

**Strategic Analysis of the Welsh Higher Education Sector,
Distinctive Assets
March 2013**



Contents **Pages**

Contents.....	2
Introduction and Brief.....	3
Executive Summary.....	4-12

Main Report

1 Higher Education Institutions in Wales.....	13
2 Life Sciences, Health and Quality of Life.....	14-17
3 Science and Engineering.....	18-22
4 Energy & Resources, Earth, Oceans and Planets.....	23-26
5 Intelligent Systems and Smart Living.....	27-29
6 Sport and Tourism.....	30-32
7 Creative Industries.....	33-36
8 Arts, Humanities and Social Sciences.....	37-40
9 Educational and Social Access and Justice.....	41-42
10 International Engagement.....	43-46
11 Celtic Identity, Bilingualism, Languages and Culture.....	47-48
12 Student Experience, Employability and Support.....	49-51
13 Research Overview.....	52-53
14 Other Significant Networks and Initiatives.....	54-55
15 Record of Interviews.....	56

Data Sets

1 About Wales.....	57-58
2 Institution Profiles.....	59-63
3 University Research Assessment Results 2008 (RAE).....	64-70
4 Other Rankings and Ratings.....	71-73
5 International Student Numbers.....	74-77
6 Further Education Colleges in Wales.....	78-80
7 Background to the University of Wales.....	81
8 Welsh Government Strategies.....	82-84

Introduction and Brief

This report aims to identify work in the higher education sector in Wales that is outstanding, unique or distinctive at the UK or international level.

There are many examples across Wales of people, research, teaching, innovation and enterprise, partnerships, knowledge exchange, facilities and the student experience that fit this brief – too many to list in full. This report tries to identify case studies that exemplify the best. In all cases, the use of the term “national” refers to the UK.

The brief is to cover a range of themes including research and innovation, learning and teaching and knowledge exchange and diverse subject areas, including life sciences, arts and humanities, business, finance, energy, education, science, engineering and the creative industries. The geographical remit is broad; to provide an all Wales picture of the UK, European and global strengths of the sector at universities with a student presence on campus. The brief also asks for the report to take into account British Council and Welsh Government priorities and the use of specified qualitative and quantitative indicators.

The report is divided into the broad categories shown below, which reflect the fact that much outstanding work does not fit into a single academic discipline or economic sector. Academics work in partnership a great deal – with academics in other departments and externally with industry, companies and other universities and colleges. Their work often deals with social challenges that do not fit within specific subject boundaries: work in Engineering or Agriculture, for example, may have outcomes that directly address problems in Health or Social Justice.

- Higher Education Institutions in Wales
- Life Sciences, Health and Quality of Life
- Science and Engineering
- Energy & Resources, Earth, Oceans and Planets
- Intelligent Systems and Smart Living
- Sports and Tourism
- Creative Industries
- Arts, Humanities and Social Sciences
- Educational and Social Access and Justice
- International Engagement
- Celtic Identity, Bilingualism, Languages and Culture
- Student Experience, Employability and Support
- Research Overview
- Other Networks and Initiatives
- Record of Interviews

The following stand-alone data sets follow the report for background information: About Wales; Institution Profiles; University Research Assessment Results 2008 (RAE); Other Rankings and Ratings; International Student Numbers; Further Education Colleges in Wales; Background to the University of Wales; Welsh Government Strategies.

Executive Summary

Parts of the higher education sector in Wales, and many of the further education colleges are experiencing a period of transformation. Capital and infrastructure developments will see both continue to develop and strengthen in the next 5 years and beyond.

As of 1st July 2013, the nine universities in Wales are Aberystwyth University; Bangor University; Cardiff University; Cardiff Metropolitan University; Glyndŵr University; Swansea University; University of South Wales, Newport; University of Wales Trinity Saint David (incorporating Swansea Metropolitan); University of Wales and the Open University in Wales. The University of Glamorgan and University of Wales, Newport are in the process of merging. The Royal Welsh College of Music and Drama is a wholly owned subsidiary company of the University of South Wales Group .

Outstanding activity is identified in 11 areas: Life Sciences, Health and Quality of Life; Science and Engineering (including Advanced Manufacturing); Energy & Resources, Earth, Oceans and Planets; Intelligent Systems and Smart Living; Sports and Tourism; Creative Industries; Arts, Humanities and Social Sciences and Educational and Social Access and Justice. Examples of the case studies expanded further in the report are:-

Life Sciences, Health and Quality of Life

- A critical mass of work in areas such as Neuroscience; Psychology; Cancer; Tissue; Animal Sciences related to human health; Mental Health; Psychology and Ageing.
- Important work on understanding diseases such as autism, Alzheimer's, breast cancer and cystic fibrosis by internationally-renowned academics including Nobel Prize winners for Medicine and for Chemistry.
- Significant partnerships with global blue-chip companies such as IBM, Smith & Nephew, GE Healthcare, Siemens Healthcare and Johnson & Johnson, and research councils including the Biotechnology and Biological Sciences Research Council (BBSRC).

Science and Engineering

- Outstanding work in science and engineering fields related to Advanced Manufacturing, Aeronautical, Automotive, Materials, Electronics, ITC, Optoelectronics, Medical, Sustainability, Energy, Food, Water, Physics, Chemistry and Biology.
- Innovative applications in areas such as Space, Manufacturing, Microwave, Broadband, Photovoltaics, Lasers, Logistics, Modelling, Materials Testing and Robotics.
- Work in Science and Engineering attracting major companies, such as BP, Fujitsu, Airbus, British Airways, Ford and Rolls-Royce and grants from the Engineering and Physical Sciences Research Council (EPSRC).

Energy & Resources, Earth, Oceans and Planets

- Important work in biological, environmental, marine and rural sciences, particularly for food and water security; marine and coastal work in the management of environment and resources; glaciology, volcanism and environment management for global sustainability.
- Environmentally-friendly fuels such as renewable hydrogen, solar, marine and wind power.

- Partnerships with and investment from Tata Steel, EDF, Babcock, Hitachi, the Engineering and Physical Sciences Research Council (EPSRC), the National Environment Research Council (NERC) and the Biotechnology and Biological Sciences Research Council (BBSRC).

Intelligent Systems and Smart Living

- Innovations in robotics, visualization, optics and other intelligent tools for smart living, such as optical internet cabling to increase broadband transmission by up to 2,000 times, and virtual medical training tools.
- Applied use in mobile applications, future-proof living, space missions, quality in ageing.
- High Performance Computing partnership with companies including Microsoft, Intel, Mellanox, IBM, CISCO and more.

Sports and Tourism

- Outstanding applied research and teaching in Sports Science, Physiology, Performance Monitoring, Sports Psychology, Motor Control, for students, elite athletes, national squads, the military and industry.
- Internships and placements with international organisations such as Walt Disney World.
- Facilities including School of Golf, making use of the Celtic Manor, venue for the 2010 Ryder Cup, and facilities used by national squads preparing for Olympic, Commonwealth and other international events.

Creative Industries

- Training, internships and interaction with the industry at 1 of 9 UK national conservatoires whose honorary fellows include Sir Anthony Hopkins and Katherine Jenkins.
- Cannes Film Festival and BAFTA award-winning staff and alumni, unique and distinctive work in Glass, Animation, Journalism and Media, Design, Photography and more.
- New UK Arts and Humanities Research Council Knowledge Exchange Hub for Creative Industries based in Cardiff.

Arts, Humanities and Social Sciences

- Leading research in Accounting, Banking & Finance; Architecture; English; Politics, Law and Criminology; Classics and Ancient History; Welsh and applied research in novel areas such as Criminal Typology and Gender Studies.
- World-leading work in dictionary development and pioneering work in translation and language technologies.
- Outstanding research output and success rates in grants from Arts and Humanities Research Council and other funding bodies.

Educational and Social Access and Justice

- Research and teaching in Social Ethics, Human Rights in Children, Crime and Social Justice and Migration Policy.
- Partnerships with Further Education colleges to extend pathways into higher education and make provision available more locally and accessibly.

- Innovative combined teaching and learning between higher and further education to widen access and improve skills and qualifications.

Celtic Identity, Bilingualism, Languages & Culture

- Cultural openness and awareness, reflected in high student satisfaction ratings in the National Student Satisfaction Survey and International Student Barometer.
- Outstanding work in Celtic Archaeology, Bilingualism, Multilingualism, Translation and Minority Languages.
- Supporting the enhancement of Welsh heritage in a global context.

The case studies in these 11 areas are followed by a **Research Overview** and sections on strengths in **International Engagement** and in the **Student Experience, Employability and Support**. It also provides a summary of significant **Networks and Initiatives** not included elsewhere.

Research Overview

Based on its research output, publications, investment and other recognised measures, the UK is generally recognised to be in the top 2 nations in research league tables. Research in universities in Wales is unusually broad in range and makes a significant contribution to the UK position in some areas.

In the 2008 Research Assessment Exercise (RAE), the most recent RAE conducted, Wales had 20 units of assessment that outperformed the UK average in terms of the proportion of research rated “world-leading” (4*) and “internationally excellent” (3*). These were in the Social Sciences (7 units), Arts and Humanities (6), Health and Medicine (4) and Engineering and Science (3) (*Source: Higher Education Wales*). In the same RAE, 2 or more universities attained proportions of 3* and 4* quality exceeding the UK average in Civil Engineering, Psychology, Allied Health Professions, Computer Science and Informatics and Celtic Studies (*Source: Hefcw*).

Individual universities significantly exceeded the UK average for proportions of 3* and 4* quality in a number of Units of Assessment including Politics and International Studies, Accounting and Finance, Business and Management, Communications, Cultural and Media Studies, Psychiatry and Neuroscience, Town and Country Planning (*Source: Hefcw*), General Engineering and Mineral & Mining Engineering, Social Work and Social Policy & Administration, Geography and Environmental Studies, History, and German, Dutch and Scandinavian Languages (*Source: Swansea University*)

According to the *Elsevier Scopus* database of publications, the number of articles authored by researchers in Wales grew at a rate that outpaces the world and UK average, in the period 2001-2010. The impact of Welsh research, as measured by the number of citations per paper (a widely used index of research quality) has also been growing steadily. Figures from *Thomson Reuters* show that Wales has, over the past decade, come from behind to take a place within the top 20 research countries in the world. Since 2008, Wales has been included in the top 20 countries “for all fields” listed by *Thomson Reuters’ Essential Science Indicators*, and in 2011 it was ranked 15th (ahead of France and Australia). Wales’ current research impact exceeds the world, Organisation for Economic Co-operation and Development and European Union average ECD and EU average. According to

these citation data, high impact areas for universities in Wales are plant and animal science, as well as computer sciences, social sciences, psychology and psychiatry.

Universities in Wales have been awarded 7 Queen's Anniversary Prizes since 1998 for pioneering research into the causes of violent injury and new ways to reduce harm; industry oriented degrees in materials engineering; research on plant breeding and economic/environmental benefit; work identifying genetic causes of diseases; for state-of-the-art engineering facilities; and for the pioneering use of chemiluminescence in clinical settings, research that has revolutionised biomedical research and clinical diagnosis.

The number and the range of academics from Wales elected to prestigious UK Learned Societies, such as the Royal Society, Royal Academy of Engineering, Academy of Medical Sciences, British Academy and Academy of Social Sciences have both grown significantly over the past 5 years. There are internationally-renowned academics in most universities, including professors Sir Martin Evans, 2007 Nobel Prize for Medicine, and Dr Robert Huber, 1988 Nobel Prize for Chemistry.

Time magazine rated work on the discovery of new scientific knowledge by "Adam" the robot scientist by Professor Ross King and his team at Aberystwyth University as the 4th most significant world scientific discovery of 2009. In the same year, Professor Julie Williams' discovery at Cardiff University of susceptibility genes for Alzheimer's disease was named by *Time* magazine as among the world top 10 medical breakthroughs, and there are many other academic stars. The Sêr Cymru/Stars Wales programme will attract even more, with up to £50m Welsh Government funding and the establishing of National Research Chairs in Advanced Engineering and Materials; Life Sciences and Health; and Low Carbon, Energy and Environment. The Welsh Crucible programme of personal, professional and leadership development for future research leaders of Wales offers the opportunity for all researchers in Wales to explore how they can work across institutional and disciplinary boundaries to tackle the research challenges that Wales currently faces.

Wales attracts Arts and Humanities Research Council, Economic and Social Science Council and Biotechnology and Biological Sciences Research Council funding in line with and in some cases exceeding the target of at least 5% for Wales (set by Welsh Government based on the size of the higher education sector in Wales as a percentage of the UK higher education sector). Currently, Wales secures 3.4% of total UK Research Council funding.

The 2010-11 *Higher Education, Business and Community Interaction Survey* (HEBCIS) also shows that, in relation to the UK, Wales accounted for 7% of income from collaborative research involving both public funding and funding from business; 11% of income from regeneration and development programmes; 6% of total learner days of Continuing Professional Development and Continuing Education courses delivered; 11% of software only licenses generated; and 9% of active spin-out and staff start-up companies that have survived at least 3 years.

International Engagement

Universities in Wales engage with governments, organisations and other bodies internationally, and manage hundreds of staff and student exchange agreements and research and teaching partnerships with universities in the USA, China, India, Brazil, Australia, Japan, Singapore, South Korea and others.

There has been a move, particularly in the last 5 years, towards more strategic sustainable partnerships with core partners. For example, the joint Institute for Oncology Research between Cardiff University and Peking University Cancer Hospital won 1st prize in the International Collaboration category in the Times Higher Education Awards 2011, and Swansea University won an Engineering and Physical Sciences Research Council grant in 2012 to support Building Global Engagements in Research and the development of the Centre for NanoHealth as a global hub.

There are 3 Confucius Institutes in Wales, at Cardiff, University of Wales Trinity Saint David and Bangor universities, the latter with a unique focus on Law. Universities are heavily involved in international schemes such as *Science Without Borders*, *Erasmus Mundus* and *UKIERI*. All of the universities also partner with one or more institutions in Chongqing, working alongside Welsh Government in a Wales-Chongqing regional relationship.

Student Experience, Employability and Support

Peer guiding, buddy schemes and student volunteering programmes are a feature of the universities' student support, as are safe and secure managed campuses. Student employability is high on the agenda, with industry partnerships an important feature: 91% of graduates from full-time degree courses are employed 6 months after leaving higher education in Wales, which is above the UK average. There are a number of initiatives designed to maximise employability, such as *Go Wales*, which provides work placements and work experience, and the *Agreement on Skills and Employability for Wales* (the first agreement of its kind in the UK, involving 4 organisations: Confederation of British Industry Wales, Higher Education Funding Council for Wales, Higher Education Wales and the National Union of Students Wales).

Significant Networks and Initiatives

These include Welsh Crucible, an inter-disciplinary career development programme for early and mid-career researchers and the Wales Strategic Insight Programme, which develops collaborative partnerships by placing university staff short-term in public, private and third-sector organisations. The development of research staff and involvement with business, industry and employers are important areas of activity for the universities.

A List of the National Assets

Universities understand and articulate their own strengths effectively, and they recognise that it is a challenge to provide information that meets the diverse requirements of different audiences.

It is a significant challenge to compile a fair and representative list of the national assets of higher education across Wales to serve the needs of all audiences: Researchers might measure success at the UK or international level by Research Assessment results. Industry might value training or testing and development facilities as a national asset. International students may perceive staff to student ratios or work placement opportunities to be a measure of achievement, and the general public may consider connections with blue-chip companies or famous brands the mark of a national asset.

What are the real strengths of higher education in Wales?

One way to answer this question is through a list of distinctive selling points compiled for an average member of the public with no real knowledge of Wales. Any such list is to some extent subjective. The following, based on analysis of the background research for this report, is intended as a starting point for discussion and development:-

1. The universities are a firmly-established part of the history and tradition of UK higher education – the quality assurance, research culture and approach to teaching and learning.
2. They have a unique set of strengths in
 - **Life Sciences** – Academic stars include 2 Nobel prize-winners at Cardiff University: Professor Sir Martin Evans, 2007 Nobel Prize for Medicine, Professor Dr Robert Huber, winner of the 1988 Prize for Chemistry. A critical mass of expertise includes the Institute of Life Sciences at Swansea University, and Life Sciences work at the Institute of Biological, Environmental & Rural Sciences at Aberystwyth University.
 - **Psychology, especially Neuroscience** – Cardiff University School of Psychology ranked 1st in the UK in the 2008 Research Assessment Exercise. Professor Julie Williams' discovery of susceptibility genes for Alzheimer's disease was highlighted by Time Magazine as among the top 10 medical breakthroughs of 2009. Psychology also features strongly at Bangor and Swansea universities and the Wales Institute of Cognitive Neuroscience brings together over 250 academics from all 3 universities.
 - **Engineering, especially Advanced Materials, Opto-Electronic, Mechanical & Manufacturing.** Swansea University has attracted £100 million in active Engineering research grants in 5 years and the university is now building a new Science & Innovation Campus. Engineering at Cardiff University partners with, amongst others, Airbus, BAE Systems, Bosch, Tata Steel, Daimler, Fiat, Hewlett-Packard, IBM, Mitutoyo, Renault, Rolls-Royce and Siemens. Bangor University is exploring the use of current optical internet cabling to increase broadband transmission by up to 2,000 times current speed and capacity (which would mean downloading 20 feature length films in one second). At Glyndŵr University, OpTIC Glyndŵr is the location for the manufacture of prototype hexagonal segments for the world's largest telescope, the €42m European Extremely Large Telescope (E-ELT), to be built by the European Southern Observatory in Chile. Prime Minister, David Cameron, described the work of those in the project as 'world leading'. Applied Engineering training is also important across Wales. Swansea Metropolitan, University of Wales Trinity Saint David University have work experience relationships with Silverstone race circuit, Prodrive and the organisers of the Wales Rally GB and graduate destinations include Silverstone, Bridgestone Motorsport and Mercedes World. The University of South Wales and Glyndŵr university have on-campus flight simulators.

- **Rural Environment and Sustainability:** Wide-ranging work in Wales including that of the Institute of Biological, Environmental and Rural Sciences at Aberystwyth University (IBERS) owns farms and other operations, produces c£60 million for the economy and supports over 300 scientists and support staff in the Institute – the largest collection of expertise of its kind in the UK. Much of the work at IBERS has international benefits– for instance, developing high yielding crops that can withstand some of the effects of climate change, and developing vaccines against costly world-wide diseases such as TB and bilharzia, a water-borne parasite which affects 200 million people and causes 300,000 deaths annually.
- **Coastal and Marine** – Bangor University works in Fisheries Protection and Aquaculture, as well as marine environmental management (such as oil spill management) and operational oceanography through the Centre for Applied Marine Sciences, with Aberystwyth and Swansea universities. Bangor’s Research Vessel, the Prince Madog, is a national facility for the UK marine science community and it has an inshore boat fleet and seawater laboratories. Aberystwyth and Bangor collaborate in the Centre for Catchment & Coastal Research and Swansea Metropolitan, University of Wales Trinity Saint David’s Coastal and Marine Research Group and Cardiff’s Marine and Coastal Environment Research Group conduct research in coastal and marine science.
- **Sustainability & Climate Change** - At the University of South Wales, the CymruH2Wales project is advancing development of fuel cells and hydrogen combustion engines. Both Bangor and Glyndŵr universities conduct research into photovoltaics, which could supply up to 30% of Europe’s electricity needs by 2050, significantly reducing carbon emissions. Aberystwyth, Bangor, Cardiff and Swansea universities form Climate Change Consortium of Wales (C3W) to improve fundamental understanding of the causes, nature, timing and consequences of climate change on earth’s environment and on humanity.
- **Intelligent Systems and Innovative Solutions, especially Robotics and Visualisation** - Professor Ross King and his team at Aberystwyth University, developed ‘Adam’, the robot scientist, whose discovery of new scientific knowledge Time Magazine rated the 4th most significant scientific discovery of 2009. The Intelligent Robotics Group has been involved in space robotics, including Beagle2 and several future Mars missions. The Advanced Medical Imaging and Visualization Unit at Bangor University has developed a surgical training tool for the iPad called ‘VCath’, available to download from iTunes, for neurosurgical training with a virtual 3D patient. Bangor, Cardiff, Swansea and Aberystwyth universities operate the Wales Research Institute of Visual Computing. Visual computing represents one of the most challenging and inspiring arenas in computer science. Today, 50% of content on the internet is in the form of visual data and information, and more than 50% of the neurons in the human brain are used in visual perception and reasoning. At the National Centre for Product Design and Development Research, Cardiff Metropolitan University, the Medical Applications Group works with hospital trusts on the use of design

technologies for the development of prostheses and surgical planning. At University of South Wales, the Centre of Excellence in Mobile Applications and Services researches Futuristic Applications in mobile, internet and sensor-based technologies and Futuristic (next-generation) Network Infrastructure. The Smart Clothes and Wearable Technology Research Centre, also at the University of South Wales, examines the role of wearable technologies in sport and fitness and corporate wear.

- **Creative industries, especially Animation & Film-making** - Wales has been at the heart of Animation for close to a century, and characters such as SuperTed and Fireman Sam have given Welsh animation a world-leading reputation in the industry. University of South Wales' Animation Direction and Production Programme is one of six UK Skillset accredited Animation programmes. Film-making generally is strong at University of South Wales: Staff and alumni hold awards including PRIX ART ET ESSAI at Cannes film festival, Best Documentary and Best Editing at the 2012 British Academy of Film and Television Arts (BAFTA) Film Awards. At Cardiff Metropolitan University, 70% of Art & Design submitted for the RAE 2008 was rated as either Internationally Excellent (3*) or World Leading (4*) and world-leading research was specifically noted in the Film Photography & Screen Media, Fine Art and Ceramics research groups. University of South Wales, Cardiff Metropolitan University, and more recently Swansea Metropolitan, University of Wales Trinity Saint David together form the Wales Institute for Research in Art and Design.
 - **Arts & Humanities** – all of the universities in Wales are either comprehensive in their subject range, with real strengths in Arts and Humanities, or they focus mainly on Arts and Humanities: University of Wales Trinity Saint David can be likened to the American model of a Liberal Arts institution; the Royal Welsh College of Music and Drama is a national conservatoire in international standard facilities; and apart from its School of Engineering, Technology and Computing, University of South Wales is an Arts, Humanities and Social Sciences institution. Wales also achieves a higher level of research funding in Arts and Humanities than in other areas.
3. Campuses are based in safe managed environments in relatively small non-industrial cities or towns, with facilities in walking or easy travelling distance, familiarity with bi-lingualism and an emphasis on safe cultural integration and dedicated personal support.
 4. International sports brands can also put a nation on the map: The Golf Ryder Cup 2010 was held at the Celtic Manor Resort, Newport. The Millennium Stadium in Cardiff has hosted the FA Cup Final, Olympic Games Football 2012 and World Cups in Rugby League and Union. Swansea City Football Club joined the Premier League in 2011 and is starting to gain international coverage.

Data sets accompanying the report provide facts and figures in the following areas:

- **About Wales** – describes Wales’ UNESCO World Heritage sites, National Areas of Outstanding Natural Beauty, National Parks and national cultural institutions.
- **Institution Profiles** – factual descriptions of institutions by location, date established, Vice-Chancellor, academic structure, and number of home, EU and international students.
- **University Research Assessment Results 2008** - RAE rankings by institution.
- **Other Rankings and Ratings** – Times Higher, Times Good University Guide, National Student Satisfaction Survey, Independent Complete University Guide, I-Graduate International Student Barometer and other rankings for each institution.
- **International Student Numbers** – full-time international students by country of origin, institution and level of study; first degree home, EU and international Science students by institution and field of study; first degree home, EU and international non-Science students by institution and field of study.
- **Further Education Colleges in Wales** – description of the 17 FE colleges and 2 designated FE institutions in Wales.
- **Background to the University of Wales** – explanation of history and current status.
- **Welsh Government Strategies and other influences** – summary of strategies relevant to higher education in Wales.

1. Higher Education Institutions in Wales

Parts of the higher education sector in Wales are experiencing a period of transformation. In 2013, the sector is quite different from a decade ago and plans for capital and infrastructure developments will to see it continue to develop and strengthen in the next 5 years.

The universities in Wales as of 1st March 2013 are:

- Aberystwyth University www.aber.ac.uk
- Bangor University www.bangor.ac.uk
- Cardiff University www.cardiff.ac.uk
- Cardiff Metropolitan University www.cardiffmet.ac.uk
- Glyndŵr University www.glyndwr.ac.uk
- Swansea University www.swansea.ac.uk
- University of South Wales www.southwales.ac.uk
- University of Wales Trinity Saint David ^① www.trinitysaintdavid.ac.uk
- University of Wales ^① www.wales.ac.uk/en/Home.aspx
- Open University in Wales ^② www3.open.ac.uk/near-you/wales

^① [Swansea Metropolitan University](http://www.smu.ac.uk) and University of Wales Trinity Saint David merged in 2012. Swansea Metropolitan University is now known as Swansea Metropolitan, University of Wales Trinity Saint David www.smu.ac.uk, and is therefore not listed above as an independent university. The University of Wales has agreed to merge with the University of Wales Trinity Saint David, with merger to be fully implemented in 2017.

^② The Open University is a UK open-learning organisation which has a base in Wales.

There are 19 Further Education colleges and institutions in Wales

http://www.collegeswales.ac.uk/en-GB/wales_colleges-42.aspx

The state funds 222 secondary and 1,435 primary and 43 special schools and there are 66 independent schools <http://wales.gov.uk/docs/statistics/2012/120529keyeducation12en.pdf>.

This report covers only the institutions with a student presence on campus in Wales.

2. Life Sciences, Health and Quality of Life

In this report, *Health* includes practical and theoretical activities, such as Nursing or Health Policy. The theme of *Quality of Life* includes work that broadly contributes to an improvement in the quality of people's lives, such as research into Ageing. The term *Life Sciences* refers to the study of subjects concerned with living organisms that advances medical science. The *Life Sciences* sector is growing rapidly in Wales (by about 20% since 2009) with universities and companies working collaboratively at an internationally significant level:

Key Facts from Welsh Government

http://www.wales.com/en/content/cms/english/business/business_sectors/life_sciences/life_sciences.aspx

- Wales has 5% of the UK population but 10% of the UK workforce in the Life Sciences sector.
- Companies based here include those in the fields of medical technology, diagnostics, wound healing and contract research organisations.
- There are over 300 companies here that employ over 15,000 people and contribute more than £1.3 billion to the economy annually.
- GE Healthcare, Cardiff, hosts the company's international centre for groundbreaking work in stem cell technologies. BTG, the UK's biggest biotechnology group, is based in mid Wales.
- The UK's largest cluster of in-vitro diagnostic companies is in Wales, including Albany Molecular Research Inc. (AMRI), Quay and Quotient Bioresearch.
- Siemens Healthcare Diagnostics Products Ltd relocated the majority of its manufacturing and distribution operations from Los Angeles to its north Wales site at Llanberis.
- Larval therapy firm ZooBiotic was the first spin-out from an NHS trust in the UK and is now the dominant global player.
- Ortho Clinical Diagnostics draws on a rich mixture of scientists, engineers and quality and regulatory personnel in south Wales and from the M4 corridor.
- Biomet, global leader in the orthopaedics market, has its largest European subsidiary and UK headquarters in Bridgend, south Wales.

Life Sciences span a wide range of academic areas such as Animal Science, Bio-engineering, Biomedical Imaging, Biomedical Systems, Ecology, Genetics and Genomics, Nanotechnology, Neuroscience, Plant Science and Tissue Engineering. Companies in the field include biotechnology, pharmaceuticals, life systems technologies, food processing, environmental, and biomedical devices and in Wales, there is an industry cluster in Medical Devices. Companies are usually involved in research, development, technology transfer and commercialization and the Welsh Government has created a portal for business to identify academic expertise in Wales

<https://www.expertisewales.com/search-for-expertise>.

In the 2008 RAE, more than 1 university in Wales attained a proportion of 4* quality (world-leading in terms of originality, significance and rigour) and a proportion of 3* quality (internationally excellent in terms of originality, significance and rigour) which significantly exceeded the UK average for Psychology and for Allied Health Professions.

At Cardiff University, research in Psychology submitted to the 2008 RAE was rated 1st in the UK in the Research Power Rating table (grade point average x the number of full-time equivalent staff submitted). Psychology at Bangor University is the 3rd largest department in the UK (in terms of student numbers). In the RAE 2008, Bangor returned over 97% of RAE-eligible staff to the exercise and was rated joint 7th in the UK (with York, St Andrews and Glasgow) for the percentage of research rated as world-leading (4*), and 7th in the UK in the Research Power Rating table. Some of the Psychology at Bangor falls under Social Science and some under Life Sciences, including in the latter the study of cognitive neuroscience - considered one of the most significant areas of contemporary science that is beginning to transform understanding of both normal and damaged brain function. With Welsh Government co-funding of £5m, the Psychology departments at Bangor, Cardiff and Swansea universities form the Wales Institute of Cognitive Neuroscience <http://www.wicn.ac.uk/>. WICN brings together over 250 academics and has brought in about £12m in grants since 2009. At the School of Psychology, University of South Wales, the development of the FAST Alcohol Screening Test (FAST) (2004) resulted from research into the feasibility of screening and treating alcohol-related admissions in A&E departments. The FAST is now used worldwide as an alcohol screening measure, recommended by bodies including the National Institute for Clinical Excellence (NICE), NHS Wales Primary Care Support Service, and Healthcare Improvement Scotland <http://office.research.glam.ac.uk/rae-psychology/>.

Cardiff University is also home to two major Research Institutes in Health and Life Sciences: The European Cancer Stem Cell Research Institute, which aims to develop new cancer therapies (Patron: Sir Terry Matthews, Welsh technology entrepreneur and owner of the Celtic Manor Resort) <http://www.cardiff.ac.uk/research/cancerstemcell/>, and the Neuroscience and Mental Health Institute <http://www.cardiff.ac.uk/research/neuroscience/> which brings together neuroscience and mental health research to seek answers to psychiatric disorders such as autism and schizophrenia and neurodegenerative disorders such as Alzheimer's and Parkinson's diseases. Internationally renowned staff include Professor Julie Williams, current Chief Scientific advisor to the Alzheimer's Research Trust, UK, whose discovery of susceptibility genes for Alzheimer's disease was highlighted by Time Magazine as among the top 10 medical breakthroughs of 2009. Cardiff University's work in Cognitive Neuroscience involves different groups at and outside the university, such as the Brain Research Imaging Centre and the Neuroscience and Mental Health Institute; as well as related departments at Oxford, London and Imperial College London, as well as the Wales Institute of Cognitive Neuroscience. In the RAE 2008, the University submitted staff under a very wide range of Units of Assessment related to life sciences, health and quality of life <http://www.cardiff.ac.uk/rae/results/> and attained proportions of 3* and 4* quality which significantly exceeded the UK average for Psychiatry and Neuroscience.

The Institute of Life Science (ILS), at Swansea University <http://www.swansea.ac.uk/ils/> is a purpose-built medical research facility, developed with Welsh Government, the Health Board, IBM and other industry partners. The Institute houses 200+ specialists in medical research, business incubation and technology transfer, a clinical research facility, an imaging suite in conjunction with Siemens Healthcare, and the Centre for NanoHealth <http://www.swan.ac.uk/nanohealth/>, which addresses the early diagnosis and treatment of diseases such as cancer. The Centre is a £21.6m initiative combining expertise in Medicine and Engineering, in partnership with industry and the regional Health Board. It is a pioneering, integrated facility where novel devices and sensors can be designed,

manufactured and evaluated. Specialist facilities at Swansea University also include the EPSRC National Mass Spectrometry Service Centre <http://www.nmssc.ac.uk/>, which provides a mass spectrometry service to university research groups throughout the UK; the NHS Wales Health Informatics Research Laboratories <http://www.healthinformaticsresearchlabs.swansea.ac.uk/en/>, which are designed to form "NHS in a lab"; to study the patients' journey through the NHS; and Blue C – the IBM-built supercomputer dedicated to life science research, a rarity worldwide for computers of this power <http://www.swan.ac.uk/ils/supercomputing/bluecscapabilities/>. In its first submission for RAE assessment, 87 % of staff submitted for evaluation in Swansea University's College of Medicine were assessed as producing research of international quality or above (grades 4*, 3* and 2*). In the field of Health, Swansea University is also home to the Centre for Children and Young People's Health and Well-being; the Centre for Innovative Ageing; and the Centre for Health Economics <http://www.swansea.ac.uk/research-centres/>.

Cardiff University School of Biosciences is one of the largest bioscience departments in the UK. In the authoritative 2012 Annual World University Ranking (based on research strength and performance) compiled by Shanghai Jiao Tong University, Life Sciences at Cardiff University is in the top 100 worldwide and in the top 10 in the UK. It is known world-wide for work from ecology and diversity to the molecular biology of disease and includes 2 Nobel Prize winners among its researchers: Professor Sir Martin Evans won the 2007 Nobel Prize for Medicine for his work in discovering embryonic stem cells and now works with others to enhance understanding of a wide range of diseases, including breast cancer and cystic fibrosis. Nobel Laureate, Professor Dr Robert Huber, winner of the 1988 Prize for Chemistry, is a Visiting Professor with the Molecular Cell Biology research group in the development of Structural Biology which aims to determine the structure of proteins and their interactions with each other and with other molecules in cells and has major implications for the treatment of many diseases. Research income consistently includes substantial grants won from medical charities, including the Wellcome Trust and Cancer Research UK. Cardiff is also world-renowned for work in Wound Healing. The Cardiff Institute of Tissue Engineering and Repair (CITER) is an established interdisciplinary network led by Professor Keith Harding CBE in the field of tissue repair, regeneration and rehabilitation. Its Wound Healing Research Unit (WHRU) investigates both acute and chronic human wounds and has close links with industry, earning more than £1m a year by working with commercial partners. The Unit undertakes clinical trials of wound materials and devices and blue-chip companies such as Smith & Nephew, Johnson & Johnson and KCI regularly test out new ideas at Cardiff.

The Institute of Biological, Environmental and Rural Sciences <http://www.aber.ac.uk/en/ibers/> at Aberystwyth University carries out science in plant, animal and microbial sciences, agriculture, cell biology and physiology, genomics parasitology, ecology, plant and animal breeding/reproduction, social sciences and evolutionary processes. In the 2008 RAE, the scientists submitted by IBERS were ranked in the top 7 of UK Universities (*Times Higher Education Table of Excellence and Guardian Research Fortnight Power Rankings*) and almost 50% of research publications produced by IBERS' scientists were rated as either 4* 'World class' or 3* 'Internationally excellent'. The Diet and Health research group in IBERS links plant and animal breeding and chemical phenotyping of food raw materials with diet and health. Core research centres on enhancing the quality of animal products to meet the need for food which is safe, healthy, traceable, of consistent eating quality, diverse and

convenient, the importance of which has been highlighted recently in relation to the integrity of beef products in the UK.

Aberystwyth University is also the base for the Centre for Health and International Relations (<http://www.aber.ac.uk/en/interpol/research/research-centres-and-institutes/chair/>), part of a world network at the interface between health and International Relations. It is involved in a 4-year European Research Council (ERC) project with the London School of Hygiene and Tropical Medicine in the study of global health governance in areas such as access to medicines, tobacco control, pandemic influenza and HIV/AIDS. (There are now several holders of prestigious ERC grants in Wales, including in this field an award of €1.8m for research into the repair of spinal cord injury by controlling neural stem cells at Cardiff University).

Important work into Health and Quality of Life is also conducted through the Mental Health Research Network Cymru <http://www.mhrnc.org/> and the Older People and Ageing Research & Development Network <http://www.opanwales.org.uk/index.htm>, both involving Cardiff, Swansea and Bangor universities. Swansea University is also host to the Centre for Innovative Ageing (CIA), for interdisciplinary ageing research and scholarship across Human and Health Sciences, Engineering and Medicine. The CIA hosts the Older People and Ageing Research & Development Network, and the Wales Stroke Research Interest Group and has strong links with Wales Dementias and Neurodegenerative Diseases Research Network.

The Wales Centre for Behaviour Analysis <http://wcba.bangor.ac.uk/> at Bangor University explores basic human learning processes and positive behaviour change in children and adults. The Centre unites existing research with training through the first European BCBA approved Masters in Applied Behaviour Analysis and with the Bangor Centre for Developmental Disabilities, which provides support for children with developmental disabilities and severe behaviour disorders. University of Wales, Newport hosts the DYSCOVERY Centre providing services for children and adults with developmental disorders. The team helps individuals with living and learning difficulties, such as Dyspraxia, Dyslexia, Attention Deficit Hyperactivity Disorder and Asperger's Syndrome. <http://www.newport.ac.uk/research/ResearchGroups/dyscovery/Pages/dyscovery.aspx>

As well as research strengths, there is a critical mass in relation to teaching in Health and Life Sciences: Cardiff University offers courses in the Schools of Biosciences, Biomedical Sciences, Dentistry, Healthcare Studies, Medicine, Nursing & Midwifery Studies, Optometry & Vision Sciences and Psychology. Teaching in the College of Human & Health Sciences at Swansea University includes courses under Health, Nursing, Midwifery, Social Care, Social Policy and Psychology; and the College of Medicine provides medical-related teaching in areas such as Medicine, Genetics and Trauma Surgery. At Bangor University, courses are available under Healthcare Sciences, Medical Sciences and Psychology. At the University of South Wales, courses in the faculty of Health, Exercise & Sport include Chiropractic, Nutrition and Midwifery. Health-related courses at Cardiff Metropolitan University are in Health Sciences, including Podiatry and Musculoskeletal Studies, and in Sport, for example Sport Conditioning, Rehabilitation & Massage. Glyndŵr University provides some postgraduate teaching in Health & Social Care, for example in Advanced Clinical Practice and Community Specialist Practice. University of Wales Trinity Saint David offers courses in the area of Sport, Health & Exercise, Nutrition & Lifestyle and Outdoor Education.

3. Science and Engineering

Key Facts from Welsh Government (Advanced Engineering and Materials):

http://www.wales.com/en/content/cms/english/business/business_sectors/advanced_materials/advanced_materials.aspx

Aerospace and Defence:

- 160 companies employing 20,000 in Wales with an annual turnover of excess of £5 billion.
- Some of the world's biggest aerospace and defence companies have bases in Wales: Airbus, GE Aviation, BAE Systems, Nordam, British Airways (which has 3 Maintenance, Repair & Operations facilities in Wales), Hawker Beechcraft (a large MRO facility in north Wales).
- Wales undertakes around 25% of the UK's MRO activity.
- The Airbus wing manufacturing centre is the biggest aerospace operation in the UK.

- **Automotive:**
- 150 companies employing over 15,000 people in Wales with a turnover of £3 billion.
- A significant number of 'Tier 1' suppliers, including Ford and Toyota – serviced by an established, diverse supply chain – are based in Wales.
- Wales has specific expertise in alternative fuels (such as hydrogen research and technology).
- Wales is a leading area in the UK working to develop a low carbon infrastructure for vehicles. We have already established key locations on the M4 motorway in collaboration with Welsh academic centres of excellence, where vehicles can be refuelled with hydrogen.

- **Optoelectronics:**
- 85 opto-electronic businesses, employing 5,000 people with a turnover of £1 billion.
- Key technologies are represented in Wales, including communications, electro-optics, instrumentation, sensors, lasers, fibre optics, thin film coating, optical design, solar cells (photovoltaics), optical storage, displays, imaging, photonic materials and holography.
- A recognised cluster of excellence in north Wales, which includes Qioptiq and academic support from Glyndŵr University.

Universities in Wales are working at an internationally significant level in Science and Engineering in advanced engineering, materials, techniques and process that impact on a wide range of social issues and business sectors, including aerospace and defence, automotive and optoelectronics.

A review of significant scientific achievements in 2012 (<http://io9.com/5971542/the-biggest-scientific-breakthroughs-of-2012>) highlights sending a powerful robot scientist to Mars, discovering the elusive Higgs Boson particle, and sequencing the genome of a human ancestor. Universities in Wales played a key role in some of these scientific breakthroughs: One of the most significant moments in modern science took place in 2012, when CERN – the European Organisation for Nuclear Research – started up the world's most powerful man-made particle accelerator. Swansea University physicists made major contributions to the success of the Antihydrogen Laser Physics Apparatus (ALPHA) project at CERN. Swansea's Professor Charlton, Dr Madsen and Dr van der Werf were co-recipients of the 2011 American Physical Society's John Dawson Award for Excellence in Plasma Physics Research for the development of techniques which led to the demonstration of

antihydrogen trapping, and alumnus and Honorary Fellow Dr Lyndon Evans CBE was at the centre of CERN operations as Director of the Large Hadron Collider project. The university was also awarded the Physics World 'Physics Breakthrough of the Year for 2010' prize.

Engineering has been studied at Swansea University since 1920 and it has been awarded £100 million in active research grants since 2008. Swansea hosts two Doctoral Training Centres funded by the Economic & Social Research Council and the Engineering & Physical Sciences Research Council. A further European Knowledge Economy Skills Scholarship Project (KESS) supports Research Masters and PhDs with external partners based in the Convergence region of Wales. These 3 strategic initiatives provide opportunities for over 125 doctorate engineers and social scientists. Research is in 3 main areas: Aerospace and Manufacturing; Energy and Environment; and Health and Sport. The Welsh Centre for Printing and Coating <http://www.swan.ac.uk/printing/> specialises in the application of materials by all forms of printing processes. In the RAE 2008, Materials Engineering at Swansea ranked 8th in the UK. The university's Institute of Structural Materials is a core member of the Rolls-Royce University Technology Centre in Materials, part of a global initiative. Research is funded by organisations such as Rolls Royce, Airbus, the European Space Agency, and Tata Steel, generating a research grant portfolio in excess of £40 million. The Institute has a newly incorporated commercial company Swansea Materials Research & Testing Ltd (SMART) <http://www.smart-swansea.com/> set up by Rolls Royce and Swansea University to serve Rolls Royce's and other clients' needs for creep and fatigue testing of new and existing materials used in the aerospace and aero engine industries.

Swansea University's Civil and Computational Engineering Centre (C2EC) is an academic partner for BAE Systems in computational electromagnetics and computational engineering. Research from C2EC is also contributing to the aerodynamic design of the BLOODHOUND SSC, which aims to take land speed record to 1000mph. The University has pioneered the development of numerical techniques such as the finite element method and associated computational procedures across a number of areas, including applied mechanics, biomedical engineering, computational electromagnetics, computational fluid dynamics, geotechnics and human/computer interfaces.

Swansea University's planned new Science and Innovation Campus, due to open in 2015, is intended to be a next generation 'Science Park', co-locating University and industry researchers, students and academics on one site. It will contain an Innovation Hub and Manufacturing Facility for industry and facilities for Engineering, Business and Economics, as well as student resources and residences. This aims to address a challenge facing higher education more generally; that Science and Innovation is usually sited separately from Business. As part of a £38 million partnership the university and BP will also create an Energy Safety Research Institute at the site. The European Commission said that Swansea is creating an exemplar of how higher education can help drive innovation and knowledge economy growth within a region. The EC is supporting the new campus through the European Investment bank.

The School of Electronic Engineering at Bangor University <http://www.bangor.ac.uk/eng/> is the oldest in the UK and ranked joint 2nd in the UK based on a submission of 8 full-time academic staff in the 2008 RAE. All of the research papers submitted were judged to be of international quality (rated 2*, 3* or 4*) and 75% of those submitted were rated either world leading (4*) or

internationally excellent quality (3*). The School has research themes in: Optoelectronic Devices and Systems and Organic Electronics. There is a Medical Microwave Systems Group and laser micromachining <http://www.lasermicromachining.com/> is undertaken in the university's spin-out company UK LMC Ltd based in the OptIC Technium in St Asaph.

At Cardiff University, the School of Engineering ranked among the top 10 combined Engineering schools in the UK in the RAE 2008. It focuses on research in Energy and Environment, Engineering Sustainability and Advanced Manufacturing and Health Security and the Digital World, within 7 multidisciplinary research institutes: BRE Institute of Sustainable Engineering; Institute of Energy; Institute of Environment and Sustainability; Institute of Green Electronic Systems - Communications, Sensors and Materials; Institute of Mechanical and Manufacturing Engineering; Institute of Mechanics and Advanced Materials; Institute of Medical Engineering and Medical Physics. The School's SEREN project <http://grc.engineering.cf.ac.uk/research/seren/> recently received a £1M boost from the Welsh Government for groundbreaking geo-energy research and technologies. SEREN is a research project, led by the university's Geoenvironmental Research Centre (GRC), aimed at developing innovative engineering technologies for commercial applications, in Ground Source Heat, Underground Coal Gasification, Carbon Sequestration in Coal and Soil, Geoinformatics and Low Carbon and Advanced Computational Modelling. It is a £10m project, with £4.5M from the European Regional Development Fund through the Welsh Government.

Applied Engineering is important across Wales and Swansea Metropolitan, University of Wales Trinity Saint David provides courses in Automotive Engineering; Motorsport Engineering and Design; Motorsport Engineering and Motorcycle Engineering. The School of Applied Design and Engineering focuses on engineering skills for students planning to enter the automotive industry. All motorsport courses are industry approved and the university was one of the first in the UK to become a Motorsport Academy UK recognised Educator (HE). The School collaborates with Belron, owners of companies such as Autoglass, in research into windscreen performance and works with TWI in railway, aircraft, ship and bridge maintenance. They provide a flexible, part-time degree scheme for Ford employees and have a relationship with Silverstone race circuit, Prodrive and the organisers of the Wales Rally GB, presenting work experience opportunities for students. Students test competition cars and motorbikes at the Pembrey Circuit and graduate destinations include Silverstone, Bridgestone Motorsport and Mercedes World at Brooklands. The university also works in Logistics and Transport (including Motorsport Management) with the Supply Chain Management Development Centre (SCMDC), whose clients include the UK Ministry of Defence (the Royal Logistics Corps, the Royal Fleet Auxiliary and the Army School of Catering) and international companies such as Peacocks, Bon Marche, Interbrew, British Airways, Corus, Ford and Hanson.

University of South Wales' wide-ranging Engineering courses include Aeronautical, Civil, Structural, Computer Systems, Environmental, Electrical, Electronic, Electronic Mobile Communications, Embedded Systems Design, Mechanical, Mobile Satellite Communications and Sustainable Power Technology. The University prioritises employability so that, for example, all Civil Engineering degrees are accredited by the four professional bodies that comprise the Joint Board of Moderators (JBM): the Institution of Civil Engineers (ICE), the Institution of Structural Engineers (IStructE), the Institute of Highway Engineers (IHE) and the Chartered Institution of Highways and Transportation (CIHT). Courses such as Aircraft Maintenance Engineering make use of dedicated aircraft experience

with real aircraft facilities, including the university's full-size BAE Jetstream 31 commercial plane and an MP521 flight simulator. The university has a partnership with British Airways Engineering, through which it delivers the qualifying elements required for aircraft maintenance personnel.

Glyndŵr University provides Engineering teaching in, among other subjects, Aeronautical & Mechanical, Aircraft Maintenance, Composites, Digital and Radio Frequency Communication Systems, Electrical & Electronic, Industrial, Mechanical, Manufacturing, Motorsport Design & Management, Performance Car Technology, and Renewable Energy & Sustainable Technologies. On the university's Aircraft-and Electronics- related courses, students can test in-flight control systems using the university's 3-axis flight simulator. Strong links have also been developed within the aircraft industry, including Airbus who run the largest wing manufacturing site in Europe in nearby Broughton. The University Research Centre for Materials, Engineering and Manufacturing brings together research including advanced composite materials, large scale precision optics, water soluble polymers, photovoltaics and fluid dynamics which can be applied in a range of industry sectors. The university hosts specialist facilities for large scale precision optics and photovoltaics research and the Advanced Composite Training and Development Centre, a partnership between the University, Airbus, Deeside College and the Welsh Government. The university is a member of the Wales Opto-Electronics Forum, along with Aberystwyth, Bangor, Cardiff and Swansea universities, companies, and others. Optoelectronics is a major part of daily life and includes any combination of light or images functioning with, or being processed by electronics, or vice versa, and includes the components that bring this about. It can be as simple as a LED display or as complex as a satellite telescope system, including for example optical sensors such as optical smoke alarm or an infra red detector used to control a light; lasers for theatrical lighting, medical and industrial applications, screen pointers and barcode readers. http://www.wof.org.uk/home.php?page_id=20.

SPECIFIC - the Sustainable Product Engineering Centre for Innovative Functional Industrial Coatings <http://www.specific.eu.com/> is an academic and industrial consortium of universities including Imperial College, Bath, Bangor, Cardiff, Glyndŵr and Strathclyde. Led by Swansea University, it involves Tata Steel as the main industrial partner, along with multi-national industry players such as BASF, Akzo Nobel, Beckers and Pilkington, Perkin Elmer, and the Energy Technologies Institute. SPECIFIC develops functional coated steel and glass products for roofs and walls that generate, store and release renewable energy - transforming buildings into power stations. It is a £20 million, 5-year project, located at the Baglan Bay Innovation and Knowledge Centre, backed with £10 million funding from the Engineering and Physical Sciences Research Council (EPSRC) and Technology Strategy Board and £2 million funding from the Welsh Government.

ASTUTE: Advanced Sustainable Manufacturing Technologies <http://www.astutewales.com/> is a partnership of universities in Wales that helps local manufacturing industry to adopt more advanced technologies, and reduce environmental impact. The project is led by Swansea University, in collaboration with the universities of Aberystwyth; Bangor; Cardiff; Cardiff Metropolitan; Glyndŵr; University of South Wales and Swansea Metropolitan, UW Trinity St David. The £27million project targets the aerospace and automotive sectors, as well as other high technology manufacturing companies including medical and energy. ASTUTE works closely with other funded projects and forums:

- [Aerospace Wales Forum](#);

- [MediWales](#)

- [Centre for Nano Health](#)
- [HPC Wales](#)
- [Institute of Life Sciences](#)
- [Institute of Sustainable Design Wales](#)
- [Low Carbon Research Institute \(LCRI\)](#)
- [Seacams](#)
- [Software Alliance Wales](#)
- [Welsh Automotive Forum](#)
- [Welsh Optoelectronics Forum](#)

4. Energy & Resources, Earth, Oceans and Planets

Research and teaching in Wales is internationally strong in these areas augmented by the resources and environment of the geography and location of Wales.

The Institute of Biological, Environmental and Rural Sciences <http://www.aber.ac.uk/en/ibers/> at Aberystwyth University (IBERS), already mentioned under Life Sciences, is a centre of excellence in biological, environmental and rural sciences. Research is organised into three core themes: [Animal and Microbial Sciences; Environmental Impact and Genome Diversity](#). In the 2008 RAE, IBERS scientists were ranked in the top 7 of UK universities (Times Higher Education Table of Excellence, Guardian Research Fortnight publication) and in 2011, the Institute won one of the first ever Excellence With Impact Award from the Biotechnology and Biological Sciences Research Council. Around 300 staff conduct basic, strategic and applied research in biology from the level of genes and other molecules to the impact of climate change and bio-energy on sustainable agriculture and land use. Waitrose supermarket funds the Waitrose Chair of Food and Farming, held by Professor Nigel Scollan. IBERS is the lead partner in SOLID (Sustainable Organic and Low Input Dairying) http://www.solidairy.eu/?page_id=48, an EU financed £5.3m project involving 26 partners from 11 different countries which aims to improve breeds and feeding methods in cows and goats to maintain productivity and to improve animal health and welfare. The BEACON project <http://beaconwales.org/en/> also led by IBERS, is in collaboration with Bangor and Swansea universities. It is backed with £10.6 million from the European Regional Development Fund through the Welsh Government to help businesses develop new ways of converting crops such as rye grass, oats and *Miscanthus* (Asian elephant grass) into products including pharmaceuticals, chemicals, fuels and cosmetics. Aberystwyth is also working with Glyndŵr and Bangor universities investigating the production of novel biosurfactants and polymers as part of a rye-grass biorefinery, in a project funded by the Biotechnology and Biological Sciences Research Council. IBERS is also a partner in SUPERGEN, an Engineering & Physical Science Research Council funded Bioenergy hub <http://www.supergen-bioenergy.net/> which brings together UK industry and academia to focus on sustainable bioenergy deployment.

Aberystwyth and Bangor universities also have a **Research and Enterprise Partnership** established with funding from the Higher Education Funding Council for Wales (HEFCW), which includes a **Biosciences and Environment Alliance** (BEA) to create an international research and development hub that underpins the next phase of growth in the agriculture, food, bio-renewable and land based industries. The R&E Partnership draws together research capacity in 4 selected areas, 2 of which relate to this field: **The Centre for Integrated Research in the Rural Environment (CIRRE)** and the **Centre for Catchment to Coast Research (CCCR)**.

The £2.7M **Centre for Catchment & Coastal Research** <http://www.cirre.ac.uk/> integrates the study of rivers, estuaries and coastal waters in a single system to provide benefits for the long-term sustainable management of water, of rivers and of the land-ocean interface in Wales and internationally. There are strong links with the **National Environment Research Council (NERC)** **Centre for Ecology and Hydrology** (which partners with Bangor University in the Environment Centre Wales). The £5m **Centre for Integrated Research in the Rural Environment** <http://www.cccr.ac.uk/>

integrates research from molecular biology through ecology to the social sciences, to predict how landscape function and condition will change as a consequence of management and climate change.

At **Bangor University**, Professor Gary Carvalho of the **School of Biological Sciences** was also recently appointed to the UK National Committee for Biodiversity, which will represent the UK on the Intergovernmental Science-Policy platform on Biodiversity and Ecosystems. **Food and Water Security** is also a key area at **Aberystwyth**, lead by Professor David Kay, Head of the Centre for Research into Environment and Health, who has advised organisations such as the European Economic Community, UK Department of the Environment, National Rivers Authority, the House of Lords of the UK Parliament and the World Health Organisation/United Nations Environment Programme on water quality issues and the design of epidemiological studies.

Swansea University's Moving Animal Team and Technologies for Ecological Research (SMATTER) research centre examines the role of the environment in animal movement and distributions, and uses new technologies to access particularly intractable species. **EnAlgae**, a four-year £12 million transnational Energetic Algae project also led by Swansea University, is a strategic initiative funded by the INTERREG IVB North West Europe Programme via the European Regional Development Fund, and co-sponsors. It involves 19 partners and 14 observers across 7 EU member states and aims to reduce CO2 emissions and dependency on unsustainable energy sources.

At **Swansea Metropolitan, University of Wales Trinity Saint David**, the **Coastal and Marine Research Group** is also involved in important coastal research in areas such as shoreline responses to climate change and sea level rise <http://www.smu.ac.uk/research/index.php/coastal-and-marine-research-group>.

At **Aberystwyth University's Institute of Geography and Earth Sciences**, the **Centre for Glaciology** <http://www.aber.ac.uk/en/iges/research-groups/centre-glaciology/> is one of the leading British research groups concerned with the study of glaciers and their sedimentary products in, for example, Antarctica, Patagonia, Norway, the Nepalese Himalaya, New Zealand, the Peruvian Andes and the Yukon. Professor Michael Hambrey was awarded the Polar Medal by HM The Queen in 1989, and was recognised in the naming of "Hambrey Cliffs" on James Ross Island in Antarctica in 2006. There is also strong work in IGES in areas such as **Remote Sensing of Environments, Fluvial Health, Flood Risk, and Volcanism**, in which Professor John Grattan's volcanic research has been the subject of media interest, including the BBC docudrama "supervolcano" and BBC TV's Timewatch, which recently dedicated a programme to his research, (with the media-friendly title "Killer Cloud").

Bangor University hosts the **BioComposites Centre** www.bc.bangor.ac.uk/ which specialises in industrial contract research on the processing of wood and plant materials. The BioComposites Centre is a self-financing concern and part of the **Centre for Advanced and Renewable Materials** <http://www.carmtechnology.co.uk/index01.asp>, a centre for excellence in training and industrial collaboration, along with the **School of Chemistry at Bangor** and the **Centre for Water Soluble Polymers at Glyndwr University**. The BioComposites Centre also works with **Aberystwyth and Swansea universities** in the **Welsh Institute for Sustainable Environments** <http://www.wisenetwork.org/>. Also at Bangor University, the **School of Ocean Sciences** <http://www.bangor.ac.uk/oceansciences/> is especially well-known for work in **Fisheries Protection**

and Aquaculture. Since 2001, the School has published over 500 peer-reviewed papers and awards have exceeded £14.5M. Expertise in marine environmental management and operational oceanography is exploited by the [Centre for Applied Marine Sciences \(CAMS\)](#), together with Aberystwyth and Swansea universities, which has close links with national and international agencies and governmental bodies, and has had a profound impact on applied shelf sea science through work on particle tracking, oil spill management, and aquaculture and marine conservation. **The School has a Research Vessel, the [RV Prince Madog](#),** a state-of-the-art, 35-metre vessel which constitutes a national facility for the UK marine science community. **It also has an inshore boat fleet and seawater laboratories** providing experimental facilities of international standard. The university and companies such as **Babcock, Hitachi, Rolls-Royce, Horizon Nuclear Power, Magnox Ltd and EnergySolutions** are involved in early discussions on the possible development of a next generation nuclear power station in the area, and in the **Anglesey Energy Island Programme**, to establish nearby Anglesey Island as an international centre of excellence for the production of safe sustainable low-carbon energy.

SEACAMS <http://www.seacams.ac.uk/> is a new development to integrate research and business opportunities in the coastal and marine sector in Wales, and is a partnership between **Bangor, Swansea and Aberystwyth** universities. At **Swansea University** there is an **Institute for International Shipping and Trade Law**, which has expertise in Admiralty law, marine environmental conservation, EU maritime law and fisheries law and policy. There are plans for a pioneering tidal lagoon and associated electricity generating infrastructure off-shore at Swansea.

At Cardiff University, the **School of Earth and Ocean Sciences** <http://www.cardiff.ac.uk/earth/> is a large international research School whose staff are addressing themes including global change, biosphere-hydrosphere-geosphere interactions, environmental science, natural resource exploration, and the evolution of Earth and its biosphere. In addition to on-land activities, the **Marine and Coastal Environment Research** Group conducts research in marine science.

At the University of Glamorgan, the **Sustainable Environment Research Centre is leading the CymruH2Wales project** which will advance development of fuel cells and hydrogen combustion engines. This involves the **Renewable Hydrogen Research and Demonstration Centre** based at Baglan and much of the activity is embedded within **Wales' Low Carbon Research Institute**, established with funding from the Higher Education Funding Council (HEFCW). The university's **Engineering Research Centre** <http://www.engineering.research.glam.ac.uk> undertakes applied research in collaboration with industrial partners such as **Tata Steel, Arcelor Mital, RWE npower, GDF Suez and EDF**. Work in Energy Efficiency & Zero Carbon Emissions for Industrial Boilers & Furnaces has been funded by the European Commission through its Framework Programmes and the Research Fund for Coal and Steel. In Biohydrogen and Biomethane Production, research on the production of high quality biofuels in the form of hydrogen and methane gas from low grade biomass resources, using naturally occurring micro-organisms, has been funded through the Engineering and Physical Sciences Research Council, European Union FP6, European Union-IEE, Carbon Trust, Welsh Government and European Regional Development Fund.

Glyndŵr University's Centre for Solar Energy Research (CSER) is conducting important research into photovoltaics. Solar photovoltaic (PV) panels could supply up to 30% of Europe's electricity needs by

2050, significantly reducing carbon emissions. CSER is a leading centre for research into producing and characterising PV cells based on “thin film” materials. The **School of Electronic Engineering at Bangor University** is also working in photovoltaics, and is part of the ‘**Wales Ireland Network for Innovative Photovoltaic Technologies**’. [WIN-IPT](#) is part-funded by the European Regional Development Fund (ERDF) through the Ireland Wales Programme 2007-13, and also involves [Waterford Institute of Technology](#) and [Swansea University](#).

Aberystwyth, Bangor, Cardiff and Swansea universities launched the **Climate Change Consortium of Wales (C3W)** <http://www.climatechangewales.ac.k/> in 2009, funded by the Higher Education Funding Council for Wales (HEFCW), to improve fundamental understanding of the causes, nature, timing and consequences of climate change on earth's environment and on humanity. C3W has targeted four ‘Grand Challenges’ that need to be addressed through an interdisciplinary approach: Earth system modelling, sea-level change, hazard evaluation, mitigation and adaptation, and the Welsh dimension of climate change.

With funding from the Higher Education Funding Council for Wales (HEFCW), **Bangor, Cardiff, South Wales, Glyndŵr and Swansea** universities built on existing research expertise to form the **Low Carbon Research Institute (LCRI)** <http://www.lcri.org.uk> in 2009, to establish Wales as an internationally recognised centre for low carbon energy research. Research is in low carbon energy generation, storage and distribution; and carbon reduction and energy efficiency. The LCRI later launched its **Convergence Energy Programme**, with funding of more than £15 million in European Union funding matched with £19 million from Welsh universities and industry.

5. Intelligent Systems and Smart Living

Professor Ross King and colleagues at **Aberystwyth University, Department of Computer Science Intelligent Robotics Group** <http://www.aber.ac.uk/en/cs/research/ir/> developed 'Adam', the robot scientist, whose discover of new scientific knowledge **Time Magazine** rated the 4th most significant scientific discovery of 2009. Researchers at Aberystwyth and the University of Cambridge designed Adam to carry out each stage of a scientific process automatically without the need for further human intervention. The publication of the findings sparked world-wide media interest. The work was funded by the **Biotechnology and Biological Sciences Research Council (BBSRC)** and the Higher Education Funding Council for Wales amongst others. Biologically inspired models of control and cognition provide a common theme to much of the **Intelligent Robotics Group's** work, including robot vision systems work. Work in space robotics has been prominent with involvement in **Beagle2 and several future Mars missions** and the IRG has developed a number of robots – space, field, laboratory, space and humanoid – for applied research. For example, the iCub is a humanoid robot, developed under the [RobotCub project](#) and being used within the [IM-CLeVeR project](#) to investigate developmental learning processes in human infants. The **Department of Computer Science** at Aberystwyth has also developed new real-time dynamic passive profiling. The technique involves a special camera equipped with biometric sensors that detect fluctuations in a person's mood by taking thermal images of his or her face, allowing users to observe individual's feelings and emotions beyond what is expressed visually. The designers envisage it being used to prevent future criminal activity. In 2010, the research was presented at the Royal College of Art, London; **the first collaboration of its kind between the Engineering and Physical Sciences Research Council (EPSRC), the National Endowment for Science, Technology and the Arts (NESTA) and the Royal College of Art.** The Royal College of Art exhibition also led to the research being displayed at the **Museum of Modern Art.**

Bangor University's School of Electronic Engineering was ranked joint 2nd in the UK for research in electrical and electronic engineering in the 2008 RAE, with all of the research papers submitted rated 2*, 3* or 4* and 75% of 3* (internationally excellent) or 4* (world-leading) quality. It works closely with the university's **School of Computer Science**, to contribute to the development of electronics and technology. A current project led by Professor Jianming Tang looks at the use of **current optical internet cabling to increase broadband transmission by up to two thousand times** the current speed and capacity, regardless of subscribers' home location. To illustrate, that would mean downloading 20 feature length films in one second, which would revolutionise communication technology. Partners working with Bangor University in the consortium (project name **OCEAN**) include world leading technology companies and leading research institutes: **Fujitsu Semiconductors Europe, Finisar Israel, Fraunhofer Heinrich Hertz Institute and VPIsystems GmbH.** Valued at over three million Euros, the project is funded by the European Union.

http://www.bangor.ac.uk/international/documents/Bangor_International_%20December2012.pdf

The Centre for Advanced Functional Materials and Devices (CAFMaD) <http://www.cafmad.ac.uk/>, established with funding from the Higher Education Funding Council for Wales (HEFCW), brings together the **Institute of Mathematics and Physics (IMAPS)** and the **Visualisation Centre at Aberystwyth University**, and the **College of Physical and Applied Sciences at Bangor University.** CAFMaD's strengths are in materials, sensors, mathematics, space physics, synthesis and catalysis,

molecular modelling, visualisation, image recognition, characterisation, photovoltaics, biological chemistry, optoelectronics and high performance computing.

Bangor, Cardiff, Swansea and Aberystwyth universities operate the **Wales Research Institute of Visual Computing** <http://www.rivic.org.uk/>, also with funding from the Higher Education Funding Council for Wales, to amalgamate research programmes between their computer science departments. Visual computing represents one of the most challenging and inspiring arenas in computer science. Today, 50% of content on the internet is in the form of visual data and information, and more than 50% of the neurons in the human brain are used in visual perception and reasoning.

The **Advanced Medical Imaging and Visualization Unit at Bangor University** <http://medical-imaging.org.uk/>, funded by the Welsh Government **National Institute for Social Care and Health Research** (NISCHR), has developed a **surgical training tool for the iPad called 'VCath'**, designed to take a neurosurgical trainee through the steps of positioning and inserting a catheter into the brain of a virtual 3D patient. The 'VCath' enables neurosurgery trainees to improve their understanding and skill set needed for the procedure before having to perform in the operating theatre. The 'VCath' training tool, available to download from [iTunes](#), has been developed by the Unit at Bangor's [School of Computer Science](#), in collaboration with **Leeds General Infirmary and the Institute of Psychological Medicine and Clinical Neurosciences, Cardiff University**.

At Glyndŵr University, OptIC Glyndŵr, based at St Asaph, is a leading centre for the research and development of cutting-edge opto-electronics technology. It has facilities for techniques such as precision polishing of complex substrates such as lenses and mirrors; micro-structured patterned drums – using a unique drum diamond turning machine to replicate patterns/shapes/structures to tolerances and designs unparalleled in the world; and photovoltaics applied research, testing and manufacture. The university's **Centre for Solar Energy Research (CSER)** researches novel photovoltaic materials and devices, and is the base for the **Welsh Solar Car team**. Optic Glyndŵr is also the location for the manufacture of prototype hexagonal segments for the world's largest telescope, the €42m **European Extremely Large Telescope (E-ELT)**, to be built by the **European Southern Observatory in Chile**. The E-ELT will help address fundamental questions beyond the reach of current facilities, from detecting Earth-like planets around other stars, to resolving deep issues in our understanding of the large-scale structure and evolution of the universe. ESO is a pan-European consortium which operates major observatories in the Chilean Andes. In September 2011, [Prime Minister, David Cameron](#), described the work of Glyndŵr University and others in the project as 'world leading' in a keynote speech in Moscow attended by Russian President Dmitry Medvedev.

At the **University of South Wales**, The **Centre of Excellence in Mobile Applications and Services** <http://www.cemas.mobi/> conducts research covering the wide-spectrum of areas in Mobile Telecommunications, Wireless and Sensor communications and Internet technology. The research themes of the centre are **Futuristic Applications**: Application concepts that blend the mobile, internet and sensor-based technologies; and services and proof-of-concepts that may contribute to the "mobile/digital" revolution; and **Futuristic Network Infrastructure**: the establishment of next-generation network infrastructure as well as research on the emerging service delivery platforms. **The Smart Clothes and Wearable Technology Research Centre**, also within the University of South

Wales, <http://www.newport.ac.uk/research/ResearchGroups/scwt/aboutus/Pages/default.aspx> examines the role of wearable technology and how it can be deployed to create near market prototypes, examining motivations and commercial possibilities, in areas such as sport and fitness, corporate wear and inclusive design.

The National Centre for Product Design and Development Research at Cardiff Metropolitan University <http://www3.uwic.ac.uk/English/Research/Pages/PDR.aspx> is a multidisciplinary centre for product design and development which has run 39 completed Knowledge Transfer Partnerships with SMEs and large companies. **Design Wales** at the Centre leads a network of 11 European design organisations and regional policy makers, funded 75% by the European Commission and 25% by the Welsh Government, with a focus on the role of design in innovation policy. The **Medical Applications Group** works with hospital trusts, utilising design technologies for the development of prostheses and surgical planning and work for other clients is in consumer products, automotive, and defence.

The Institute for Sustainable Design <http://www.isdwales.com/en/about-us.htm>, comprises business, design and technical advisors from **Swansea Metropolitan, University of Wales Trinity Saint David and Cardiff Metropolitan University** who assist businesses through concept generation and development; product testing and prototyping; and manufacturing and implementation. For example, they have worked with Land Rover to generate design concepts that challenge the normal perception of what it is the company could offer their customers.

High Performance Computing Wales (HPC Wales) <http://www.hpcwales.co.uk/> is a development that is providing the most advanced and evolving computing technology available. It is a collaboration between all of the universities, Welsh Government and **Fujitsu**, with support from partners that include **Microsoft, Intel, Mellanox Technologies, The Numerical Algorithms Group (NAG), The National Science Foundation (NSF), ClusterVision, Symantec Corporation, The PSBA network (Public Sector Broadband Aggregation), Logicalis Group, Datadirect, IBM, Allinea Software, nVIDIA, CISCO and Lloyds TSB Bank**. HPC Wales will provide state-of-the-art HPC capability, technology, infrastructure and facilities on a pan-Wales basis, to deliver research innovation, high-level skills development and transformational ICT for wider economic benefit. The **Software Alliance Wales (SAW)** <http://softwarealliancewales.com/> supports innovation and growth amongst the ICT and Software Sector and creates a platform for developers to network and share best practice, and to promote Wales as a key driving force in software development. The project is led by **Swansea University in partnership with the universities of Bangor, South Wales, Aberystwyth, and University of Wales Trinity Saint David**. It is funded by the EU's Convergence European Social Fund through the Welsh Government.

6. Sports and Tourism

Cardiff Metropolitan University is one of the leading universities for student sport in the UK, with facilities and activities for elite athletes, students, staff and the community, including the **National Indoor Athletics Centre, Outdoor Athletics Track, and Tennis Centre**. Research and teaching are carried out in the **School of Sport** which offers courses such as Performance Analysis, Sport Psychology and Sport Conditioning, Rehabilitation and Massage.

<http://www3.cardiffmet.ac.uk/english/studyatuwic/virtualtours/pages/cardiff-school-of-sport.aspx>

The **UK's first Olympic gold medal** of 2012, and the first ever British Olympic gold medal in women's Rowing, was won by university alumna Helen Glover, with her partner. According to the results of the 2008 Research Assessment Exercise, 70% of the School's submitted research has international impact (2*) with a quarter being classified as internationally excellent (3*) or world leading (4*). The university power rankings calculated by Research Fortnight, based on the quality and quantity of research output, placed **Cardiff Metropolitan University** 6th in the UK in the Unit for Sports-Related Subjects. There were 38 institutions submitted in this subject field with Cardiff Metropolitan returning the 2nd largest number of research active staff. The university also has a **Centre for Performance Analysis** offering commercial services in the sports industry. Cardiff Metropolitan is planning a joint submission with the School of Sport, Health & Exercise Sciences at **Bangor University** under the 2014 Research Excellence Framework.

The School of Sport, Health and Exercise Sciences <http://www.bangor.ac.uk/sport/> at **Bangor University** is most known for **sport and exercise psychology, motor control and learning and exercise physiology** in which it provides support to elite athletes, national squads, the military and industry. The School was placed in the top 10 in the UK for Sport Science in the 2008 RAE (*Bangor University*) and the Independent Good University Guide 2013 (9 May 2012) lists the School as 3rd in the UK for Student Satisfaction. The School is accredited by the **British Association of Sport and Exercise Sciences (BASES)**.

The Department of Exercise and Sport Science <http://www.aber.ac.uk/en/sport-exercise/> at **Aberystwyth University** was recently ranked in the Guardian University Guide 2012 as 3rd best in the U.K. In the 2008 RAE, the department, returned for the first time since its formation in 2001, had 65% of research submitted rated as being recognised internationally (2*) and 15% being of international excellence (3*).

Other universities in Wales offer sport-related research and courses, combining to create a national level area of strength. At **University of South Wales'** facilities include a **School of Golf**.

<http://www.newport.ac.uk/study/subjectareas/sport/Pages/default.aspx>. Students have access to a dedicated Golf Director, a personal academic tutor and world-class facilities at the **Celtic Manor Resort** (venue for the 2010 Ryder Cup), which has a 28-bay floodlit driving range, short game practice facilities, 2 golf courses and a Golf Academy with computerised video swing analysis. Students follow a sports science programme developed to enable student golfers to continue to excel in the sport while studying for their degree. In addition, the university helps students to gain **National Governing Body coaching awards** and take work placements and provides 30 acres of playing fields at the Glamorgan Sport Park. This purpose-built playing area has five floodlit pitches and two all-weather pitches, one of which is a FIFA approved full-size 'rubber crumb' pitch.

Professional teams, such as the **Wales National Football Team** and **Cardiff City Football Club**, as well as the touring **New Zealand and South African rugby teams**, use the facilities for training. **Swansea University** is building a reputation for sport, with facilities including the **Wales National Pool** and a Sports Village, a strong relationship with the increasingly successful Premiership team [Swansea City Football Club](#), which uses the university playing pitches, and a strong history in Rugby. The university offers a popular BSc Sports Science course. The **Research Centre in Applied Sports, Technology, Exercise and Medicine (A-STEM)** <http://www.swansea.ac.uk/sport/> is a growing centre, based in the School of Engineering to exploit the synergies between sport and exercise science, technology, engineering and medicine. Partnerships have been developed with UK Sport including professional and international team and individual sports such as British Cycling, Welsh Rugby Union, Premier League Academies and MacLaren F1. At **Swansea Metropolitan University**, international placement opportunities on HND and BA programmes are available including: **Walt Disney World (USA)**, **CN Tower (Canada)**, **Holidaybreak (Mainland Europe)** and other companies. At **Glyndŵr University**, the on-campus sports centre is a premier sporting venue. The university owns Wrexham Football Club's Racecourse Football stadium **Glyndŵr University Racecourse Stadium**, the world's oldest active international football ground and Colliers Park Training Ground.

As well as the location for the Royal Welsh College of Music & Drama and the universities of Cardiff, Cardiff Metropolitan and South Wales' Atrium, Cardiff is the site of the 72,000-seat Millennium Stadium, Cardiff City Stadium (home of the Cardiff City Football Team and Cardiff Blues Rugby Union team), Cardiff International Sports Stadium, an athletic stadium which has a fully certificated international track & field facilities, and the SWALEC Stadium cricket ground. The ground opened in 2008 after a £9.5 million building project and was host to the Ashes Series in 2009. In Cardiff Bay, there is a 50-metre Olympic standard swimming pool, ice rink and white water canoeing and kayaking centre at the International Sports Village. Swansea is also particularly well-resourced for sport, with 6 leisure and sports centres.

The Tourism, Hospitality and Events Management Department at Cardiff Metropolitan University <http://www3.uwic.ac.uk/english/cardiff-school-of-management/tourism-hospitality-events-management/pages/home.aspx> provides courses in areas such as International Tourism, Marketing and Hospitality and students are able to undertake work placements in several countries. The department achieved a satisfaction score of 90% in the National Student Survey 2008 – the highest ever achieved by any university department in the UK. The **Welsh Centre for Tourism Research** <http://www3.uwic.ac.uk/english/cardiff-school-of-management/research/welsh-centre-for-tourism-research/pages/home.aspx> was the only tourism research centre in the UK to have its own research profile in the 2008 RAE. Over two-thirds of research was ranked as of international standing (2*) and a quarter was deemed to be world-leading (4*) or internationally excellent (3*). In the university power rankings calculated by Research Fortnight the Centre was ranked 6th in the UK for Sports-Related Subjects, including Tourism. The Centre has also established the **African Centre for Sustainable Tourism Development (ACSTD)** and the **Middle East and North Africa Tourism Research Centre (MENATREC)** to promote research and international partnerships in sustainable destination development. There are close links with the New Zealand Tourism Research Institute at Auckland University of Technology, Fayoum University in Egypt, the International University of Business and Technology, Dhaa in Bangladesh and the Institute for Tourism Research in Zagreb, Croatia.

The Food Industry Centre at Cardiff Metropolitan University

<http://www3.cardiffmet.ac.uk/english/aboutus/investing/pages/foodindustrycentre.aspx> supports food businesses in a technical and operational capacity, by providing expertise in Food Science, Nutrition and Dietetics, Environmental Health, Trading Standards and Biomedical Sciences. The Centre provides food processing facilities, test and development kitchens, a sensory evaluation suite and training facilities for food scientists, dieticians and nutritionists. Businesses come from a variety of food disciplines including baking, dairy and meat technologies, hygiene management, packaging design, technical management systems and new product development. Cardiff Metropolitan University is also planning to establish the first **Hotel School in Wales, in partnership with Tenby Development Trust**, to provide in-house training for students.

7. Creative Industries

This report uses a broad definition of *Creative Industries* to include research and teaching in areas including and beyond Architecture; Animation; Design; Fashion; Film and Photography; Music; Visual and Performing Arts; Television and Media. The UK's creative economy – which includes the creative industries as well as museums, galleries, libraries, orchestras and theatres – is, relative to GDP, probably the largest creative sector in the world. Chief Executive Officer of the Arts and Humanities Research Council, Professor Rick Rylance has said: "The UK is outstanding at many things and leads the world in some. Of these the quality and innovation of our research and the dynamism of our creative economy are two that stand out".

The Royal Welsh College of Music and Drama <http://www.rwcmd.ac.uk/> is the National Conservatoire of Wales and part of the University of South Wales Group. It prepares students to enter and influence the world of music, theatre and related professions using international-standard facilities, including a concert hall; the **Richard Burton Theatre** and 2 more theatres; state-of-the-art rehearsal studios; and the **Anthony Hopkins Centre** - an award-winning restoration of a former castle mews building. In 2009, in its 60th anniversary year, the College became **the UK's first All-Steinway Conservatoire**. In 2011, it launched new world-class facilities and is now a networking hub for arts professionals and a **public Arts Centre** with an annual audience of 65,000. Around 3,000 theatre designers are anticipated for the **World Stage Design Exhibition** in 2013 which will showcase work of 100 international theatre designers. Different disciplines co-exist, so that Opera students will perform on sets designed by Design students, and be accompanied by instrumental Music students. Many students also gain experience in practical skills such as Customer Service, Marketing and Health and Safety and one week a year the Arts Centre is run entirely by the students. Students perform at other venues internationally and in 2012 performed for the Queen at the opening of the Welsh Government 4th National Assembly. The College works with organisations such as the **BBC**, which provides professional work placements as part of student training and **Welsh National Opera**, which also provides opportunities for internships. It also has **8 International Chairs** held by artists such as Simon Halsey, who was recently awarded the Order of Merit of the Federal Republic of Germany for his outstanding services to choral music; actors Michael Sheen and Jonathan Pryce, and the Swedish trombonist, conductor and composer Christian Lindbergh.

At **University of South Wales**, creative industries work spans **Design** (Creative Writing, Advertising, Computer Gaming, Fashion), **Creative Music, Performing Arts, Photography** (Documentary Photography, Photographic Art, Contemporary Photographic Practice, Photography for Fashion and Advertising) and **Film & Screen Media** (Animation Direction and Production, Creative Audiovisual Media, Documentary Film and Television, Film and Video, and Scriptwriting for Film, Media and Stage). <http://www.newport.ac.uk/study/subjectareas/Pages/default.aspx>. Wales has been at the heart of animation for close to a century, and characters such as SuperTed and Fireman Sam have given Welsh animation a world-leading reputation. University of Wales, Newport provides industry-connected training in Animation with links with major companies such as Aardman and Dinamo Studios. The university's **Animation Direction and Production Programme** is one of six **UK Skillset accredited** Animation programmes. Film-making generally is strong at UW Newport: The film *Sisters-in-Law* co-directed by Florence Ayisi, Reader in Documentary Film at the university, has won over 28 prestigious awards including **PRIX ART ET ESSAI at Cannes film festival**. Asif Kapadia, a University of

South Wales Film Production graduate, won **Best Documentary and Best Editing at the 2012 British Academy of Film and Television Arts (BAFTA) Film Awards**, for his documentary story of legendary Formula One driver Ayrton Senna's career. *Senna* is Kapadia's second major BAFTA win. In 2002, he won for his film *The Warrior*, awarded the Alexander Korda Award for Best British Film and he won the Carl Foreman Award for the Most Promising Newcomer in 2003.

As well as its work in Animation and Film-making, **University of South Wales** carries out practical, applied research relevant to business and industry through a range of centres, such as the **European Centre for Photographic Research; Newport Design Centre**, involved in Sustainability & Design, Design for an Ageing Population, Smart Clothes and Wearable Technologies; and various business-facing units such as the **Centre for Research in Entrepreneurship and Marketing**, established to stimulate research in areas related to socioeconomic development activity. In partnership with **Swansea Metropolitan University and Aberystwyth University, University of South Wales** is also part of **Skillset Screen Academy Wales**, a recognised centre of excellence within the UK-wide Skillset Academy network <http://www.screenacademywales.org/>,

University of South Wales, Cardiff Metropolitan University, and more recently Swansea Metropolitan, University of Wales Trinity Saint David together form the **Wales Institute for Research in Art and Design** <http://www.wirad.ac.uk/>. In the RAE 2008, 70% of research was rated as internationally excellent (3*) or world leading (4*). There has been an Art School in Cardiff since 1865 and **Cardiff Metropolitan University** is in the process of building a new £14m Arts and Design Building, which will house a "FABrication" lab for the pilot test production of materials. The **School of Art & Design** has a strong teaching record in Illustration, Fine Art, Ceramics, Product Design, Textiles, Graphic Communication, Artist Designer Maker and Architectural Design and Technology. Its research, mainly conducted through WIRAD, ranked 11th in Research Power in the UK in the 2008 RAE. In the Assessment Exercise the Art & Design panel rated 95% of the research submission as international standard (2*), with 70% rated as either Internationally Excellent (3*) or World Leading (4*). World Leading research was specifically noted in the **Film Photography & Screen Media, Fine Art and Ceramics** research groups. Using Times Higher weightings the university's submission was 12th out of 70 in the UK. The School also provides courses open to all in the **Cardiff Open Art School**, is home to the **Cardiff Design Festival** and has a key partner institution in the **Samsung Art and Design Institute** in Korea.

At **Swansea Metropolitan, University of Wales Trinity Saint David**, the **School of Glass** <http://www.smu.ac.uk/index.php/potential-students/faculty-of-applied-design-and-engineering/swansea-school-of-glass> has a long-standing reputation as a centre of excellence in the field of stained glass. In 2013, the Schools of Glass, Product Design and Automotive Design will be centralised in a new **Sustainable Design Centre**.

Cardiff University is part of a new **Knowledge Exchange Hub for the Creative Economy, funded by the Arts and Humanities Research Council** to drive forward creative and digital innovation and bring benefits to education, society and business. It is a partnership between Cardiff, the University of the West of England (UWE), the universities of Bristol, Exeter and Bath, as well as Bristol's Watershed and creative industry partners <http://www.react-hub.org.uk/>. In total 4 new UK hubs were announced by the Arts and Humanities Research Council (AHRC) at an investment of some £16M

over 4 years. Professor Ian Hargreaves, Chair of Digital Economy in the **School of Journalism, Media and Cultural Studies and Cardiff Business School** will lead the Cardiff team's involvement. Last year Professor Hargreaves recently led an [independent review](#) of intellectual property, announced by Prime Minister David Cameron, and his report [Digital Opportunity](#) was published in May 2011. Of the new Knowledge Exchange Hub, David Willetts, Minister for Universities and Science said: "Interaction between businesses and universities is crucial for driving growth. It enables businesses and organisations to benefit from our world-class research base, gaining new knowledge and ideas. This major investment will not only enrich the creative industries but is also a vote of confidence in the excellent arts and humanities research at our higher education institutions."

At Cardiff University, the School of Journalism, Media and Cultural Studies

<http://www.cardiff.ac.uk/jomec/> was recently listed as one of the [top ten Journalism schools for Asian students](#) in the world. The School combines a long-standing record of excellence in teaching and journalism training with an outstanding research portfolio – with over 40 awards from a wide range of Research Councils, Foundations, Charities and the media industry since 2001. It offers courses in journalism, media, cultural studies and related areas as academic, research-based degrees or industry oriented, broadcast, magazine and newspaper practice-based training. Students come from all over the world and the School's reputation for international research was recognised in the 2008 RAE which judged 45% of the School's research to be 4* 'world-leading' and a further 30% as 3* 'internationally excellent', making it one of the UK's top departments in any field. No other institution in the field in the UK has achieved this level of excellence in academic teaching, postgraduate training *and* research.

The Atrium, also in Cardiff, is the base for the **University of South Wales' School of Creative and Cultural Industries** <http://cci.glam.ac.uk/>, and provides teaching under the themes of Animation and Visual Effects; Fashion and Retail Design; Communication, Design and Photography; Drama; Media; and Music and Sound. The School's Theatre and Media Drama Research Unit has secured a number of Arts and Humanities Research Council grants. The Atrium partners with Cardiff University's Confucius Institute in the **Wales-China Creative Industries Forum** to provide an opportunity to meet with industry experts from China <http://waleschinacreativeindustries.net/>. The School is working with **BBC Future Media** to develop a regional 'Connected Studio Partnership' which will provide facilities for exploring technology, content and new online platforms. BBC Future Media is responsible for output such as BBC iPlayer and the BBC News site. BBC Wales partners with a number of universities in Wales and is one of the occupants of a £5m **Centre for the Creative Industries** opened at **Glyndŵr University** in 2011.

The Department of Film, Theatre and Television at Aberystwyth University

<http://www.aber.ac.uk/en/tfts/> includes theatre spaces, digital media suite, rehearsal studios, HD digital television studio, 36 digital and HD editing suites and over 40 industry standard HD and digital cameras, digital sound studio with advanced multi-track digital recording and editing facilities. Its **Centre for Performance Research** has its own Resource Centre -a unique set of collections of books and audio-visual materials on world theatre and performance, lecture theatres with integrated screening facilities. (The **National Library of Wales**, one of 4 UK copyright deposit libraries, which is based in Aberystwyth, also includes the specialist National Sound and Screen Archive). The **BBC's mid-Wales offices and studios** are also housed in the Department. According to the results of the

2008 RAE, 30% of the Department's research is 'world-leading' (4*). A further 30% is rated as meeting the standards of 'international excellence' (3*), ranking 3rd in the UK by, Research Fortnight's 'Power' league table. Over 5% of the UK's total graded research in this field is conducted by staff within the Department. The Department is jointly responsible, with the History Department, for the [Centre for Media History](#) and along with the **Mercator Institute for Media, Languages and Culture** and other academic departments is involved in Aberystwyth University's [Minority Languages Research Group](#).

University of Wales Trinity Saint David hosts the Wales International Academy of Voice <http://www.tsd.ac.uk/en/wiav/> to provide a highly specialised environment for a small number of exceptional singers at the early-professional stage. Dame Kiri Te Kanawa is the Honorary President and Welsh tenor Dennis O'Neill CBE is the Director. The university has English-medium and Welsh-medium **Schools of Performing Arts** providing courses in Acting, Theatre and Production.

Bangor University is developing *Pontio*, to open in 2014 as a world class **Arts and Innovation** Centre to bridge arts and sciences, the University and the local community, and Bangor and the wider world. **The School of Creative Studies and Media** at the university specialises in Creative Studies, Film, Journalism, Media and New Media, Theatre and Writing. http://www.bangor.ac.uk/creative_industries/index.php.en?menu=0&catid=0.

8. Arts, Humanities & Social Sciences

There is crossover between the *Creative Industries* and *Arts and Humanities*, as well as between the *Social Sciences* and *Arts and Humanities*, which between them cover a very wide range of areas. For the purposes of this report, some highlights are covered separately in the Creative Industries section, and Arts and Humanities refers to areas such as Art, Literature, Performing Arts, Ancient and Modern Languages, History, Philosophy and Religion. The term Social Sciences includes areas such as Anthropology, Archaeology, Criminology, Cultural Studies, Economics, Human Geography, Psychology, Law, Politics and Sociology.

At Cardiff University, the School of Architecture <http://www.cardiff.ac.uk/archi/index.php> has a reputation as one of the best schools in the UK, recognised internationally for its research through a number of centres: **The Centre for Research in the Built Environment**, which focuses on the sustainable built environment; The BRE (Building Research Establishment) **Centre for Sustainable Design of the Built Environment**, a partnership with UK's largest built environment research organisation; **PRASADA** (Practice, Research and Advancement in South Asian Studies), which involves researchers in the UK and India specialising in the architectural and cultural heritage of India; and **The Design Research Unit Wales**, where design and research come together to produce innovative sustainable buildings. The **Cardiff University School of English, Communication, and Philosophy** has over a thousand students on degree programmes in language, communication, literature, critical theory, and philosophy. The research centres are: Critical and Cultural Theory; Editorial and Intertextual Research; Health Communication Research; Language and Communication Research; and Applied Ethics. There is also the 'Wales-Ireland' and the **Philosophy of Mind** research networks. In the 2008 RAE, English at Cardiff was ranked 7th in the UK for 'research power' (quality multiplied by size), and given the highest possible score for 'Environment and Esteem'. **Cardiff University School of European Languages, Translation and Politics** has an international reputation in research and appears in the first quartile on all major indicators in the Research Assessment Exercise, including 2nd out of 27 for Research Power. **Political Science** at Cardiff achieved the ranking of excellent in the most recent *Centre for Higher Education Development (CHE) Excellence Ranking* which rates the School among 'the most interesting places in Europe for doing your master's or doctoral degree.' Cardiff was 1 of only 21 universities in the UK to be ranked excellent on the basis of publications, citations and mobility. The **School of Law at Cardiff University** is recognised as a leading legal research institute. In the RAE 2008 nearly all research activity was classed as 4* world leading or 3* internationally excellent and the School was ranked 7th out of the 100 Law Schools in the UK. The School runs an award-winning Pro Bono Scheme, mooted competitions and client interviewing competitions.

Cardiff University's School of Planning and Geography is a leading international centre for teaching and research in spatial planning and human geography. A multi-disciplinary applied human geography and urban studies school ranked 1st in the UK in the 2008 RAE for spatial planning research and professionally accredited education. Teaching Excellence is consistently high with a **95% satisfaction rate** in the 2011 National Student Survey. The research centres include the **Sustainable Places Research Institute** <http://www.cardiff.ac.uk/research/sustainableplaces/>; an ESRC Centre for Business Relationships, Accountability, Sustainability and Society <http://www.brass.cf.ac.uk/>; and **Wales Institute of Social & Economic Research, Data & Methods**

<http://www.wiserd.ac.uk/about-us/organisation/wiserd-partner-institutions/wiserd-at-cardiff-university/>, all of which bring together scholars from across the University. WISERD was established with funding from the Higher Education Funding Council for Wales (HEFCW) and the Economic and Social Research Council (ESRC).

At **Aberystwyth University**, 40% of research submitted by the **Department of International Politics** is rated 4*, placing the Department in the top 3 (*THES*) in the UK. 65% of research submitted by the **Institute of Geography and Earth Sciences** and the **Department of Welsh** is rated 4* (world-leading) or 3* (internationally excellent) and 60% of research submitted by the **Department of Theatre, Film and Television Studies** is rated 4* or 3*. The **Department of International Politics** is renowned for teaching and research that has helped to shape the direction of the field and shed light on some of the most urgent problems of contemporary international politics. The university's **Department of Law and Criminology** delivers research of international quality in the fields of law, sociolegal studies and criminology.

Of the 5 research centres in Aberystwyth's **Department of English & Creative Writing**, 2 are collaborative ventures with Bangor University: **Contempo** is a joint project between the English and Creative Writing Departments at Aberystwyth and Bangor, and the **Institute for Medieval and Early Modern Studies** (established with funding from the Higher Education Funding Council for Wales). The **Anglo-Norman Dictionary project** (AND) based in the **Department of European Languages** at Aberystwyth University, has been awarded the Prix Honoré Chavée by the Académie des Inscriptions et Belles-Lettres in Paris. Its Director, Professor David Trotter has recently been awarded a further £802,412, bringing the total awarded to this project since 1996 from Research Council and other sources to £2.28 million. Aberystwyth's **Department of Information Studies** has an international teaching reach and a well-established reputation for research. Contemporary issues relate to intellectual property, cultural memory and identity, and communication and creativity in a digital age <http://www.aber.ac.uk/en/media/research-highlights-2010-11-english.pdf>.

In the 2008 RAE research in the areas of **Accounting, Banking and Finance at Bangor Business School** was rated 1st in the UK (*The Guardian*). It has one of the largest PhD cohorts of any business school in the UK, was the 1st UK university to introduce an MBA in Banking and Finance, and is now offering the UK's 1st combined MBA and Chartered Banker status. The university is home to a conference centre and hotel on campus http://www.bangor.ac.uk/management_centre/. Also at Bangor University, **Psychology** has been previously mentioned. In the 2008 RAE, **Sports Science** was placed as one of the top 10 in the UK (with all of the department's staff submitted). The **School of Music** had 90% of the research staff it submitted rated as 4* world leading or 3* of international quality.

At **Swansea University**, the programme in **Classics, Ancient History and Egyptology** <http://www.swan.ac.uk/classics/> studies the ancient civilisations of Egypt, Greece, and Rome. The School works closely with the **Egypt Centre** <http://www.egypt.swan.ac.uk/>, which houses some 3000 archaeological objects of Egyptian material culture. In the 2008 RAE, which evaluated 100% of the academic staff of the Department of Classics, Ancient History and Egyptology, 75% of research activity was graded as 2*, of a quality that is recognised internationally in terms of originality, significance and rigour, or higher. **Swansea University's Research Institute for Arts and Humanities**

(<http://www.swan.ac.uk/riah/>) hosts two research centres: the **Callaghan Centre** for the Study of Conflict, Power and Empire, which manages major Research Council funded projects; and the **Richard Burton Centre** for the Study of Wales. In September 2010 Swansea University embarked on the Economic and Social Research Council funded project *History, Heritage and Urban Regeneration: The Global and Local Worlds of Welsh Copper*. Project partners include the National Waterfront Museum, the Royal Commission on the Ancient and Historical Monuments of Wales, the University of South Wales, and the City and County of Swansea. The copper industry in the area was once the centre of the international trade in copper, the world's first globally integrated heavy industry.

American Studies in the Department of Political and Cultural Studies at Swansea University

<http://www.swan.ac.uk/american/> is a leading centre for American literature, history and politics and popular culture. Its links have also provided extensive Study Abroad opportunities for students to go to or visit from the United States <http://www.swan.ac.uk/international/opportunities/>. The university is also growing its **Translation Studies** <http://www.swan.ac.uk/translation/>, which in addition to research and teaching is home to **OPTIMALE** (Optimising Professional Translator Training in a Multilingual Europe), an Erasmus Academic Network involving 70 partners from 32 different European countries, funded by an EU grant of over 1 million euros. The university's **Research Institute for Applied Social Sciences**, <http://www.swan.ac.uk/riass/Institute> also aims to be a significant contributor to the development and training of the next generation of social scientists. The Economic and Social Research Council has recently concentrated doctoral funding in fewer Institutions across the UK, leading to the creation of the Wales ESRC Doctoral Training Centre (DTC), in which Swansea University is a member.

The Institute of Classics and Ancient History brings together the 3 Welsh Classics and Ancient History departments, in **Cardiff, Swansea and University of Wales Trinity Saint David** (at Lampeter). <http://www.cardiff.ac.uk/share/research/ancienthistory/uniwalesinstitute/index.html>. The Institute oversees the biennial Celtic **Conference in Classics**, which rotates between Wales, Scotland, Ireland and Brittany, and a programme of international conferences. The former University of Wales Lampeter, now part of **University of Wales Trinity Saint David**, submitted research in 4 areas to the RAE 2008. In relation to Arts, Humanities and Social Sciences, 15% of activity in the **Archaeology, History & Anthropology** research cluster was identified as 4* "world-leading" in terms of its originality, significance and rigour, whilst 90% of activity in **Theology & Religious Studies** was considered to be of international quality (2*). Classics also performed well with a high percentage of early career researchers <http://www.trinitysaintdavid.ac.uk/en/research/raeresults/>

Within the **Faculty of Business and Society at the University of South Wales** <http://fbs.glam.ac.uk/subjects/research> in **English, History and Criminology** is practical and applied. For example, research into criminal typology by Dr Fiona Brookman, the university's Head of Criminology, is the only academic work cited in the Murder Investigation Manual, the definitive guide on homicide investigation and a reference point for the investigation of all major crime. The University has a range of focused applied research, including centres and units for **Enterprise; Research in Futures and Innovation; Consumption, Markets and Culture; Criminology; Gender Studies in Wales; History Research; Lifespan Research; and Psychology Research**. The Faculty of Business and Society also maintains strong links with professional bodies such as chartered institutes

and professional councils to benchmark ensure the content of the academic portfolio against the demands and requirements of work <http://fbs.glam.ac.uk/accreditations/>.

Wales Institute of Social and Economic Research, Data and Methods <http://www.wiserd.ac.uk/> involves **Cardiff, Swansea, Aberystwyth, Bangor and South Wales** universities and draws together expertise in quantitative and qualitative research methods and methodologies at the partner institutions. As well as building research capacity on a Wales basis, WISERD contributes to UK wide capacity building through its involvement in the **Economic & Social Research Council's National Centre for Research Methods**. WISERD has facilitated a high number of research bids from across the social science sector.

9. Educational and Social Access and Justice

The Welsh Centre for Crime and Social Justice <http://wccsj.ac.uk/>, funded by the Higher Education Funding Council for Wales, brings together academics from the universities of **Aberystwyth, Bangor, Cardiff, Cardiff Metropolitan, Glamorgan, Glyndŵr, Swansea and University of South Wales** to generate theoretically informed, policy-relevant research on crime and social justice. The Centre also works in partnership with the **Universities Police Science Institute** <http://www.upsi.org.uk/> (South Wales and Cardiff), and the **Wales Institute of Social and Economic Research, Data and Methods** (WISERD).

Wales Observatory for Human Rights in Children <https://twitter.com/WalesObsHrcyp>, <http://www.facebook.com/WalesObservatoryHRCYP> is based in **Swansea University** as a forum for research, advocacy and expertise on human rights of children and young people and is associated with the World Congress on Rights of Children and Adolescents. The **Centre for Welsh Legal Affairs at Aberystwyth University** <http://www.aber.ac.uk/en/law-criminology/research/cwla/> was one of the initial collaborative partners of the Wales Observatory on Human Rights of Children and Young People. Some of the human rights work at Aberystwyth, conducted independently by the university and in conjunction with the Wales Observatory can be seen at <http://www.aber.ac.uk/en/law-criminology/research/fundedresearchprojects/>. The **Social Ethics Research Group at University of South Wales** combines research and teaching in a range of fields including distributive and social justice; the welfare state; disability rights; professional ethics; toleration and multiculturalism; equality; human rights; liberalism; migration; democracy; authority and legitimation; environmental ethics and healthcare ethics. The university has a new MA degree in Social Ethics and Public Advocacy <http://www.newport.ac.uk/research/ResearchGroups/serg/aboutus/Pages/default.aspx>.

The Centre for Migration Policy Research <http://www.swan.ac.uk/cmpr/> is an inter-disciplinary Research Centre based at **Swansea University**. At a time when asylum and migration issues are high on political and policy agendas, the Centre aims to encourage the exchange of ideas and ensure that policy making is underpinned by empirical evidence. Research Associates have regional expertise which includes Wales and the UK, Europe, Sub-Saharan Africa and South East Asia. The Centre has its own video channel on **Human Rights TV**. In the **Research Institute for Applied Social Sciences**, other groups associated with educational and social access and justice are the **Global Drug Policy Observatory** and the **Centre for Criminal Justice and Criminology**.

At **University of Wales Trinity Saint David**, the **School of Social Justice and Inclusion** <http://www.trinitysaintdavid.ac.uk/en/schoolofsocialjusticeandinclusion/> provides foundation courses and degrees in areas such as Inclusive Studies for Teaching Assistants; Special Educational Needs; Adolescent Psychology; and Youth and Community Work, with the aim of combining academic challenge and vocational elements.

The Centre for Criminology at University of South Wales <http://criminology.research.glam.ac.uk/>, previously mentioned under Arts and Humanities, delivers teaching, research and consultancy in criminology, which encompasses the study of crime, criminals, victims and the criminal justice system, including the police, court systems and prisons. **Universities Heads of the Valleys Institute**

(UHOVI) <http://www.uhovi.ac.uk/index.aspx> is a strategic partnership between the University of South Wales with further education colleges and training providers, local authorities, businesses, schools and the voluntary sector. The Institute provides a wide range of higher education courses of varying lengths, in a number of different subject areas to those who may be employed or unemployed, at local colleges and community venues.

Open University in Wales <http://www3.open.ac.uk/near-you/wales/index.asp> provides flexible support, tailored to the needs of the individual student and their area of study. Widening access to higher education is a major objective of the Welsh Government, and is core also to the Open University's mission to create an inclusive and socially just Wales, where each citizen has the opportunity to fulfil their potential and contribute to a more economically prosperous nation. **Wales Open Learning Portal.** There is already a UK Open Learning Portal and the universities in Wales, including the Open University, are involved in early discussions about a potential Open Learning Portal to provide one-stop access to on-line open education resources across higher education in Wales.

10. International Engagement

Research, teaching, staff and students are becoming increasingly international and mobile. In 2012, there were about 200 international branch campuses worldwide and the number continues to grow, although not without challenges (*Observatory on Borderless Higher Education, 2012*). New education hubs are developing and attracting growing concentrations of mobile students: South Africa, for example, received 17% of mobile students from sub-Saharan Africa in 2010 and in the same year at least 3.6 million students were enrolled in tertiary education abroad globally, up from 2 million in 2000 – so the number of internationally mobile students (who have crossed a national border to study, or are enrolled in a distance learning programme abroad) has grown by 78% in a decade (UNESCO).

In the UK, there were 2,496,645 students in total enrolled at higher education institutions in 2011-12, of which 132,550 were from other European Union countries and 302,680 were from other parts of the world (HESA).

As well as international engagement with governments, organisations and other bodies internationally, universities in Wales have an enormous number student and staff exchange and mobility agreements, teaching articulations and research partnerships. Agreements number in the hundreds at larger institutions and are impossible to list in full in this report. There has been a change in approach to international collaboration, particularly in the last 5 years, towards more strategic, sustainable partnerships with key partners. University curricula are also becoming increasingly international to encourage an understanding of cultural diversity, global influences and entrepreneurialism.

Cardiff University engages with universities worldwide. Its relationship with China is described below as it demonstrates how universities in Wales are building strong, broad relationships internationally.

The university has a **Joint Institute for Oncology Research with Peking University** and an **International Centre for Biomedical Research with China's Capital Medical University**. The work of this partnership, which aims to find new ways of detecting and treating breast cancer, won **1st in the International Collaboration category at the annual Times Higher Education Awards in 2011** and over 20 research fellows from CMU have spent time at Cardiff. Cardiff University's Honorary International Pro Chancellor is Professor Zhong Binglin, President of Beijing Normal University, and a Cardiff engineering alumnus, and many Chinese academics work at Cardiff. There are also about 950 students from mainland China (the university is one of few in the UK to have a presence on the Weibo social networking site) and in 2012, an award ceremony took place in the Great Hall of the People in Beijing, honouring 15 scholars who had taken part in the **China Medical Scholarship programme**, which brings gifted young medical students to Cardiff. Another area where there have been particularly close links between Cardiff and China is in Engineering, especially in relation to electrical power engineering. There is a 'two plus two' programme involving **North China Electric Power University**, whereby students spend two years studying in China and two years at Cardiff, and a similar partnership with **Beijing Jiaotong University**. The Welsh School of Architecture has been working on projects in China for some twenty years. Their recent work has focused particularly on

the creation of sustainable buildings, through the Cardiff-led Low Carbon Research Institute, which has set up 3 low carbon research centres in China at the **Chongqing Academy of Science and Technology (CAST), Tianjin University, and Nanchang University**. The School of Architecture has also been working with **Hong Kong Polytechnic University** to develop environmental assessment models tailored specifically to Hong Kong, with the ultimate aim of enabling buildings to be designed there that are more environmentally friendly. Professor Phil Jones, Chair of Architectural Science and Head of School at the Welsh School of Architecture, and his team also recently refurbished a temple in Guangzhou to create a sustainable, low-energy conference centre for the **South China University of Technology**. The School is now involved in a project funded by CAST, the **Chongqing Iron and Steel Design Institute, and the UK Foreign and Commonwealth Office**, looking at the lessons that can be learned from ongoing low carbon building projects in Chongqing, and their further implications for developing buildings standards.

At **Cardiff Metropolitan University**, European Projects are core to the Internationalisation Strategy. These come about largely as a result of successfully applying for European Commission funding. Cardiff Metropolitan is currently the only university in the UK that coordinates 5 different **Erasmus Mundus Action 2 – EMA2 projects**, led by Professor Mohamed Loutfi, Pro Vice-Chancellor International and his team. These offer financial support to undertake staff and student mobility exchanges level between Europe and other countries. The university's current partners include Egypt, Morocco, Algeria, Tunisia, Libya, Lebanon, Syria, Jordan, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan, India, Western Balkans and the Caucasus region. Also, within **TEMPUS**, Cardiff Metropolitan coordinates the **Tempus Leadership in Higher Education Management project**, working closely with the Leadership Foundation. The project stakeholders include 4 Arab ministries, Magna Charta Observatory, UK Leadership Foundation, the Arab Network for Quality Assurance Agencies, Association of Arab Universities and Women in Higher Education Elite Leaders (WHEEL). The project aims to help on three levels: Existing Leaders, Potential Leaders and Aspiring Leaders. The university also coordinates the Tempus **Building Capacity in University Management project, which** involves 10 universities in Libya, Morocco, Egypt and Lebanon and aims to satisfy the Middle East and North Africa regional priority of University Management and Student Services. The wider objective of the project is to demonstrate that good management practices can build sustainable higher education cooperation between nations, by addressing the challenges facing the management of a global university in the 21st Century. Cardiff Metropolitan University also has an extensive Transnational Education Network involving partners in Bulgaria, Egypt, Hong Kong, India, Korea, Lebanon, London, Morocco, Singapore, Sri Lanka and South Africa. The university is also developing collaborative distance learning programmes, delivered 100% online, with partners in India, Lebanon and South Africa. Building on the transnational and Erasmus Mundus partnerships, the university is able to offer home students study abroad opportunities at over 50 institutions in 24 countries.

Wales is home to 3 **Confucius Institutes** offering language courses and programmes and raising awareness of Chinese language and culture, with support from the Welsh government and from the Office of Chinese Language Council International (Hanban), which acts on behalf of the Chinese government to raise awareness of Chinese culture. The **Cardiff Institute partners with Xiamen University**. At **University of Wales Trinity Saint David, the Confucius Institute is in partnership with Beijing Union University** and the the first Confucius Institute in the world with a distinctive legal

flavour is based at **Bangor University in collaboration with China University of Political Science & Law**. The latter Institute's unique focus means that it promotes exchange in legal culture between the UK and China and fosters greater understanding of the legal culture in China.

In 2012, **Swansea University** secured £500,000 in the form of an **Engineering and Physical Sciences Research Council (EPSRC) grant for *Building Global Engagements in Research (BGER)***, awarded specifically to internationally mobilise staff expertise. It has facilitated a series of staff exchanges over a 12 month period. Through the **Global Hub in Medical Technologies and NanoHealth**, Swansea researchers exchange knowledge face-to-face in China, France and the US, where partners include Texas A&M University, Rice University, the Methodist Hospital Research Institute, Texas. The university has also secured research projects in collaboration with leading Chinese telecom company, Huawei Technologies Co. Ltd and is the only UK university to have signed a Master Research & Development Framework agreement with them. Swansea University is also heavily involved in the **Science Without Borders** Scheme, which has brought over 70 Brazilian postgraduates to the university alone (as well as some to other universities in Wales) and is helping to generate government and industry connections with Brazil.

Aberystwyth University has over 150 international partnerships; for example the Institute of Biological, Environmental and Rural Sciences partners various international organisations in research and socially important development <http://www.aber.ac.uk/en/media/Brochure---Partnerships-for-International-Agricultural-Development.pdf>. **Bangor University's** International Partnerships and Development Office is responsible for international institutional partnerships with universities, government bodies and industry. The office supports and promotes international collaborations and developments, trans-national education and taking university expertise around the globe. The university has close links with institutions such as **KYM International, Malaysia, Beijing Normal University, China and Central College Abroad, Iowa** and works with partners around the world in countries as diverse as **Columbia, Costa Rica, Iraq, Qatar, Tanzania and, Vietnam**. The university recently established key partnerships with the **Research Institute of Tsinghua Shenzhen** and with **Central South University of Forestry and Technology in Changsha**, which will become the base for a **Bangor University campus in China** http://www.bangor.ac.uk/international/other_partners.php. **Glyndŵr University** engages with universities in countries including the USA, Russia, Malaysia, China, India, Japan, Ukraine, Iraq and Sudan. The Phillips Hydrocolloids Research Centre has built an international reputation in water soluble polymers and hydrocolloids, with much of the work funded by the university's industrial partner in Japan – **SanEi Gen** – together with Phillips Hydrocolloids Research Ltd. The success of this collaboration has led to the launch of a new research centre in Wuhan, central China. The university also organises an annual international conference on Advanced Composite Materials and Technologies for Aerospace Applications in collaboration with **Bauman Moscow State Technical University**.

Partnerships that include student exchange are widespread in the US, arising in part from their established interest in semester and year abroad schemes, and in Europe largely as a result of EU mobility schemes such as Erasmus. Increasingly though, universities are offering home students other opportunities to study part of their course elsewhere. **Bangor University** operates a **Worldwide Exchange Programme** to give undergraduate students at Bangor the opportunity to study for a period in Australia, Canada, China, Japan, South Korea, Singapore or the USA as part of

their degree. **Swansea Metropolitan, University of Wales Trinity Saint David**, which has internationalised its student base only within the last 5 years or so, has teaching partnerships with universities in Finland, China and elsewhere. **University of South Wales** has Study Abroad and other partnerships reaching back 20 years, across Europe and in India, Canada and the USA. It is also the base for the Wales International Study Centre, in partnership with Study Group, which provides pre-degree pathways for international students who want to study at a university in Wales <http://www.studygroup.com/isc/wales/> and is a model of best practice in web information provision for international students <http://international.southwales.ac.uk/>. **University of Wales Trinity Saint David** has study abroad partnerships providing home students with opportunities in Performing Arts at Rio Grande and California State Fullerton in the USA (including through the medium of Welsh); and other subjects in Norway; Hong Kong; Canada; Sweden; Tarragona, Spain; Italy and Turkey. **Swansea University** includes a year abroad option in 27 academic areas of study, in a wide range of countries, as well as **Work Abroad** opportunities such as ERASMUS work placements in Europe or internships in India.

Former international students of universities in Wales have gone into business, education, the arts, sport and politics in most countries of the world, and become very important contacts for the universities and for Wales. Some have achieved international prestige, such as Ahmad Tejan Kabbah, as President of the Republic of Sierra Leone; Datuk Hishamudin Tun Hussein, as Minister of Education in Malaysia; His Excellency Dr Mohamed Latheef, as the Ambassador Extraordinary and Permanent Representative to the United Nations for the Republic of Maldives; and Sulak Sivaraska, the human rights campaigner in Thailand, awarded the Right Livelihood Award in 1995 and twice nominated for the Nobel Peace Prize.

11. Celtic Identity, Bilingualism, Languages and Culture

The universities of Aberystwyth, Bangor, Cardiff, Cardiff Metropolitan, South Wales, Glyndŵr, Swansea and University of Wales Trinity Saint David offer degree courses through the medium of Welsh, the benefits of which include greater employment opportunities on graduation.

As well as the study and teaching of Welsh as an academic subject and to language learners the universities have diverse strengths in bilingualism, multilingualism and languages:

At **Bangor University**, there is academic expertise in bilingualism and multilingualism across Education; Psychology; Linguistics and Modern Languages. The School of Welsh is at the heart of Welsh literary life and aims to be an interface between creative practice in Wales and a wider international audience. Cross-disciplinary research centres include the **Welsh Institute for Social and Cultural Affairs (WISCA)**, home to a **Welsh Diaspora Research Group** and the **R.S. Thomas Study Centre**. The **Centre for Place Name Studies** is also part of the School of Welsh, where the Place-Name Database is recognised by the National Archives as an example of best practice research, and forms the basis of the *Dictionary of the Place-Names of Wales* (2007). Supported by an Arts and Humanities Research Council grant, it is the most comprehensive published work of its kind. Pioneering work by the university's **Language Technologies Unit** was highlighted in the Welsh Language Board launch of an on-line version of Geiriadur yr Academi, the Welsh Academy English-Welsh Dictionary. The university's **Centre for Galician Studies** researches contemporary Galician culture, language and politics from multiple perspectives. Issues pertaining to bilingualism and cultural identity and their relevance to both Galician and Welsh culture are a particular interest.

Cardiff University's School of European Languages, Translation and Politics has an international reputation in research and appears in the first quartile in all major RAE indicators, including 2nd out of 27 for Research Power. The **School of Welsh** is the base for the oldest established Chair of Welsh and for over a century the department has produced eminent scholars and writers, including W. J. Gruffydd, G. J. Williams, A.O.H. Jarman and Saunders Lewis. As well as degree teaching, work with the local community is conducted through the [Welsh for Adults Centre](#), and the School hosts the [Cardiff Centre for Welsh American Studies](#) and the [Language, Policy and Planning Research Unit](#).

The work of the Department of **European Languages at Aberystwyth University** has been highlighted in the Arts, Humanities and Social Sciences section of this report. The university is also home to the **Mercator Institute for Media, Languages and Culture** <http://www.aber.ac.uk/en/tfts/research/groups-grwpiau/theatr-cyf-cym/mercator/> which hosts projects in languages, creative and literary translation, media, publishing and culture, with much of the activity based around European and world-wide networks. Minority languages are at the forefront of the Mercator Institute's mission, and most of its projects include these languages alongside state languages and transfrontier languages. The Institute's current projects include:

- [Mercator-Media](#)
- [Literature Across Frontiers](#) including [Transcript](#) Review of Books and Writing
- [Wales Literature Exchange](#), including Translation House Wales and Writers' Chain
- [Mercator Network of Language Diversity Centres](#)
- [Broadcasting Compliance Monitoring and Research Unit](#)

Courses at the **School of Welsh and Bilingual Studies at University of Wales Trinity Saint David** include Bilingualism and Multilingualism, Simultaneous Translation and Subtitling. Supporting the enhancement of Welsh heritage in a global context is another key element of the School's work. The distance MA in Celtic Studies attracts students from all over the world, and the MA in Bilingualism and Multilingualism is also available via a distance learning option. Key to the work of the School is CAIACH, the **Centre for Language Study, Education and Community** which offers a specialist service to support training and educational needs in the field of language planning in Wales. The university also provides study abroad opportunities in the USA for home students through the medium of Welsh, for example in performing Arts.

Swansea University students can study a wide range of combined honours courses with Welsh, in particular with another language such as Welsh and German, Greek or Spanish. Courses such as Modern Languages, Translation and Interpreting can be studied part-time at bachelor's, master's and PhD level, and there is a 240-credit (120 ECTS) version of the MA programmes, designed for students based in continental Europe or planning to work there after their degree. The university's **OPTIMALE** project (Optimising Professional Translator Training in a Multilingual Europe) is an Erasmus Academic Network involving 70 partners from 32 different European countries which builds on work being undertaken by the European Masters in Translation Network, in which the university is also involved. The overall aims of both projects are to enhance the quality of translator training throughout Europe, and to increase the status and visibility of the translation professions.

Coleg Cymraeg Cenedlaethol <http://www.colegcymraeg.ac.uk/en/> plans, supports and develops Welsh-medium education and scholarship at universities in Wales. An integral part of the Coleg is 'Y Porth' ("the gateway"), a collaborative e-learning platform for the Welsh-medium higher education sector. The College has branches in every university that offers degree studies through the medium of Welsh: Aberystwyth, Bangor, Cardiff, Cardiff Metropolitan, Swansea, University of South Wales and University of Wales Trinity Saint David.

12. Student Experience, Employability and Support

Universities are increasingly under pressure to succeed by the criteria of numerous sets of indicators and surveys by governments, agencies and the media. The outcomes, often in the form of rankings, are shared instantly via formal and informal social media. These rankings have a significant influence on the decisions and choices made by students in particular.

Rankings are not always objective. They often apply set criteria which provide universities with advantages or disadvantages and do not necessarily take account of individual characteristics or niche strengths. They also frequently depend on indicators that have a financial element, putting institutions at a disadvantage if their HE funding is lower than other regions. But they are useful and used by a variety of audiences. Universities in Wales perform particularly strongly in independent surveys of the student experience: The results of surveys such as the *National Student Survey*, *Times Higher Education's Student Experience Survey* and *I-Graduate International Student Barometer* are very positive and are attached in an annexe to this report.

Student employability is an important aspect of support. Industry partnerships are an essential part of this, creating opportunities for work placements and pathways into employment, commerce and business. 91% (HESA data) of graduates from full-time degree courses in Wales are employed six months after leaving higher education, which is higher than the UK average, and 37% of these are employed in managerial or professional jobs. Most of the universities offer work placements and internships, which are an increasingly important feature: Examples include Swansea Metropolitan University, University of Wales Trinity Saint David internships with Walt Disney World and CN Tower; Royal Welsh College of Music and Drama internships with the BBC and Wales national Opera; University of South Wales students working in sports organisations and Swansea University students taking ERASMUS work placements in Europe and internships in India.

The Confederation of British Industry Wales (CBI Wales), the National Union of Students Wales, the Higher Education Funding Council for Wales and Higher Education Wales (the Committee of Vice-Chancellors) have developed a **Skills and Employability Framework** to improve the job-related skills of graduates from universities in Wales. There are 3 key areas: work placements and work experience; employer approved courses; and embedding employability skills across all higher education curricula [HEFCW website](#).

Go Wales <http://www.gowales.co.uk/> is an initiative jointly funded and managed by the European Social Fund (ESF) and Higher Education Funding Council for Wales. It co-ordinates work placements, work experience and other services for European students, graduates and businesses to retain graduates' high level skills, knowledge and innovative potential in businesses in Wales. Between 2009 – 2011, 1,413 students and graduates secured paid GO Wales work placements, 65% of students and graduates on placement were offered longer term work with the host company or another SME afterwards, 1,128 students and graduates took part in a Work Taster to improve their employability and 1,650 businesses took part in GO Wales. Also related to the employability objective, **Future Directions for Higher Education in Wales** is a Higher Education Academy project to enhance specific areas of the student learning experience. The current enhancement theme is 'Graduates for Our Future', which is being delivered through three strands: Students as Partners;

Learning in Employment; and Learning for Employment. Details are available on the [HEA website](#). **Swansea Employability Academy (SEA)** is a partnership between the university, its students, local employers and entrepreneurs, the sector skills councils and government, established to improve the employment prospects of Swansea graduates. The Patron and Chair of the Academy is Simon Gibson, CEO of venture capitalist firm Wesley Clover. SEA will support the development of employability, innovation and entrepreneurial skills amongst the student body. The 'Swansea University Global Graduates' concept will further enhance their employability by encouraging them to address global problems and develop a global understanding.

Most of the universities run student buddy or mentoring schemes, which match up international students with alumni before they depart from home, or newly-arrived students with existing students from the UK or from their own country. **Bangor University's Peer Guide Scheme** is one of the largest of its type in the UK and post-graduate students now have a parallel 'buddy' scheme with their own dedicated Postgraduate Ambassadors. The university also runs **Student Volunteering Bangor (SVB)**, a student-led charity based at the Students' Union which coordinates volunteering projects such as Beach Clean project, Out & About, providing trips out for over 65s, and Spectrwm, a project for children with autism. Bangor is also home to the **Miles Dyslexia Centre**, a self-financing, nationally and internationally renowned specialised Centre within the School of Psychology. The Centre was the first unit of its kind to be established combining research into dyslexia with clinical work. It was founded by [Professor Tim Miles OBE](#) who was Head of Psychology. Most of the larger universities also arrange airport collection for international students so that they are met by other students and staff from International Offices

The **University of South Wales** addresses the challenge of large student numbers through the **Glamlife student portal**. Glamlife is a one-stop-shop online resource, accessible from any device, allowing students to do everything from looking for part-time jobs to sourcing support for dyslexia sufferers, to using the library and joining a sports club. Recent developments range from the ability to book a counsellor or career advice session, to practising psychometric testing for graduate scheme applications, purchasing print credits, and completing module amendment forms.

Some of the smaller campuses, such as **University of Wales Trinity Saint David**, Carmarthen and Lampeter, provide for a highly personal level of support for students as the student experience is within a small community. Students receive individual attention and are quickly recognised by staff, creating a highly individual support network. The university has a community-facing ethos and has even been awarded the Buttle UK Quality Mark in recognition of its commitment to care leavers in higher education. At **Royal Welsh College of Music & Drama**, which has only 650 students and is based on one campus, there is a similarly personal level of recognition, attention and support.

The success of universities in Wales in student satisfaction rankings is also partly due to the fact that they are situated in towns or small cities, rather than very large industrial or urban centres, so that students do not have to make long journeys or commute to get to their destinations. In most cases, students walk everywhere, or cycle, without the need for long train or bus journeys and find it easy to reach shops, residences, academic and social venues. This is an important, if often unrecognised, aspect of the quality of student life. Equally important is cost of living, which again is generally lower without costs such as transport associated with larger cities. As a country Wales is also known for

safety and low crime statistics, and universities operate on contained and carefully managed campuses. But, results such as the i-graduate International Student Barometer ranking that places Cardiff Metropolitan University 1st in the UK for Student Satisfaction in 2011, 2012 and 2013 are due to carefully planned and delivered university approaches to the student experience.

The **Wales Initiative for Student Engagement** <http://www.wisewales.com/> engages students in enhancing their own learning experiences. Set up by National Union of Students Wales, Colleges Wales, the Higher Education Academy, Higher Education Funding Council for Wales, Higher Education Wales, and the Quality Assurance Agency, WISE engages students as active participants in the leadership, management, development and delivery of their own educational experience. Every university in Wales also has a **Student Charter** –a high level statement, covering all students and staff, setting out the mutual expectations of universities and students. The Charters were jointly written by the institutions and students' unions and are available at institutions' individual websites.

The Higher Education Achievement Report is a new initiative which will mean that when students leave their programme of study, higher education providers give them a detailed record of their studies to provide evidence to others of their academic achievement. Every university in Wales has committed to producing a HEAR for students enrolling from 2012/13 [HEAR website](#).

13. Research Overview

Based on its research output, publications, investment and other recognised measures, the UK is generally recognised to be in the top 2 in research league tables internationally. But competition is tough: **Increasing numbers of countries are producing international standard research** and are capable of acting as collaboration partners across the world and attracting research investment, scholars, researchers and visiting students.

It can be seen from the extensive range of their research that academics from **universities in Wales make significant contributions to research and industry** nationally and internationally, including leading in areas such as the creation and study of antimatter, in numerical modelling of engineering structures, in neuroscience and in understanding cancer and diseases such as Alzheimer's.

In the 2008 RAE, Wales' performance in some subjects was amongst the best in the UK, with **world-class achievement, in Civil and Electrical Engineering, Computer Science and Informatics, Psychiatry, Neuroscience, Psychology, Art and Design and Celtic Studies**. In terms of the proportion of research rated 4* "world-leading" and 3* "internationally excellent", Wales had 20 units of assessment that outperformed the UK average, located in the social sciences (7) and Arts and Humanities (6), Health and Medicine (4) and Engineering and Science (3).

The recent Welsh Government strategy [Science for Wales](#) comments favourably on progress made in recent years including impressive successes in the social sciences and arts and the humanities. **Wales is particularly successful at attracting UK research council funding from the Arts and Humanities Research Council, Economic and Social Science Council and Biotechnology & Biological Sciences Research Council**. The generative value of such research funding is demonstrated by the example of Swansea University: for every £1 million of Higher Education Funding Council for Wales (HEFCW) research grant awarded to Swansea University, more than £2.5 million of competitive research funding is secured from other sources.

According to the **Elsevier Scopus database of publications, the number of articles authored by researchers in Wales grew at a rate that outpaces the world and UK average, in the period 2001-2010**.

The impact of Welsh research, as measured by the number of citations per paper (a widely used index of research quality) has also been growing steadily. Judged in terms of citations per paper, the bibliometric figures from **Thomson Reuters show that Wales has, over the past decade, come from behind to take a place within the top 20 research countries in the world**.

Wales' current research impact exceeds the world, Organisation for Economic Co-operation and Development and European Union average ECD and EU average.

Since 2008, Wales has been included in the top 20 countries "for all fields" listed by Thomson Reuters' Essential Science Indicators, and in 2011 it was ranked 15th (ahead of France and Australia). According to these citation data, high impact areas for universities in Wales are plant and animal science, as well as computer sciences, social sciences, psychology and psychiatry.

The number and range of academics from Wales elected to prestigious **UK Learned Societies**, such as the Royal Society, Royal Academy of Engineering, Academy of Medical Sciences, British Academy and Academy of Social Sciences have grown significantly over the past 5 years. For example, in February 2013, Professor Heaven Crawley, Professor of International Migration at Swansea University, was conferred the title of Academician of the Academy of Social Sciences. In 2010 the **Learned Society of Wales** was formally launched in 2010 to demonstrate, celebrate and disseminate the excellence of Welsh research and scholarship.

The **Queen's Anniversary Prizes** are awarded every two years to universities and colleges in the UK for work of outstanding excellence. Universities in Wales have been awarded 7 Queen's Anniversary Prizes since 1998 for pioneering research into the causes of violent injury and new ways to reduce harm, for industry oriented degrees in materials engineering, for research on plant breeding and economic and environmental benefit, for work identifying genetic causes of diseases, for state-of-the-art engineering facilities and for the pioneering use of chemiluminescence in clinical settings, research that has revolutionised biomedical research and clinical diagnosis.

The annual **Higher Education, Business and Community Interaction Survey** (HEBCIS) also shows that Wales punches above its weight in many areas. The 2010-11 survey shows that, in relation to the UK, Wales accounted for 7% of income from collaborative research involving both public funding and funding from business; 11% of income from regeneration and development programmes; 6% of total learner days of CPD and CE courses delivered; 11% of software only licenses generated; and 9% of active spin-out and staff start-up companies that have survived at least 3 years.

14. Other Significant Networks and Initiatives

Some networks and initiatives have been mentioned in the broad academic areas covered in this report. There are others that contribute significantly to university activity:

The Sêr Cymru (Stars Wales) programme is funded by up to £50 million from Welsh Government to enhance and build on the research capability by attracting more world-leading scholars and their teams to Wales. The programme supports the establishment of a collaborative **National Research Network and Research Chairs** in each of the three Grand Challenge research areas identified in the 'Science for Wales' strategy: Advanced engineering and materials; Life sciences and health; and Low carbon, energy and environment. Approximately 60% of Sêr Cymru funding will be allocated to Research Chairs, and 40% to the Networks and their Directors, each of whom will be based at a Welsh university or research institute. The universities will also contribute to the funding, which may also be augmented by industry and the European Union. The Sêr Cymru scheme and National Research Networks follow on from the findings of Wales' Chief Scientific Adviser Professor John Harries. The resulting Science Strategy sets a target for Wales to win 5% of competitive research funding - principally from the UK Research Councils. First Minister of Wales Carwyn Jones said *"If our universities gain 5% of the competitive research funding from the UK Research Council, this will bring £27 million into our economy. This rises to over £64 million if you look at all sources of competitively-funded research. Sêr Cymru and our network plans will enable us to attract more talent to Wales to help drive this figure up and in due course create more high quality business and research jobs in Wales."* <http://wales.gov.uk/topics/businessandconomy/csaw/sercymruprogramme/?lang=en>

Welsh Crucible <http://www.welshcrucible.org.uk/>, was established with funding from the Higher Education Funding Council for Wales (HEFCW) as a programme of personal, professional and leadership development for future research leaders of Wales. Welsh Crucible offers the opportunity for researchers in Wales to explore how they can work across institutional and disciplinary boundaries to tackle research challenges. Welsh Crucible is designed to introduce new ways of thinking and working to researchers who are already excelling in their fields, with the aim of creating long term changes in attitude and working practice, as well as encouraging practical collaborations between participants. Welsh Crucible also provides a high profile vehicle for publicising and demonstrating to the public the contribution that Welsh research makes. Current research covers a wide range of disciplines, including engineering, social science, chemistry, computer science, and English literature. Exciting research collaborations have already begun to emerge from the Welsh Crucible network. Collaborations between social science and computer science are looking at how we can use a combination of mobile phone technology and weight-watching groups to tackle obesity problems. Making the most of our 750 miles of coastline, other researchers are also looking at developing new methods for harvesting energy from the sea, and the development of software that will allow us to model the effects of climate change.

The Expertise Wales Portal <https://www.expertisewales.com/welcome-to-expertise-wales> provides businesses with a central gateway to the expertise, facilities and services available in Wales' universities and colleges free of charge to organisations and individuals seeking academic expertise and facilities. Database content is supplied and maintained directly by the institutions. The project is funded by the European Regional Development Fund (ERDF) via the Welsh Government's [Academic](#)

[Expertise for Business \(A4B\) programme](#), which aims to ensure that Wales maximises the economic impact of its academic institutions through collaboration with industry.

Knowledge Transfer Partnerships <http://www.ktponline.org.uk/> is a UK-wide programme to encourage business and knowledge collaborations. KTPs help businesses and organisations to improve their competitiveness and/or productivity through the use of the knowledge, technology and skills in universities and higher education institutions, research organisations and further education colleges. At the same time, KTPs help to increase the business relevance of research and teaching. A KTP involves forming a relationship between a company and an academic institution ('Knowledge Base' partner), which facilitates the transfer of knowledge, technology and skills to which the company partner currently has no access. Each partnership employs one or more recently qualified people (known as an Associate) to work in a company on a project of strategic importance to the business, whilst also being supervised by the Knowledge Base Partner. Projects vary in length between 12 and 36 months. The Associates are postgraduate researchers, university graduates, or individuals qualified to at least NVQ (Level 4) or equivalent.

Wales Strategic Insight programme (SIP) <http://www.siprogramme.org.uk/en/>, also funded by the Higher Education Funding Council for Wales, involves all universities in Wales. It develops collaborative partnerships by funding short term placements of university staff in public, private and 3rd sector organisations and vice versa. Dr Marco Odello, from Aberystwyth's Department of Law and Criminology secured SIP funding to work with the Legal Directorate of the Foreign and Commonwealth Office to gain insights into the structure and functioning of the FCO and develop stronger links between lawyers in Government and lawyers in academia and private practice.

The Higher Education Academy Wales supports universities in areas such as education for sustainable development and global citizenship, supporting and championing teaching, enhancing learning through technology, assessment and feedback, quality enhancement, change and widening access. It works with staff in 24 academic subject groups from Art, Design and Media (ADM), through Health Sciences and Practice to Social Policy and Social Work. **Gwella** is the Higher Education Academy's [weblog](#) for supporting the implementation of [Enhancing Learning & Teaching Through Technology: A Strategy for Higher Education in Wales](#), now commonly called the [Gwella Programme](#).

15. Record of Interviews

Thanks go to the following people for providing information for this report.

Aberystwyth University: Professor John Grattan, Pro Vice Chancellor Student Experience & International; Gary Reed, Head of the Research Office.

Bangor University: Professor Oliver Turnbull Pro Vice Chancellor Teaching & Learning; Professor David Shepherd Pro Vice Chancellor Research; Dr Xinyu Wu, Director of International Development; Iwan Roberts, Head of International Partnerships; Angharad Thomas, Head of International Recruitment; Mike Davies, Director, Finance Office; Paul Storey, Accountant, Finance Office.

Cardiff University: Professor Hywel R Thomas, Pro Vice Chancellor, Engagement & International; Dr Aleksandra Koj, Researcher, Seren Project; Geraint Jones, Director, Research & Commercial Division.

Cardiff Metropolitan University: Richard Moremon, Director Marketing & Communications; Orla Govers, Research and Enterprise Services; Prof Mohamed Loutfi, Pro-Vice Chancellor International.

Glyndŵr University: Stewart Milne, Research Office.

Royal Welsh College of Music and Drama: Hilary Boulding, Principal; Mathew Talfan, Head of External Relations; Louisa Jones, International Officer.

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University of South Wales: Professor Hefin Rowlands, Director of Research, Graham Wood, Dean of International; Denis Jones, Pro Vice-Chancellor (Resource Planning) and Director of Finance.

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University of Wales: Professor Dylan Jones-Evans, Director of Enterprise and Innovation.

Colleges Wales: Dr Greg Walker, Deputy Chief Executive.

Higher Education Funding Council for Wales: Roger Carter, Head of Research & Business; Dr Tove Oliver, European & International Manager, Dr Linda Tiller, Senior Research Manager.

Higher Education Wales: Amanda Wilkinson, Director; and Rachel Cable, Policy Officer. **Welsh**

Crucible: Professor Peter Halligan, Director Welsh Crucible (on secondment to Higher Education Wales from School of Psychology, Cardiff University).

British Council: Simon Dancey, Director Wales; Bill Burson, Head of Education and Society (Wales); Nicholas Bourne, Wales Advisory Committee Member; Shreela Ghosh (India), Paula Maria (South America), Tamsin Thomas (USA), Chen Bing (China), Peredur Evans (SE Asia).

Welsh Government: Gary Davies, Director, European & External Affairs Directorate; Dr. Alastair Davies, Department of the Chief Scientist, Business, Enterprise, Technology & Science Directorate.

Data Sets

Data Set 1: About Wales

Wales is on the western part of mainland Britain, bordering England and surrounded by sea to the north, south and west. Tourists and walkers can visit 1,200kms (750 miles) of coastline and beaches; the All-Wales Coastal path, along the full length of the coastline, is named the world's leading must-see destination in the [Lonely Planet Best Places in Travel Guide 2012](#). Its natural and man-made heritage, within a land mass of 20,779 km² (about 8,000 square miles), includes:

6 UNESCO World Heritage sites

- The Pontcysyllte Aqueduct and Canal, built by Thomas Telford, which can be crossed on foot or in a narrow-boat.
- Each of the castles of Beaumaris, Harlech, Caernafon and Conwy built by King Edward I in the 13th century. These are among 641 castles in total in Wales, more by land area than any other country in the world.
- The Blaenafon Industrial Landscape recalling the coal mines, furnaces and workers' homes of 19th Century South Wales, when it was one of the world's major producers of iron and coal.

5 National Areas of Outstanding Natural Beauty

- The Clwydian Range and Dee Valley, a 35 km long chain of hills rising between the Vale of Clwyd to the west and the Dee Estuary to the east to form a dramatic skyline.
- The Gower Peninsula, in south-west Wales, exceptional coastline and beaches in an outstanding natural environment with a wide variety of scenery and wildlife.
- The Llŷn Peninsula, in north-west Wales, famous for its unspoilt coast and the volcanic domes of the inland plateau.
- The Isle of Anglesey (Ynys Mon in Welsh), in north-west Wales; a variety of coastal landscapes and three stretches of Heritage Coast.
- The Wye Valley, a fine lowland river landscape and the only protected landscape to straddle the border between England and Wales.

3 National Parks

- Snowdonia, the largest National Park in Wales, with the highest mountain in England and Wales, the largest natural lake in Wales, and historic villages.
- The Pembrokeshire Coast National Park, with over 950 km of public footpaths and bridleways in spectacular scenery.
- The Brecon Beacons in central-south Wales, 1,300 sq km of **hills**, rivers, waterfalls and the Black Mountains, which form a natural border with Herefordshire, in England.

Some National Cultural Institutions of Wales

- National Museum and Art Gallery (Cardiff) <http://www.museumwales.ac.uk/cy/cardiff/>
- St Fagan's National History Museum (Cardiff) <http://www.museumwales.ac.uk/en/stfagans/>
- Big Pit National Coal Museum (Blaenafon) <http://www.museumwales.ac.uk/en/bigpit/>
- National Wool Museum (Llandysul) <http://www.museumwales.ac.uk/en/wool/>
- National Roman Legion Museum (Caerleon) <http://www.museumwales.ac.uk/en/roman/>
- National Slate Museum (Llanberis) <http://www.museumwales.ac.uk/en/slate/>

- National Waterfront Museum (Swansea) <http://www.museumwales.ac.uk/en/swansea/>
- National Library of Wales (Aberystwyth) <http://www.llgc.org.uk/index.php?id=2>
- National Botanic Gardens of Wales (Llanarthne) <http://www.gardenofwales.org.uk/>
- National Theatre Wales <http://nationaltheatrewales.org/>
- Theatr Genedlaethol Cymru (the Welsh medium national theatre) <http://www.theatr.com/>
- Wales Millennium Centre (national Arts Centre based in Cardiff) <http://www.wmc.org.uk/>
- BBC Wales <http://www.bbc.co.uk/wales/>
- The National Eisteddfod of Wales (cultural festival) <http://www.eisteddfod.org.uk/english/>
- The International Eisteddfod (Llangollen) <http://international-eisteddfod.co.uk/>

Wales has an international airport <http://www.tbicardiffairport.com/en/>

Government: As part of the United Kingdom and the European Union, Wales elects Members to the European and UK parliaments. Wales also has its own government structure: The National Assembly for Wales, made up of 60 Assembly Members, is the democratically elected legislative body that represents the interests of Wales and its people. The Welsh Government is the executive body, made up of the First Minister, other Welsh Ministers, Deputy Ministers and the Counsel General and is responsible for the day to day running of Wales in devolved areas such as the Health Service, Education, Housing and Transport.

Currency: The currency of Wales is the British pound.

Language: Wales is a bi-lingual nation of just over 3 million people, about 20% of whom speak Welsh in addition to English.

Visit Wales provides information about what to see and do in Wales
<http://www.visitwales.co.uk/things-to-do-in-wales/>

Data Set 2: Institution Profiles

Note: Student numbers are from HESA and include full-time and part-time Higher Education students but exclude students writing up theses beyond the minimum period for submission and Further Education students.

Aberystwyth University <http://www.aberystwyth.ac.uk/en/> Established: 1872

Vice Chancellor: Professor April McMahon

18 departments: Computer Science; Biological, Environmental & Rural Sciences; Institute of Geography & Earth Sciences; Mathematics & Physics; Art; Education & Lifelong Learning; English & Creative Writing; English Language; European Languages; History and Welsh History; Theatre Film & Television Studies; Welsh; Information Studies; International Politics; Law & Criminology; School of Management and Business; Psychology; Sport & Exercise Science

Student Numbers: Higher Education Statistics Agency 2010-11: 11,140 total HE students, 1,030 EU students (9%), 655 international students (6%).

Location: Aberystwyth, mid-Wales

The university has three principal sites: Most academic facilities are based on the main Penglais Campus overlooking the town and Irish Sea. Aberystwyth Arts Centre is based on this campus. Just behind here is the Llanbadarn Campus, which is currently being re-developed. On the seafront is the original home of the university, the Old College. Just inland is the 3rd site, the Gogerddan Campus.

Strategic Plan http://www.aber.ac.uk/en/media/StrategicPlan_EN.pdf

Research News <http://www.aber.ac.uk/en/research/research-news/>

Bangor University <http://www.bangor.ac.uk/> Established: 1884

Vice Chancellor: Professor John Hughes

The academic activities of the university are grouped into 5 Colleges:

Arts & Humanities: Creative Studies and Media; English; History, Welsh History and Archaeology; Lifelong Learning; Linguistics and English Language; Modern Languages; Music; Philosophy and Religion; Welsh; ESRC Centre for Research on Bilingualism; Welsh for Adults Centre. Business, Law, Education & Social Sciences: Business; Education; Law; Social Sciences; Academic Development Unit; Confucius Institute. Natural Sciences: Environment; Natural Resources and Geography; Biological Sciences; Ocean Sciences; Welsh Institute for Natural Resources. Health & Behavioural Sciences: School of Healthcare Sciences (Midwifery, Nursing, Operating Department Practice, Occupational Therapy, Radiography); Medical Sciences; Psychology; Sport, Health & Exercise Sciences; Institute of Medical & Social Care Research; North Wales Centre for Primary Care Research. Physical & Applied Sciences: Chemistry, Electronic Engineering, Computer Science.

Student Numbers: Higher Education Statistics Agency 2010-11: 11,175 HE students in total, 450 EU students (4%), 1,510 international students (13.5%).

Location: Bangor, on the coast of north-west Wales

Strategic Plan <http://www.bangor.ac.uk/stratplan/SP10%20v6%20Print%20version.pdf>

Annual Review

<http://www.bangor.ac.uk/ccm/documents/BU%20Ann%20Review%202012%20Eng%20FINAL.pdf>

Cardiff University <http://www.cardiff.ac.uk/> Established: 1883

Vice Chancellor: Professor Colin Riordan

The academic activities of the university are divided into 31 Research centres, 3 research institutes (The European Cancer Stem Cell Research Institute, Neuroscience & Mental Health Institute and Sustainable Places Research Institute) and 3 Academic Schools:

Arts, Humanities & Social Sciences: Business; English, Communication & Philosophy; European Languages, Translation & Politics; History, Archaeology & Religion; Journalism, Media & Cultural Studies; Law; Lifelong Learning; Music; Planning & Geography; Social Sciences; Welsh. Biomedical & Life Sciences: Biosciences; Dentistry; Healthcare Studies; Medicine; Nursing & Midwifery Studies; Optometry & Vision Sciences; Pharmacy & Pharmaceutical Sciences; Postgraduate Medical & Dental Education; Psychology. Physical Sciences: Architecture; Chemistry; Computer Science & Informatics; Earth & Ocean Sciences; Engineering; Mathematics; Physics & Astronomy.

Student Numbers: Higher Education Statistics Agency 2010-11: 28,840 HE students in total, 1,180 EU students (4%), 4,315 international students (15%).

Location: Cardiff, south Wales.

Cardiff is home to national institutions such as the National Museum and Gallery of Wales and the Millennium Stadium. The Cathays Park Campus is situated in Cardiff city centre. The nearby Heath Park Campus is located near the University Hospital of Wales and hosts academic schools in healthcare-related subjects.

Strategic Plan <http://www.cardiff.ac.uk/plann/strategicplan/index.html>

Annual Review <http://www.cf.ac.uk/about/annualreview/index.html>

Cardiff Metropolitan University <http://cardiffmet.ac.uk>

Established: 1865 (became Cardiff Metropolitan University in 2011)

Vice-Chancellor: Professor Anthony J Chapman

Cardiff Metropolitan University is made up of 5 academic schools: Art & Design, Education, Health Sciences, Management, and Sport. Cardiff School of Art & Design: Department of Creative Communication; Department of Material Arts; Department of Fine Arts; Department of Architectural Studies. Cardiff School of Education: Department of Humanities; Department for Professional Development; Department of Teacher Education and Training. Cardiff School of Health Sciences: Applied Social Sciences; Biomedical Sciences; Complementary Therapies; Dental Technology; Nutrition Dietetics & Food Science; Department for Psychology; Public Protection; Speech & Language Therapy; The Wales Centre for Podiatric Studies. Cardiff School of Management: Business & Management; Accounting, Economics & Finance; Hospitality, Tourism & Events; Computing, Information Systems & International Studies; The Cardiff Met MBA. Cardiff School of Sport: Dance; Sports Coaching; Sports Development; Sport & Exercise Science; Sport & PE; Sport Management; Sport Massage.

Student numbers: Higher Education Statistics Agency 2010-11: 13,485 HE students in total, 325 EU students (2.5%), 3,660 international students (27%).

Location: Cardiff, south Wales. The university is located on four campuses in the city of Cardiff: Colchester Avenue, Cyncoed, Howard Gardens and Llandaff. The London School of Commerce is the University's associate college www.lsclondon.co.uk .

Annual Review:

<http://www3.cardiffmet.ac.uk/English/News/Pages/CardiffMetReleases201112AnnualReview.aspx>

Strategic Plan (contact university): <http://www3.cardiffmet.ac.uk/english/vcb/pages/dprice.aspx>

Glyndŵr University <http://www.glyndwr.ac.uk>

Established: 2008 (formerly North East Wales Institute)

Vice-Chancellor: Professor Michael Scott

Glyndŵr University is organised into the Institute for Health, Medical Sciences and Society (Early Childhood and Family Studies; Education; Health Sciences; Psychology; Society and Community; Sport and Exercise Sciences; Theology); and the Institute for Arts, Science and Technology (Art and Design; Creative Industries, Media and Performance; Business and Management; Computing; Engineering and Applied Physics; Polymer and Biopolymer Science; Humanities; Natural Environment; Built Environment and Welsh).

Student Numbers: Higher Education Statistics Agency 2010-11: 8,960 HE students in total, 1,490 EU students (17%), 2,060 international students (23%).

Location: mainly in the town of Wrexham, with sites around North East Wales. The university also has a London base <http://london.glyndwr.ac.uk/>.

Strategic Plan

<http://www.glyndwr.ac.uk/en/AboutGlyndwrUniversity/Governance/TheFile,24811,en.pdf>

Annual Review

<http://www.glyndwr.ac.uk/en/AboutGlyndwrUniversity/Governance/AnnualReviews/TheFile,23188,en.pdf>

Swansea University <http://www.swansea.ac.uk/> Established: 1920

Vice-Chancellor: Professor Richard B Davies

Swansea University's academic activities are structured in 6 academic colleges:

Arts and Humanities: Academi Hywel Teifi (research and teaching in Welsh language and literature); Adult Continuing Education; English Language & Literature; History & Classics; Languages; Translation & Communication; Political & Cultural Studies. Business, Economics & Law: Business School; School of Law; Economics; Criminology. Engineering: Aerospace; Chemical; Civil; Computational; Electrical & Electronic; Environmental; Mechanical; Nanotechnology; Product Design; Sports Materials; Sport & Exercise Science. Human & Health Sciences: Health; Nursing; Midwifery; Social Care; Social Policy; Psychology. Medicine: Medicine; Genetics; Biochemistry; Medical Biochemistry; Trauma Surgery and Military Trauma Surgery; Health Informatics; Liquid Chromatography; Mass Spectrometry. Includes the Institute of Life Science – the research and innovation arm of the college of Medicine. Science: Biosciences; Computer Science; Geography; Physics; Mathematics.

Student Numbers: Higher Education Statistics Agency 2010-11: 14,480 HE students in total, 360 EU students (0.25%), 1,670 international students (11.5%).

Location: Swansea, south Wales

Strategic Plan <http://www.swan.ac.uk/media/media,40519,en.pdf>

Employability & High Level Skills brochure <http://www.swan.ac.uk/media/media,40311,en.pdf>

Research Highlights <http://www.swansea.ac.uk/breakthrough/>

University of South Wales

The University of South Wales was established in April 2013 following a merger between the University of Glamorgan and University of Wales Newport. The Royal Welsh College of Music and Drama (National Conservatoire of Wales), is part of the University of South Wales Group.

<http://www.southwales.ac.uk>

Vice-Chancellor: Professor Julie Lydon.

The university is arranged into four faculties spread over its five campuses in South East Wales.

Faculty of Business and Society: School of Business; School of Law; School of Humanities and Social Sciences

Faculty of Computing, Engineering and Science: School of Computing and Mathematics; School of Engineering; School of Applied Sciences

Faculty of Creative Industries; School of Drama and Music; School of Art and Design

Faculty of Life Sciences and Education: School of Psychology, Counseling and Early Years; School of Education; School of Inter-professional practice, Sport and Wellbeing; School of Care Sciences

Student Numbers: 33,500 students (sixth biggest campus-based University in the UK by student number.)

Location: South Wales. The University of South Wales is located at five campuses in South Wales in Treforest, Pontypridd, Newport, Caerleon and in Cardiff city centre. The Royal Welsh College of Music & Drama and The College Merthyr Tydfil are part of the University of South Wales Group.

The Royal Welsh College of Music & Drama (RWCMD) <http://www.rwcmd.ac.uk>

Established: 1949

Principal: Hilary Boulding

RWCMD is a national conservatoire for the performing arts.

Courses are available in: Music Performance; Orchestral Performance; Historical Performance; Jazz; Repetiteurship; Composition; Creative Audio & New Media; Orchestral Conducting; Brass Band Conducting; Choral Conducting; Opera Performance; Acting for Stage, Screen & Radio; Music; Musical Theatre; Stage & Event Management; Theatre Design; and Arts Management.

Student Numbers: Approximately 650. The College returns its student numbers to HESA through the University of Glamorgan.

Location: Cardiff, south Wales

<http://www.rwcmd.ac.uk>

University of Wales Trinity Saint David <http://www.trinitysaintdavid.ac.uk/en/>

Established: 2012, formerly Trinity University College and University of Wales Lampeter

Vice-Chancellor: Professor Medwin Hughes

The University merged with Swansea Metropolitan University in 2012. It offers undergraduate and postgraduate courses in the areas of Archaeology, History & Anthropology; Business; Classics; Creative Arts; Cultural Studies; Early Childhood; Initial Teacher Education & Training; Social Justice & Inclusion; Sport, Health & Outdoor Education; Performing Arts; Welsh & Bilingual Studies. It also offers postgraduate courses in Theology, Religious Studies & Islamic Studies and through the Wales International Academy of Voice.

Student Numbers: Higher Education Statistics Agency 2010-11: 6,705 HE students in total, 290 EU students (4%), 1,380 international students (20%).

Location: Campuses in Carmarthen (west Wales), Lampeter (mid-Wales) and London, as well as the Swansea Metropolitan campus listed separately below.

<http://tsdlondon.ac.uk>

Learning & Teaching Enhancement Strategy

http://www.trinitysaintdavid.ac.uk/en/media/uniweb/content/documents/theuniversity/learning_teaching_enhancement_strategy.pdf

Swansea Metropolitan, University of Wales Trinity Saint David <http://www.smu.ac.uk>

Established: 2012, formerly Swansea Metropolitan University

Vice-Chancellor: Professor Medwin Hughes

The university specialises in vocational courses with strong industry links across 4 faculties: Applied Design & Engineering; Art & Design; Business & Management, and Humanities. Applied Design & Engineering: Applied Computing; Automotive Engineering; Built & Natural Environment; Digital Media; Industrial Design; Logistics & Manufacturing Engineering; Swansea School of Glass. Art & Design: Fine Art; Photography & Video; Surface Pattern (Textiles); Visual Communication. Business & Management: Business; Management; Leisure, Tourism & Sport; Public Service Leadership. Humanities: South West Wales Centre of Teacher Education; Social Sciences; Performing Arts.

Student Numbers: Higher Education Statistics Agency 2010-11: 5,965 HE students in total, 180 EU students (3%), 420 international students (7%).

Location: Swansea, south Wales. Most schools are located on Mount Pleasant Campus near Swansea city centre, including Swansea Business School, Applied Design & Engineering and the Centre of Leisure, Tourism and Sport. The Townhill Campus, located above the city, is home to the Swansea School of Education, the Centre for Performance and Literature (incorporating Film) and the Centre for Psychology and Counselling. The Dynevor Centre in the city centre is the location for the Faculty of Art & Design and the Centre for Innovation in Photography and Video

Strategic Plan: <http://www.smu.ac.uk/index.php/the-university/documents/130-strategic-plan-documentation>

Data Set 3: University Research Assessment Results 2008 (RAE)

The Research Assessment Exercise (RAE) provides a detailed profile of research activity in universities and colleges in the UK and is a recognised indicator of research quality, influencing student choice and the distribution of public funds for research www.rae.ac.uk. It involves submissions to independent panels of experts who assess the quality of research according to defined criteria. The most recent RAE was conducted in 2008, since when research activity in Wales has changed significantly. The RAE will be replaced by the [Research Excellence Framework \(REF\)](http://www.ref.ac.uk) in 2014 www.ref.ac.uk.

The REF will be undertaken by the 4 UK higher education funding bodies. The exercise will be managed by the REF team based at the Higher Education Funding Council for England and overseen by the REF Steering Group, consisting of representatives of the 4 funding bodies. The primary purpose of the REF is to produce assessment outcomes for each submission made by institutions. The funding bodies intend to use the assessment outcomes to inform the selective allocation of their research funding to HEIs, with effect from 2015-16. The assessment provides accountability for public investment in research and produces evidence of the benefits of this investment, and outcomes provide benchmarking information and establish reputational yardsticks.

The REF is a process of expert review. HEIs will be invited to make submissions in 36 [units of assessment](#). Submissions will be assessed by an expert sub-panel for each unit of assessment, working under the guidance of four main panels. Sub-panels will apply a set of generic [assessment criteria and level definitions](#), to produce an overall quality profile for each submission.

The 2008 RAE provided quality ratings for research across all disciplines. Prior to 2008, the RAE had provided a single figure score for each unit of assessment using a scale of 5* highest to 1 lowest. In 2008, this was changed to define quality based on a scale ranging from 4*, which is the highest rating and indicates world-leading research, to Unclassified which is of a standard below national recognition or outside of the definition of research.

In the 2008 RAE, the grading system was:

- 4* - Quality that is world-leading in terms of originality, significance and rigour.
- 3* - Quality that is internationally excellent in terms of originality, significance and rigour but which nonetheless falls short of the highest standards of excellence.
- 2* - Quality that is recognised internationally in terms of originality, significance and rigour.
- 1* - Quality that is recognised nationally in terms of originality, significance and rigour.
- U/C - Quality that falls below the standard of nationally recognised work. Or work which does not meet the published definition of research for the purposes of this assessment.

In the 2008 RAE, independent assessment panels assessed the research submitted and determined the proportion of the research that met each of the four quality levels, or was unclassified or failed to meet the published definition. In each case, the panel took account of 3 overarching components of the submission - research outputs, research environment and indicators of esteem. The results are published as a graded profile for each Unit of Assessment for each submission.

An example of quality profiles for a hypothetical submission:

Unit of assessment A	Full-time equivalent research staff submitted for assessment	Percentage of research activity in the submission judged to meet the standard for:				
		4*	3*	2*	1*	Unclassified
Geography	30	15	25	40	15	5

2008 Research Assessment Exercise (RAE) - Wales

Research is only one measure of university performance. Potential students and other stakeholders may look to research rankings as a determiner of overall university quality, but it is only one element; there is frequently applied research, excellent teaching, integration with industry and strong quality student experience in universities and colleges for which research is not the main focus (as is the case for teaching-led or skills-based institutions such as the Royal Welsh College of Music & Drama).

In the UK, universities and colleges have become identified as research-led or teaching-led, although most do both. Institutions that acquired university title in the transformation of higher education during the 1990s (often called the post-92 universities) have generally focused less on pure research and more on applied teaching and practical research, usually with strong industry partnerships.

In Wales, the universities often more widely associated with a predominantly research-led approach are, in alphabetical order, Aberystwyth, Bangor, Cardiff and Swansea. University of Glamorgan* is also associated with this group to a lesser extent as it was traditionally teaching-led. (Its history dates back to 1913 when it opened as the South Wales and Monmouthshire School of Mines, developing into Glamorgan Polytechnic in 1970 and emerging as the University of Glamorgan* in 1992). The universities more frequently associated with a teaching-led approach are, in alphabetical order, Cardiff Metropolitan, Glyndwr, Swansea Metropolitan, University of Wales, Newport* and University of Wales Trinity Saint David, although each has distinctive research strengths. It is to be expected then that these institutions are positioned lower than the research-led institutions in RAE rankings.

In the 2008 RAE, there were particularly strong performances by the universities in Wales in the following Units of Assessment where, in each case, more than one institution attained proportions of 3* and 4* quality which significantly exceeded the UK average for the Unit of Assessment:

- **Civil Engineering**
- **Psychology**
- **Allied Health Professions**
- **Computer Science and Informatics**
- **Celtic Studies**

There were also a number of Units of Assessment in which individual universities performed very strongly, attaining proportions of 3* and 4* quality which significantly exceeded the UK average for the Unit of Assessment. These included:

- **Accounting and Finance (Bangor University)**
- **Business and Management (Cardiff University)**
- **Communications, Cultural and Media Studies (Cardiff University)**
- **Psychiatry and Neuroscience (Cardiff University)**
- **Sociology (Cardiff University)**
- **Politics and International Studies (Aberystwyth University)**
- **Town and Country Planning (Cardiff University)**
- **General Engineering and Mineral & Mining Engineering (Swansea University)**
- **Social Work and Social Policy & Administration (Swansea University)**
- **Geography and Environmental Studies (Swansea University)**
- **History (Swansea University)**
- **German, Dutch and Scandinavian Languages (Swansea University).**

Additionally, there was a good performance in the **joint submission from Cardiff Metropolitan University (known as UWIC at the time of the RAE) and University of Wales, Newport* in Art and Design**, where although the level of 4* quality was below the UK average, the 3* was very significantly above.

These areas do not represent all of the strengths of and improvement in Wales since the previous RAE. The 2008 RAE showed that Swansea University, for example, had the largest increase in internationally excellent research in the UK, with over 90% of staff classed as research active. The last RAE took place 5 years ago, during which time the approach to research in Wales has changed, and some very different results can be expected from the 2014 REF.

There are no official rankings for RAE outcomes. However, journalists and others have used a number of different ways of combining 2008 RAE outcomes to measure research success comparatively. These include:

- **A Research Power Ranking** – this uses a quality score (a grade point average or GPA) times the number of full-time equivalent staff submitted. This is a measure of research volume and ranks the relative contribution of units of assessment or universities in the creation of new knowledge.
- **A Ranking based on quality score (GPA) alone** – this quality measure is influenced by the selectivity of universities regarding the number of researchers submitted, with some universities being more selective than others. (Two universities may both say that “50% of staff submitted rated as internationally excellent”, but one university may have submitted 100 staff and the other may have submitted 1,000 staff).
- **A Ranking based on the proportion of research recognized as having international standing or assessed as being internationally excellent.**

The Research Power Ranking below (GPA times the number of full-time equivalent staff submitted to measure research volume i.e. quality x quantity) ranks all 159 institutions that submitted research to the 2008 RAE by the relative contribution to the creation of new knowledge of their overall submission. A full list of all 159 UK universities by Research Power is at <http://www.cardiff.ac.uk/rae/researchpower/index.html>. (Source: Research Fortnight, reproduced by Cardiff University). Power rankings are also available by Unit of Assessment which shows the ranking of each institution by subject category.

2008 RAE Results by University (Wales)

Note: As mentioned above, there are no official rankings for RAE outcomes. This information is produced by the universities to describe their own performance. It is taken from their websites and cross-checked where possible.

Aberystwyth University [16 subject areas submitted to the RAE 2008.](#)

The results show that 85% of research activity submitted by Aberystwyth University is of an international standard (2* or above), with world leading research (4*) identified in 15 of the 16 subject areas submitted. 48% of research activity at Aberystwyth University is rated as world leading (4*) or internationally excellent (3*) and 97.4% of researchers who were submitted work in disciplines where world leading (4*) research is undertaken. 5 academic departments (1 in 3 of submissions) had over 60% of their research activity rated 4* (world leading in terms of originality, significance and rigour) or 3* (internationally excellent in terms of originality, significance and rigour) in the 2008 RAE. 40% of research submitted by the **Department of International Politics** is rated 4*, placing the department in the top 3 (THES) in the UK. 65% of research submitted by the **Institute of Geography and Earth Sciences** and the **Department of Welsh** is rated 4* or 3*. 60% of research submitted by the **Department of Theatre, Film and Television Studies** is rated 4* or 3*. The university was 41st out of 119 in the UK for quality of research according to the Times Higher Education Supplement (THES) and the Research Fortnight *RAE 2008 Quality Index of University Research*. Aberystwyth University also has one of the highest research incomes per member of academic staff in the UK. Information on Aberystwyth University's 2008 RAE performance: <http://www.aber.ac.uk/en/research/aber-research/rae/>

Bangor University [19 subject areas submitted to the RAE 2008.](#)

The RAE assessment has identified world leading (4*) research in all of the university's 19 assessed subject areas with nearly 50% given the grading of 3* or 4*. Areas of particular excellence include **Accounting & Finance** which is judged as world-leading (4*) and ahead of all other UK universities conducting research in this area and **Electronic Engineering** which is rated 2nd in the UK (based on a relatively small number of staff submitted). In addition, **Sports Science** and **Welsh** are placed in the top 10 in the UK in their respective units of assessment and **Psychology** 11th in the UK. The University's School of Electronic Engineering was also placed in 2nd position in the UK (in a subject where the expectation is that greater capacity is required to produce research of this caliber). In the Arts & Humanities, the School of **Music** had 90% of the submitted research staff rated as world leading (4*) or of international quality (3*), as were 90% of the submitted research staff in the **Earth Systems and Environmental Sciences** field, which includes Ocean Sciences. In the last ten years research income has risen by 25%. Information on Bangor University's 2008 RAE performance: <http://www.bangor.ac.uk/scholarships/rae2008/index.php.en?menu=4&catid=7539&subid=0>

Cardiff University 34 subject areas submitted to the RAE 2008, involving 1,000 research staff.

The RAE 2008 shows that world-leading research is being undertaken throughout Cardiff University <http://www.cardiff.ac.uk/rae/>. The University was 15th out of 159 institutions in the UK based on Institutional Averages Sorted by Research Power. **Almost 60 per cent of all research at Cardiff University was assessed as world-leading (4*) or internationally excellent (3*) and the University provided 40% of the 2,500 researchers submitted for assessment by universities in Wales.** 33 out of 34 research areas submitted by the university for assessment are shown to be undertaking research that includes work that is 4* “world-leading in terms of originality, significance and rigour.” The University is also home to three major new Research Institutes in neurosciences and mental health, cancer stem cells and sustainable places. Cardiff is a member of the Russell Group of top 20 UK research-led universities. The University generates more than £100 million annually from research grants and contracts. The subjects submitted for assessment were: **Allied Health Professions and Sciences (C12); Archaeology (H33); Architecture and the Built Environment (H30); Biological Sciences (D14); Business and Management Studies (I36); Cancer Studies (A2); Cardiovascular Medicine (A1); Celtic Studies (M56); Chemistry (E18); Civil Engineering (G27); Communication, Cultural and Media Studies (O66); Computer Science and Informatics (F23); Dentistry (C10); Earth Systems and Environmental Sciences (E17); Electrical and Electronic Engineering (G24); English Language and Literature (M57); European Studies (L50); History (N62); Infection and Immunology (A3); Law (J38); Mechanical, Aeronautical and Manufacturing Engineering (G28); Music (O67); Nursing and Midwifery (C11); Other Hospital Based Studies (A4); Pharmacy (C13); Philosophy (N60); Physics (E19); Primary Care and Other Community Based Clinical Subjects (B8); Psychiatry, Neuroscience and Clinical Psychology (B9); Psychology (K44); Pure Mathematics (F20); Sociology (J41); Theology, Divinity and Religious Studies (N61); Town and Country Planning (H31)** Information on Cardiff University’s 2008 RAE performance including results for each academic subject are available at <http://www.cardiff.ac.uk/rae/results/index.html> .

Cardiff Metropolitan University 6 subject areas submitted to the RAE 2008 (UWIC at the time of the submission). The areas were within Sport, Health Sciences, Business & Management, Education, Tourism and Art & Design (the last submitted jointly with the University of Wales Newport*). CMU is home to the **Wales Institute for Research in Art & Design** jointly managed by CMU and the University of Wales Newport*. Most Art and Design research is conducted through WIRAD. In the 2008 RAE the Art & Design panel rated 95% of the research submission as international standard (2*), with 70% rated as either Internationally Excellent (3*) or World Leading (4*). World Leading research was specifically noted by the panel in the **Film Photography & Screen Media, Fine Art and Ceramics** research groups. The university power rankings calculated by Research Fortnight, based on the quality and quantity of research output, ranks the University was ranked 6th in the UK and 1st in Wales for **Sport Related Subjects**. 70% of the Cardiff School of Sport’s research was rated as having international impact (2*) and a quarter was classified as internationally excellent (3*) or world leading (4*). There were 38 UK institutions submitted in this subject field with the university returning the second largest number of research active staff. In Health Sciences, 15% of the research submitted was rated internationally excellent (3*) or world-leading (4*); 50% was rated as being of international standing (2*). In Business & Management, 10% of research submitted was rated internationally excellent (3*) or world-leading (4*); 35% was rated as being of international standing (2*). In Education, 30% of the research submitted was rated as being of international standing (2*).

For more information about the Cardiff Metropolitan University (UWIC) RAE 2008 performance:

<http://www3.cardiffmet.ac.uk/english/research/pages/home.aspx>

Glyndŵr University 6 subject areas submitted to the RAE 2008.

These areas were Nursing and Midwifery, Computer Science and Informatics, Metallurgy and Materials, Social Work and Social Policy and Administration, Education, and Art and Design.

In all areas, a proportion of the research was judged to be "internationally excellent" (3*). In 2 areas, namely **Computer Science & Informatics and Metallurgy & Materials**, a proportion of the research was judged to be 4* "world leading". Overall, 57.5 per cent of submitted research was recognised as being of quality that is recognised internationally (2*). For more information about the Glyndŵr University RAE 2008 performance <http://www.rae.ac.uk/results/qualityProfile.aspx?id=86&type=hei>

Swansea University 31 subject areas submitted to the RAE 2008.

The university was ranked 36th of 159 UK universities in the 2008 RAE power table, where 27 out of Swansea University's 31 research areas are shown to be undertaking world-leading (4*) work. The RAE results showed that Swansea had the largest increase in internationally excellent (3*) research in the UK, since the previous 2001 RAE. Over 90% of academic staff submitted were classed as research active and almost 50 per cent rated as world-leading (4*) or internationally excellent in terms of originality, significance and rigour (3*). The university demonstrated particularly strong performances in **Engineering, Medicine and Computer Science**. The results also highlight outstanding internationally recognised (2*) research excellence in **Geography, Economics, Welsh and History**. When the profile for each Unit of Assessment is turned into a weighted average, Swansea University's **Civil Engineering** department achieves an overall UK ranking of second, after Imperial College London. 92 per cent of staff within the University's College of Engineering are classed as producing research of international quality or above (grades 4*, 3* and 2*). In its first submission for assessment, 87 per cent of staff in the College of **Medicine** staff were assessed as producing research of international quality or above (grades 4*, 3* and 2*). Overall at Swansea University, almost 50 per cent of staff submitted for assessment were given the highest ratings, producing research which is world-leading (4*) or internationally excellent (3*) in terms of its originality, significance and rigour. 85% of Business staff were classed as producing research of international quality (2*) or above. 87% of staff in the School of Medicine were assessed as producing research of international quality (2*) or above, and 60% of Economics staff were rated world leading (4*) or internationally excellent (3*). For more information about Swansea University's RAE 2008 performance: <http://www.swan.ac.uk/research/excellence/rae2008/>

University of Glamorgan* Research submitted in 17 areas (see [17 units of assessment](#)).

Glamorgan* performed well in **English, History, Engineering, Built Environment, Nursing, Social Policy and Computing**. It also performed well in the Creative and Cultural Industries. The University is committed to research which meets the needs and aspirations of society in its broadest sense and to the view that research and knowledge transfer go hand in hand with learning and teaching and that the three activities are mutually reinforcing. For more information about University of Glamorgan*'s RAE 2008 performance: <http://office.research.glam.ac.uk/rae-glam/>

University of Wales, Newport* Research submitted in 5 areas for the RAE 2008.

Traditionally known as a teaching institution, the university has begun to grow its research capabilities in recent years. The 5 subject areas submitted for the RAE 2008 were:- Art and Design;

Mechanical Engineering; Social Work and Social Policy & Administration; Education; History. All areas achieved international recognition, with 55% of research submitted classed as of quality that is internationally excellent in terms of originality, significance and rigour (3*) and 7% classed as world-leading in terms of originality, significance and rigour (4*). The best results came in **Art and Design** – University of Wales, Newport* submitted a joint bid in this area with the Cardiff Metropolitan University (then known as UWIC). 70% of research assessed was deemed to be world leading or internationally excellent in terms of originality, significance and rigour (3* and above), which resulted in a Times Higher Education Supplement ranking of 12th out of 70 universities. This was a unique bid in this subject area. More information about University of Wales, Newport*RAE 2008 performance is available at <http://www.newport.ac.uk/research/REF2014/Pages/default.aspx>

The Royal Welsh College of Music & Drama (RWCMD). RWCMD is the National Conservatoire of Wales and a centre of excellence for the performing arts. The College trains and educates talented students from around the world and is a teaching institution that does not submit any research to the RAE.

University of Wales Trinity Saint David was formed by the recent merger of University of Wales Lampeter and Trinity University College. The RAE 2008 preceded the merger. University of Wales Lampeter [submitted research in 4 areas to the RAE 2008](#): 15% of activity in the **Archaeology, History & Anthropology** research cluster was identified as “world-leading” (4*) in terms of its originality, significance and rigour, whilst 90% of activity in **Theology & Religious Studies** was considered to be of international quality (2*). Classics also performed well with a high percentage of early career researchers. <http://www.trinitysaintdavid.ac.uk/en/research/raeresults/>

Swansea Metropolitan, University of Wales Trinity Saint David [Research submitted in 4 areas for the RAE 2008](#). These were Art & Design, Education, General Engineering & Mineral and Mining Engineering, Geography and Environmental Studies. **The highest proportion of its results were of a quality that is recognised internationally in terms of originality, significance and rigour (2*).** Research, in all of its manifestations, but especially of an applied nature or comprising professional practice, is strongly encouraged. SMU has merged with the University of Wales Trinity Saint David since the last RAE. <http://www.smu.ac.uk/research/>

Data Set 4: Other Rankings and Ratings

Rankings are not objective. They often apply set criteria which provide universities with unfair advantages or disadvantages and do not take account of individual characteristics. The following rankings are published by the universities, and confirmed at independent websites where available. They are included here because they are used by a variety of audiences as performance indicators.

Aberystwyth University

- [*The Times Higher Education's Student Experience Survey \(published 2012\)*](#)
Best All-round Student Experience in UK for the 4th successive year ; 4th for Teaching and Learning; 8th in the UK overall out of the total of 113 universities surveyed
- [*The Times Good University Guide 2013*](#)
The best university in UK for student satisfaction for the 6th successive year; 47th overall in UK; Accounting and Finance 37th in UK; Geography and Environmental Sciences 19th in UK; Geology 25th in UK; Politics 14th in UK
- [*National Student Satisfaction Survey \(2011\)*](#)
The top University in the Country for student satisfaction
- [*I-Graduate International Student Barometer \(2012\)*](#)
One of the top 5 best places in the world to be a student
No. 1 for 'living costs'; No. 1 for 'friendliness'; No. 3 for 'social activities'
- [*The Independent Complete University Guide*](#)
48th in the UK
- [*The Guardian University Guide 2012*](#)
50th in the UK; 8th for Art & Design
- [*The Complete University Guide 2013*](#)
58th in UK
- [*National Policing Report 2012 / Dyfed Powys Police, 24.01.13*](#)
Safest Place in the UK

Bangor University

- [*WhatUni? Student Choice Awards in Accommodation \(2011\)*](#)
Top 10 in UK
- [*The Times Higher Education's Student Experience Survey \(2011\)*](#)
25th in UK
- [*The Times Good University Guide 2013*](#)
56th in UK; Accounting and Finance 37th in UK; Chemistry 26th in UK; Business Studies 46th in UK; Geology 22nd in UK; Electrical and Electronic Engineering 21st in UK
- [*The Independent's A-Z of Universities and Higher Education Colleges*](#)
Lowest cost of living in UK to study
- [*The Guardian University Guide 2012*](#)
79th in UK
- [*The Complete University Guide 2013*](#)
66th in UK

Cardiff Metropolitan University

- [The Guardian University Guide 2012](#)
71st in UK
- [The Times Good University Guide 2013](#)
78th in UK; Aeronautical and Manufacturing Engineering 38th in UK; Hospitality, Leisure, Recreation & Tourism 12th in UK
- [I-Graduate International Student Barometer \(2011, 2012 & 2013\)](#)
1st in UK for Student Satisfaction
- [People & Planet Green League](#)
1st class

Cardiff University

- [The Guardian University Guide 2012](#)
39th in UK; 4th for Architecture
- [The Complete University Guide 2013](#)
36th in UK
- [The Times Higher Education's Student Experience Survey \(2011\)](#)
22nd in UK
- [The Times Good University Guide 2013](#)
32nd in UK; Pharmacology and Pharmacy 3rd in UK; Civil Engineering 4th in UK; General Engineering 4th in UK; Communication and Media Studies 6th in UK; Mechanical Engineering 10th in UK; Business Studies 11th in UK; Geography & Environmental Sciences 16th in UK; Law 18th in UK; Geology 19th in UK; Sociology 23rd in UK; Economics 24th in UK; Politics 25th in UK; Chemistry 30th in UK; Mathematics 36th in UK.
- [Sunday Times University of the Year 2013 Shortlist](#)

Glyndwr University

- [The Times Good University Guide 2013](#)
97th in UK; Aeronautical & Manufacturing Engineering 31st in UK

Swansea University

- [The Guardian University Guide 2012](#)
94th in UK
- [The Complete University Guide 2013](#)
49th in UK; 5th safest place in UK; 1st in Wales
- [The Times Good University Guide 2013](#)
52nd in UK; Materials Technology 8th in UK; Civil Engineering 9th in UK; General Engineering 10th in UK;
Aeronautical & Manufacturing Engineering 15th in UK; Chemical Engineering 16th in UK;
Mechanical Engineering 24th in UK; Geography & Environmental Sciences 33rd in UK;
Computer Science 33rd in UK; Electrical & Electronic Engineering 33rd in UK; Economics 39th in UK; Accounting & Finance 48th in UK
- [The Times Higher Education's Student Experience Survey \(2011\)](#)
24th in UK

- [National Student Survey 2012](#)
Top 3 of UK universities for student satisfaction; Materials Science 1st in UK; Zoology 1st in UK
- [WhatUni Awards 2011](#)
2nd in UK
- [QS Stars Global University](#)
5* teaching quality

Swansea Metropolitan, University of Wales Trinity Saint David

The university website (March 2013) explains that the University does not appear in any newspaper or any other organised league tables apart from tables published prior to August 2008. (This position may be subject to change following the merger between Swansea Metropolitan and University of Wales Trinity Saint David). The university view is that Government and its official agencies should be the formal assessors of higher education in the UK. The university received an outstanding report in the last Teaching Quality Assessment (2007).

University of Glamorgan*

- [Times Higher Education Awards 2012](#)
Outstanding Support for Students
<http://news.glam.ac.uk/news/en/2012/nov/30/glamorgan-wins-national-award-oustanding-student-s/>
- [The Guardian University Guide 2012](#)
68th in UK
- [The Times Good University Guide 2013](#)
95th in UK; Aeronautical & Manufacturing Engineering 30th in UK; Civil Engineering 41st in UK; Chemistry 49th in UK

University of Wales, Newport*

- [The Times Good University Guide 2013](#)
108th in UK

University of Wales Trinity Saint David

- [The Times Good University Guide 2013](#)
105th in UK
- [Guardian University Awards](#)
INSPIRE shortlisted for Sustainable Project category

Sources

<http://www.timeshighereducation.co.uk/world-university-rankings/2011-12/world-ranking/>;
<http://www.thetimes.co.uk/tto/public/gug/>; <http://www.thecompleteuniversityguide.co.uk/>;
<http://unistats.direct.gov.uk/>; <http://www.hotcoursesabroad.com/study/university-rankings/ranking/pno/5/ranking.html>; <http://www.topuniversities.com/university-rankings/world-university-rankings/2012>; <http://www.timeshighereducation.co.uk/story.asp?storycode=419771>;
<http://www.topuniversities.com/university-rankings/world-university-rankings/2012>
<http://peopleandplanet.org/green-league-2012/tables?ggl12profile=8795&test=97930d>
 Universities' websites.

Data Set 5: International Student Numbers

International Student Numbers: Full-time students from outside the EU by country of origin 2004-05 to 2011-12

By Country	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12
China	2,115	1,943	1,785	1,941	2,283	2,823	3,597	4,406
India	647	867	1,054	1,350	1,712	2,117	2,264	1,644
Saudi Arabia	89	97	157	274	483	702	788	671
Nigeria	298	329	351	452	457	549	635	660
Malaysia	485	429	409	530	553	622	603	620
Pakistan	178	264	389	296	355	376	516	517
Hong Kong	180	214	147	277	327	314	381	403
US	86	190	193	219	263	342	324	376
Bangladesh	39	54	74	116	94	136	246	216
Brunei	42	76	108	172	173	189	186	202
Qatar	47	50	56	50	137	217	198	191
Oman	112	118	100	140	144	169	187	190
Norway	45	66	58	75	111	132	186	172
Sri Lanka	26	18	41	59	49	74	159	146
Canada	77	70	84	125	140	156	179	145
Kenya	134	129	150	134	133	148	141	142
Bahrain	48	39	50	57	51	118	111	138
Kuwait	30	35	52	59	80	86	104	137
Iraq	3	2	16	70	44	79	97	123
Libya	33	73	96	113	161	208	155	105
Jordan	33	29	66	75	91	101	107	99
Iran	28	30	37	55	72	82	78	81
UAE	44	53	62	61	83	101	69	72
Thailand	41	52	50	42	49	62	62	65
Japan	188	162	140	125	81	89	84	60
Tanzania	31	23	44	36	51	79	95	58
Botswana	46	34	37	68	98	115	99	56
Korea	61	73	70	61	78	60	89	53
Taiwan	103	116	129	98	92	97	66	44

International Student Numbers: Full-time students from outside the EU by institution and level of study 2011-2012 (Wales International Consortium)

	UG	PGT	PGR	FP	EL	PM	JYA	SA	OTH	TOTALS
Aberystwyth University	358	132	54	15	13	2	0	0	39	613
Bangor University	743	576	221	0	49	0	32	7	4	1,632
Cardiff University	1,411	1,197	330	69	33	0	0	11	0	3,051
Glyndwr University	345	263	18	0	0	0	0	0	0	626
Royal Welsh College of Music and Drama	25	30	0	0	0	0	0	1	0	56
Swansea Metropolitan University	337	191	4	11	0	0	0	0	0	543
Swansea University	977	511	132	5	361	0	184	0	0	2,170
Swansea International College Wales Swansea (Swansea University)	111	0	0	154	0	63	63	0	0	328
University of Glamorgan*	916	516	49	45	415	0	0	0	0	1,941
Cardiff Metropolitan University	383	828	63	35	16	0	0	0	0	1,325
UW Newport*	218	491	8	2	0	0	0	13	0	732
Wales International Study Centre (UW Newport*)	7	0	0	54	9	2	2	0	0	72
UW Trinity Saint David	12	14	4	0	9	0	0	4	0	34
Totals	5,843	4,749	883	390	896	67	216	36	43	13,123

NOTES

1. Statistics in the above 2 tables were returned by the institutions to Wales International Consortium and apply to full time or full-time equivalent, full fee paying students from outside the European Union.
2. ICWS = International College Wales Swansea, Navitas college embedded at Swansea University.
3. WISC = Wales International Study centre, Study Group college embedded at UW Newport*.
4. UG = Undergraduate; PGT = Postgraduate Taught; PGR = Postgraduate Research; FP = Foundation Programme; EL = English Language; PM = Pre-Masters; JYA = Junior Year Abroad (includes students studying for 1 or 2 semesters); SA = Study Abroad (includes a range of visiting student programmes)

Student Numbers: All first degree SCIENCE students (home, EU & International) by institution and field of study (HESA).

	Medicine/ Dentistry	Allied to Medicine	Biological Sciences	Agricultur & related	Physical Sciences	Math Sciences	Comp Sciences	Engin & Technol	Archi, Bld,	TOTAL SCIENCE
Aberystwyth University	0	0	945	305	790	185	420	70	0	2720
Bangor University	0	625	2075	100	500	0	210	80	0	3590
Cardiff University	1,945	2,300	1655	0	1215	430	325	1215	580	9660
Cardiff Met University	0	685	1570	100	0	0	120	65	190	2730
University of Glamorgan*	0	1,300	1040	5	680	115	570	1155	210	5125
Glyndwr University	0	640	185	5	65	0	180	470	100	1645
UW Newport*	0	60	270	0	5	15	185	110	0	640
Swansea Met University	0	75	85	35	0	0	400	330	55	975
Swansea University	145	160	1150	0	490	365	230	1260	0	4700
UW Trinity Saint David	0	0	80	0	90	0	260	0	0	430
Total Wales	2,090	6,795	9,050	555	3,835	1,100	2,900	4,750	1,140	32,215
Total UK incl Wales	45,375	105,690	123,445	8,130	58,340	27,380	55,970	85,640	30,365	544,875
% of students in Wales	4.6%	6.4%	7.3%	7%	6.5%	4%	5.2%	5.5%	3.7%	5.9%

Notes:

Veterinary Sciences is not available in Wales. The UK total for Veterinary Science was 4,545 first degree students.

The statistics in the above table were returned to the Higher Education Statistics Agency (HESA)

Student Numbers: All first degree other students (home, EU & International) by institution and field of study (HESA).

	Social Studies	Law	Bus & Admin	Mass Comms	Langs	Hist & Philos	Creative Arts & Design	Education
Aberystwyth University	860	640	540	95	835	475	945	150
Bangor University	545	305	790	165	630	400	385	420
Cardiff University	1005	945	1360	470	1405	880	210	135
Cardiff Met University	420	0	1655	70	210	80	1110	575
University of Glamorgan*	405	625	1165	575	205	130	1750	235
Glyndwr University	385	0	355	75	65	60	485	335
UW Newport*	280	95	205	0	50	135	1485	485
Swansea Met University	50	0	590	0	15	5	1020	335
Swansea University	1240	755	1090	260	1120	920	0	70
UW Trinity Saint David	85	0	620	110	170	450	270	790
Total Wales	5,275	3,365	8,365	1,825	4,700	3,535	7,660	3,535
Total UK incl Wales	119,965	56,970	170,780	37,935	79,870	55,060	132,975	48,445
% of students in Wales	4.4%	5.9%	4.9%	4.8%	5.9%	6.3%	5.7%	7.5%

Notes:

Statistics in the above table were returned to the Higher Education Statistics Agency (HESA)

Data Set 6: Further Education Colleges in Wales (January 2013)

Further Education institutions often offer some Higher Education e.g.: Foundation Degrees, Higher National Diplomas, Higher National Certificates and Access to Higher Education courses. They also often offer a range of career-specific professional qualifications.



The following is based on information at institution websites.

1. [Coleg Gwent](#) has partnerships with University of Glamorgan* and University of Wales, Newport* and is also involved in Universities Heads of the Valleys Institute (UHOVI). UHOVI is a strategic partnership between University of Glamorgan* and University of Wales, Newport*, which aims to improve qualifications and skills in the south Wales valleys area, ultimately contributing to regeneration and improved job prospects for local people

2. [St David's Catholic College](#) is a sixth-form college for students of all backgrounds and abilities. The college offers A' level courses and a range of vocational BTEC qualifications.

3. [Cardiff and Vale College](#) The college is based on 11 sites, in Cardiff and the Vale of Glamorgan*. Around 1,000 courses are offered including A Levels, GCSEs and vocational qualifications.

4. [Coleg Morgannwg](#) is also part of UHOVI with University of Glamorgan* and University of Wales Newport*. Courses include Access to Higher Education; A Level programmes; General Education including GCSEs and Higher Education in subjects including Public and Uniformed Services; Science; Sports Studies; Travel and Tourism.
5. [Ystrad Mynach College](#) The College was opened in 1959 to meet the needs of the local coal mining industry. There are several campus locations:-[The College Ystrad Mynach](#) - the main campus site. [The College Rhymney](#) – to develop the basic and intermediate skills of the area. [College @ Centres](#) – based in High Street locations in [Aber Valley](#), [Bargoed](#) & [Blackwood](#), to provide ‘drop in’ training in IT. [Centre Training](#) –provides training for public sector and private sector companies. Coleg Morgannwg and Ystrad Mynach College are now in the process of merging.
6. [Merthyr Tydfil College](#) Merthyr Tydfil College is part of the Glamorgan* Group (University of Glamorgan*). Courses are under three faculties: Business & Lifelong Learning, Services to People and Technology.
7. [Bridgend College](#) The College has partnership agreements with the University of Glamorgan*, Cardiff Metropolitan University and University of Wales Newport*, which allow students to study selected university courses (mainly HNC, HND or a Foundation Degree) at the College.
8. [Neath Port Talbot College](#) A wide range of qualifications, work-based learning, links with employers (as with the entire FE sector). The college is in the process of merging with Coleg Powys.
9. [Gower College Swansea](#) A wide range of qualifications, work-based learning, training and apprenticeships and links with employers (as with the entire FE sector).
10. [Coleg Sir Gâr](#) A wide range of qualifications, work-based learning, training and apprenticeships and links with employers, plus a wide range of bachelor’s and master’s degree schemes, awarded by UW Trinity Saint David, with whom the College is in partnership.
11. [Pembrokeshire College](#) - Pembrokeshire College provides a range of post-16 education and training from A-levels and apprenticeships to degrees and part-time evening classes.
12. [Coleg Ceredigion](#) A wide range of qualifications, work-based learning, training and apprenticeships and links with employers. Coleg Ceredigion has a partnership with University of Wales Trinity Saint David.
13. [Coleg Harlech WEA \(North\)](#) Coleg Harlech Workers' Educational Association (North Wales) was formed by the merger of 2 of Wales’ oldest adult education bodies, the Workers’ Educational Association North Wales and Coleg Harlech.
14. [Grŵp Llandrillo Menai](#) Grŵp Llandrillo Menai comprises Coleg Llandrillo, Coleg Menai and Coleg Meirion-Dwyfor. The Group (Grŵp in Welsh) creates an umbrella organisation to oversee the operation of the 3 member colleges. The merger has created one of the largest FE college groups in

the UK. It delivers courses to around 34,000 students across 4 counties. A new University Centre at Coleg Llandrillo is planned, as a result of a recent strategic alliance with Bangor University.

15. [Deeside College](#) Partnership agreements have been signed by Deeside College with Aberystwyth University, Bangor University, the University of Chester and Glyndwr University to provide progression opportunities across a variety of subject areas.

16. [Yale College Wrexham](#) Yale College describes itself as a friendly and vibrant learning community in the heart of Wrexham, open to all members of the community and striving to help students of all ages succeed and progress into university and employment.

17. [Coleg Powys](#) Coleg Powys and Neath Port Talbot College are in the process of merging. The College has 4 campuses, each in rural mid Wales and provides a wide range of qualifications, work-based learning, training and apprenticeships and links with employers.

Designated FE Institutions

[YMCA Community College](#) - YMCA Wales Community College is a further education institution dedicated to providing community based learning opportunities for people in Wales wishing to re-engage with education, in particular those who do not wish to follow traditional education routes.

[WEA South](#) - The Workers' Educational Association (WEA) South Wales is unique in the education world because it is a voluntary association of its learners. Each WEA branch or group negotiates the learning it needs giving the learner a voice in deciding how, where and what to study.

Data Set 7: Background to the University of Wales

The University of Wales was founded in Wales in 1893 as a federal university with 3 foundation colleges: University College Wales (now Aberystwyth University), which had been founded in 1872; University College North Wales (now Bangor University); and University College South Wales and Monmouthshire (now Cardiff University) founded in 1881.

Prior to the foundation of the federal university, these 3 colleges had prepared students for the examinations of the University of London. A 4th college, Swansea (now Swansea University), was added in 1920. Other institutions joined the federal university thereafter, including St David's College (now part of the University of Wales Trinity Saint David). In 1992 the university lost its position as the only university in Wales when the Polytechnic of Wales became the University of Glamorgan*.

After the merger between Cardiff University and the University of Wales College of Medicine (UWCM) on 1 August 2004, the merged institution, known as Cardiff University, ceased to be a constituent institution of the University of Wales and joined a new category of 'Affiliated/Linked Institutions'. At the same time, the University of Wales admitted 4 new institutions: North East Wales Institute of Higher Education (now Glyndŵr University), Swansea Institute of Higher Education (now Swansea Metropolitan, part of University of Wales Trinity Saint David) and Trinity College, Carmarthen (now part of University of Wales Trinity Saint David), along with the Royal Welsh College of Music and Drama, were admitted as full members of the university on 27 July 2004.

The Royal Welsh College of Music & Drama subsequently left the University of Wales in January 2007. It is now part of the Glamorgan Group, with University of Glamorgan* and Merthyr Tydfil College. More changes followed in 2007 when individual institutions which had gained the status of universities in their own right started to use the title of University – these institutions are Aberystwyth University, Bangor University, Glyndŵr University, Swansea Metropolitan University and Swansea University.

In June 2011, a report commissioned by the Welsh Assembly Government recommended that the University of Wales should “change radically”. In October 2011, the governing bodies of Swansea Metropolitan University, the University of Wales and the University of Wales Trinity Saint David agreed to merge. The 3 institutions are now a unified institution under the 1828 Charter of the University of Wales Trinity Saint David. The transformed University of Wales will in the near future cease to be an accrediting body for other universities in Wales and will close validated programmes offered at other centres in the UK and internationally.

Data Set 8: Welsh Government Strategies and Other Influences on Higher Education in Wales

As well as the influence and impact of global trends, universities in Wales operate in the specific context of a small country with a population of only about 3 million and relatively small-scale significant industry, compared to power-houses such as China, India and the USA.

Recently, UK universities have been particularly challenged by immigration controls which have affected international staff and student recruitment and mobility; by budget cuts and the slowing of the economy; by the introduction and increase in tuition fees for home students and by changes to research funding. In Wales, universities have also been affected by Welsh Government changes to the number of home/EU students each university can recruit, and some restructuring of the sector.

Higher education in Wales is a substantial industry in its own right with a turnover of £1.2bn in 2008/09. This turnover makes a direct contribution to the economy supplemented by knock-on effects. These knock effects generated an additional £1.5bn expenditure in other industries throughout Britain - with £1.1bn accruing to Welsh industries. Universities direct outputs have a multiplier effect of 2.02: in other words, for every £1m of university expenditure, £1.02m accrues to industries located in Wales ([Investing for the Upturn - Securing the future of our economy and society, Higher Education Wales 2011](#)).

In Wales, there were 25,270 students from outside the UK, of whom 6,020 were from the rest of Europe and 19,250 from the rest of the world in 2010/11 (*Higher Education Statistics Agency, 2012*). *The Impact of International & EU Students in Wales*, a report by Oxford Economics in 2011, determined that in 2010-11 Wales' international and EU students contributed £237 million to Wales' GDP, equivalent to 0.5% of the Welsh economy, and that their presence supported 9,230 jobs in Wales.

The Welsh Government sets out its intentions for higher education in the 2009 education strategy *For Our Future*, the 2010 economic development strategy, *Economic Renewal: a new direction*, and in *Science for Wales – a strategic agenda for science and innovation for Wales* published in 2012. It is soon to publish its *Innovation Strategy for Wales* which will build on *Science for Wales*.

For Our Future sets out the Welsh Government's expectations for the higher education sector. It focuses in particular on its priorities for:

- widening access to universities through improved links with schools and FE colleges;
- more accreditation of prior learning and learning in progressive, credit bearing steps;
- a focus on employability skills;
- delivering world-leading research particularly in science, technology, engineering, and mathematics;
- a strong postgraduate base to feed innovation and the future academic community;
- knowledge exploitation, consultancy, workforce programmes, spinout and other services;
- championing Welsh cultural awareness and identity, in an environment of global awareness.

And it sets out how it expects these challenges to be met through:

- Developing a regional dimension to planning and delivery of higher education;
- Diversity and flexibility in course design, duration and delivery to match need and demand;
- Increasing the impact of university research, through targeting support on areas of strength and national priority, and promoting collaboration;
- Strengthening the exploitation of knowledge;
- Increasing collaboration among HE providers and between HE and other providers;
- Promoting the role of HE providers as Corporate Citizens;
- Targeting financial support to widen access;
- Ensuring that the student voice strengthens HE;
- Strengthening the contribution of HE to workforce development;
- Enabling study through the medium of Welsh in a wider range of programmes and locations.

Science for Wales is aligned to the European Commission's *Europe 2020 Strategy and Innovation Union* policy in which research and innovation and the international dimension are central to economic growth. The strategy focuses on building a strong and dynamic science base that supports the economic and national development of Wales. It notes that there are vital links between the research and science skills base in Wales, and the processes of innovation, development and commercialisation that transform scientific outputs into economic advantage for Wales. A strong, advanced industrial sector depends critically on the science base. They each should feed one another. In this context, the Strategy is interested in ideas for closer linking between the research, the innovation, and the commercial development stages of projects.

The Welsh Government target for Wales' share of UK Research Council funding is over 5%, which would equal about £27m (Wales has some world-class science and won 3.4% of UK Research Council funding in 2009/10). There is therefore the aim to create an environment where learners want to study science, perform well internationally at school level, and progress in science-related careers (while delivering excellence in industry and world-class standards in further and higher education).

To achieve this, the strategy notes, the Welsh Government will focus on key sectors to promote an economy where science is a major generator of wealth and prosperity. It will launch a programme in three Grand Challenge priority areas: Life Sciences and Health; Low Carbon, Energy and Environment; and Advanced Engineering and Materials, where Wales already has a track record of excellence, and where the route from research to commercialisation is reasonably clear. The programme in these three Grand Challenges builds on 4 underpinning capabilities: fundamental research; STEM outreach; the e-infrastructure; and exploitation of intellectual property. The strategy notes that the guiding principles must be clear leadership and the pursuit of excellence, world-class research, international openness in cooperating with the best, funding stability, readiness to take risks and systematic engagement with research funders.

The strategy also outlines the setting up of the 'Sêr Cymru' initiative. This sets up National Research Networks, each led by a specialist director, for each of the 3 major Grand Challenge science activities and aims to bring global 'stars' to Wales. Health and well-being of the Welsh population are prioritised, as are: engaging more young people in science through the National Science Academy;

international excellence in education and training including in the work place in apprenticeships and other work-based learning schemes; and coordination and leadership in all stages of building the science base. This will be provided by the Chief Scientific Adviser and the Science Advisory Council for Wales; the National Science Academy; universities; industry sector panels; a new strategic advisory group for innovation; the Higher Education Funding Council for Wales; a new Labour Market Intelligence Unit; and enhanced careers advice, as well as European Funding. Once the new Innovation Strategy is published, consideration will be given to appointing a national leader for innovation under a new Chief Scientist's Department, including a new Science Division.

A co-ordinating group with representation from the Higher Education Funding Council for Wales, Higher Education Wales, Colleges Wales (UK) International and Welsh Government produced A *Higher & Further Education International Action Plan for Wales* in December 2012. It confirms the view that the strengthening of research and innovation and international collaboration will be key to the long-term success of Wales, and identifies 5 priorities:

- Making Wales a destination of choice
- Promoting international partnerships that are mutually beneficial
- Building internationally excellent research capacity in selected areas
- Developing closer links between universities and businesses operating overseas
- Improving Wales's contribution to international development

Economic Renewal: a new direction emphasises the need for relationships with high growth firms, and major companies with extensive supply chains in Wales, within and outside the Welsh Government's 9 economic priority sectors

- Creative industries
- Information, Communication and Technology (ICT)
- Energy and Environment
- Advanced materials and manufacturing
- Life Sciences
- Financial and Professional services
- Food and Farming
- Construction
- Tourism

Wales also has an *Education in Sustainable Development and Global Citizenship Strategy* and the Welsh Government supports international development and providing humanitarian assistance through its *Wales for Africa* programme, its *Education for Sustainable Development and Global Citizenship Strategy*, and the *Enhancing Learning and Research for Humanitarian Assistance* initiative. Other relevant strategies, reports and background papers include *Jones Review of Higher Education in Wales* (2008); *Investing for the Upturn* (2011), Higher Education Wales; *The Impact of International & EU Students in Wales*, Oxford Economics Ltd (2011), for Higher Education Funding Council for Wales, Higher Education Wales and Wales International Consortium; *First Minister's Speech to Leadership Foundation* (2012); *Higher & Further Education International Plan for Wales* (2012), Higher Education Funding Council for Wales, Higher Education Wales, Welsh Government and College Wales (UK) International.