

UNIVERSITY OF PLYMOUTH



Over 150 years of excellence





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Welcome

It is my pleasure to introduce this publication, which captures a snapshot of the many exciting and internationally leading activities that contribute to the University of Plymouth’s continued success and international reputation. UK higher education is rightly held in high esteem globally and the University is proud to play its part in reinforcing this position. It is an academic community distinguished by high quality research and teaching, and the ambition and achievements of its staff and students. Our alumni (more than 100,000 graduates) are present in over 100 countries, contributing to economies and cultures through their chosen careers, while our research has truly global impact which influences policy, contributes to economic and cultural prosperity, and transforms lives. The University’s origins are rooted in the spirit of exploration and discovery, key values that remain strong drivers of our vision and ambition. I hope you will find the examples of our contributions as inspiring as I do.

Professor Judith Petts, CBE
Vice-Chancellor

Our heritage

Founded in 1862 as a School of Navigation, and among the highest-ranked modern higher education institutions in the world, the University of Plymouth has a proud heritage.

A twice winner of the Queen’s Anniversary Prize for Higher and Further Education, and with a world-class research pedigree and a reputation for innovation in its approach to teaching and learning, the University has consistently built upon its roots.

Degree courses in science and engineering were the first to be developed in the early 20th century, and the playwright George Bernard Shaw opened the first undergraduate hall of residence in 1929, funded in part by a £10,000 donation from Lord and Lady Astor. But it was not until the 1960s that the transformation of the academic community began – from part-time, vocational courses, to research-

informed degree programmes in science, technology and business, a process accelerated by the award of polytechnic status in 1970.

The diversification of its academic offer continued through the 1980s as the polytechnic joined forces with Exeter College of Art & Design, Exmouth’s Rolle College of Education and Seale-Hayne Agricultural College near Newton Abbot. In 1992, Plymouth secured university status, and rapid expansion followed, including the opening of the Robbins complex of lecture theatres, conference facilities and student accommodation in 1995 and the Sherwell Centre in 1997.

In 2000, the Peninsula Medical School, a partnership between the universities of Plymouth and Exeter and the NHS in Devon and Cornwall, was established, and there followed a new Dental School in 2007 – the

first such new school in the UK in 40 years. The now expanded Plymouth College of Medicine and Dentistry established itself as one of the leading medical schools in the country, with a distinctive and inclusive educational and research offer that sought to address the extreme health inequalities in the South West.

Building on its success, the decision was taken by the universities in 2012 to develop two distinct offers, and so the Plymouth University Peninsula Schools of Medicine and Dentistry were founded – with Plymouth becoming the first modern university in the country to boast its own medical school.

Recent years have seen the University’s reputation for excellence in teaching and research go from strength to strength. In 2005, it was awarded £18 million in government funding for four Centres for Excellence in Teaching &

Learning, the maximum awarded to any one university, and collaborated in a fifth. The University has also been awarded 20 National Teaching Fellows in little more than a decade, one of the highest numbers in the sector.

With the arts and education degrees moving to Plymouth, a multi-million pound campus investment programme was instigated, one which changed the skyline of the city, with striking new additions such as the Rolle Building and the award-winning Roland Levinsky Building. In 2012, the University opened the £19 million Marine Building, which houses some of the country’s most advanced wave tanks, and provides crucial testing facilities for the development of marine renewable energy technology. It was fitting that such a facility should be opened on the 150th anniversary of Dr Merrifield’s founding

of the School of Navigation, and coincided with the award of that second Queen’s Anniversary Prize in respect of the University’s marine and maritime work. New additions since then have included a £7 million performing arts centre; a stunning £5 million waterfront teaching, research and scientific diving station; new research laboratories at the Derriford campus; and investment in a new student health and wellbeing centre.

The research profile of the institution has soared, with acknowledged world-class expertise across areas including marine science, medicine, robotics, and psychology. In the 2008 UK Research Assessment Exercise, 80% of the research submitted was judged to be of international repute, with the majority of areas containing world-class examples – the highest rating possible. In the 2014 Research

Excellence Framework, the University improved its performance, with nearly two-thirds of the submission classed as world-leading or internationally excellent.

The University has a strong reputation for working with business and industry, and offers thousands of placements every year to its students. It has also earned a stellar reputation for sustainability, particularly for the way it has embedded it into the curriculum.

From several hundred students to the 21,000 enrolled today – with a further 17,000 studying for a University of Plymouth award at institutions in the UK and overseas – and with more than 100,000 alumni in more than 100 countries, Plymouth has become one of the largest and most influential universities in the UK, with research and teaching that positively impacts cultures and economies across the globe.




An aerial photograph of a vast, flat landscape, likely a coastal plain or a large body of water. The foreground shows a dark, textured surface, possibly a beach or a shallow reef flat. In the middle ground, there is a large, irregularly shaped body of water with a darker blue hue. The background features a range of low, rolling hills or mountains under a clear, light blue sky. The overall scene is serene and expansive.

Our research

MARINE SCIENCE

With arguably the broadest research portfolio of any university in Europe, Plymouth's expertise across the marine sciences is world-leading. Grounded in 150 years of marine and maritime heritage, and supported by cutting-edge facilities and equipment, the University is at the forefront of major research projects and consortia that have a direct impact upon policy and maritime governance.



The plastic problem

The marine environment – from the deep ocean to our coastal zones, and from the polar regions to the tropics – is an important barometer for the planet’s health. And the University of Plymouth has many eminent marine biologists and chemists researching in this field and documenting changes – both natural and anthropogenic.

Professor Richard Thompson is a world-leading authority on the issue of plastics in our seas, and in particular, the microscopic particles that are entering the food chain as a by-product of our consumer society. He has spent much of the past 20 years studying the causes and effects, and indeed it was his keystone report, published in *Science* in 2004, that first coined the term ‘microplastics’.

Examining the fossil record dating back to the 1950s, Professor Thompson discerned a

rapid rise in the amount of plastics found in marine organisms from the 1960s onwards. He now estimates that there are 54 trillion pieces of microplastic, and that number is only likely to rise as larger items degrade at sea.

One source of plastic pollution has been identified as originating in cosmetic products, in the form of polyethylene microbeads used as abrasive exfoliants. Measuring a quarter of a millimetre in width, tens of thousands of these beads are washed down the sink after every use, and can persist in the environment for decades.

When Professor Thompson and scientists in the International Marine Litter Research Unit at the University analysed six off-the-shelf products, they found that they contained up to three million microbeads.

His research is also uncovering the impact that microplastics are having upon marine life,

and widespread evidence that species – from the smallest marine worms to huge filter-feeding whales – located across the globe are ingesting plastic. In some cases, such as with mussels, which show evidence of retaining plastic contaminants for at least 50 days, this has serious implications for seafood.

It is little wonder, therefore, that Professor Thompson has been sought out by international governments and environmental organisations for his expertise, and he has provided evidence to the UN, the EU, the US Secretary of State, the National Oceanic and Atmospheric Administration, the OECD and the UK Government, among others. And it was oral and written evidence to the Environmental Audit Committee that was drawn upon directly in the government’s move to ban the use of microbeads in cosmetics.



Rising temperatures in the Mediterranean have contributed to the spread of the venomous lionfish



Professor Thompson coined the term ‘microplastics’ and was instrumental in the banning of microbeads

Ocean acidification and warming waters

As the climate of the planet changes, so the conditions of its marine environment are being altered, with our seas and oceans showing signs of increased acidity and elevated temperatures.

Professor Jason Hall-Spencer is among a number of world-renowned experts within the Marine Biology Environment Research Centre who are studying the way in which marine species have been forced to adapt to – and in some cases take advantage of – the changes around them. In particular, he has been one of the pioneers of using underwater volcanic areas high in CO₂ as natural analogues for future climate change.

Basing much of his fieldwork in the coastal waters surrounding the islands off Sicily, he has found evidence that acidic waters can weaken the skeletons of some species of algae, such as the mermaid’s wineglass, reducing marine biodiversity in the process. He has also

published papers on how fish reproduction is affected and about how molluscs respond and adapt to these conditions, lowering metabolic rates and sacrificing shell growth as a trade-off for surviving in areas low in competing species.

The issue of invasive species is another area of concern for Professor Hall-Spencer, with the revelation that some are taking advantage of reduced biodiversity due to ocean acidification, or expanding their territories as water temperatures rise. Some types of algae, jellyfish, crabs and shellfish benefit, including nuisance species such as Japanese kelp, the slipper limpet, and the stinging jellyfish *Pelagia noctiluca*. And rising temperatures in the Mediterranean, coupled with the widening and deepening of the Suez Canal, have contributed to the spread of venomous lionfish. In the space of just one year, they have colonised Cyprus, and they may be at the vanguard of more to

come – which could have major implications for commercial fishing and aquaculture.

Professor Hall-Spencer has taken up a Visiting Professorship at the University of Tsukuba to lead research expeditions in 2017–19 so that Japanese and UK scientists can work closely on the marine biological effects of rising CO₂ levels. The discovery of volcanic seeps in kelp forest settings will be of widespread relevance to those living in regions with colder coastal water masses, such as the west coast of the US, the UK, South Africa and Japan. Because volcanic CO₂ seeps are visually striking, they provide a valuable communication tool with which to inform the public and scientific communities about what ocean acidification has in store. The project will show the effects of ocean acidification on the ecosystem in Asia and raise awareness about the consequences of unabated CO₂ emissions.



Researchers are using plankton indicators to provide information on the state of marine life

Managing the marine environment

Marine ecosystems extend across geopolitical boundaries, so it therefore stands to reason that efforts to sustain and support a healthy environment require cross-border collaboration. In Europe, the Marine Strategy Framework Directive (MSFD) does just that, binding member states to implement an ecosystem approach to managing European seas.

Dr Abigail McQuatters-Gollop, a lecturer in marine conservation and NERC-funded research fellow in the Marine Institute, plays a significant role in the delivery of the MSFD, as the lead scientist for pelagic habitats for both the UK and the North Atlantic through OSPAR.

The pelagic zone encompasses life in the water column, with a particular emphasis on plankton. As the base of the food web, the

environmental status of plankton is intrinsically linked to the health of the species that depend directly and indirectly upon it.

Dr McQuatters-Gollop works with counterparts in countries including France, Spain, Sweden, Germany and the Netherlands, as well as UK agencies such as SAHFOS, PML, CEFAS, SAMS and the Environment Agency, to determine whether pelagic habitats are in good environment status. They do this by using plankton indicators to provide information on the state of marine biodiversity, invasive species, food webs and seafloor integrity.

These indicators are tested using long-term time-series data held by research institutes across Europe. This helps to establish whether observed changes are climate-induced or

anthropogenic (and therefore needing political intervention to reduce the corresponding man-made pressures). Those anthropogenic changes could manifest in a number of ways – from the destruction of coral habitats through trawling, to harmful plankton blooms caused by increased agricultural nutrients running off the land.

Dr McQuatters-Gollop, who is invited by countries around the world to talk about the importance of establishing close relationships between scientists and policy-makers, is in the process of delivering her OSPAR and UK assessments on the environmental status of pelagic habitats. These will then pass through a period of consultation on their way to the European Commission by 2018.

Coastal intelligence

The winter storms of 2013–14 had a seismic impact upon the UK coastline, causing significant damage and disruption to infrastructure. Having established that they were the most energetic to hit Western Europe since 1948, a specialist University research team is heading up a new project to look at some ongoing reverberations of that extreme weather upon our coastal environments.

The Coastal Processes Research Group is coordinating one of the work streams of the multi-million pound BLUE-coast project, focusing upon the question of why, after several summers of calm wave conditions, the sand swept away by the storms has not returned.

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Funded by the Natural Environment Research Council, it will specifically address the importance of ‘sediment budgets’, and their role in coastal recovery. The first two years of the project will see Professor Gerd Masselink and his team conduct extensive field measurements at two key sites: the sandy beach and dune system of Perranporth on the north coast of Cornwall, and the gravel beaches of Start Bay on the south coast of Devon.

The following two years will then focus on improving existing, and developing new, computer models of coastal change, which can be used to investigate the impact of different climate change scenarios and address issues of

coastal vulnerability.

One of the key outputs will be putting together the total sediment budget of the beaches, which includes measuring sand dunes and the sand below the water-line up to a depth of 20 metres, involving surveys on foot, by boat and from the air. Using instruments deployed on the seabed and a weather station in the dunes, the team will also take a range of in-situ measurements, from waves and tidal currents to wind speeds and sediment transport through the air, in a variety of calm and energetic conditions.

It promises to provide an unparalleled understanding of the dynamic forces at work in our coastal environments.

“Research tends to focus on the more exciting aspects of coastal change, such as erosion. But recovery from erosion is equally important”
PROFESSOR GERD MASSELINK



A specialist team is investigating the reverberations of extreme weather upon our coastal environments

EARTH SCIENCE & ENVIRONMENT

Good planets are hard to find, so understanding the way Planet Earth works is of paramount importance. At Plymouth, academics go one step beyond, conducting extensive research into mankind's impact and dependency upon the surrounding environment, both natural and built.





Researchers from Plymouth unlock scientific data from sea ice in the Antarctic

Pioneering techniques in polar ice analysis

The polar regions are a litmus test for underlying changes to the planet’s marine climate, and there is a wealth of scientific data locked deep within the crystalline structures of the ice. Thanks to a pioneering new technique developed by environmental chemists at the University, those secrets are being thawed out for both the Antarctic and the Arctic.

Building on methods developed over the past decade in relation to sea ice in the Arctic, Professor Simon Belt and colleagues are working to demonstrate past alterations to sea ice, glaciers and ice shelves caused by climatic changes in the Antarctic.

The previous technique is based on the presence of IP25 (ice proxy with 25 carbon

atoms), a lipid chemical made solely by microalgae that live in the bottom of Arctic sea ice. When the ice melts, the algae and its lipids fall into the sediments which can be recovered, dated and analysed. IP25 does not exist in the Antarctic, but Professor Belt, working with colleagues from Hanyang University, the Korea Polar Research Institute, the British Antarctic Survey and Isoprime Limited, has discovered a related chemical in the Southern Ocean.

Analysis of surface sediments covering different regions of Antarctica – including the Weddell Sea, the Antarctic Peninsula, the Bellingshausen Sea and the Ross Sea – showed the presence of IPSO25 (ice proxy for the Southern Ocean with 25 carbon atoms) in nearly

all cases. Its source, *Berkeleya adeliensis*, is a widespread and commonly occurring constituent of microalgae inhabiting Antarctic sea ice, which explains why IPSO25 is so common in the sediments.

Research published by Professor Belt has already revealed when Arctic sea ice expanded to its current extent, while other international scientists have used the Plymouth method to identify periods when the Arctic was previously ice-free during summers. This new discovery will enable scientists at the University to analyse Antarctica to the same degree and look at past changes to glaciers, ice shelves and sea ice, with all of the implications that these have for understanding modern climate change.

Digging deep into the structure of graphite and soil

Porous substances, both natural and artificial, fulfil vitally important functions in life. From the properties of the paper used in printing to the rocky structures above and below the ground, the porosity of our environment is of fundamental interest to a huge range of industries and sectors.

The Environmental and Fluid Modelling Group (EFMG) at the University has, for more than 20 years, been working to understand the complexities and connections that lie below the surface of porous substances. And, thanks to its PoreXpert® software, developed over that time, it does so to a remarkably microscopic degree.

For example, the EFMG is working with EDF Energy to analyse the rate at which the cores of the UK’s nuclear reactors, which generate nearly one-fifth of its electricity, are oxidising and ageing. By studying tiny samples of the graphite under electron microscopes and using other specially developed apparatus, the team, led by Professor Peter Matthews, can use PoreXpert® to model and measure mass loss and thereby establish for how long it is safe to run the reactors beyond their original lifespan.

Professor Matthews is also preparing to deliver the findings of a major research project, funded by the Natural Environment Research Council, which is investigating why natural soils become water repellent after periods of dryness and drought.

Working with colleagues in Swansea, the Met Office and Rothamsted Research, the team has studied soil samples from grassland sites in Wales and England. Testing at the micro- and nano-scale, PoreXpert® has built complex three-dimensional models of the soil structure, and revealed how microbes within the pores of



“Porous materials are vital to improving and sustaining our standard of living. It is of great importance to know how fluids behave and move within them”

PROFESSOR PETER MATTHEWS

the soil produce proteins with the capacity to stem the flow of water – effectively turning it hydrophobic. For the first time, the University’s research will reveal that an increase in protein production of just 0.5% can cause a 60% increase in its hydrophobic properties.

The results will be integrated into the Met Office’s JULES (Joint UK Land Environment Simulator) simulation software, and could have profound implications for land management and the prevention of floods and erosion, especially in areas experiencing significant climate change.

X-ray vision locating toxins in the environment

The world around us is a complex compound of elements and man-made materials, and we often take for granted the inherent safety of our interactions with the natural and the built environment.

It is in this field that the work of one University scientist has reverberated around the globe, following his discovery of potentially toxic levels of lead in the paint used in children’s playgrounds.

Dr Andrew Turner, of the School of Geography, Earth and Environmental Sciences, uses adapted X-ray technology to analyse surfaces for their chemical constituents. With his equipment, he is able to obtain

near instantaneous breakdowns of painted structures, as well as plastics and electronic waste, including discarded fridges, computers and phones.

In the course of his initial groundbreaking piece of research, he analysed 50 playgrounds across the south of the country, including some less than a decade old, and recorded lead content up to 40 times greater than recommended concentrations. In some cases he also found higher than expected levels of chromium, antimony, mercury and cadmium.

The discovery resulted in the removal of some playground equipment, and councils calling from around the country asking him to

test new areas and to make recommendations. As a result, Dr Turner is helping to set up a new consultancy that can react to such calls while he continues to pursue research angles.

And his work is diversifying and deepening following the discovery that the analysis works with natural substances as well, including leaves, soil, sediment and even seaweed. Dr Turner found lead on beaches in the form of microplastics – including degraded shotgun cartridges, fishing gear and polyurethane foam.

With some states in America banning the sale of old toys in shops, the presence of potentially toxic materials at our fingertips is a tangible issue requiring further research.

Travelling smart

From analysing the impact of rising sea levels on the arterial train line between London and the South West, to understanding the needs of older people living in rural areas, the University’s Centre for Sustainable Transport has developed an outstanding reputation for its research into key travel issues facing societies around the world. Thanks to its work on smartcard ticketing technology – judged to be ‘world-leading’ in the latest Research Excellence Framework – it’s now actively changing the way that people travel.

In a ‘transport first’ for Europe or the UK, the project, led by the School of Geography, Earth and Environmental Sciences’ Dr Andrew Seedhouse, has created an innovative not-for-profit company called South West Smart

Applications Ltd (SWSAL). Operating since 2010, SWSAL initially supported the delivery of smartcard ticket machines and back-office software for all registered local buses in the South West. But having been successful in being awarded £4.87 million in grant funding, and generating a further £7 million in commercial matched funding, SWSAL has grown to become the UK’s largest smart ticketing managed service provider, with more than 81 operators’ platforms, covering 17 local authorities in England.

SWSAL delivers more than nine million smart transactions each month for 1.2 million customers, with a value of more than £112 million per year. And this has had significant environmental benefits, with an

estimated saving of £35 million, thanks to factors such as travellers opting to travel by bus rather than by car, and reduced waiting times at bus stops leading to smoother, faster journeys.

With both Transport Scotland and the Welsh Government recently becoming SWSAL members, the operation is set to grow across British borders – and the company will itself be relaunched on a national platform. Little wonder, therefore, that it has won – and been a finalist in – key national and international awards including the Transport Ticketing Global Awards in 2016.

SWSAL has delivered five core research outputs since 2015 and is delivering a £2.2 million national research programme on scholars ticketing for government.



ARTS, HUMANITIES & EDUCATION

Arts research at Plymouth crosses disciplinary boundaries and draws inspiration from a wide range of fields in tackling themes such as marine cultures, transdisciplinary creative practices, and memory and memorialisation. With practitioners across Art and Design; Music, Drama, Dance and Performing Arts; English Language and Literature; History; and Architecture, Built Environment and Planning, it is a research culture as multifaceted as it is creative.



The Computer Music Research team seeks to help people with locked-in syndrome



Making music with the mind

Can music be a tool to unlock the most devastating of neurological conditions? Could you build a Brain–Computer Music Interface (BCMI) for a person with locked-in syndrome?

These are some of the questions that Professor Eduardo Reck Miranda, of the Interdisciplinary Centre for Computer Music Research, has sought to answer over the last decade, in particular since he started working with music therapy patients at the Royal Hospital for Neurodisability, London, in 2014.

Using the BCMI equipment that he’s developed, Professor Miranda is able to read the electrical signals produced by the visual cortex of the brain via electrodes in a skullcap. It measures steady-state visually evoked potentials: the natural response to visual stimulation at specific frequencies. When the retina is excited by a visual stimulus ranging from 3.5 Hz to 75 Hz, the brain generates

electrical activity at the same (or multiples of the) frequency of the visual stimulus.

With his background in composition, Professor Miranda has developed musical algorithms that are triggered by the eye focusing on an image. In tests, patients are shown four images flashing at different frequencies, and by looking at one, they ‘play’ an associated melody. The system is even able to read the intensity of a stare, and in turn change the dynamic output of the melody.

Patients with locked-in syndrome and other debilitating neurological conditions have successfully trialled the system. In one groundbreaking experiment, four people with varying levels of musical ability, including a former violinist with the Welsh National Opera Orchestra, were paired with a member of a string quartet, whose role was to interpret the signals from the BCMI. Named the Paramusical Ensemble, the ‘Activating

Memory’ performance generated international media coverage and further potential outputs for research. Discussions are under way to explore its commercial potential.

Until recently, developments in electronic technologies have seldom addressed the wellbeing of people with special needs within health and education. But this research is opening up fascinating possibilities for people with physical disability, supporting music-based activity for palliative care within occupational and music therapy.

“Our work is giving people an opportunity to communicate in ways not normally possible”
PROFESSOR EDUARDO MIRANDA

The energy-saving game: insert coin to continue

How do you help a homeowner visualise the issue of energy use – and misuse – in a modern house? It’s a challenge that has perplexed the energy sector for many years, but one that is being investigated by a European research project using gaming technology as a driver for change.

EnerGAware is a €2 million Horizon 2020 project, being led by building performance analysis experts from the University, working alongside leading housing provider DCH, EDF Energy and partners across Europe.

Dr Alba Fuertes, Dr Rory Jones and Professor Pieter de Wilde, from the School of Art, Design and Architecture, and Dr Sabine Pahl from the School of Psychology, are coordinating the University’s research and have been engaging

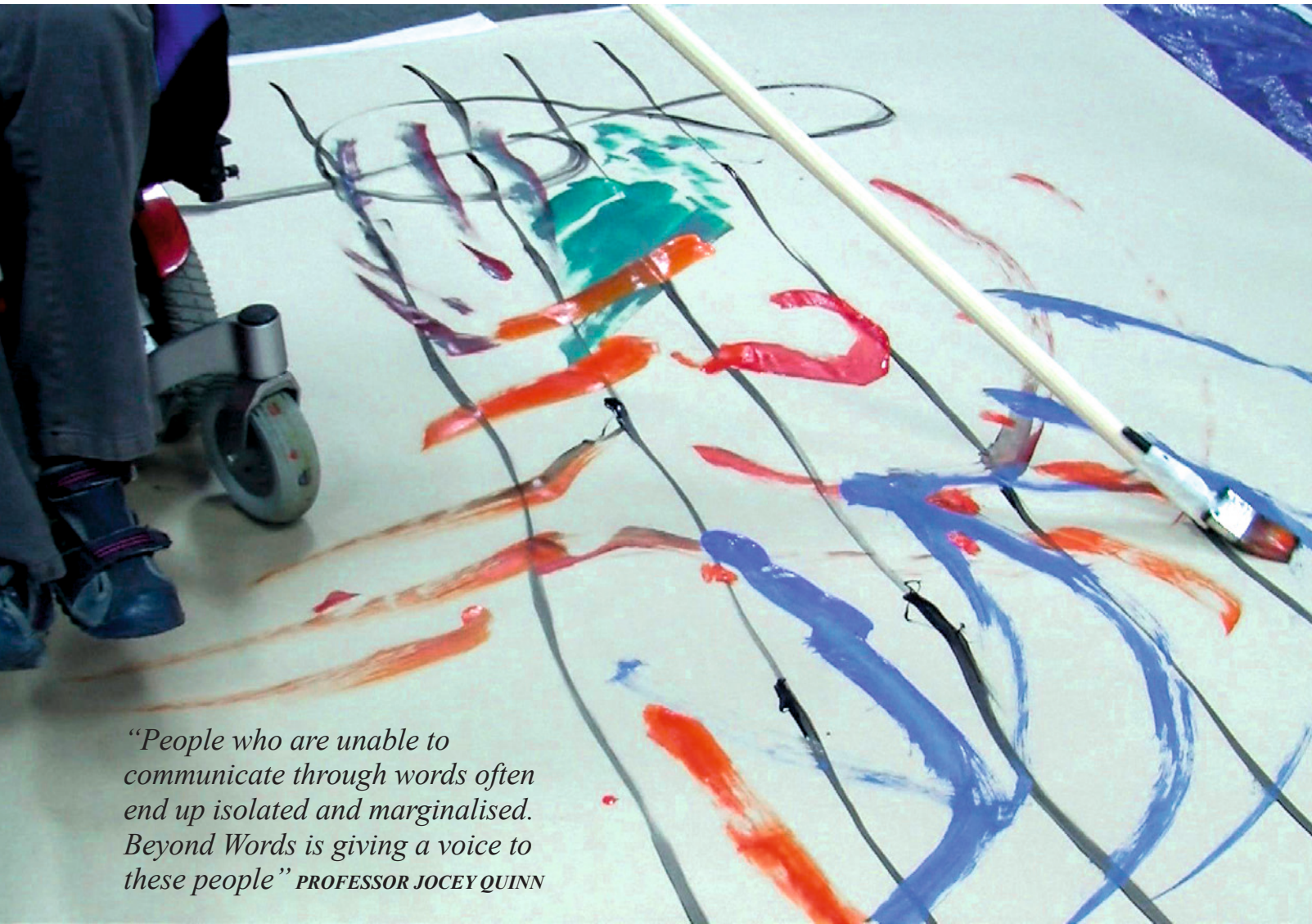
with residents in affordable housing to help shape the design and content of the game. One hundred households have also chosen to have smart energy meters fitted in their homes.

The meters are able to communicate with the game, sending live energy data to the virtual home, which players can interact with using a smartphone or tablet. They can role-play new energy-saving behaviours and see the impact they have upon energy use, and they will be able to compete with other participants and share achievements through social media.

In this way, the project not only improves awareness of energy efficiency behaviours – players will be able to translate the virtual into the real in their own homes – but also addresses issues of digital literacy and social inclusion.

The game is currently being piloted in 100 homes in the UK, but will soon be launched as a free-to-download application for smartphones and tablets for households to use worldwide. The EnerGAware game will be able to link with the energy data that will become available from the roll-out of smart meters, to be completed by 2020.

The University is recognised nationally as a pioneer of environmental building and design education and research. Indeed, EnerGAware builds on the EPSRC (Engineering and Physical Sciences Research Council)-funded project eViz (Energy Visualisation for Carbon Reduction), which is showing people where energy is being lost in the home and how different behaviours impact upon energy usage.



Beyond Words

How do you give a voice to those who cannot speak? How can you create new modes of expression for an audience constrained by neurological or physical disability? These are questions that a flagship Arts Council England research project is seeking to address through the medium of music.

Beyond Words is being led by Professor Jocey Quinn, of the University’s Institute of Education, working with Plymouth Music Zone (PMZ), a charity that uses music to reach out to vulnerable members of society.

One of just eight national projects to receive

Arts Council England funding in the 2015 round, Beyond Words builds on work done by Professor Quinn and PMZ, collaborating with older people and their families in a domestic abuse refuge. The focus is on whether music can help people with dementia, autism or severe learning difficulties, or who have suffered a stroke, be more included in the community.

Research assistant Claudia Blandon observes the sessions delivered by PMZ, and participants are also encouraged to express their feelings about music through art. In addition to this, Professor Quinn is interviewing families and

carers to find out how these initiatives help their lives too. What is already apparent is just how creative such individuals are and how important it is to them to be able to express themselves through music, when words are out of reach.

The research will be delivered at an international conference in 2017, but will also take the form of academic papers, policy briefings for ministers, and reports for practitioners. It could also lead to further grant applications to extend the work across other artistic disciplines, including theatre, dance and video, as well as across international borders.

Historical perspectives

In recent years, scholars from a range of disciplines have sought to understand the politics and society of 16th-, 17th- and 18th-century Europe and America, from a variety of perspectives. At Plymouth, two major international studies are now under way that promise new insight into these hugely significant historical periods.

Professor James Daybell, Director of the Arts Institute, is leading the Arts and Humanities Research Council-funded ‘Gender, Power and Materiality in Early Modern Europe 1500–

1800’. This international and transdisciplinary network brings together academics from the UK, Sweden, the Netherlands and Australia, in association with museums and archives, including the Victoria & Albert Museum, and the National Archive in Stockholm.

The project has three themes, which will be the focus of conferences and publications throughout the course of the project: ‘Methodologies and meanings of gender, power and materiality’, considers objects as ‘social agents’ and looks at how gender positions were enforced or made unstable by materiality; ‘Gender and the politics of early modern archives and spaces’, will look in detail at the history of archives and explain the absence or marginalisation of women’s records; and ‘The politics of gift-exchange and early modern emotions’ will research a range of secular and religious spaces, such as courts, libraries, galleries and colleges, where material objects were located.

One of the goals of the network is to recover a wide range of physical objects across Europe, such as jewels, clothing, books, paintings and needlework.

Professor Daniel Maudlin, meanwhile, has a highly prestigious three-year Leverhulme Trust Major Research Fellowship: ‘Different Places, Same Spaces: The Inn and the Traveller in the Atlantic World’.

From Canada to the Caribbean, the British Atlantic world was seen and experienced by travellers through its inns, which were built at ports and along key routes by independent innkeepers, breweries or landowners. Outside of major urban centres, they operated as meeting-houses, magistrates’ courts and trading rooms, becoming projections of British or British-American cultural identity.

It’s the first time that such a transnational route-based study of British Atlantic architecture has been undertaken, and Professor Maudlin has identified 12 key routes encompassing great roads and coach roads, turnpikes and ports, linking shipping routes to land travel. He is also accessing regional and local archives, to assess to what extent inns maintained a consistent British Atlantic architectural experience for travellers as the surrounding landscape and climate changed – and to do so before modern trends cause them to disappear.





Preserving a photographer’s archive

What happens to the archive of a photographer at the end of their life? How do we preserve the photographic legacies of our most influential artists – those whose work often charts important contemporary cultural and social developments of our times, while also contributing to the development of the medium itself? How can we ensure that such archives are safely housed and cared for within our national collections?

These are some of the questions reflected upon by Professor Jem Southam, one of the country’s leading photographers, renowned for his colour landscape photographs, in particular the observation of changes to selected sites over periods of many years. It was the death of his contemporary, James Ravilious, which prompted him to consider how to safeguard the legacy of his generation of photographic artists.

Professor Southam, an active researcher in the recent development of the medium and the manner in which photographs can contribute

to our cultural and social understanding of the world, soon realised that there is currently no form of national strategy or repository to hold such photographic work. Furthermore, there is no national policy or framework which can assess work as ‘significant’, and therefore worthy of preservation.

So Professor Southam, drawing together contacts at institutions such as the V&A, Tate, the National Media Museum in Bradford and Birmingham Library, together with others working across the medium – including curators, collectors, artists and academics – has begun to question and challenge the situation. This has included looking at the potential role of universities, with consideration to those in the United States who frequently hold many such archives.

He has also used funding by the Arts Council and the University of Plymouth to develop a new website – the Photographers’ Archives & Legacy Project (photolegacyproject.co.uk)

– which aims to assist photographers with the many issues they might confront when considering their own archives. Working with a research colleague, Professor Southam is conducting in-depth interviews with renowned photographers to create case-studies for the website. These deal with a range of questions, from the very practical to the more esoteric, aiming to help individuals negotiate the complexities of their own situation.

With national and international interest being expressed, the project has also recently helped preserve a study made in 1971 of a traveller community in East Sussex, taken by a student colleague of Professor Southam who died suddenly over the summer.

This has reinforced his desire to ensure that such issues are built into university curriculums, for while there are no clear answers, ensuring the questions remain in sharp focus is clearly in everyone’s interest, including those at the start of their careers.

Transforming data into art

The traditional gallery is defined by the concept of ‘look but don’t touch’: the exhibit in its final form being gazed upon, passively or otherwise, by the beholder. But what if you could explode that model and engage the audience in the very act of creation, a dynamic and interactive artistic process?

That is the focus of the internationally acclaimed i-DAT collective, whose underpinning research revolves around transforming the ‘data’ generated by human, ecological, economic and societal activity into forms of artistic expression with a cultural and social impact.

Founded in 1998, i-DAT specialises in designing, constructing and exhibiting immersive media environments and interactive networked artefacts that make data tangible, playable and readily available as a material, to generate new meaning and inform participation, audience engagement and innovation in the arts.

Led by Professor Mike Phillips, the team has developed an open infrastructure that enables them to harvest and visualise data. Called ‘Quorum’ it is a strategic research initiative that builds on i-DAT’s research strengths in cultural computation, ludic data and playful experimentation with creative technology. Quorum creates engaging synergies between audience behaviours, interactive media environments (Fulldome and VR), physical objects (Internet of Things) and modern computational techniques.

i-DAT has been a key player in a range of interdisciplinary collaborations with organisations including UNESCO Biosphere, World Heritage Sites and Arts Council England. Most recently Quorum provided the platform for a commission from Tate Modern, with the support of Arts Council England, to create a new installation for the launch of the new Tate Modern Switch House.

Called, ‘This Is Where We Are’ (TIWWA), the interactive sculpture was driven by complex algorithms that interpreted movement and touch, social media interactions, and environmental changes, such as temperature, energy consumption and even CO₂ levels within its proximity. Manifest through dynamic visualisations on its interactive surfaces and a

complex 3D sound system, the 5 x 3.5 metre structure and wandering robotic fragments create a playable crowd-sourced, but very intimate, data-driven experience.

Quorum also underpins i-DAT’s work in VR and Fulldome immersive environments. i-DAT’s research, generating interactive visualisations and simulations from Big (and little) Data, is rooted in the University’s Immersive Vision Theatre (IVT). As a founding partner of the international Fulldome Biennial,


Fulldome UK (fulldome.org.uk) held at the National Space Centre, and supported by research funds, such as the EU Culture-funded (£400,000) collaboration of European and Canadian cultural organisations (E/M/D/L – emdl.eu), i-DAT fosters an international and transdisciplinary community of researchers, media artists and scientists dedicated to exploring bleeding-edge experimentation with creative technologies.



“TIWWA is without doubt one of our most ambitious and technically challenging projects to date, at the international forefront of algorithmic and data-driven art”
PROFESSOR MIKE PHILLIPS

HEALTH, MEDICINE & DENTISTRY

The first modern university to launch its own medical and dental school, and home to a multidisciplinary research community across the wider allied health professions, Plymouth has pioneered the 'bench to bedside' approach. Whether working directly with patients, or empowering them to manage their health and wellbeing, the University's researchers are driven by their desire to improve the human condition.



A new generation of antibiotic

In recent years, the World Health Organization and Chief Medical Officer have identified antibiotic resistance as one of the biggest threats to global human health. Health services across the world are struggling to contain some bacterial infections, as the antibiotic arsenal available to them dwindles in effectiveness and bacteria evolve resistance to the last-line therapies.

The O'Neill Review on Antimicrobial Resistance estimates that, by 2050, the global cost of antibiotic resistance will rise to \$100 trillion and account for an additional 10 million deaths per year, with infectious diseases killing more people than cancer. It is

against this backdrop that biomedical scientists at the University are developing a new class of antibiotic to help fight bacteria such as MRSA.

Epidermicin was discovered in 2008 by Dr Mathew Upton and his team, while he was at the University of Manchester. Now, Dr Upton, Associate Professor in Medical Microbiology within Plymouth's School of Biomedical and Healthcare Sciences, is leading the project to realise its potential and bring it to market, where it will take the form of a nasal spray administered to patients prior to surgery.

He and his team have been in collaboration with world-leading industrial biotechnology and

synthetic biology business Ingenza, to develop an efficient, scalable microbial production system for epidermicin.

In infection model trials, a single dose has proven to be as effective as six doses of the current standard clinical therapy, and the next phase is to test it with human volunteers. If successful, it is likely that the drug will move to licensing after 2018.

The team is also researching alternative uses for the drug, such as investigating whether in ointment form it is effective against superficial skin infections, alongside developing a range of related antibiotics with broad spectrum activity.

“No new classes of antibiotics have been discovered for 30 years, and there is a critical need for new antibiotics to treat infections caused by resistant bacteria” DR MATHEW UPTON



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Self-disseminating vaccines

The unpreparedness of health services for the 2014 Ebola outbreak in West Africa revealed the vulnerability of our global community to emerging infectious diseases (EIDs). Ebola, HIV, avian influenza, Hendra, Nipah and SARS are all EIDs that originated from animals, and were completely unknown until they had already entered and started to spread within the human population.

Dr Michael Jarvis, a molecular virologist in Plymouth's Peninsula Schools of Medicine and Dentistry, works on a new kind of vaccine called a 'self-disseminating vaccine' as one potential way to prevent future outbreaks of these deadly diseases.

Dr Jarvis's recent expert review, the first to be published on the subject, identified the challenge facing biomedical science – namely the need to develop vaccines for these diseases and find new ways in which to deliver them to often remote and dispersed target animal populations. Self-disseminating vaccines offer the potential to reach far beyond standard inoculation programmes because they use virus-based vectors that can spread within individual members of a species with little or no significant impact on that species' health. The vectors in effect become 'carriers' for the vaccine, spreading immunity against an EID throughout the targeted animal population.

Working with collaborators at the National Institute of Health and the University of California, among others, Dr Jarvis's team has shown the ability of a vaccine vector – based on a common benign herpesvirus called cytomegalovirus (CMV) expressing Ebola virus glycoprotein (GP) – to provide protection against Ebola virus in the experimental rhesus macaque, non-human primate (NHP) model. Among a number of further areas of interest, and particularly relevant to the southwest of England, Dr Jarvis has started to develop this and other vaccination strategies towards resolving the bovine TB problem in both cattle and badgers here in the UK (thejarvislab.com).



Clean air research

Chronic lung disease is the third leading cause of death globally and presents a huge problem in developing countries where issues such as ageing populations, biomass smoke and excessive tobacco may be present. Tragically, although it is preventable and treatable, at present little is being done to either halt its progress or alleviate the symptoms for those affected.

But researchers from the University's Peninsula Schools of Medicine and Dentistry are part of an international consortium that has secured funding of almost €3 million from the EU Horizon 2020 programme, to investigate novel ways to prevent, diagnose and treat it in

low- and middle-income countries. The three-year programme of study, called FRESH AIR, is a continuation of projects carried out by the University team, led by Dr Rupert Jones, in Uganda, and will operate in Uganda, Vietnam, the Kyrgyz Republic and Greece. They draw upon the experience gained from establishing pulmonary rehabilitation clinics and lung health education programmes, which use innovative means to achieve awareness and success, such as involving local midwives.

Dr Jones and his team are training healthcare workers in spirometry (breathing tests) and testing new smartphone spirometry. They will also adapt 'very brief advice' smoking cessation

training and provide training for healthcare workers in pulmonary rehabilitation.

In Uganda, almost one in five adults has chronic pulmonary obstructive disorder, smoking is on the increase – up to 60% of young men smoke in some areas – and women are affected by biomass smoke (from cooking fires). In Vietnam 56% of adult males smoke, and Greece has the highest rate of tobacco use in the EU at 38% of the population, at a cost of more than 10% of its national hospital budget. It is against that backdrop that the team has applied for further major funding from the Medical Research Council for new research on rehabilitation.

Turning the tide on brain tumours

Every year, around 16,000 people are diagnosed with a brain tumour in the UK. Of those sufferers, a shocking 58% die within a year of diagnosis, compared with just 6% for prostate cancer and 4% for breast cancer. Brain tumours kill twice as many women as cervical cancer and more men under the age of 45 than any other cancer.

And yet, brain tumour research receives just 1% of national spending on cancer research, and nationwide there is a critical lack of researchers

investigating the condition. So the work being conducted by researchers at Plymouth, in association with the charity Brain Tumour Research, is part of a nationwide drive to tackle the issue. Indeed, it has selected Plymouth as one of four UK centres of excellence.

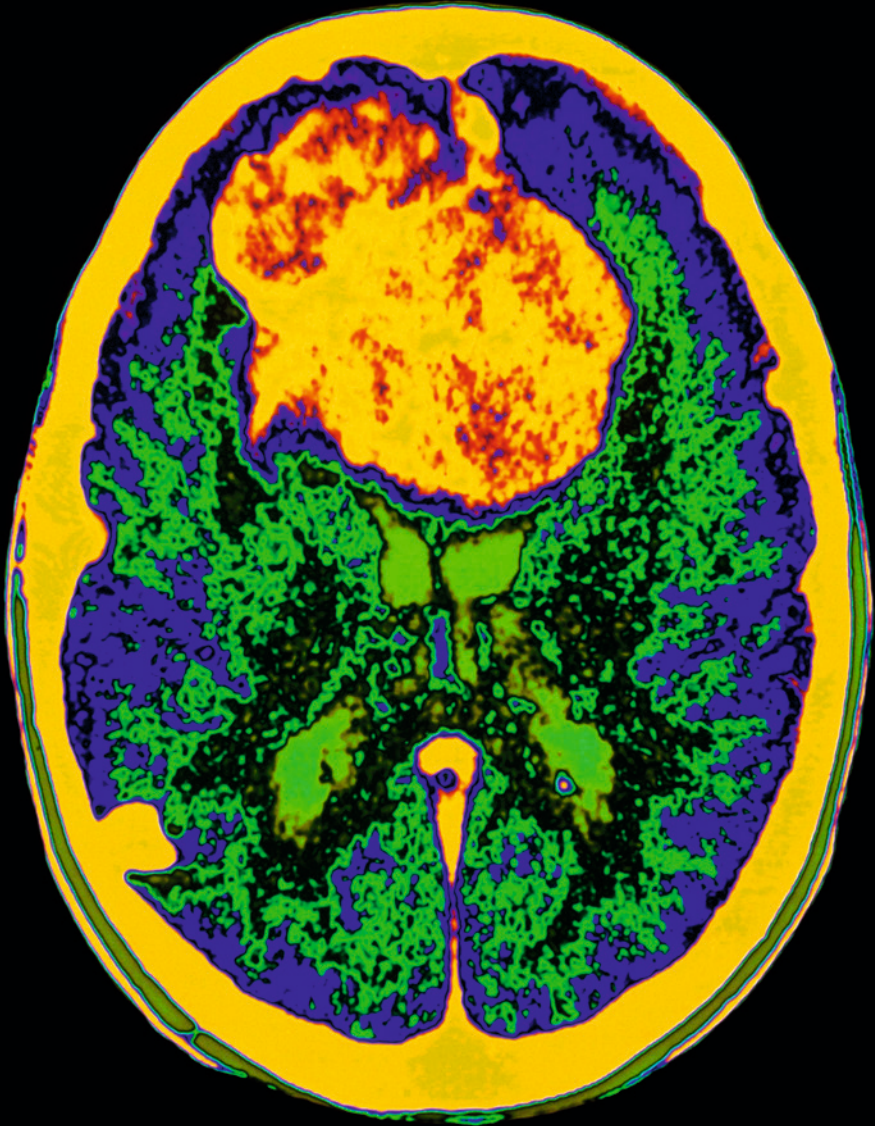
The team, led by Professor Oliver Hanemann, Director of the Institute of Translational and Stratified Medicine, focuses on low-grade brain tumours. They are working to identify and

understand the mechanism that makes a cell become cancerous, and are trying to stratify brain tumours into specific subtypes to allow a personalised treatment approach. Professor Hanemann and colleagues are exploring ways in which to find biomarkers and ways to halt or reverse cells from becoming cancerous.

The work the team is undertaking is at the translational end and aims to result in patient benefit as quickly as possible.

"It has taken an enormous amount of persistence to get the underfunding of research into brain tumours discussed by our politicians. It will take yet more commitment to drive the momentum forward"

**PROFESSOR OLIVER
HANEMANN**



Stem cell growth and oral cancer

Stem cells are vital building blocks for the body, able to divide and self-renew indefinitely, to repair and regenerate organs and tissues when disease or injury occurs. And they are one of the key lines of research for a team in the Peninsula Dental School, who are studying them in relation to cancer.

Using teeth, skin and saliva glands as models, researchers led by Dr Bing Hu, Associate Professor in Oral and Dental Health Research, are performing sophisticated research on cellular and molecular events. These include cells orientating in a specific direction, gene code change and protein-to-protein binding, all potentially impacting upon the regulation of stem cell self-

renewal and proliferation. And if the research can lead to a better understanding of the basic mechanism, then it can be translated and applied to treating human diseases and enhancing tissue regeneration.

As part of the work, Dr Hu, working with researchers from China and Switzerland, conducted a first-ever study on the potential impact of local anaesthetic on tooth cell growth and the development of children’s teeth. Using pig teeth and human young permanent tooth pulp cells, the research identified that local anaesthetics commonly used in clinics can affect the proliferation of tooth cells.

Recognition of the impact and potential of Dr

Hu’s work has recently come from his homeland of China, whose government bestowed upon him one of their highest academic accolades, Distinguished Expert of Beijing City. The title means that Dr Hu is recognised by them as a ‘high talent’ and therefore eligible to apply for major grant awards and investments from the country.

Dr Hu has also established collaborations with more than 20 international institutes, including the Max Planck Institute, University of Cambridge and University of California in San Francisco, and has been instrumental in Plymouth signing four Memoranda of Understanding with schools and hospitals in China.



“Through our research we expect to improve clinical guidelines to minimise the dosage of local anaesthetic drugs”

DR BING HU



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Food as a Lifestyle Motivator

Empowering marginalised communities has long been a challenge in the UK and worldwide – made even harder in recent years with cuts impacting on social and welfare provision. As a leading voice in the emerging area of public health dietetics, Dr Clare Pettinger is using creative approaches to tap into the problem: exploring how food activities can provide meaningful occupation, encourage reflective thinking, and give a voice to the people who might not otherwise have a seat at the table.

Dr Pettinger’s research methods differ from those traditionally used in health and medicine, encompassing a broader ecological perspective and producing human narrative insights into current wellbeing challenges faced by disadvantaged communities. Her project, Food as a Lifestyle Motivator (FLM), uses participatory action research, including photo elicitation methods, to gain insight into how food affects the lives of people with multiple and complex needs.

Phase one involved service users being asked to take photos of their individual food interactions over a 10-day period, followed by discussions about them. Pictorial results illustrated that all

participants told a subtly different story, as images varied from cows in a field to growing vegetables, with accompanying sentiments ranging from childhood memories to frustration and social isolation.

The engagement illustrated that food holds meaning and marks identity for these individuals, providing insights into the diverse mindset of a population group commonly considered ‘hard to reach’. Phase two is under way, involving work to gain participants’ views on the role of food and how it can be used more effectively within care pathways as a catalyst for lifestyle change.

The success of the first phase saw Dr Pettinger invited to present to an audience of public health and third sector partners in London, with a view to considering how it might expand and develop into a national multi-centre collaboration.

Dr Pettinger has also presented at the Critical Dietetics conference in Granada, Spain, which has developed links with public health experts in Australia and Canada and unlocked the potential to explore similar FLM projects on the other side of the globe.

Getting FIT through psychology

Obesity is one of the most pressing and potentially costly issues facing the country’s health service today. Statistics from the Health Survey for England show that, for 2014, 61.7% of adults were overweight or obese, and the trend is rising among young people especially.

Psychologists at the University have been researching issues around cravings and addictions for a number of years, most notably cravings for food that make it hard to eat healthily. And recently, they have been developing a new intervention to strengthen desires for goals such as losing weight or quitting an addiction, effectively creating cravings for healthy activities.

Professor Jackie Andrade and Professor Jon May, of the School of Psychology, have previously shown that cravings take up mental space. As we only have so much of this ‘mindspace’, a simple task like playing the videogame *Tetris* for just a couple of minutes can significantly reduce the desire for food, drugs and cigarettes. Building on that work, Professors Andrade and May have partnered with Professor David Kavanagh, of Queensland University of Technology, to develop a new intervention called Functional Imagery Training (FIT). It works by getting people to focus on the positive, short-term benefits of changing their behaviour. Using imagery rather than dialogue, it might encourage someone to picture a post-exercise shower, or imagine the feeling of pleasurable tiredness, rather than the effort required in the gym beforehand. These images strengthen the desire to engage in the activity and block the negative cravings that might get in the way.

The team is coordinating trials to compare how FIT works with patients against the current ‘gold standard’, and is overseeing the training of healthcare professionals in this new form of intervention, putting the tools directly into people’s hands with the development of web-based resources and a smartphone app, and testing whether talking to a robot can replace face-to-face consultation to massively increase access to motivational support.

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ENGINEERING & TECHNOLOGY

*Inventing, testing, modelling, improving;
there is a culture of creation at the
University that sees its engineers and
computer experts breaking new ground in a
variety of fields. Whether it is complex fluid
dynamics and marine renewable energy
research, or advancing artificial
intelligence in robots and establishing
ethical boundaries for human interaction,
Plymouth is in the heart of the machine.*

A team from Plymouth
engineered the hand-
powered cycle that broke
the land speed record
in Nevada, USA



Smarter energy; cleaner future

Extracting energy from the sun and reducing the amount of electricity wasted by domestic appliances are two different issues facing societies striving to be cleaner and greener. Now, thanks to landmark research by a Plymouth expert in digital signal processing, new technology is reaching the market that could revolutionise both fields.

Dr Mohammed Zaki Ahmed, Associate Professor of Information Technology, has for a number of years worked with complex numerical methods and algorithms applicable to electrical systems and power electronics. The author of more than 86 peer-reviewed publications, Dr Ahmed has amassed industrial experience in safety systems and reliability modelling, and it is his innovative research in the field of electrical power conversion systems

that has created the new ‘PulsiV’ technology.

PulsiV has two main applications. The first focuses on increasing the amount of energy harvested from solar panels using a pulsed-energy extraction technique. Taking the form of a micro-inverter, the device relies on a combination of sophisticated circuitry and algorithms, and has been demonstrated to increase the power output of solar panels by up to 30% – significantly in advance of the best existing technology.

But PulsiV – in the form of the rectifier – also tackles the issue of power consumption and wastage. The issue is that when an electrical device is plugged in, it has to expend a significant amount of energy, converting the power from source into usable high voltage electricity, and significant wastage occurs

during the process. With the PulsiV rectifier attached, the conversion process is radically improved, reducing the amount of power lost, and essentially upgrading the performance of the electrical appliance.

The research is regarded as so groundbreaking that the University has launched a new business, with Dr Ahmed at the helm, based at the Plymouth Science Park. Working with intellectual property partners Frontier IP Group PLC, PulsiV has secured industry funding for further research, and to create a demonstrator to showcase to industry. With a number of companies expressing significant interest, and the award of Best Scientific Paper at the third IEEE Transportation Electrification Conference held in Busan, South Korea, the profile of PulsiV is going global.



“Imagine a world where we can get more energy from our household devices, without making any changes to the power source”

DR MOHAMMED ZAKI AHMED

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New methods are being developed to measure and model the ways in which lighthouses vibrate and shake in storms

STORMLAMP lights the way

The seas around the UK are home to many rock-mounted lighthouses, iconic structures that for all of their historic symbolism still play a vital role in helping vessels to navigate safely around perilous reefs. Assailed by the elements from all angles, they stand as testament to engineering ingenuity.

But if they are to continue to provide a valuable physical visual aid to vessels, how is it possible to assess their structural health and longevity?

Thanks to civil engineers at Plymouth, a new project is under way to develop methods of measuring and modelling the different ways in which lighthouses vibrate and shake in storm conditions.

STORMLAMP – STructural behaviour Of Rock Mounted Lighthouses At the Mercy of imPulsive waves – is being funded by a £1 million grant from the Engineering and Physical Sciences Research Council and will extend to the end of 2019.

Working with collaborators at UCL and Exeter, the team is using a variety of field and laboratory tests, with computer modelling, to evaluate the impacts upon six of the most exposed rock-based lighthouses in England, Scotland and Ireland.

The findings will be used to inform the comprehensive structural health monitoring of other lighthouses, both in the British Isles and further afield, through the International Association of Lighthouse Authorities.

“Robots, with their cross-cultural attraction and fascination, might be just what is needed to provide one-to-one language teaching to children”

PROFESSOR TONY BELPAEME

Young people with medical conditions are more inclined to perform related tasks if prompted by a friendly interactive robot

Learning from robots; learning with robots

Humans are fascinated by robots, and that is especially true of children, who engage on a deep and instinctive level with artificial life forms.

The University’s Centre for Robotics and Neural Systems has for a number of years been at the vanguard of pioneering research into this area, and especially the use of robots in social situations. Indeed, the five-year ALIZ-E project, which placed robots in hospitals to communicate with young patients such as those with diabetes, confronted the very ethics of such interaction for the first time.

Now, under the auspices of Professor Tony Belpaeme, the centre is leading a new multi-million Euro collaboration, this time exploring the effectiveness of robots as language teachers

for young people. L2TOR involves academics and companies from across Europe, and aims to design a child-friendly tutor robot that can be used to support pre-school and primary school children learning a second language.

The three-year Horizon 2020 initiative is focusing on teaching English to native speakers of Dutch, German and Turkish, but also teaching Dutch and German to children whose first language is Turkish.

Even in its infancy, L2TOR has revealed that the most cutting-edge speech recognition software cannot cope with the grammatical idiosyncrasies of children aged 4–6. And the initial phases of the project have also revealed a number of new avenues for enquiry, including

the use of ‘deep learning’ to help the artificial intelligence overcome its inability to read emotion in faces.

Professor Belpaeme and his team are now establishing a technological setup that will act as the model for the partners across Europe to follow. It will see their Nao robots sitting alongside the children as they take part in a language game that involves learning numbers, spatial language, and basic vocabulary through storytelling. It is already generating huge interest in both the educational and robotics sectors, and entertainment giant Disney has even invited one of L2TOR’s academics to work with its technologists in a bid to improve the experience of its theme parks.

Home help from AI

The University’s ‘Robot Home’ enables researchers to study the interaction between AI and people in an experimental domestic setting. And the new campus-located facility is at the heart of a three-year Horizon 2020-funded project focused on supporting independent living through robotic companions.

The project ‘MoveCare: Multiple-actors Virtual Empathic Caregiver for the Elder’ is being coordinated in Milan, with Plymouth leading a €440,000 strand on social interaction. Led by Professor Angelo Cangelosi, with support from Professor Ray Jones as co-investigator, this interdisciplinary project will see participants from a residential home interact with ‘Pepper’, a one-metre robot. With partners including the University of Oxford, sector specialists Korian and social services in Spain, MoveCare builds on work done in Pisa – with Plymouth among the lead contributors – that considered the use of robots as home help, able to carry out simple requests.

Professor Cangelosi is also working with the US Air Force on the issue of trust and robots, and studying the importance of eye contact and perceptual interest in establishing a rapport.

Safeguarding schools



Experts within the School of Computing, Electronics and Mathematics have created a new device that provides round-the-clock monitoring against internet child abuse for primary and secondary schools.

ICALert plugs straight into a school’s network, checks all web traffic, and immediately generates an alert if there is any attempted access of illegal material. It is being offered to schools through a collaboration with South West Grid for Learning (SWGfL) and the Internet Watch Foundation (IWF).

The technology has been developed by Paul Dowland, Associate Professor of Information Systems Security, and Bogdan Ghita, Associate Professor of Computer Networks. Once plugged in, ICAlert receives periodic updates that include the latest list of banned web content links, as published by the IWF, in an encrypted format. It is against this list that it compares internet traffic at the school.

The device provides an alternative solution to ‘filtering’, where access to banned sites is simply denied and the attempt to perpetrate an offence goes unnoticed. SWGfL has seconded specialist police officers with extensive experience at handling child pornography offences to manage any alerts.

Wave-powered research

The University’s COAST Laboratory offers some of the most technologically advanced facilities in the fields of marine renewable energy testing, fluid dynamics and coastal modelling. And it is to be at the heart of a new Horizon 2020 project that will see researchers from across Europe travelling to Plymouth to work with the team based there.

The €10 million trans-national access MARINET2 project has 40 partners, and seeks to ensure the continued integration and enhancement of all leading European research infrastructure and facilities specialising in research, development and testing of offshore renewable energy systems. It recognises a need for accelerated development and deployment of reliable, efficient offshore renewable energy technologies, which in turn,

require dedicated testing facilities.

MARINET2 will bring researchers and developers from Europe to Plymouth and provide access to 100 days of testing in the COAST Lab’s 35-metre-long ocean basin.

At the same time, Professor Deborah Greaves, Director of the COAST Lab, is leading an EPSRC-funded collaborative computational project on wave structure interaction that will look to build a national numerical wave tank.

Bringing together computational scientists, and computational fluid dynamics specialists and experimentalists, the virtual facility will be fully complementary to existing and future UK experimental laboratory facilities, such as the COAST Lab.

The central code will be professionally engineered and maintainable, tested and validated against measurement data provided by Plymouth and the partners, and will be made available to members of the wave structure interaction research community. In so doing, it will support those institutions and organisations looking to work in marine renewables, but which do not have the physical facilities to do so.

The COAST engineering research group is also contributing to the 12-partner H2020 WETFEET project, which investigates technological breakthroughs in wave energy.

The Plymouth team is focusing on the array breakthrough via sharing of mooring and electrical connections between near-wave energy devices.

BUSINESS & SOCIAL POLICY

Across the business and public services sectors, you will find researchers from the University of Plymouth leading programmes of work that support, guide and even challenge policy and the process of creating legislation. Their expertise, whether in financial services, human relations, tourism, marketing, funding and philanthropy, law or international relations, is helping organisations and authorities – both national and local – to make better decisions and implement bold new approaches.



The ‘postcode lottery’ of public sector funding

Public sector funding is a perennial issue for the UK government – but the models used by departments to guide their spending decisions are often opaque as far as the general public is concerned. Now, two renowned social scientists are helping to make this complex issue rather more transparent through the publication of their book, which brings together nearly two decades of standard-setting research.

Professor Sheena Asthana and Dr Alex Gibson, from the University’s School of Law, Criminology and Government, will release *The Postcode Lottery in English Public Services: The Role of Formula Funding in 2017*, highlighting the complex formulae at work in areas such as health, education, local government services and policing. And sitting alongside the book will be an online comparator that will enable members of the public to compare and contrast the funding for their residential area with others around the country

across a range of services.

Professor Asthana and Dr Gibson’s involvement with funding models dates back to the late 1990s, when they completed a landmark study of estimates of coronary heart disease in English Primary Care Trusts (PCTs) and compared the figures to actual rates of intervention. Their findings revealed that, against expectations, urban deprived areas had higher procedure rates relative to need. Subsequent research suggested that differential access to healthcare reflected differential access to funding. This is associated with a huge gap in spending per head for critical healthcare. For example, cancer expenditure per cancer patient ranges from £15,000 in some parts of London to just £4,000 in Dorset.

A recently completed study on proposed changes to the way policing is funded revealed a number of similar themes. The proposal to use the number of thefts (rather than the rate)

recorded in an area as the principal basis for allocating money skewed the weighting in favour of larger (typically urban) police forces and failed to reflect the diverse challenges and roles played by police in rural areas.

Now, with the forthcoming publication of *The Postcode Lottery in English Public Services*, Professor Asthana and Dr Gibson will bring the issue of how we balance competing priorities in different communities firmly into the public domain for debate and discussion.

“When people are given access to very different levels of service, it is only right that we question the rationale and the reasons why that occurs”

PROFESSOR SHEENA ASTHANA

Poverty alleviation and women refugees in the Middle East

With civil war and terrorism causing displacement of people around the world, the issue of refugees and their growth in numbers is an increasingly pressing topic for governments. And while some find new homes and citizenship in adopted countries, many refugees remain in limbo and poverty, denied access to employment opportunities around them.

The extent to which entrepreneurship is a catalyst for empowerment and poverty alleviation among women refugees in Arab countries is a new area of study being led by Dr Haya Al-Dajani, Associate Professor (Reader) in Entrepreneurship at the University’s Futures Entrepreneurship Centre.

Working with collaborators at the University of Nottingham, and researchers in Jordan, Lebanon and Turkey, Dr Al-Dajani is analysing

entrepreneurship as a sustainable means of poverty alleviation.

Many women refugees engage in ‘informal’ micro-entrepreneurship, sometimes producing traditional crafts as a means of heritage preservation and expression of social identity, as this is all they have left of their homeland. As such, the outcomes here are not limited to economic gains, but rather, provide opportunities for social engagement and political expression which may contribute to the ongoing processes of empowerment and entrepreneurship.

The three-year study, which began in July 2016, is funded by the UK’s Economic and Social Research Council (ESRC) with the Department for International Development (DfID), and assesses the impact of institutional

support from governmental and other aid agencies on refugee communities, to develop recommendations that enhance the effectiveness of aid programmes across the Middle East region.

Dr Al-Dajani is working with several distinct refugee communities residing in Jordan, Lebanon and Turkey: Palestinians who fled their homeland following the Six-Day War of 1967; Iraqis who either fled during the first Gulf War in 1990 or in 2003 following the fall of Saddam Hussein; and Syrians displaced by the ongoing war in their nation.

The ultimate aim of the project is to develop guidance and policies that will be shared with governments and agencies in the Middle East, as well as with other nations which host significant refugee populations.



Online behaviour and mental wellbeing

The emotional wellbeing and mental health of children and young people is a growing concern to policy-makers in the UK. And it is the subject of a major Lottery-funded project set to run for the next five years, with a national expert on online behaviour heading up the underpinning research in the South West.

Andy Phippen, Professor of Social Responsibility in IT, is one of the country’s leading authorities on young people and digital behaviours, particularly the rise of practices such as ‘sexting’ and online abuse. And while much work has already been done to examine the impacts of such behaviours, Professor

Phippen, through the £8.9 million project in Cornwall, HeadStart Kernow, will be leading the first major study into their motivations for doing so in the first place and the impact of technology upon wellbeing.

Working with schools across the county, Professor Phippen is focusing upon 10- to 15-year-olds and how their relationship with technology changes over time. Using platforms such as Instagram, Snapchat and online gaming, the research considers issues such as the ‘currency of popularity’ and the legitimisation and normalisation of exploitative and

coercive behaviours.

Cornwall is in many respects the perfect location for the research: prevalent issues around deprivation, isolation and rural communities all contribute to children relying upon the internet as their portal to the world – along with its pitfalls.

Professor Phippen’s work, which is also looking at the model for intervention, will highlight the dearth of support available to those who are not deemed sufficiently unwell for state intervention and contribute to the development of new resources to enable the children’s workforce to help in this area.

Conflict in the workplace

Employment tribunals are often the arena where grievances between organisations and their employees are played out, in many cases at great cost to careers, brand values and business performance. So when, during the 1990s and 2000s, there was a notable increase in the volume of cases making their way to tribunal, the UK government made it a priority to understand the challenges facing organisations in handling individual employment disputes.

Professor Richard Saundry, of the Plymouth Graduate School of Management, is one of the foremost experts in this field, and has worked for the last five years with the Advisory, Conciliation and Arbitration Service (Acas) to explore ways in which conflict in the workplace can be managed more effectively.

Through the course of half-a-dozen major studies, Professor Saundry has led interviews with more than 170 human resources professionals, line managers and trade union

representatives. He has also coordinated 26 focus groups, the findings of which helped to shape a new report, entitled ‘Managing individual conflict in the contemporary British workplace’.

That report has helped to shape public policy, advice and guidance relating to dispute resolution. It revealed a wide range of potential causes for increasing conflict in both the private and public sector, including pressures on funding leading to increased tensions; a lack of competency among managers and an over-reliance on ‘procedure’; a greater employee awareness of their employment rights; and disciplinary issues caused by misuse of social media.

In a foreword to a new book based on this programme of research, *Reframing Resolution: Innovation and Change in the Management of Workplace Conflict*, Sir Brendan Barber, Chair of Acas, said that the work led by Professor

Saundry would “assist Acas to reflect on the structural, policy and practical influences that have shaped the way conflict is handled in the modern workplace; and will provide a vital resource as we look to the future and to developing conflict management strategies that fit with organisations and reflect the changing world of work”.

Professor Saundry is currently working on the development of new models for conflict management, and is also looking in greater detail at the ways in which trends in human resource management are impacting on the management of conflict within organisations. One of the themes that is already emerging is that changes to HR models are hampering efforts to deal with grievances, especially where the HR team is geographically remote. This leads to a disconnection that makes it more difficult to resolve disputes at an early and informal stage.



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“A bank can be well-managed, and have all of the right processes in place, but that will count for little if there’s a rotten risk culture at its core” DR SIMON ASHBY

Risk in the banking sector

In the years since the global banking crisis plunged economies around the world into recession, a great deal of research has been conducted into the structures and systems that precipitated – and failed to prevent – the disaster.

A financial services expert at Plymouth has pioneered a different approach, digging down into the very fabric of the banks and building societies to locate the architects themselves, the people who created the culture of risk that led to the establishment of LIBOR and its ilk.

Dr Simon Ashby, Associate Professor of Financial Services at the Plymouth Business School, has been able to use his experience as a

former financial regulator to gain almost unique access to the people who observed the crisis in the making.

Funded by the ESRC, and industry partners including the Chartered Institute of Management Accountants, Dr Ashby has worked with the London School of Economics over an 18-month period to gather accounts from 17 financial organisations.

The research is designed to support both policy-making and industry practice, and Dr Ashby is delivering seminars and training to improve understanding of risk culture and the factors that can affect its assessment and management. These have included significant

organisations, including the Institute of Risk Management, the international Risk Minds conference, and the UK Financial Conduct Authority.

Dr Ashby’s research has already supported international regulatory policy development, and is continuing to yield new avenues of enquiry, such as a study on leadership qualities, and another on the element of hubris and leadership. He is also leading another high-profile project with the University of Nottingham, on how the reporting of operational risks and losses impacts upon the reputation and brand of financial services organisations.



“Shipping is heavily regulated for its safe and secured operations and for cleaner seas. As tens of thousands of ships are governed by the legal regimes, it is crucial to ensure they are sound and effective”

PROFESSOR JINGJING XU

Law, regulation and management in shipping

According to the International Maritime Organization (IMO), 90% of global trade is carried by sea, with more than eight billion tonnes of goods loaded aboard more than 100,000 cargo vessels every year. If shipping is “truly the lynchpin of the global economy”, as described by the IMO, then the legal, managerial and environmental workings of the industry are fundamental to not just its health, but the wellbeing of economies and societies around the world.

It is a topic of enquiry that Professor Jingjing Xu, Associate Dean (Research) in the Faculty of Business, and Director of the Institute for Social, Policy and Enterprise Research, has been working in for a number of years. She has been conducting research across a broad range of law, policy and management topics in the maritime domain, and in particular,

topical issues in the areas of maritime safety and security, and marine pollution control.

One of the areas Professor Xu is passionate about and has explored in depth is the law and policy governing ship-source pollution. She has published numerous studies and her work has informed the curricula for some of the world’s leading maritime universities.

In one of her recent studies she examined the use of liquefied natural gas (LNG) as a marine fuel, as part of an EU project focused on green shipping. LNG produces virtually no sulphur dioxide emissions, and when compared with conventional marine bunker fuels, has the potential to reduce carbon dioxide emissions by 10%, nitrogen oxide emissions by up to 90%, and particulate matter emission by up to 100%. But while the number of ships able to utilise it is increasing, the international legal framework

governing the use of LNG as a marine fuel needs further development.

Published in the journal *Ocean Development and International Law*, Professor Xu first looked at the regulatory law aspect relating to the use of LNG, then identified the gaps in the legal regimes and made recommendations as to how it could be best addressed. She then looked at the private law aspect in a study that will be published in the *Journal of Environmental Law* in 2017. Within the report, she has looked at the lack of a legal framework governing its use and how this has created uncertainty around the issue of liability for damage and potential compensation. The research goes on to consider next steps, with the potential to develop an international legal regime or amend one of the existing conventions governing noxious substances.

Sustainability in ports

The long-term survival of many of Britain’s small and medium-sized ports has been increasingly called into question in recent years in the face of stiff competition and the challenges of complying with necessarily strict legislative requirements. The gateway to international markets and the provider of high-quality jobs, such ports are key to the health of British maritime communities, but potentially fragile to the winds of change.

Professor John Dinwoodie, an expert in maritime logistics, is an innovative researcher in this field, and working with colleagues in the Plymouth Graduate School of Management, in collaboration with smaller ports in the UK, has evolved a port sustainability management

system (PSMS) and some best practice guidelines designed to support sustainability and improve resilience.

The work was initially funded by a NERC and ESRC-supported Knowledge Transfer Partnership, which brought the University together with Falmouth Harbour Commissioners (FHC) in Cornwall. Over the course of the KTP, the research team with Dr Sarah Tuck as principal investigator, studied environmental issues such as tidal data, anchorage points, and ship bunkering practices. They also worked with FHC on stakeholder management, improving links with, among others, schools and environmental interest groups, and encouraging them to be more

proactive in communication and staging events.

The impact upon FHC was transformational, with jobs created and safeguarded, costs reduced, and community relationships improved. The KTP won national awards, and its outcomes were written up and disseminated to an international audience.

Professor Dinwoodie, working on a European Social Fund Combined Universities of Cornwall project with former PhD student Dr Andrei Kuznetsov, now of Southampton Solent University, and Professor Gibbs of Hull University, then developed an 11-point sustainability checklist for smaller ports in Cornwall and Devon. The project identified areas such as asset management and maintenance, safety management, environmental knowledge and awareness, and stakeholder engagement. Under each ‘pillar’, there are five statements through which harbour masters can rank their current performance and earmark areas where they can improve their practices.

The system has already been successfully trialled, with adopters reporting a more proactive stance towards sustainability and the safeguarding of local communities, improved understanding, and more effective discourse with stakeholders. Professor Dinwoodie and colleagues have been disseminating these findings, as well as the transformative history of his research area, through a number of avenues, including prestigious national reports for the Association of Business Schools, and the ESRC. He also has overseen a joint workshop on sustainable port management, which brought together the Chartered Institute of Logistics and Transport (CILT) Ports, Maritime and Inland Waterways Forum, and other port professionals to consider how academic research can bring new insights to their operations.

Current research by doctoral student Ridvan Karacay is investigating how the PSMS can be extended to ports beyond Devon and Cornwall, and the extent to which the system can enhance sustainability management in specialist sectors such as container ports. Dr Lynne Butel is advising on how critical issues such as organisational strategy can be linked with port governance systems to incorporate sustainability management. As new findings emerge, further dissemination to practitioners is planned in 2017 and beyond.



International footprint

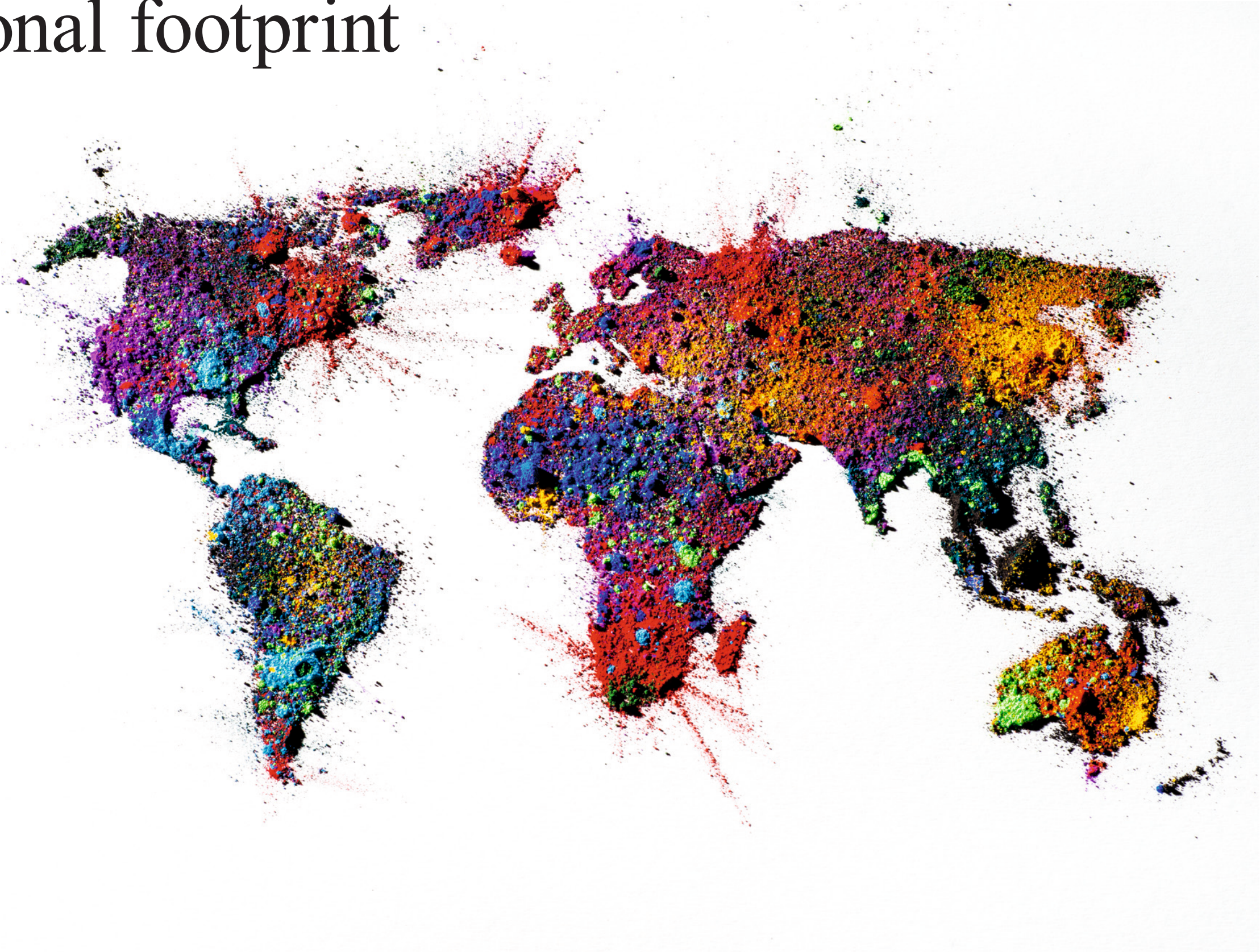
The University of Plymouth’s influence is felt much farther afield than its own shores, reflecting both the heritage of a city that has launched so many great seafarers – Sir Francis Drake, Captain Robert Falcon Scott, Sir Francis Chichester – and its own ambitions for the institution and its students.

The University prides itself on its ability to bring learning to life through a range of innovative experiences, and is committed to offering all of its students a myriad of global opportunities.

Thousands of students around the world have had the benefit of its teaching expertise, receiving their University of Plymouth degrees at graduation ceremonies in London, China, Singapore and Sri Lanka. One such event was the first graduation ceremony at the National School of Business Management, in Sri Lanka. This marked the culmination of more than three years of hard work, not just from the 100 graduates, but from Plymouth’s academic staff who regularly flew the 5,500 miles to deliver teaching at the School, based in Colombo. During the first three years, student numbers rose to 1,500, and students from both institutions benefit from international study opportunities.

The University enjoys strong connections with China, and each year around 50 of its students spend four weeks studying at Shanghai Maritime University, one of its partner institutions. The programme is based around language learning, cultural exchange and broadening understanding of societal and economic issues. The University has also partnered with the University of Hong Kong’s School of Professional and Continuing Education (HKU SPACE) since 2009, enabling students to take Plymouth degrees at one of a dozen learning centres or online.

A collaboration with America’s world-renowned Carnegie Mellon University (CMU) has resulted in a unique programme that enables students to receive two master’s degrees in robotics technology. The aim is to immerse students in crucial themes such as sustainability and technology to prepare them for the global workplace when they graduate. The programme involves students studying for a full year at each institution, supplemented by video-conferencing and visits from academics.



The University’s expertise in marine and maritime teaching and research, and its partnership with the Britannia Royal Naval College, has resulted in a number of international partnerships. With the experience of delivering degrees to aspiring officer cadets in Dartmouth since 2008, the University now provides education to the Kuwaiti Coastguard, accredits training programmes in Saudi Arabia, and works with the Higher Colleges of Technology in the UAE.

And through its commercial arm, University of Plymouth Enterprise Limited, the University has also embarked on its largest-ever contract research project with the UAE. UAEOcean is a £4 million collaboration with the United Arab Emirates to create an ocean forecasting centre to help its people make strategic decisions around the marine and maritime environment.

The University is building a stand-alone oceanographic centre in Abu Dhabi, providing the technology and training required over the ongoing five-and-a-half year project. Software tools developed in Plymouth will be used to interpret a wide range of global and local oceanographic data. The project is being delivered from the Plymouth Ocean Forecasting Centre based on campus, and includes sub-contract partners such as the Met Office and the National Oceanographic Centre.

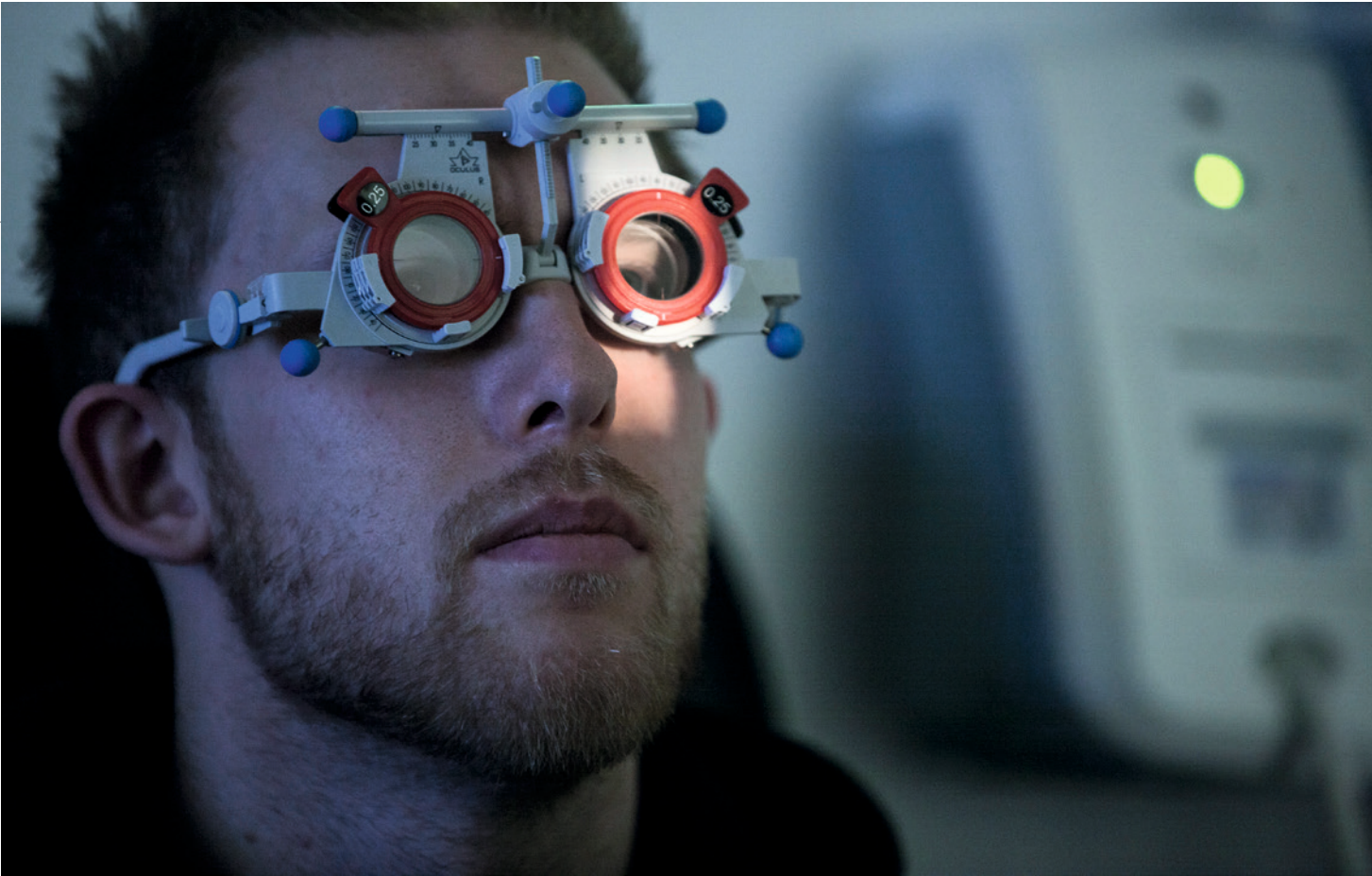
We are one of just ten UK universities that belong to the International Student Exchange Program (ISEP). This allows students to apply for a year of study in one of more than 300 colleges and universities in 50 countries, from Virginia Tech to Tokyo University. The host university provides an orientation programme, and welcomes the exchange student into the routine of academic life. Through ISEP, we have welcomed hundreds of international students and given them a taste of the unique atmosphere of the South West.

And as a member of the Santander Universities network, Plymouth has new links to institutions across the globe. Each year, students and staff can apply for a share of £50,000 of scholarships and awards for a study trip that will enrich their learning or career development. Opportunities include volunteering, learning a language or conducting research.

The University now has 80 partnerships in 30 countries, which speaks volumes not just for its global footprint, but for its commitment to extending the boundaries of the University and its students – geographically, culturally and collaboratively.

Student success

Plymouth students have a proud reputation for not only being highly successful individuals, but also well-rounded global citizens, as seen through their many activities, including those supported by a nationally award-winning students' union (UPSU). Here are just some examples of the ways they make valued contributions to society.



Addressing healthcare inequalities through curriculum innovation

Experiential learning is a defining characteristic of many areas of the Plymouth curriculum, and in subjects such as medicine and dentistry, nursing and optometry, and law and business, students are making significant contributions to society and communities, while at the same time developing valuable life and employability skills.

For example, undergraduates studying for a career in dental health (as dentists, nurses, hygienists and therapists) treat patients under supervision at one of four specialist facilities in

Devon and Cornwall. In 2015, 267 students delivered 88,210 clinical procedures across 20,182 appointments. Students also undertake Inter Professional Engagement (IPE) projects as an integral feature of the curriculum, working with community groups to raise awareness of oral health.

Teams of nine students work with local schools, elderly groups such as Age UK, the Salvation Army, and charities such as The Big Issue that are dealing with vulnerable members of society, such as the homeless and people with

drug problems.

In optometry, students help to run the Centre for Eyecare Excellence, a drop-in facility for the public that provides access to a broad range of eye-related services, while their counterparts in medicine help to treat more than 1,000 NHS patients registered at the Cumberland Surgery.

And in nursing, a UK-first 'patients as partners' project sees students working with patient participation groups within GP surgeries to identify issues, suggest and create solutions, and generally seek to raise engagement levels.

Consultancy in business and law

Students from Plymouth Business School modules undertake live consultancy projects with real businesses, enabling them to explore and practise entrepreneurial frameworks, behaviours and skills. In 2016, 636 students from eight modules undertook 138 Inspiring Futures projects, and the initiative was highly commended at the National Enterprise

Educators Awards.

And students in the School of Law, Criminology and Government provide legal advice to members of the public at special clinics in the city. Working in pairs, the students donate six hours per week at the City Council First Stop Shop, offering advice on employment law, a health check for businesses and charities,

and information and guidance in family law. This complements the existing Law Clinic on campus that works closely with local and national organisations, including the Citizens' Advice Bureau, the Red Cross, and local legal practices. The school also runs an employment advice service, the South West Employment Rights Centre, and a Family Law Clinic.

Our estate

The University has invested hundreds of millions of pounds in state-of-the-art facilities that support its teaching, learning and research ambitions. From the country's most technologically advanced wave tanks to a purpose-built performing arts centre, its campus and extended estate is full of distinctive features that enable staff and students to explore new possibilities within their field. And with further investment planned, and new facilities under construction, the horizons of the campus – and the people who study and work there – are constantly evolving.

Marine Station

Opened in 2015, the Marine Station is a bespoke teaching, research and scientific diving centre that enables students to move from the classroom to the marine environment in a matter of minutes. Situated on the shores of Plymouth Sound, next to the National Marine Aquarium, the £5 million facility has a seawater laboratory and aquarium, and is home to the University's fleet of research vessels.

It is the only facility of its kind in UK higher education to be accessible on foot from campus – emphasising the symbiotic relationship that many areas of the University's teaching have with the natural environment.



The House

The House is the University's new performing arts centre, home to a 230-seat theatre where students from a range of arts disciplines can take to the stage to develop their craft. The £7 million facility provides the latest technical and lighting areas, and has been designed with integrated dance in mind – enabling artists

of different physical abilities to learn and perform together.

The House is also home to the Interdisciplinary Centre for Computer Music Research, an REF 4* rated group conducting world-leading research across the boundaries of neuroscience, technology and music composition.

The Derriford Research Facility

Currently under construction is the University's Derriford Research Facility (DRF), a cutting-edge biomedical centre located close to the University's main Peninsula Schools of Medicine and Dentistry building. Due to be completed by spring 2017, the £14.8 million DRF will house world-leading research carried out by teams in the areas of cancer, neuroscience and infection, immunity and inflammation.

From brain tumours to vaccines, tissue regeneration to hepatitis, antibiotic resistance to innovative therapies for cancer, the DRF is a bringing together of the University's medical, dental and biomedical laboratory-based research. A neighbour to Plymouth Hospitals NHS Trust, the DRF will provide new opportunities for research collaborations across the University and with clinical research colleagues at Derriford Hospital.

The Marine Building

Bringing together marine engineering and fluid dynamics, navigation and maritime education and training, and business innovation and commercialisation support, the Marine Building is a truly leading-edge facility that creates a corridor from teaching, research and development, to industry and the oceans.

At the heart of the £19 million building is the Coastal, Ocean And Sediment Transport (COAST) laboratory, which provides physical model testing with combined waves, currents and wind, offered at scales appropriate for device testing, array testing, environmental modelling and coastal engineering. With a 35-metre-long ocean basin that can simulate a range of sea states to test renewable energy technology, a smaller coastal wave tank, and two wave flumes, it offers a broad range of research opportunities, and is home to a team of technicians who work with visiting clients.

The Marine Building also boasts a Navigation Centre, with a full bridge simulator that enables students to learn to pilot vessels of all kinds in virtual seas around the world. And it is home to the Marine Innovation Centre (MARIC), which provides the interface with the marine and maritime businesses of the South West and the wider UK, and works with companies – especially in renewable energy – to support growth and investment.



The Dartmoor Institute of Animal Science pod

What the diminutive Dartmoor Institute of Animal Science (DIAS) pod lacks in scale, it more than compensates for in pedagogical potential, situated as it is in the heart of Dartmoor Zoo, one of the University’s partners.

The pod’s innovative design and location puts students, from a broad range of subjects, at the centre of the action, allowing them to use animal interaction to facilitate study.

Whether this translates as a psychological study into animal behaviour, or an aid to a conservation biology dissertation, the pod is unique to the University.



The Ocean City

Boasting perhaps the finest natural location of any city in the UK, Plymouth's dazzling waterfront and deep water harbour have provided a blue canvas for centuries of maritime and naval narrative, a proud global tradition dating back to Sir Francis Drake. Today, the 'Ocean City' is home to an unparalleled collection of world-renowned marine institutions, the National Marine Aquarium, the largest naval dockyard in Western Europe, a thriving fishing port, and some of the UK's finest beaches and sailing waters.

And the city is putting these natural and built assets at the heart of its future development, with the creation of 'Oceansgate'. Funded following the conferring of City Deal status on Plymouth in 2014, Oceansgate will be a waterfront development on a 35-hectare site at Devonport Dockyard, and will provide a hub for marine industries, with opportunities for research, innovation and production in a collaborative environment.

Framed by the rivers Tamar and Plym, Plymouth is also a green city thanks to the rugged splendour of Dartmoor to the north, and the rolling hills, valleys and estuaries of the South Hams, an Area of Outstanding Natural Beauty.

Home to more than 250,000 people, Plymouth is the largest city on the South West peninsula, and its location on the border of Devon and Cornwall ensures it serves as the region's major industrial and cultural hub. As one of the city's largest employers, the University holds a pivotal role within the local

community, generating 4,000 jobs and an annual turnover of £234 million in 2014–15. It is a co-owner of Plymouth Science Park – a world-class office, research and laboratory space where 80 digital and science-based businesses can accelerate their growth and success. The University also runs Formation Zone incubation centres on campus and manages three Innovation Centres on behalf of Cornwall Council, offering supportive and collaborative environments that nurture entrepreneurialism and in which ideas can flourish. It is also the first university in the world to be awarded the Social Enterprise Mark in respect of its support for the sector.

As the cultural heart of the South West, Plymouth boasts a vibrant arts programme, to which the University makes a significant contribution through Peninsula Arts on campus, which hosts exhibitions, concerts, film programmes and prestigious lectures. Annual events such as the Contemporary Music Festival attract national reviewers to its innovative concerts. Meanwhile, Theatre Royal Plymouth is one of the most successful regional theatres in the country, producing West End successes, and hosting the Royal Shakespeare Company as well as European opera and ballet companies.

The University is also a partner in the Plymouth History Centre project, which will see the current Museum and Art Gallery transformed into a major new museum in the heart of the city, showcasing the city's rich and colourful history for residents and visitors alike.

Royal William Yard: The Grade I former naval victualling buildings have come to life with cafes, bars, restaurants, a museum, art galleries, offices and apartments



University of Plymouth in numbers

100,000
alumni in over 100 countries

2,900 *staff*

One of just six
institutions internationally to receive a Global Showcase award from the Royal Institute of Chartered Surveyors (RICS)

Bloomberg Best Employers 2016
Top 50 employer; ranked third best employer in the education sector; behind only the University of Cambridge and University of Oxford

Rated as one of the
Top 30
universities in the 2016 Whatuni Student Choice Awards

Top 50
Research Fortnight Power List

1st

Plymouth was the first university in the world to be awarded the Social Enterprise Mark



The Times Higher Education Top 150 global modern universities, ranked

4th
in the UK and 59th globally

Over 21,000

University of Plymouth students, with a further 17,000 students studying for our awards at institutions both in the UK and overseas

Over 4,500

University of Plymouth students benefit from placements and work-based learning opportunities every year

Plymouth's Graduate School provides support not just to our international research students, but to all
1,000 members
of our postgraduate community, the largest of any post-1992 university

The University of Plymouth Students' Union (UPSU) has
121 societies and 4,300 members



awarded at institutional level

No.1

nationally for clinical medicine research output (2014)

Our Students' Union has NUS Green Impact 'Excellence Outstanding' status

Varsity Champions for the
4th
year running

1st

The first and only post-1992 university to launch its own medical and dental school

The House and Marine Station building projects have been built to BREEAM Excellent standard (an environmental assessment method rating system for buildings)





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