge from household dyes leeching into drinking water. This work is looking to enhance the efficiency of photocatalytic techniques, which use catalysts stimulated by light, to purify water.

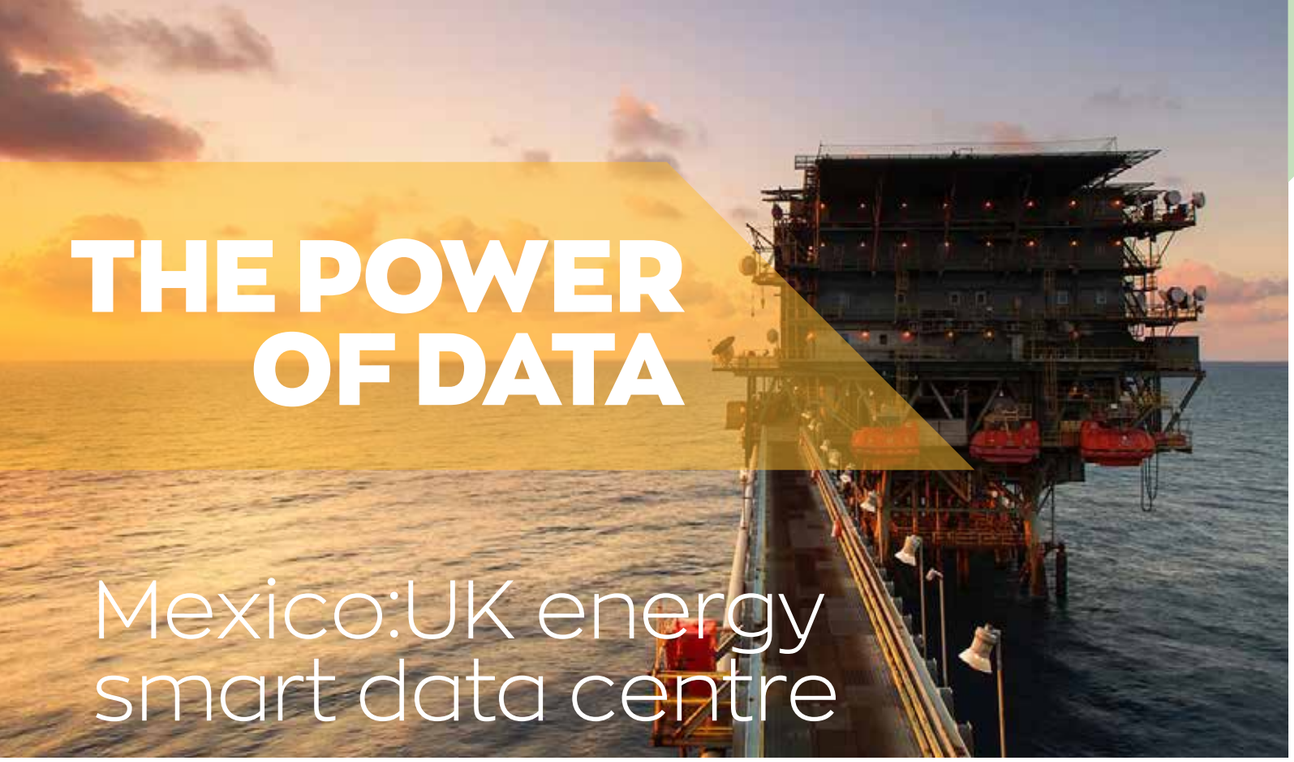
Professor Linda Lawton and Professor Christine Edwards
Sri Lanka

Go to page four 'Working to protect public health' to find out about this GCRF project, ranked top out of 31 projects submitted for funding.

Smart data technologies for industrial growth and efficiency in DAC countries

Professor John McCall
Mexico

This project is seeking to build research connections in DAC countries (countries that receive support from the Organisation for Economic Cooperation and Development's (OECD) Development Assistance Committee (DAC)). Mexico is one of these countries and this is where John has been building partnerships. The focus is on helping developing nations to adapt to recent technological advances. So far, the funding has been used to support staff exchanges between RGU and the Universidad National Autonomica de Mexico (UNAM), and the joint organisation of an artificial intelligence conference in Mexico City.



THE POWER OF DATA

Mexico:UK energy smart data centre

RGU's relationship with Mexico goes back a number of years, when new legislation allowed foreign participation in the country's oil and gas sector. On the back of this, the university was commissioned by the UK Foreign & Commonwealth Office (FCO) to develop a skills development framework to tackle the challenge. Drawing on decades of experience in the sector, RGU was able to map a framework to address Mexico's oil and gas skills gap over the next 15 years.

Having strengthened its relations in the country, RGU was named as one of only four European institutions to be chosen by the Mexican Government to work in collaboration with Mexican universities to address the future needs of the country's energy sector.

As part of this, RGU was awarded a contract to lead on the development of the Mexico:UK Energy Smart Data Centre.

The Mexico:UK Energy Smart Data Centre is an industrial research partnership looking to create a world-leading cluster of expertise in the application of data science and artificial intelligence to aid predictive maintenance in the oil and gas sector.

Led at RGU by Professor John McCall from the School of Computing Science and Digital Media, the Centre's main objective is the development of data science technologies for the management and optimisation of the processes of well construction, production, transportation, and refining of hydrocarbons.

Professor McCall commented: "The oil and gas industry is now waking up very fast to the potential of big data and this presents a massive opportunity for novel research.

"The delivery of the Mexico:UK Energy Smart Data Centre will first of all focus on oil and gas but will broaden later on to the wider energy sector.

"Four projects have been identified and agreed upon and these will look at exploration, drilling and wells, the natural gas network and refineries. At each stage we will be modelling the processes involved using data science and artificial intelligence to find useful patterns and possible efficiencies with the ultimate objective of lowering costs and improving safety."

COMMERCIALISING RESEARCH

Graham Carter, Intellectual Property (IP) and and Spin-out Manager, discusses how the university's innovation ecosystem supports the commercialisation of research activities.

Tell us about the link between Research and innovation.
Research is about discovery of new knowledge. Development is about the application of new knowledge towards some directed end. Development might also include invention, where an insight underpinned by research leads to some new device or way of doing things. Innovation is that next step where the developed device or process breaks into the world as a product, process or service for which there is a market. Innovation is not invention, it's about creating value through the translation of an idea to meet a market need.

What is an Innovation Ecosystem and how does it impact on research?
An innovation ecosystem is essentially an environment where innovation can flourish. At its heart are people (or organisations) with ideas, relevant skills and networks, and funding and supporting frameworks aligned to this mission. A focus of the Entrepreneurship and Innovation Group (EIG) at RGU is to help build such an environment.

One of the initiatives from the EIG has been the creation of the new IP Commercialisation policy. A key policy objective is to enable spin-out company formation and provide a transparent framework for this. The policy encourages all staff and research students to consider if they have created new IP through their research activity. They can then make the university aware of this through the Invention Disclosure process. This enables RGU to take steps to protect IP and track the creation of new IP which might translate into innovation.

Other aspects of RGU's innovation ecosystem include the Startup Accelerator programme which provides participants with seed funding, intensive training and mentoring support to validate their ideas. There are also Innovation Skills & Tools workshops and Innovation Masterclass sessions which provide insights for researchers to take into their research practice.

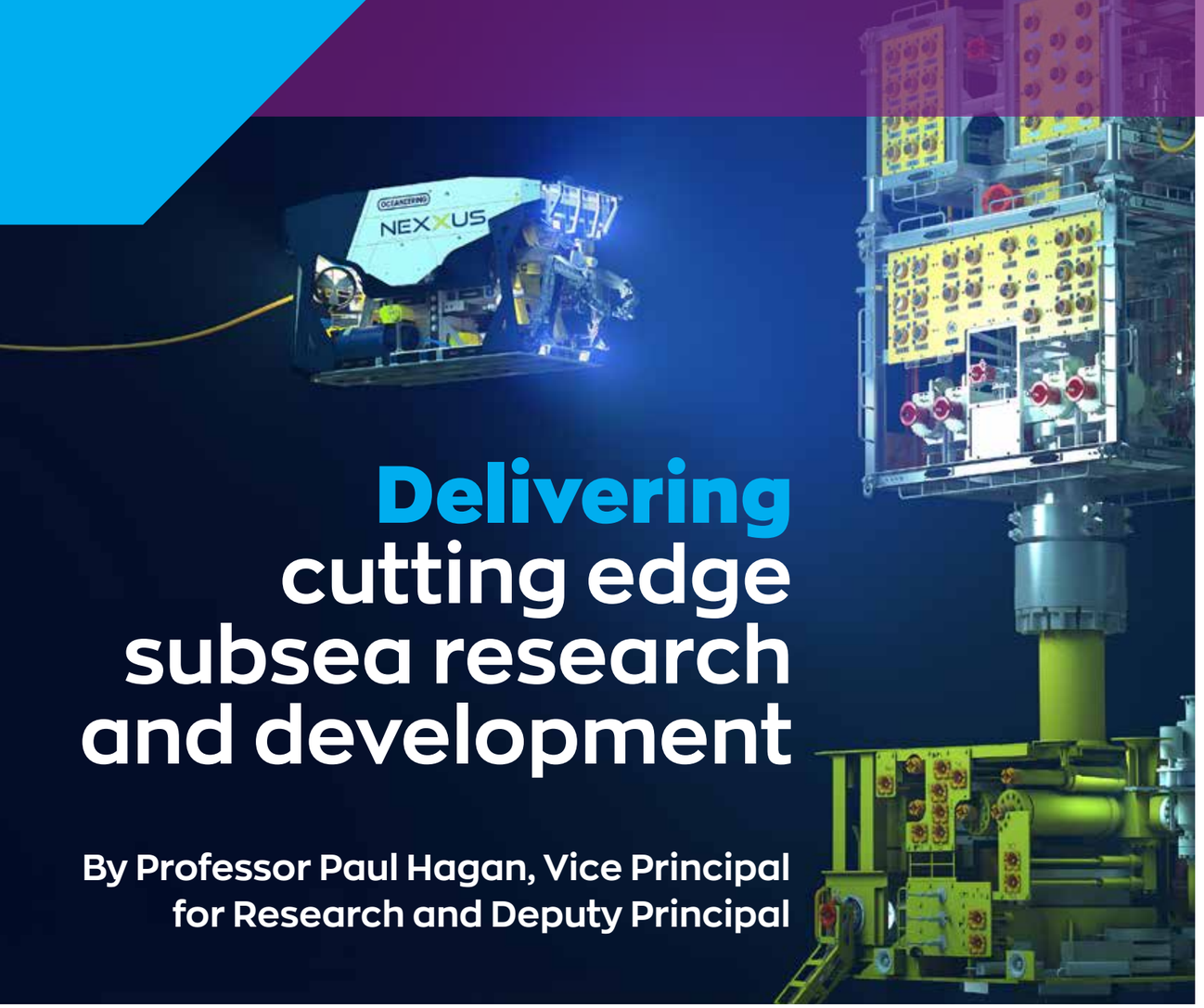
Any examples within RGU?
There are some great examples of research translating into commercial propositions going through the current cohort of RGU's Startup Accelerator. Here are just three spin-outs currently in creation:

- **Safe Influx Ltd,** a project from RGU's Oil and Gas Institute developing technology able to detect a well influxes during drilling and automatically and safely shut down operations.

- **liteSTAT,** a project stemming originally from PhD research within the School of Engineering, now being packaged as a company producing lab equipment and an associated learning environment to support the teaching of electrochemistry in schools and the tertiary education sector.

- **D-Finger Ltd,** a project from the School of Engineering seeking to commercialise a sensing technology where the surface properties of a material can be transferred to a remote device. The project is underpinned by strong practical knowledge and research in advanced materials science.

Final thoughts.
All staff and students can apply for a place on the next Startup Accelerator programme. I would encourage anyone with even a hint of an idea to come and speak to us over the summer, before the next round of applications goes live in the autumn. And finally, although the EIG focuses on commercialisation, its mission is about finding pathways to help achieve research impact.



Delivering cutting edge subsea research and development

By Professor Paul Hagan, Vice Principal for Research and Deputy Principal

With more than 45,000 employees and 650 companies, the £7.5billion subsea industry represents a huge opportunity for cutting edge research and innovation.

Recognising this opportunity, RGU is working with the Oil and Gas Technology Centre (OGTC) to establish The National Subsea Centre (NSC), a multimillion pound partnership and a central component of the innovation strand of the Aberdeen City Region Deal (ACRD) that is being supported by both the Scottish and UK Governments.

The ambition of the NSC is to accelerate the development of underwater engineering and technology to unlock the full potential of the UK Continental Shelf and maintain the UK's leadership position in this growing global market.

What does this mean in practice? The NSC aims to: support the faster development and delivery of technology; make it cheaper to develop and deploy technological solutions; help industry become smarter and more automated and finally to make the industry cleaner working to support energy transition, ultimately helping to reduce carbon emissions.

The first step is to understand the challenges the industry faces and then to work in partnership with them to secure solutions that add value to their operations. The NSC will provide a space for these initial catalytic conversations to take place and then offer to provide a broad range of services tailored to industry needs.

There will be opportunities for joint research projects in engineering, technology and integrated energy. These projects will be supported by teams of academic researchers and dedicated research students. In the early stages, we envisage a strong focus on digital and data, exploiting our significant expertise in smart data and artificial intelligence. But we are not limiting the scope of the NSC at this stage. We need to be ready and willing to respond to industry demand. demand. Our School of Computing Science and Digital Media will have a key role to play, as will our School of Engineering. We can also draw on our expertise from disciplines across the university to further enhance our contribution.

"THE NSC WILL INEVITABLY CREATE MORE PROFITABLE COMPANIES, MORE JOBS AND BRING NEW BUSINESS INTO THE REGION."

While our focus will be on harnessing the significant research strengths of RGU, our approach will involve connecting research and development in the sector, collaborating with industry and other institutions across the UK and internationally. By combining complementary strengths we can rapidly increase the impact of our research efforts for the benefit of industry.

The NSC will build capacity and capability in subsea research, and anchor that here in the north-east of Scotland but primarily the NSC is about growth in the economy. The NSC will inevitably create more profitable companies, more jobs and bring new business into the region.

Paving the way for a driverless future

Professor David Gray has a transformational vision for the future of rural areas – driverless vehicles.

He sees the way forward for transport in remote, rural and island communities to be autonomous vehicles for public transport, complemented with driverless cars and ferries and the use of drones to transport cargo.

“This has to be the way forward,” David said while speaking about his current research project in Orkney. “The goal is to to make Orkney a world-leading centre for autonomous vehicles. It could bring be a real game changer. It is what RGU research is all about, being innovative, transformational, and delivering impact.”

Working in partnership with Orkney Islands Council, Highlands and Islands Transport (HITRANS), the Orkney Renewable Energy Forum (OREF), and AquaTera, David has helped establish the Autonomous Vehicles Consortium (AVC). It is the latest project focusing on collaborative research and development for autonomous vehicles.

The AVC aims to find solutions to the transport challenges faced by communities in rural and island areas where often there is limited public transport, and what there is has to be heavily subsidised. Orkney benefits from the recent increase in the number of large cruise ships that visit the islands but this brings significant public transport and logistical challenges. The question is: how does Orkney’s transport infrastructure support local people and retain the flexibility to handle massive influxes of tourists? It also needs to ensure that the experiences of these tourists are so good that they will return or recommend that others visit.

“For local residents we have been looking at new models of social care transport for an ageing population, and how to optimise scarce public resources by introducing autonomous vehicles.

“IT IS WHAT RGU RESEARCH IS ALL ABOUT, BEING INNOVATIVE, TRANSFORMATIONAL, AND DELIVERING IMPACT.”

“By doing this you would be reducing the most significant cost – the driver. Public transport tends to have high costs per passenger, and the main cost is the driver. The fewer people you have on the buses, the higher the subsidy per individual passenger. So if we reduce the most significant cost then we can keep these services running more effectively and it could really impact on the people in Orkney.

“But it’s not just about replacing drivers. It’s about reskilling people for other roles and decentralising jobs, so someone on a remote island could be controlling the system rather than driving the vehicle.

“Drones could also be used for transporting perishable goods or medical supplies out to the smaller islands. Rolls-Royce have even trialled an autonomous ferry, which would optimise transport to the island by reducing the cost for the amount of crew needed.

“It’s hard to predict what technology and innovation will do but it will certainly transform the systems in operation today. It’s a long-term project – it could take up to ten years for the vision to be realised but the concept has been received very positively so far.”

Following his PhD studies on rural geography, and for the last twenty years, David has focused his research on transport in remote, rural and island communities.

He has been involved in projects that shape transport policy and its impact in rural areas throughout Scotland, as well as addressing key issues such as the demand for urban transport choices. His work has led to real changes to many people’s lives and impacted greatly on small communities such as those in Glenelg and Arnisdale.

“The most exciting research project I was involved in was the one with the smallest funding grant actually,” said David.

“We got a few hundred quid – it’s the smallest award we’ve ever received – to establish a community-owned and shared taxi service.The service was about to be cut due to the local council’s budget. A former student had come up with a really interesting model which was predicted to cut costs by 60% per passenger.

““It worked! Now, the community owns the service and it only costs around £3,000 per year to run. Despite the initial threat to the service, the revised operational model has allowed the service to continue to support the community for several years now. It has been a real success and it was a very clever idea that needed no new technology.

“It was unexpectedly the most exciting and fulfilling project. We had an immediate impact on the community and that’s what you aim for when you’re doing these types of projects.”

Snapshots

Four very different RGU research projects and insight into the impact they will have on industry and communities.

Effect of natural products on anticancer drug resistance

Dr Gemma Barron, School of Pharmacy and Life Sciences

Oncologists are facing the challenge of cancer cells becoming tolerant to essential drugs when targeting them with continuous treatments for cancer patients. Sometimes the cancer cells can continue to grow even in the presence of many different drugs. Such multi-drug resistant cancers may emerge when people have been treated for one cancer and survived but unfortunately develop another cancer some years later. This then limits the range of drugs that are likely to be available to treat them effectively. In extreme cases there may be no options.

Cancer cells use transporter proteins on their surfaces that rapidly pump out the drugs so that the cells are never exposed to a damaging dose of drug. Such a situation is clearly not good for the patient.

Our research is examining whether safe extracts from Scottish plants could stop these transporters from removing the anti-cancer of the drug, allowing effective drug levels to accumulate in the cancer cells, killing them off. We could then use these natural products together with the anticancer drugs to slow or stop the development of multidrug resistance.

Supernatural tourism and public engagement with place and history

Dr Rachael Ironside, School of Creative and Cultural Business

Stories of ghosts, ghouls and folkloric creatures no longer turn people away in terror, instead they inspire their interest and provide a connection to the history of a place. When tales of the green lady that haunts Crathes Castle, the ghost train of Old Tay Bridge or the friendly monk of St Andrews Cathedral are told, people learn about history in an exciting and engaging way. This research explores the value of supernatural tourism and how it engages people with the past.

Stories that are often connected to a darker past allow us to peek behind the veil of a place or people to teach us about what went on at that time. For example, the fairies that were chased away by the clergy of mainland Orkney to its other islands are a metaphor for the old folkloric beliefs dying out on the islands – chased away by new religion for being negative or blasphemous.

Understanding the relationships between history, heritage, tourist and the supernatural can reveal ways to encourage the public to learn more about their past, become interested in heritage sites and boost local economies with a more attractive and diverse tourist offering.

Safer, faster and more accurate use of historic data to inform current and future practices

Dr Eyad Elyan, School of Computing Science and Digital Media

Machine learning and vision applications is about analysing and modelling volumes of complex historical data to inform business practices and future decision-making processes. As humans, we have some cognitive bias that's shaped by our knowledge and experience. We often tend to respond to situations and make decisions based on our pre-conceived notions but not always in a reliable and consistent way. We also suffer from fatigue and human error that sets in when completing routine procedural and repetitive tasks.

By building 'intelligent' models from companies' instruction manuals used to carry out routine procedural tasks, we can exploit augmented reality. This will provide visual and easy-to-understand information that make these repetitive tasks safer, easier to understand, and less likely to cost money through human error, or put employees' wellbeing at risk. More advanced artificial intelligence models can also be produced to provide objective and conclusive results from historical data, with all bias removed. For example, a piping and instrumentation diagram that could take hours for someone to analyse and understand in relation to the functions of its component parts, could be processed and analysed in minutes through the application of a machine vision solution, increasing the accuracy and volume of the output as well as the productivity of the company involved.

"USING AUGMENTED REALITY PROVIDES VISUAL AND EASY TO UNDERSTAND INFORMATION... TO MAKE REPETITIVE TASKS SAFER."

Computational models for fluid flow

Dr Mamdud Hossain, School of Engineering

Computational fluid dynamics uses computer simulation to understand complex fluid flows. A complex fluid-flow can arise from the presence of a mixture of different fluids or particles, for example, oil and gas, or sand, in a pipeline. It could be that the flow isn't uniform and changes with time and, as a result, the flow could slow down or even stop. Mathematical models can be created to understand this type of flow and to predict how the fluids and particles will behave and thus provide information that can be used to avoid production loss or prevent pipeline failures. Potentially, this can save the oil and gas industry sizable amounts in lost revenue and repairs.

This flow modelling knowledge has been applied to solve other industrial problems. For example, providing solutions for a company to treat waste oil so that they can produce another sellable product.

This research is being applied for the development of a novel wave energy device. The novelty of the device is that it does not need a lot of big parts, and is simple to manufacture and costs less. This device could generate four times the energy density of comparable, more bulky devices, that are already in use.

THE ORKNEY PROJECT

what's changed since last year?

Over the past year, RGU's work in Orkney has gone from strength to strength. Each project aims to find an effective solution to some of the challenges of island life, building partnerships to highlight and respond to the needs of the local community.

The Orkney Project is aligned to strategic priorities identified by Orkney Islands Council (OIC) and Highlands and Islands Enterprise (HIE), including the Orkney Community Plan 2018-2021, with research activities grouped into three broad clusters: smart islands, creative innovation and the sustainable quality of life. Some of the challenges that have been identified include depopulation, an ageing population, inefficient housing, connectivity, access to services, and sustainable tourism management.

Recent Activity

The work has already had a considerable impact on the Orkney community with various initiatives seeing RGU researchers visiting the islands and establishing collaborations with a range of local organisations.

Orkney Project Development Manager, Elsa Cox, is based in the RGU office in Stromness. She commented: "Since the establishment of the RGU research hub in Stromness, the project has grown in reach and impact as the university becomes increasingly embedded in the local academic and community framework. Being visible in Orkney is key to developing valuable stakeholder collaborations and demonstrating ongoing commitment to the islands."

Recently, RGU was invited to join the Vibrant Economy Delivery Group; a vibrant economy is one of three strategic priorities in the Orkney Community Plan 2018-2021. The plan aims to strengthen and support Orkney's communities by enabling developments which will have a positive and sustainable socio-economic impact, and utilise locally-available resources, whilst striving to preserve and enhance the rich natural and cultural heritage upon which Orkney's economy and society depends.

"RGU was also invited to input into the Islands Deal proposition," said Elsa. "The biggest cross-cutting challenges locally are digital connectivity, transport, housing and fuel poverty, which impact on everything. Currently the Islands Deal, a joint proposal from the Islands' Councils (Orkney, Shetland and the Western Isles) to the Scottish and UK Governments, is being developed as the principal initiative to address these challenges. The Islands Deal, uniquely among current deals, proposes a number of measures designed to increase the local autonomy of the islands, with the potential to have a higher degree of self-determination in the future. RGU has contributed through academic participation in a number of workshops, as well as hosting sandpit events aligned to deal with priority areas.

"RGU has made a long-term commitment to Orkney and our participation in these various initiatives is a clear sign of the impact and value of the university's work in the community. The next stage of the project aims to transform exploratory work into relevant and impactful initiatives. We'll continue to weave RGU's work into the local framework, enhancing the relevance of the university's expertise in Orkney while continuing to respond directly to the needs identified by the community."

Sandpit programme

The sandpit programme sees academics from the university work with local stakeholders to better understand the challenges facing the community.

An 'active ageing' sandpit, explored innovative solutions to support the ageing population of Orkney.

A 'smart tourism' sandpit was delivered in partnership with the University of the Highlands and Islands and explored digital responses to the increasing popularity of Orkney as a tourism destination. The event underpins the development of several collaborative activities between the universities and stakeholders including Orkney Islands Council, Highlands and Islands Enterprise, Historic Environment Scotland, VisitScotland, Scottish Natural Heritage and Destination Orkney.

A 'circular economy' sandpit was held in partnership with the Industrial Biotechnology Innovation Centre (IBioIC) and Highlands and Islands Enterprise. It responded directly to challenge areas identified through a recent consultation including the valorisation of brewery and distillery by-products, plastics (including agricultural plastics), fish processing by-products and construction waste.

Pump priming projects

Seven pump priming projects relating to Orkney have been funded. Further information on these can be found on page 18, Primed for impact.

Did you know?

RGU's work on Orkney isn't just focused on research, it's also about supporting the development of the workforce to ensure employees are able to adapt to changing working environments. Six different organisations have enrolled a total of eleven employees in the university's Graduate Apprenticeship programme. Graduate Apprenticeships enable participants to earn their degree while working. They are developed in partnership with Skills Development Scotland, employers, universities, and professional bodies to address national skills shortages and extend access to degree-level studying across Scotland, while enabling employers to shape their workforce in line with business demands.

Primed for impact

Since its introduction, nineteen innovative projects have received pump priming funding. These projects were selected as they demonstrate strong interdisciplinary collaboration that will positively impact on the sectors concerned. *Research* brings you a closer look at what each project is hoping to achieve.

Addressing challenges in Orkney

The sandpit programme

The Orkney Project sandpit programme demonstrates the university's commitment to the Islands by responding directly to challenges identified by local stakeholders, supporting the development of large research funding bids. The programme kicked off with the 'active ageing' sandpit, held in September 2018 which responded to the identified challenges and opportunities associated with an ageing population. It attracted 50 participants including 21 academics from across the university, offering a truly interdisciplinary perspective. Two further sandpit sessions covering 'smart tourism' and 'circular economy' have also been held.

Each sandpit consists of an informal networking evening, followed by a full day session including presentations and group discussions, during which several potential project ideas are identified and developed, including prospective funding streams.

Principal investigator: Elsa Cox, Orkney Project Development Manager

Enhancing mental wellbeing in farming populations

Mental health issues can be difficult to address in any population and within each sector there are specific issues and triggers that could hinder an individual's mental health. The increasing pressures that farmers face have received a lot of media attention, with stories about increased suicide rates hitting the news. While much research has been conducted on farm safety and injury prevention, very little has been done on supporting positive mental health and wellbeing in the farming community.

RGU, NHS Grampian and the National Farmers' Union (NFU) Scotland are working – sometimes long, isolated hours – in this rural and often remote environment. By using farmers' marts, facilities that many in the community use to trade, individuals who would usually be hard to reach can participate and share what they think would help to enhance the mental wellbeing of the farming population.

Co-Principal Investigators: Professor Kay Cooper, School of Health Sciences (HS) and Professor Liz Hancock, Vice Principal Academic Development and Student Experience

Co-applicants: Dr Lyndsay Alexander and Stephanie Morrison, (HS) and Andrea Gilmartin and Chris Littlejohn, NHS Grampian Public Health

External collaborators: National Farmers' Union Scotland

Positive ageing: housing and place making

Orkney faces the dual challenge of an ageing population and limited affordable housing. It is predicted that between 2016 and 2041, the population aged over 75 will increase by almost 100%, from just over 2000 to 4000 people. Co-housing offers a new option for senior citizens who want to maintain their independence, away from an institutionalised environment, while providing a mutually supportive residential community. The Hope Co-housing project is a study into the feasibility of creating six self-contained sustainable homes for six senior residents in Orkney who will all share in the running of a communal building with laundry, common room, kitchen and dining area.

"TACKLING SOCIAL ISOLATION THROUGH THE SUPPORT AND COMPANIONSHIP OF THE OTHER RESIDENTS."

The main benefit of a senior co-housing community is that it encourages physical and mental wellbeing by tackling social isolation through the support and companionship of the other residents. It also lessens the demands on health and social services because one visit reaches a community group instead of an individual. The communal aspect of the project allows residents to share resources, limiting consumption, and creates a mutually supportive community, housed in affordable and happy homes.

Principal investigator: Professor Gokay Deveci, Scott Sutherland School of Architecture and Built Environment (SSS)

Co-investigators: Professor Catriona Kennedy, School of Nursing and Midwifery (SNM), Professor David Gray, School of Creative and Cultural Business (CCB), Professor Kay Cooper, Laura Stewart, Dawn Mitchell, (HS), Professor Nirmalie Wiratunga, Emeritus Professor Susan Craw, Dr Stewart Massie, School of Computing Science and Digital Media (CSDM), Daniel Sutherland, Gray's School of Art (Gray's), and Dr Chris Yuill, School of Applied Social Studies (SASS)

Supporting organisation: Hope Co-housing Ltd and Orkney Islands Council

Polypharmacy treatment burden

Polypharmacy arises when people are prescribed treatment with five or more different drugs. Typically, the older you are the more frail you become due to different drugs, conditions, and ageing, so this will affect your ability to manage your care prescriptions effectively. It can be a challenge to know which combinations of tablets have to be taken and at what time during the day. Currently, research exploring the burden of treatment has focused on specific diseases (such as heart failure and stroke). These studies on people from Scotland's central belt have identified polypharmacy as a burden.There is a need to better understand the polypharmacy treatment burden, particularly in people who live in more remote and rural communities; who may not easily be able to access hospital, GP or community pharmacy services, or have alternative support at home. The university is currently building strong relationships in Orkney so this research will enable greater insight into improving the lives of older people from Orkney's remote and rural communities.

Principal investigator: Dr Aileen Grant, (SNM)

Co-investigator: Dr Katie MacLure, School of Pharmacy and Life Sciences (PALS)

External Collaborators: NHS Tayside, University of Glasgow, and the Scottish Government

From tales to trails

When seasonal cruise ships reach dock at Orkney, tourists not surprisingly often swarm onto the islands to bombard well-marketed world heritage sites like the prehistoric village of Skara Brae and the Ring of Brodgar. This can result in congestion of rural transport routes and sporadically crowd local communities. While residents may welcome the potential benefits of tourism, ideally the impact of this influx could be better managed by dispersing the tourists across the islands, managing when they visit particular sites and also attracting them to lesser known, but equally interesting heritage sites.

Working with Orcadian storytellers Tom & Rhonda Muir, our research explores how tourists can be dispersed using digital tourism trails. Tourists follow the trail using a smartphone app that unlocks folkloric stories as they reach the lesser-known heritage sites. Users will hear the tales, as narrated by Tom, accompanied by traditional Orcadian music and imagery of the folkloric creatures. The app will supply information about local services and places of historic interest to help spread the economic benefit from mass tourism while sharing knowledge of Orkney's folklore and heritage.

Principal investigator: Dr Rachel Ironside, (CCB)

Co-investigators: Dr Stewart Massie (CSDM), Tim Melcherson (CCB)

Orkney autonomous vehicle consortium development

Autonomous Vehicles (AVs) have the potential to help address many of the transport challenges in rural and island areas, including how to provide cost effective transport for an ageing population and better management and optimisation of high-volume tourism, such as large cruise ship visits.

"AUTONOMOUS VEHICLES HAVE THE POTENTIAL TO HELP ADDRESS MANY TRANSPORT CHALLENGES."

Developed by Professor David Gray, the establishment of an autonomous vehicles consortium in Orkney complements a number of initiatives focused on introducing AVs to the islands, working in collaboration with local stakeholders including Orkney Islands Council, Orkney Renewable Energy Forum (OREF) and the Highlands and Islands Transport Partnership (HITRANS).

Principal investigator: Professor David Gray (CCB)

Co-investigator: Professor Richard Laing (SSS)

External collaborators: HITRANS, AquaTera, Orkney Islands Council

3D scanning in Stromness

Stromness' Victoria Street, one of the most historic streets in Orkney, still maintains much of its historic urban design. Last year, the main street, which is 1.5 miles long, was scanned using a 3D laser scanner; it's the biggest 3D scan the team in the Scott Sutherland School of Architecture and Built Environment has completed. The images have helped to build a visual digital image of the urban environment. A public exhibition of the images is being set up to encourage discussion and engagement with the local community. Scanning urban environments in this way allows for an accurate record of the past and present. It allows communities to track changes, such as changes brought on by climate change and coastal erosion, and this supports the local decision making and planning processes.

Principal investigator:
Dr Jonathan Scott, (SSS)

Co-investigators:
Professor Richard Laing, (SSS)

External collaborator: University of the Highlands and Islands Archaeology Institute and Orkney Islands Council

An example of the images created of Stromness during the 3D scanning work

Other pump priming projects

Simulated mass evacuation

In the UK, footfall in historic buildings is increasing by around 7% annually. While this bodes well for the economy, the increased visitor numbers and an ageing demographic bring issues which can potentially diminish the visitor experience. For example Edinburgh Castle sees over 13,000 visitors per day in the peak tourist season. Designed for its impregnability and defence and now re-purposed for mass-visitation, ironically it's challenged more by the risk of mass evacuation today. Because it is impracticable to undertake safety drills to test evacuation with large numbers of people, this must be modeled using simulation approaches, and incorporate expertise in architecture, computing and ergonomics. This project seeks to develop a menu-driven interface to simulate a historic building evacuation based on a customisable configuration, using digital characters scaled to actual body sizes taken directly from the Scottish Health Survey. This helps us evaluate the vulnerability and resilience of our heritage to increased visitation and to plan emergency evacuation operations accordingly.

Principal investigator: Dr Arthur Stewart, School of Health Sciences (HS)

Co-investigators: Dr John Isaacs, (CSDM) and Dr Yang Jiang and Dr Marianthi Leon (SSS)

External collaborator: Historic Environment Scotland

Equally safe in higher education

In 2014, the National Union of Students released the results of its Lad Culture & Sexism survey that revealed one in four students have experienced unwelcome sexual advances while at university. That statistic rises to one in three when considering women only. A sector-wide initiative, initially funded by the Scottish Government, called Equally Safe in Higher Education was created to tackle the issue.

RGU'S REPORT AND SUPPORT PLATFORM IS IN PLACE TO TACKLE GENDER-BASED VIOLENCE.

This research will add to the national data of the Equally Safe in Higher Education initiative through its campus-wide survey and create a baseline of data on how prevalent gender-based violence is on campus. Moreover, using focus groups and interviews this research will delve into the on-campus experiences of students and staff. The output will build upon the provision that RGU already has in place through its Speak Up Speak Out platform – which was shortlisted in the NUS Scotland Awards 2019 for campaign of the year – to tackle gender-based violence.

Principal Investigator: Dr Natascha Mueller-Hirth, (SASS)

Co-investigators: Professor Sarah Pedersen and Dr Graeme Baxter (CCB). Supported by the Department of Student Life in promoting the survey.

External Collaborators: University of Strathclyde and Equally Safe in Higher Education Network (11 Scottish universities)

Scottish suffragette cities

The suffragettes were members of militant women's organisations who fought for the right to vote. The activities of Scottish suffragettes have been overshadowed by what went on in London, to the extent that the history of the movement being taught at Higher level in schools in Scotland focuses mainly on English action.

"THE ACTIVITIES OF THE SCOTTISH SUFFRAGETTES HAVE BEEN OVERSHADOWED..."

This research into the locations of the Scottish suffrage campaign will initially focus on Aberdeen and Aberdeenshire. It maps the activity of the women who fought for the right to vote and will create a website containing local history with which the public can engage and contribute their own information. People who think a relative was a suffragette could take leads from the site to investigate their family history while local historians will be able to contribute to the history of their area. It is hoped that further funding will enable the site to grow, eventually to encompass the whole of Scotland.

Principal investigator: Professor Sarah Pedersen, (CCB)

Co-investigators: Dr Marianthi Leon, Professor Richard Laing and Craig Wilson, (SSS) and Dr John Isaacs, (CSDM)

Improving nutritional status of cancer survivors

In collaboration with CLAN Cancer Support, this project is testing the feasibility of a two-day course 'EatWell@CLAN' to improve diet and physical activity behaviours in men and women who have received a cancer diagnosis and completed their treatment. The course is offered at three centres (Aberdeen, Elgin and Kirkwall) and includes presentations, practical activities and group discussions. Participants will complete baseline and three-month follow-up questionnaires on diet and physical activity and provide feedback on course acceptability.

The development of an acceptable and effective course for promoting a healthy diet, tailored to the needs of people who have experienced a cancer diagnosis, will complement current services offered by CLAN Cancer Support and have an impact on both quality and quantity of life in cancer survivors.

Principal investigator: Dr Lindsey Masson (PALS)

Co-investigators: Dr Flora Douglas, (SNM) and Dr Katie MacLure, (PALS)

External collaborators: CLAN Cancer Support

The typical wind farm you see will use horizontal axis wind turbines such as those pictured.

Optimising the performance of a wind turbine

Every day the demand for renewable energy is growing. There is significant potential in the sector but researchers are still working to identify the right technology to meet demand efficiently. This pump priming project focuses on extracting greater wind energy and using novel wind turbine technology, and is seeking ways to minimise the effect of environmental conditions on turbine performance.

The typical wind farm you see will use horizontal axis wind turbines. These turbines are efficient but cannot be used in urban environments. Comparatively, vertical axis wind turbines are less noisy, easier to maintain, and effective in urban environments so, there is an opportunity to develop vertical axis wind turbines as an efficient alternative. Over the last four years, the team has designed a vertical axis wind turbine which is capable of using both lift and drag forces to extract energy; this is a unique feature. The team is working to move this turbine into technology readiness level five by validating that the technology works under diverse simulated conditions

Principal investigator: Dr Sheikh Islam, School of Engineering (ENG)

Co-investigators: Dr Mamdud Hossain and Dr Nadimul Faisal, (ENG)

Archchain

Building Information Modelling (BIM) is the prevalent method for representing all information about a building in a central database that includes geometry, materials, specifications and every conceivable aspect of its design. The lifespan of these models ranges from concept to occupation of the buildings and are used by individuals, businesses and governments to plan, design, construct, operate and maintain their buildings. As such, they have the need to be heavily project managed, robust, reliable and trusted.

"THEY NEED TO BE HEAVILY PROJECT MANAGED, ROBUST, RELIABLE AND TRUSTED."

Our research looks to integrate blockchain technology, a form of immutable digitally-distributed ledgers commonly associated with cryptocurrencies like Bitcoin, into BIM. This creates another level of highly trustworthy infrastructure that connects the physical building to its digital representation and reduces the need for a central authority to project manage the models. The opportunity to connect smart contracts through blockchain to BIM could radically transform the legal framework of insurance and fiscal instruments associated with construction.

Principal investigator: Theo Dounas, (SSS)

External collaborators: Cardiff University, the University of Liverpool, and 4ttude Design Services

Using thermally sprayed metamaterial coatings in energy harvesting

This experimental proof of concept study is looking to develop metamaterial coatings using a thermal spray technique for energy harvesting applications, essentially light trapping microstructures. The design and manufacturing of these coatings will use masking grids. Metamaterials are not naturally occurring, instead they gain their composition from engineered and designed structures. The precise nature of a chosen metamaterial's particle shape, geometry, size, orientation and arrangement during thermal spraying can affect light or electromagnetic waves in an unconventional manner which brings desirable benefits. This project will specifically focus on solar photovoltaic energy harvesting applications. This project is a collaboration with the University of Nottingham, Cranfield University, and the University of Exeter. Each has expressed strong support of the proposed technique.

Principal investigator: Dr Nadimul Faisal, (ENG)

Co-investigator: Dr Firdaus Muhammad-Sukki, Dr Nazmi Sellami, Dr Sheikh Islam, (ENG)

External Collaborators: University of Exeter, University of Nottingham, Cranfield University

Impact of Brexit on mental health and wellbeing of EU citizens

In March of 2017 the UK Government invoked Article 50 of the Treaty on European Union, beginning the legal process for withdrawal from the EU. Brexit's potential impact on many areas such as education, economy and borders is well documented, but little research has focused on the health and wellbeing of EU citizens. Researchers from the School of Nursing and Midwifery and the School of Applied Social Studies are conducting focus groups to investigate how this changing political state is shaping the lives of the communities most affected.

Focus group participants are revealing how the different facets of Brexit have affected them and what actions helped or hindered their mental health and wellbeing. The study has the potential to produce a series of recommendations for employers and health and support services, including the third sector, to help people manage the uncertainty that comes with Brexit.

Principal investigator: Professor Catriona Kennedy, (SNM)

Co-investigators: Piotr Teodorowski, (SNM) and Dr Ruth Woods, (SASS)

External collaborator: Feniks

Technological and social innovation in built heritage – layers of dissemination

Cultural heritage sites, like historic buildings, archaeological areas and monumental sculptures, have the potential to attract tourism, boost local economies and teach us about our history and culture. Each site has layers of historic and cultural information like pilgrimage routes and historical connections to other sites, that can be captured and expressed through the use of digital technologies. Combining this with three-dimensional scanning – technology that creates a digital representation of reality provides an innovative platform for disseminating these layers to different types of audiences.

This research explores how data gained from heritage sites using the latest technology can be made widely available to create genuine impact. This could be through workshops that encourage stakeholders and students to learn about new technologies and cultural heritage. Impact could be created by engaging with schools through the heritage environments found in pupils' computer games – captured using three dimensional scanning – and relating it to their local area to teach them about heritage sites and history.

Principal investigator: Dr Marianthi Leon (SSS)

Co-investigators: Professor Richard Laing and Theo Dounas, (SSS)

External collaborators: 3D Survey Group – Politecnico di Milano and Leica Geosystems

International collaboration

Pump priming funding has enabled Professor Richard Laing to build a closer collaborative partnership with Professor Anne Jensen from Aarhus University in Denmark, who is currently a visiting professor at RGU. Richard and Anne have both visited Copenhagen and Aberdeen respectively, to meet with researchers and work on projects and joint papers. These include two EU proposals and one which is intended for the Danish Research Council. Richard notes that being able to work together face-to-face allowed them to accomplish more in three days than they might during six months of working online and remotely. Their areas of focus are sustainable urban environments and mobility, with Anne bringing expertise regarding supporting better public engagement and participation in decision making.

Principal investigator: Professor Richard Laing, (SSS)

Co-investigator: Professor David Gray, (CCB) and (SSS)

External collaborator: Dr Anne Jensen, Aarhus University (visiting professor to RGU)

Food insecurity and long-term health conditions

Food insecurity is a significant public health problem that is affecting a range of vulnerable groups across the country and one that is the result of a number of factors, such as changes to social security entitlement and the rising cost of living.

Food bank usage has increased over recent years and it has been shown that a disproportionate number of people who use food banks have one or more health conditions. Food banks are only able to supply a very limited amount of food to people seeking their help, and report being unable to meet the specific dietary needs of people living with health issues.

This project is looking to understand the impact of food security and low income on people with long-term health conditions and what might be done to help tackle the situation.

Principal Investigator: Dr Flora Douglas (SNM)

Co-investigator: Dr Chris Yuill (SASS)

External collaborators: Community Food North East CFINE and Food Poverty Action Aberdeen Alliance

Protecting vehicles from cyber-attacks

With the increased use of electronics and digital controls, an average vehicle carries about a million lines of software code and up to 100 electronic control units (ECU). These critical safety elements control everything from transmission of power to steering and braking. As a result, a vehicle's cyber risks have grown significantly over the past few years; a hacker that compromises a vehicle's braking or steering system could cause a driver or passengers to lose their lives. The security of connected and autonomous vehicles is a big concern for automotive manufacturers and original equipment manufacturers (OEMs) so these companies are now looking for methods to secure their products against cyber-attacks. The project aims to develop a practically deployable cyber security solution forthe modern vehicle. Our research is developing an advanced anomaly detection technology to analyse the data coming from the vehicle's network, effectively detecting data and software anomalies and intrusions.

Principal investigator: Dr Harsha Kalutarage, (CSDM)

Co-investigators: Professor Nirmalie Wiratunga and Dr Omar Al Kadri, (CSDM)

External Collaborators: HORIBA MIRA Ltd and Institute for Future Transport and Cities – Coventry University

Meet
LESLEY DICKSON

Dr Lesley Dickson joined the university as Research Training Coordinator in February 2019. In this newly created post, Lesley will support all aspects of staff and student researcher development.

Tell us a little about yourself.
After graduating from the University of Aberdeen with my Doctorate in 2013 I worked there in a support role before moving to Glasgow and working at the Royal Conservatoire of Scotland and the University of Glasgow. A recent move back to the sunny city of Aberdeen allowed me to take up this exciting new role at RGU. In my spare time I'm writing a novel and learning French.

Yours is a new role for the university. What does it involve?
Working between the Research office and the Graduate School, I've met with a lot of researchers and other stakeholders to identify and prioritise research training needs. The outcome is the development of a programme of research development opportunities that will enrich our early career researchers' skillset.

What kind of development opportunities are early career researchers looking for?
I've identified five areas which I'll be focusing on first; grant writing, public engagement, professional and research career management, research methods, and mentorship in research. These are just starting points and within the area of 'grant writing' alone you could provide training on writing your first grant proposal, peer review in research funding, strategic approaches to applying for grants and so on.

Why do you feel it's important to focus support on early career researchers?
There are many benefits to investing in the development of our early career researchers. Firstly, we improve their effectiveness as highly-qualified and well-rounded researchers. Secondly, as they progress they become the leaders and mentors of the next generation of researchers who then benefit from their expertise. This works to foster a strong, collegiate group of researchers producing internationally recognised and impactful research.

What excites you most about your role?
Being able to put my own research hat on and take a creative and expansive approach to improving the support in place for early career researchers. By identifying examples of best practice from across the sector and building on the support already in place we can provide access to important opportunities for personal and professional development that will be integral to the growth of a thriving research community.

Tell us one thing that early career researchers can do today to help their careers.
Creative thinking can be a life-saver when you feel stuck or uninspired in the face of a research problem. Talk to researchers working on something completely unrelated, take a new route to work, and break out of established routines. My PhD supervisor encouraged me to do this and while it might be difficult to see the point at the time, it can lead to more than one 'eureka' moment.

Research from
the Graduate School

By Dr Tesnime Jebara, who recently finished a PhD in Pharmacy Practice at RGU

Several countries across the world, such as the UK, have developed and implemented frameworks to allow healthcare providers, other than doctors and dentists, to prescribe medicines in order to provide faster but equally safe access to essential drugs. Pharmacist prescribing, in particular, has proven to be safe, clinically appropriate and is highly respected by patients and fellow professionals alike.

During my third year as an undergraduate pharmacy student at Qatar University, I started looking into this further and discovered that the first pharmacist prescriber in the UK actually graduated from RGU. When it was time for me to pursue my PhD in this field, I knew this was the place I had to go to.

Benefiting from this experience, my PhD aimed to explore the development of similar prescribing frameworks in Qatar, where pharmacy practice is rapidly evolving to ensure pharmacists' skills improve patient health outcomes. That has been my task over the past three years and future further research-based development work is now required to translate the final most appropriate framework into an approved education course and practice.

I've always said that if you have a topic you are passionate about and a supervisory team willing to guide you through, a PhD is not impossible nor is it difficult. It can get challenging sometimes, but with the support of your supervisors, you will overcome any hurdle you face. I have been fortunate to have my supervisory team, who not only provided academic support, but also allowed me to explore other aspects of my personal development. As part of my PhD studies, I've been introduced to a range of research philosophies and methodologies which have shaped and extended my research expertise. I can also highlight the great support available from RGU's Library and would recommend any student to contact them if they have any questions.

I'm delighted to say that I have completed my PhD journey in only three years. To date, my PhD has resulted in three papers published in peer-reviewed journals – with three additional ones in the pipeline – and I'm working to improve my reasoning and scientific writing to have a more substantial contribution to the research community. I would like to continue with my PhD project, as I truly feel that this is the way forward for pharmacists in Qatar to help achieve the country's National Vision 2030 of making healthcare more accessible and affordable, by best utilising the expertise of its workforce.

The Graduate School aims to ensure a consistent and uniform experience for all research students across the university, and continuously seeks new ways to enhance their experience and professional development. This includes organising lectures with key speakers and providing relevant workshops on a range of researcher development topics. The Graduate School has supported the establishment of the Research Student Association, which has helped to enhance the research culture across campus and encourages fellow students to network and collaborate.

THE VALUE OF THE NATURAL WORLD

Natural products are the chemicals present in natural living sources, such as terrestrial plants, insects or animals, marine organisms, or micro-organisms, and have long been used by humans as medicines. This use of natural products as traditional medicines led to the recognition of the value of natural products in drug discovery and today over 70% of new drugs are either derived directly from a natural source or based on a chemical structure found in nature. At RGU, Professor Cherry Wainwright, from the School of Pharmacy and Life Sciences is one of the leaders of the Centre for Natural Products in Health where Cherry's particular expertise is in drug discovery.

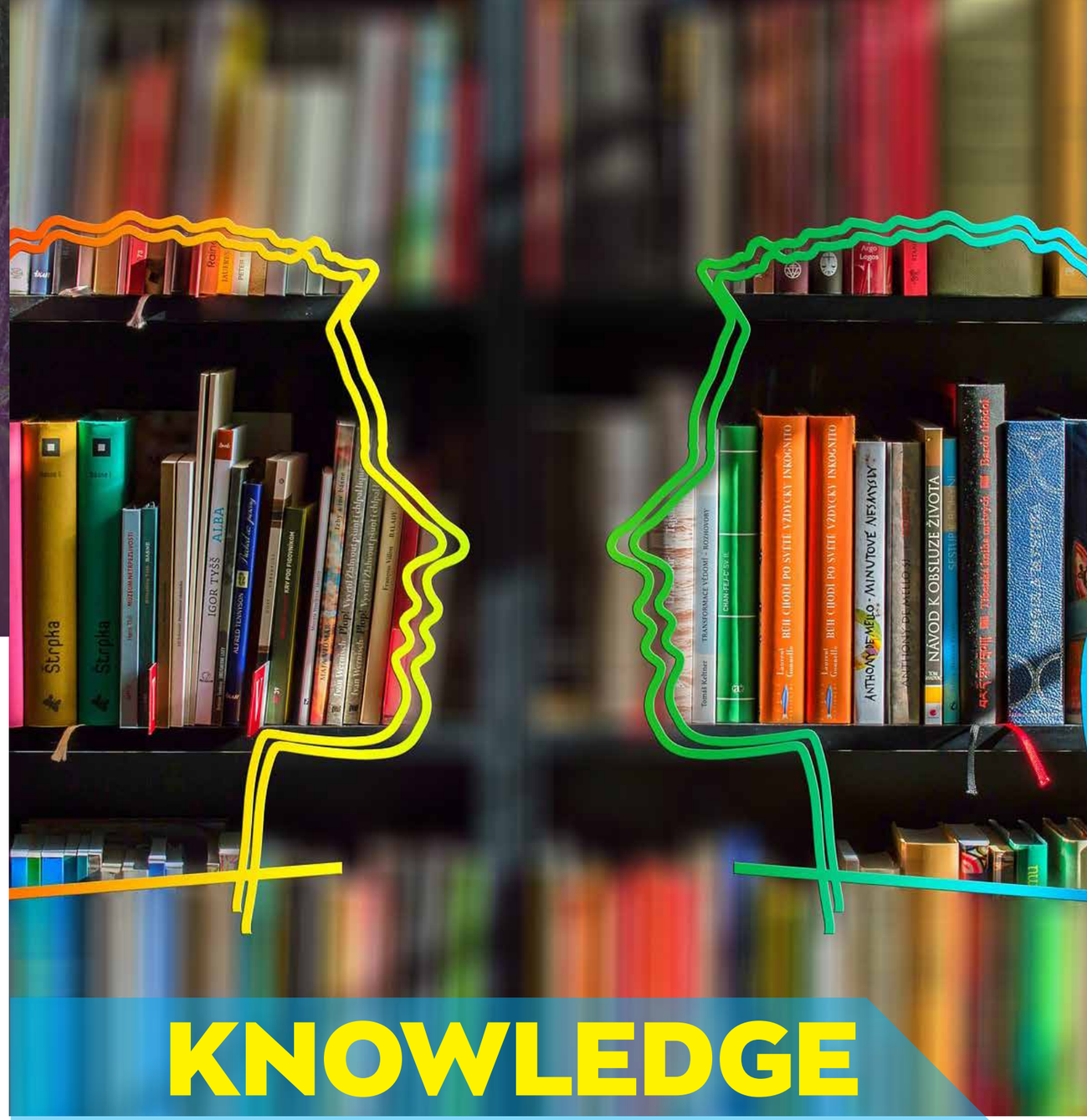
"I'm very passionate about natural products as a source of novel drugs and RGU hosts one of the most biologically diverse plant extract libraries in the world," said Cherry. "Originally created and curated by the University of Strathclyde, the collection holds over 6,000 specimens, representing 95% of the world's plant families and we use this both to support our own research and as a resource for scientists from other universities or within industry. We also have research programmes studying natural products from marine and food sources.

"My own research aims to understand how the function of cells and tissues are altered in cardiovascular disease, with the aim of identifying possible drug "targets" that could be useful in the treatment and prevention of heart disease. I'm involved in a number of collaborative projects, one example being a project with the University of Dundee which recently received funding from the Biotechnology and Biological Sciences Research Council (BBSRC). This project is studying a particular receptor protein that appears to play an important role in energy regulation, and may therefore be an important target for drug therapy in patients with diabetes or heart disease. It is possible that some natural product molecules target this protein so in a parallel project we are screening for novel compounds from our extract library that might do this."

Around five years ago, Cherry reached out to colleagues across Scotland to discuss the idea of bringing back natural product research as a Scottish strength. From this, she is now involved in the International Union of Pharmacology where she is on the Natural Products Committee. In 2017, she organised an international natural products conference at the Aberdeen Exhibition and Conference Centre (AECC) and will be running a workshop on natural product drug screening in India in December 2019.

DID YOU KNOW?

The main purpose of drug discovery is to find new drugs for conditions that remain untreatable. On average, the drug discovery pathway takes around 25 years from the discovery of the active compound, through tests and trials, to actual human use. Some examples of drugs commonly used that derive from natural products include: aspirin, a painkiller, which is derived from the salicylic acid found in the bark of the willow tree; and artemesinin, derived from *Artemisia annua* that has been used in traditional chinese medicine for thousands of years and is now used for the treatment of malaria.



is power

The breadth of knowledge and expertise within RGU is vast and far reaching. One of the most effective ways which businesses and industry can capitalise on this knowledge base is through a Knowledge Transfer Partnership (KTP).

Funded by Innovate UK, KTPs are a nationwide programme which, for the past 40 years, have been helping businesses to improve their competitiveness and productivity through the better use of knowledge, technology and skills that reside within academia.

A KTP is a three-way partnership between a business, university or college and a recently qualified graduate, known as the associate. It offers a company the chance to collaborate on a business opportunity, idea or innovation.

RGU hosts the North of Scotland KTP Centre, a joint collaboration with the University of Aberdeen, which also hosts applications from the Universities of Abertay, Dundee, Highlands and Islands, and the James Hutton Institute.

Within RGU, there has been a wide range of KTPs, from varying schools covering a number of disciplines – from art and design through to big data. The KTPs provide many benefits for each of the partners, but ultimately, they exist to build knowledge, capability and to help the economy grow.

Robin Brown, KTP Manager for the North of Scotland based at RGU, commented: "At the very core of each KTP there is a strong relationship between the participating organisation and staff within a knowledge base institution.

"Many of the KTPs we see here at RGU come on the back of an existing industry or business relationship. The academics have been able to discuss potential solutions to problems and ways in which the business can increase profits or gain a competitive advantage, which develops into a KTP.

"This year has seen a considerable boost in the funding available for KTP projects nationwide, which demonstrates the strategic importance of the scheme for Scotland's, and the UK's, growth."

CASE STUDIES

Oil and Gas UK (OGUK)

The Challenge

The gradual increase in the size of offshore workers posed a significant risk to health and safety, particularly in relation to the escape from a submerged helicopter. As a result, OGUK felt the requirement to perform a measurement survey and equip itself with the capability to undertake future surveys as needs dictated.

The Results

RGU worked with OGUK to develop and embed a scanning protocol within the industry, providing the knowledge and capability for safety applications. The KTP provided OGUK with the capability to effectively monitor evolving size and shape changes in the workforce, and to run more specific studies in the future. Company personnel were trained on the use of the scanning equipment and associated software, and developed the knowledge and logistic ability required to recruit participants for such a study.

"THE GRADUAL INCREASE IN SIZE OF OFFSHORE WORKERS POSED A SIGNIFICANT RISK TO HEALTH AND SAFETY"

The Impact

The greatest impact of this KTP was in terms of world-wide business opportunities for OGUK member companies, who will be be able to use the data to inform safety improvements both at an individual level and for installations. This includes, for example, installation design, space requirements, emergency muster areas, lifeboat and helicopter design, seating, and personal protective equipment.

ARR Craib (ARRC)

The Challenge

Changing demands of ARRC's client base as a result of the reduction in the oil price refocused the company's priorities to increase fleet effectiveness. The manual system previously used to control the fleet had reached capacity and off-the-shelf IT solutions did not suit ARRC's unique local market. RGU's knowledge was therefore needed to create a bespoke system and scheduling algorithm.

The Results

The KTP achieved enhanced vehicle allocation using a modern electronic scheduling system. This led to better communications between sales, controllers and drivers, and had a positive safety implication by removing the need for phone conversations. Driver and vehicle downtime has been reduced, and customer satisfaction has been increased as a result of fewer missed deadlines.

The Impact

Use of the system allowed for a 17% fleet productivity gain with no impact on operations, worth approximately £1.5million per annum to ARRC. ARRC and RGU have developed a strong collaborative partnership with ongoing activity in which the KTP Associate has continued employment.

Did you know?

So far, 93 KTPs have been awarded to RGU, with a total value of over £7m. Nine of these are currently active.

RGU has a KTP grant-award success rate of 95%.

THE RIGHT TO ACCESS IMPACTFUL RESEARCH

By George Bray and Colin MacLean, based in the RGU Library

Millions of pounds are invested in UK-based research every year. This money comes ultimately from the general public, allocated by the Government or other national and international organisations. Because everyone contributes to funding it, we all share the right to see our money being spent on impactful and beneficial research.

Research is a key part of RGU's mission. It contributes to evidence used for decision-making in healthcare, social services, environmental development and cultural heritage. Our researchers tackle important issues like sustainability, inequality and conflict, and collaborate in the creation of future technologies, materials and the development of commercial projects.

Research at RGU is shared mostly through conventional channels in the form of publications – books, journal articles, and conference papers. These traditional ways of sharing have historically kept university research behind paywalls, accessible only to those who are able and willing to pay. Growing demand for transparency and accountability in how public money is being spent means that today the case for making research outputs openly available is compelling. "Open Access" is the principle of making research outputs openly available online and enabling responsible re-use of the content. The aim is essentially to make it as easy as possible for people to derive benefits from research findings. The derived benefits, to people, societies and economies, are what define research impact.

Open access:

- Removes pay to view and enables the public to engage directly with publicly-funded research outputs.
- Empowers independent practitioners or researchers from developing countries – people who may not have the money to spend on books or subscriptions, but who are well-placed to use research to meaningfully impact the lives of others by improving their own practice or research projects.
- Makes it easier for decision-makers to discover or access research, making it more likely to influence policies and laws that will impact on people's lives.
- Helps create opportunities for interdisciplinary collaboration, enabling researchers to discover people and projects from other disciplines, whose work is relevant to their own research interests.

As part of RGU's aim to develop its portfolio of "globally recognised impactful research", we use our repository – OpenAIR@RGU – to make our research open access. OpenAIR hosts a growing collection of over three thousand outputs that have been downloaded over 470,500 times, proving that RGU's research has the regional, national and international reach to which we aspire.

Preparing for REF2021

By Dr Emma Gillibrand, Deputy REF Manager

The Research Excellence Framework (REF) aims to ensure the continuation of world-class, dynamic and responsive research in the UK. It does this by providing accountability for public investment, benchmarking information, and the selective allocation of funding. There are 34 subject-based units of assessment (UoAs), that universities can submit research against, and submissions are considered by a panel of subject experts. For each submission of REF three distinct elements are assessed: the quality of outputs, their impact beyond academia, and the environment that supports research. Doing well in the next REF will showcase the impact of RGU's research expertise.

"REF AIMS TO ENSURE THE CONTINUATION OF WORLD-CLASS, DYNAMIC AND RESPONSIVE RESEARCH IN THE UK."

The deadline for the university's REF2021 submission is 30 November 2020, and while this may seem far away, internal preparations are well underway. One requirement has been to write a Code of Practice which describes how the university will determine the group of staff considered to have 'significant responsibility for research'. Our Code of Practice has now been finalised and it can be found on our internal REF2021 Moodle webpages.

Staff are eligible for submission where they have a contract of 0.2FTE or greater on the census date, and whose primary employment function is to undertake either 'research only' or 'teaching and research'. All academic staff at RGU are on a contract which includes both teaching and research and so it is the annual review process (EPR) which determines the spread of activity for the coming session. Our Code of Practice provides further detail of the evidence we will use to identify eligible staff.

It's important to know that RGU has not changed individual academic contracts in order to fulfil a process for the administration of REF2021. We don't wish academics to feel pressured to channel their efforts into REF-focused types of research at the expense of important academic activities that support the quality of teaching, and the wider reach and impact of the university.

As a key measure to support equality and diversity of staff, the university is keen to recognise the effect that an individual researcher's own circumstances may have had on their productivity. These circumstances could include: being an early career researcher; having a period of absence for family related leave; or other circumstances relating to protected characteristics. We're currently collating voluntary submissions of individual circumstances from staff and encourage all eligible staff to contact myself (Dr Emma Gillibrand) if they would like to discuss their own circumstances.

We've also undertaken a review of potential outputs by academics external to RGU. This has enabled us to determine where the research areas of strength have been during the REF period (2014-2020) and thus to which units of assessment we intend to submit. We'll undertake a second external review of outputs towards the end of 2019.

If you have any questions about the REF2021 submission, please contact myself in the first instance, or review the FAQ page on Moodle.

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