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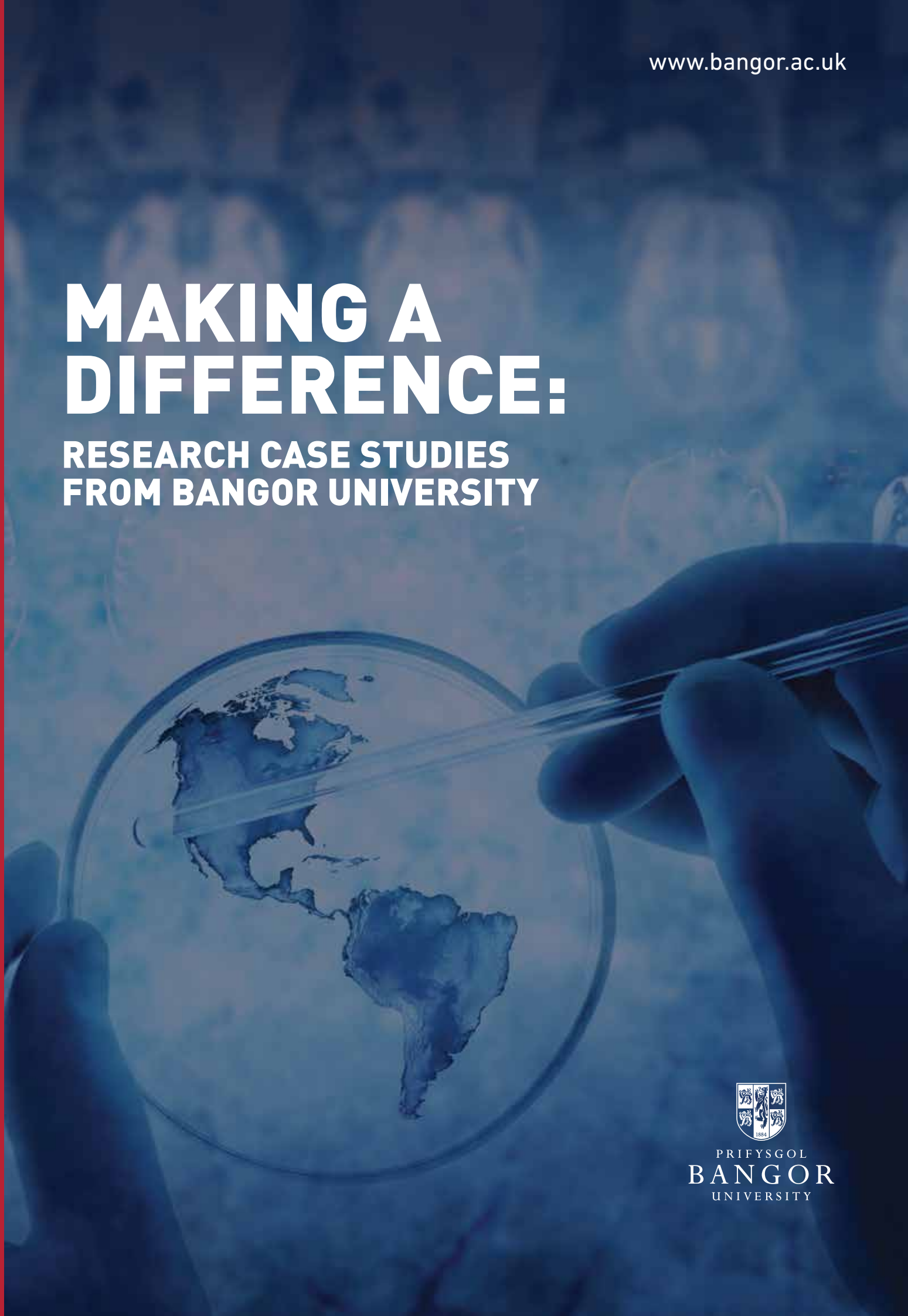
MAKING A DIFFERENCE:

RESEARCH CASE STUDIES FROM BANGOR UNIVERSITY



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RESEARCH IS CENTRAL TO BANGOR UNIVERSITY

Research is central to Bangor University; it is an integral part of our teaching and a passion of our academic staff. One of the outstanding features of our research is the breadth and depth of the impact that we create through our work. Look at the case studies featured in this brochure and you will see that our research transforms the lives of millions of people around the world and in many different ways. This impact ranges from the food we eat and the environment we live in, through health and well being to improving of the economy and the law of the land. All of this success shows that Bangor University is a world-leading research power based in Wales that is making the world a better place.

This success was reflected in the 2014 Research Excellence Framework which recognised that more than three-quarters of Bangor's research is either world-leading or internationally excellent. Based on the University submission of 14 Units of Assessment, 77% of the research was rated in the top two tiers of research quality, ahead of the average for all UK universities.

Research in the schools of Sports Science; Modern Languages; Welsh; Education; Linguistics; Social Sciences; Ocean Sciences; Biological Sciences; Environment, Natural Resources and Geography; Psychology; Healthcare Sciences and Medical Sciences have all been ranked in the top 20 in the UK.

It is clear that the excellent research carried out by Bangor University academics is having a major economic impact on the lives of people around the world. This will come as no surprise to those who are familiar with us: Bangor University, established in north Wales in 1884 by the community to serve the needs of future generations, continues to transform lives one hundred and thirty years on from its foundation.

The world leading research carried out at Bangor University, together with our high student satisfaction and the new major building projects that we have underway makes this University a unique and very attractive place to study and work.

Professor David Shepherd
Deputy Vice-Chancellor (Research & Enterprise)

IMPROVING THE LIVES OF MILLIONS OF PEOPLE

The knowledge of and access to suitable rice varieties for resource-poor farmers in India and Nepal has long been an issue. Pioneering research led by Bangor University has improved the livelihoods of more than 5 million households across these countries. This involved developing new varieties of rice which provide a 15-40% yield advantage over the varieties grown traditionally, and in India the two Ashoka rice varieties alone are estimated to provide benefits of £17million annually to the poorest farming households.

These new varieties were superior in their good taste, drought tolerance and had high pest-resistance properties. 83% of surveyed Ashoka users reported increased rice availability in 2008, with a mean increase in rice self-sufficiency of almost one month. These direct benefits allow farmers to plant an additional crop or devote time to non-agricultural activities, providing extra income and permitting them to send their children to school.

Expansion of seed distribution continues throughout northern India and seed production levels now represent over 40% of the total recorded seed production.

Using DNA to tackle wildlife crime

DNA forensic research carried out by Bangor University in collaboration with Bangor University spin-out company, Wildlife DNA Services, has had major impacts on the management and control of illegal wildlife trade.

The research was born out of the need for DNA forensic techniques to tackle wildlife crime. Bangor University's research into sustainable fishing created traceability tools, which follow the whole journey of fish from stock-to-fork, enabling control and enforcement of fisheries management strategies. Bangor University researchers developed genetic markers for four priority species for conservation and/or enforcement within the EU (Cod, Herring, Sole, and Hake) so they could detect the origin of their populations and assess their diversity.

This was the first major project to produce tests that identify the geographic origin of marine fish for fisheries enforcement with sufficient certainty and level of validation to meet forensic standards in court.

Bangor University's research has improved stock management by the UK government, has directly affected the Common Fisheries Policy and has been implemented by the Marine Stewardship Council to ensure correct labelling of products.

Preventing the recurrence of depression with Mindfulness-Based Cognitive Therapy

Research carried out at Bangor University's Centre for Mindfulness Research and Practice found that Mindfulness-Based Cognitive Therapy (MBCT) plays a major role not only in preventing the recurrence of depression, but also enhancing well-being more broadly.

MBCT integrates Mindfulness-Based Stress Reduction with aspects of Cognitive Behavioural Therapy. It was developed at Bangor University through translational research on the mechanisms of depressive relapse/recurrence.

Bangor University's research in this field has directly impacted on the transfer of the MBCT evidence base into practice settings regionally, nationally and internationally, benefitting patients, healthcare professionals and policy makers.

The UK National Institute for Health and Care Excellence (NICE) recommended their approach as an effective depression prevention programme. A body of subsequent trials suggested that it significantly and consistently reduces depressive relapse rates compared with alternative care approaches.

Since 2008, the Centre has delivered MBCT courses to over 1500 members of the public and trained over 1300 professionals to deliver MBCT within the NHS and other contexts, and has also supported the establishment of a network of skilled MBCT professionals throughout the UK.

Food Dudes: encouraging healthy eating in children internationally

Bangor University's School of Psychology devised The Food Dudes scheme to address the major public health challenge of encouraging healthy eating in children.

Psychologists used a unique combination of role modelling, rewards and repeated tasting to get long lasting results in children's intake of fruit and vegetables. For the role modelling aspect, a video was created by the Bangor team, introducing the Food Dudes: four fictional child characters that were seen happily eating fruit and vegetables which gave them "special energy to defeat the forces of evil".

The investigation proved that neither role modelling nor rewards were effective singularly. However, in the Food Dudes video, the characters combine the two, giving the children approval from, and membership of a successful and inspirational group of peers.

This initial research discovered a powerful synergy between rewards and role modelling that signified a sustainable way to change eating behaviour in children.

Roll-out of the Food Dudes programme in the UK and internationally has seen more than 500,000 four- to eleven-year-old children participate across Europe and the U.S.A., and the programme continues to attract significant funding from public health agencies internationally.

Improving the lives of people living with dementia through non-pharmacological intervention

Cognitive stimulation, an approach developed by Bangor University in collaboration with UCL, has proven effective in maintaining both cognitive function and quality of life for dementia patients.

The research set out to evaluate the effectiveness of this psychological intervention for these patients, and produced evidence of comparable quality to that from pharmacological interventions. From the research, a new intervention called 'cognitive stimulation therapy' (CST) was developed, offering a standardised programme of group sessions within a person-centred framework of respect and individual choice. CST has proven effective in maintaining both cognitive function and quality of life, and is now recommended in guidelines around the world as the major evidence-based non-pharmacological intervention.

It is estimated that since 2008, CST has helped over 50,000 patients and their carers worldwide to have a better quality of life. It was also estimated by the NHS Institute for Innovation and Improvement that extending the use of CST could save the NHS over £54.9m per annum compared with the use of anti-psychotic medicine.

‘TRAIN IN, NOT SELECT OUT’

Leadership training model decreases the high wastage rates in Armed Forces recruits and improves training practices

High wastage during the recruit training stage has always been a problem for the Armed Services. A ten-year programme of research, funded by the Ministry of Defence (MoD), was carried out by Bangor University to help identify ways to make recruit training more efficient.

The Bangor model of transformational leadership focuses upon providing an inspirational vision of what training will lead to, helping recruit trainers to develop their coaching skills, helping trainees to understand the challenges, and providing individualised support to help recruits overcome them.
The initial study was collaboration between Bangor University and the Institute of Naval Medicine, which investigated the reasons for wastage in Royal Marine recruits.

The research programme challenged and changed the behaviours of trainers, resulting in a significant reduction of up to 15% in training wastage. It also led to the formation of a new Army training establishment, and overall better mental health in military recruits. The Royal Marines adopted the Bangor coaching and leadership model and still use it to this day. This model is now used to train 1,250 Royal Marines recruits each year and has also informed training in the Canadian and United States Armed Services.

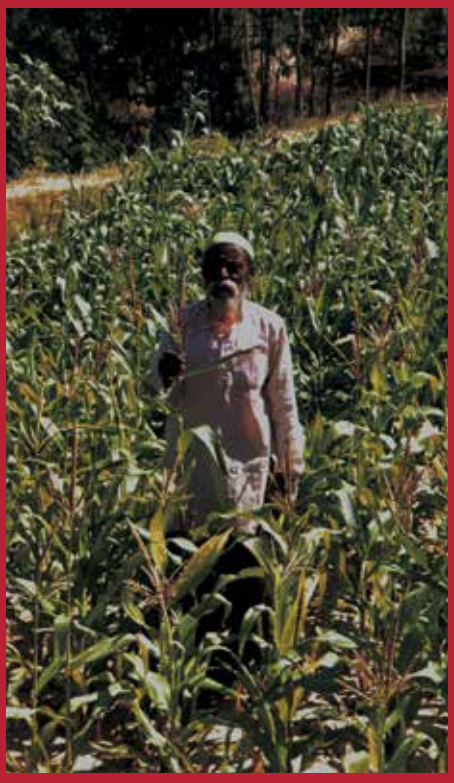
Understanding the linkages between Energy Efficiency and Global Food Production

Bangor University researchers explored the social and environmental impacts around where we source our fresh produce from. Looking at greenhouse gas emissions, energy efficiency and social impacts, the researchers used a carbon footprint model to study all components of the production chain. The research was funded by the Rural Economy and Land Use programme and has resulted in creating measures for food producers, suppliers and supermarkets to reduce their carbon footprint.

The research conclusions questioned the usefulness of buying home grown produce and carbon labelling in terms of societal and environmental impacts.

The results have also impacted on sustainability policy development by the World Bank, international NGOs, and Welsh Government, as well as sparking consumer awareness and debate on the environmental impact of food.

New Maize variety benefits more than 300,000 resource-poor farmers in India



Bangor University researchers developed a new variety of maize which was released in three states in western India. The new form of maize was found to have an earlier maturing rate, resulting in a better tolerance of major diseases and pests, as well as a higher yield when compared to conventional maize breeding.

Following its certification for use in the whole of the Gujarat agro-climatic zone by the Gujarat Seed Certification Agency, it has since become the most popular variety of maize, accounting for over 91% of the total recorded maize seed production in Gujarat State.

Since its release, maize cultivation has rapidly grown to a cumulative area exceeding 2 million hectares, and has also had major positive impacts on welfare and prosperity of at least 330,000 households per year.

TRANSFORMING ATTITUDES TOWARDS USE OF LANGUAGE

World-leading research around language policy, diversity and usage at Bangor University has provoked a transformation in national and international attitudes towards language in public and private discourse.

Since its completion, the study has had a significant impact on awareness of linguistic diversity and has even changed governmental policies and approaches to language.

This research was underpinned by exploring three interrelated areas:

- How we use language, the nature and development of the English language, and the dangers of prescriptivism within language
- The cultural value and significance of diversity in language and the negative impact of a language dying out
- Applying linguistics as a basis to improving an online search to create a 'sense engine'.

Four key sets of findings came from this research, one of them being how language is used in a public, communicative context. The impact of this can be seen in how UK governmental ministries have changed the way they use language in relation to the public.

This research and subsequent advice was heavily relied on in the creation of the report that followed: *Bad Language: The Use and Abuse of Official Language*. The impact of this report was felt UK-wide and changed linguistic and communications strategies throughout the civil service.

Another outcome from the study was heightened public awareness, appreciation and understanding of linguistic change and diversity.

VITAL PEATLAND RESOURCES

Conservation, restoration and improving drinking water quality

Bangor University carried out extensive research looking into how peatlands function as a major global carbon sink and regulator of climate and water quality. Over three years, discoveries made by Bangor University researchers led to the opening up of the entire field of peatland enzymology, revolutionising our understanding of the regulation of peatland carbon cycling.

The researchers also identified new ways to overcome the interferences in microbial activity that are responsible for the lack of degradation of organic matter in peat. They found that exports of dissolved organic carbon (DOC) from peatland have approximately doubled since 1998, and predicted these levels to increase further with global warming.

Bangor University's research has provided a scientific evidence base for land conservation managers, trusts and NGOs, often in close collaboration with water companies, for their decisions to focus resources and efforts towards peatland conservation and restoration.

The discovery of the enzymic 'latch' has had a major global impact, as the role of phenol oxidase inhibition for C sequestration in peat has helped conservation bodies to demonstrate the need for early restoration work, to bring peatland sites into the best possible condition. The importance of this research has been recognised by prestigious funding from the Royal Society and the Wolfson Foundation to establish a carbon capture laboratory.

Improving business skills among SMEs in a European Union convergence region

The North West Wales EU convergence region is dominated by SMEs operating in a rural setting with a distinctively bilingual (Welsh/English) flavour. Research at Bangor University aimed to advance the entrepreneurial and innovation skills of SMEs in the region to contribute to business growth, innovation and sustainability over the long-term.

The team developed a forecasting laboratory that complemented the research in areas relating to forecasting, foresight and strategic planning for regional and international companies, as well as various non-commercial users. They recognised the important socio-economic contribution that high-tech SMEs made to the NW Wales convergence area.

Empirical research focused on examining customer relationships that were developed by high-tech SMEs, with a particular focus on business-to-business, business-to-consumer, and inter-firm links.

This resulted in a number of benefits for SMEs including measurable growth in turnover, increased success rates in bidding and grant applications activities, improved customer management practices and enhanced knowledge transfer partnerships resulting in greater employment opportunities.

Advancing the regionalisation of Public Law

Research by Bangor University Law School has challenged the orthodox view that public law was the preserve of London by proving the equality of the Administrative Courts to the Royal Courts of Justice.

The research found that there was an evident lack of specialist legal providers in the regions and limited interaction between solicitors and the local bar. It recommended further training for local providers and more engagement with HM Courts and Tribunals Service. It also found that local barristers would be capable of handling many so-called case-level or street-level judicial review claims, despite local solicitors continuing to instruct London-based counsel.

The research has impacted upon the case for maintaining and expanding the regionalisation of public law, particularly when other local courts were being closed due to austerity measures. It has also contributed to the growing realisation of the need for those based in London to serve other nations and regions better and has reflected itself in a greater awareness of the need to travel outside London for the purpose of giving advice to court hearings.

The Law School's research has influenced the National Assembly for Wales in assessing the case for establishing a separate legal jurisdiction; led to the direction of more work to regional courts and more local solicitors instructing local counsel; informed national debate about the constitutional role of judicial review, and influenced the Administrative Court in developing training opportunities outside London.

ECONOMIC IMPACT FROM COLLABORATION

Local company secures a market leading position in Cytology stains

CellPath Ltd, a small family business focused on the production of laboratory supplies, sought assistance from Bangor University's Chemistry researchers to advise on developing processes for the manufacturing of high-quality stains, in particular for the Papanicolaou cervical cancer smear test.

Developed in the 1930s, the Papanicolaou cervical cancer smear test used a stain made up of four dyes to react with certain entities to detect any potential cancerous or pre-cancerous processes. In the late 1980s and early 1990s a series of misdiagnoses were made due to the design of the stain used for the test and were reported in the national press. Alongside this, there was also a worldwide shortage of one of the key ingredients in the stain.

This sparked CellPath's interest in exploring ways to manufacture more reliable stains. Bangor University researchers developed a new approach to compounds for the Papanicolaou test and other biomedical special stains. The new processes made the stains more effective, economical and readily available when compared with the existing formulas.

The company rapidly became the UK market leader in cytology stains, with over 50% of the domestic market, and exports to Finland, France, Italy, Japan, Norway and Sweden.

SOME FACTS ABOUT BANGOR UNIVERSITY

1. Research at Bangor has been highly rated in the 2014 Research Excellence Framework, which recognised over three-quarters of Bangor's research as either "world-leading" or "internationally excellent". Research income reached almost £20 million in 2014.

2. Following our strong performance in REF 2014, Bangor University's Quality Research (QR) funding allocation for 2015/2016 was increased by over 5.5% by HEFCW. This increase was achieved even though the overall QR funding for Welsh universities remained unchanged from 2014/15.

3. Research and teaching are closely inter-linked at Bangor University: almost all research academics teach, ensuring that our students benefit from the knowledge created by our research.

4. Bangor is rated 14th in the UK for student experience (*Times Higher Education* Student Experience Survey, 2015) and the best in the UK for its student clubs and societies according to the WhatUni awards.

5. Bangor University is ranked in the top 100 Universities in the world for its international outlook.

6. Bangor University is rated top in Wales for student satisfaction, and is in the top 10 of the UK's best non-specialist universities, the traditional institutions who offer a broad range of subjects (NSS 2014). Especially notable is that Bangor lies 3rd amongst these UK universities for satisfaction with academic support, scores well for students' ability to contact staff when they needed to (5th in UK), and for fairness of assessment arrangements and marking (7th).

7. Bangor University is among the top 10% of the world's greenest Universities (UI GreenMetric World University Ranking, 2014) and has recently achieved the internationally recognised ISO14001 Environmental Standard.

8. Bangor University climbed up 25 places in the 2016 Guardian University Guide league tables - the second highest climber in this year's rankings.

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