The University's research activity tackles the world's most urgent issues head-on: issues such as health and disease, climate change, food security, energy and social justice. Our academics are also engaged with the cultural life and history of nations, communities and individuals across the world; with the future of technology, science and medicine and the development of innovations in every field; and with the rich cross-pollination made possible by interdisciplinary fields such as nanotechnology, quantum cryptography, composite materials, stem-cell engineering and complexity science.

The University's priorities in this area are to:

- be recognised globally for the quality of our research;
- create a positive research environment and infrastructure that will attract and retain the highest quality researchers and postgraduate students worldwide;
- develop our portfolio of flagship and high-impact research, working across and between disciplines to answer important societal questions and contribute to the social, political, environmental and economic well-being of the region, the UK and the wider world;
- seek, manage and provide professional support for strategic relationships and alliances with key national and international partners – business and industry, the public sector, user communities, sponsors of research and policy-makers;
- play a leading intellectual role in informing policy and engaging with research and policy-makers;
- develop a sustainable portfolio of research helping to address major global challenges to ensure UK and national industrial and economic wellbeing;
- develop a sustainable portfolio of research helping to address major global challenges to ensure UK and national industrial and economic wellbeing.

New institute addresses global uncertainty

Some of the most pressing environmental issues facing the modern world are to be addressed by the University’s Cabot Institute, which was launched in November 2010 and brings together world-leading researchers in science, engineering, social sciences and law.

A discussion panel event marking the launch featured speakers including Sir Crispin Tickell, Director of Policy Foresight Programme; the Hon Sir Jonathan Porritt, Founder Director of Forum for the Future; Julie Hill of the Green Alliance; Brendan Gormley, Chief Executive of the Disasters Emergency Committee; and Professor Ric Parker, Rolls-Royce Director of Research and Technology. The first director of the Cabot Institute is Professor Paul Bates from the School of Geographical Sciences.

Historic China explored

The history of modern China before the Cultural Revolution is being pieced together by researchers including Professor Robert Bickers from the Department of Historical Studies, whose new book The Scramble for China: Foreign Devils in the Qing Empire, 1852-1914 tells the epic story of foreign impact on China from the early 19th century to the start of the First World War. The Sunday Times praised the book as ‘compelling, erudite and clear-sighted’. Professor Bickers is also the Director of the Historical Photographs of China (HPC) project, which after several years of collecting and digitising images has developed into the JISC-funded Visualising China, an online resource that offers access to an extraordinary collection of images of China, the Chinese and Chinese life from 1860 onwards.
China-related publications. Visualising collections and a Google Books library of featured are previously unseen and private Research Institute, Cambridge). Also Photographs of wartime China (Needham 10 could represent a faster route to a quantum computer – a powerful type of computer – that uses quantum bits (qubits) rather than the conventional bits used in today’s computers that will help us understand the most complex scientific problems.’

A collaboration involving the universities of Bristol, Toronto and Seoul has found the basis for a novel approach to more effective, targeted relief of chronic pain caused by nerve injuries. A protein molecule known as PKM zeta is required to store memories, and chronic pain involves a malfunctioning in this neural process, causing an individual to re-experience pain as the memory of it persists. The new research, having detected the cause of this malfunction, has identified a target for the treatment of neuropsychiatric pain. By inhibiting PKM zeta in a part of the brain involved in the perception of pain in a mouse model, the international team has been able to eliminate the painful memory responsible for chronic pain.

Professor Graham Collingridge, from the University’s MRC Centre for Synaptic Plasticity, and part of the Bristol Neuroscience network, said: ‘It may be possible one day to treat some forms of chronic pain by inhibiting PKM zeta or other molecules involved in the storage of the painful memory. The challenge will be to target the drug so that it inhibits painful memories but not other forms of memory.’

‘Jailbreak’ bacteria can trigger heart disease
Bacteria that cause dental plaque can move from the mouth into the bloodstream and increase the risk of heart attack, according to research by the School of Oral and Dental Sciences and the Royal College of Surgeons in Ireland (RCSI).

‘Poor dental hygiene can lead to bleeding gums, providing Streptococcal bacteria with an escape route into the bloodstream,’ said Professor Howard Jenkinson. These bacteria use a protein on their surface, called PadA, as a weapon to force platelets in the blood to bind together and form clots. These completely encase the bacteria, providing a protective cover not only from the immune system, but also from antibiotics that might be used to treat infection. As well as helping out the bacteria, platelet clumping can cause small blood clots, growths on the heart valves (endocarditis) or inflammation of blood vessels that can block the blood supply to the heart and brain.

The team is using a new blood-flow model, developed by Dr Steve Kerrigan at the RCSi, that mimics conditions in the human circulatory system, to investigate how the platelet-activating function of PadA can be blocked. This could lead to new treatments for cardiovascular disease, the biggest killer in the developed world.

UK researchers release draft sequence coverage of wheat genome
The first sequence coverage of the wheat genome has been released by a team of UK researchers, including Professor Keith Edwards and Dr Gary Barker at the School of Biological Sciences. This major step towards a fully annotated genome is a significant contribution to efforts to support global food security and to increase the competitiveness of UK farming. The work was funded by the Biotechnology and Biological Sciences Research Council (BBBRC).

The wheat genome is five times larger than the human genome and presents a huge challenge for scientists. These ‘raw’ draft sequences give scientists access to 95 per cent of all wheat genes (a complete copy of the genome requires further revisions, annotations and the assembly of the data into chromosomes). Understanding the genetic differences between varieties will enable development of new types of wheat that are better able to cope with drought or salinity, and to deliver higher yields.

This is one of the largest genome projects undertaken to date, and the rapid public release of the data (a condition of the original BBBRC support for this project) is expected to accelerate the use of the information by wheat breeding companies. The team also included researchers from the University of Liverpool and the John Innes Centre, a BBBRC-funded institute.

‘Honour-based’ violence study makes international impact
Research by Professor Gill Hague and Dr Nazanin Béghirí from the School for Policy Studies into ‘honour-based’ violence and honour killings in Iraqi Kurdistan and the UK has earned plaudits from the Foreign and Commonwealth Office and the UN.

The study, conducted with colleagues from the University of Rosthampston, assessed the nature and extent of such violence (which is carried out against family members, most often women, by other family members, most often men), and evaluated the impact of these practices on women’s experiences in Kurdish communities. Attention was paid to cultural and family traditions, and to media representations of Kurdish ideas concerning gender relations and family honour.

The study was described by Alastair Burt, former Minister for the Middle East, as offering ‘a roadmap to combating honour-based violence in Iraqi Kurdistan’. The Kurdish Regional Government supported the study in order to get a better understanding of the nature and consequences of this violence and abuse, and the findings have already led to legislation to reduce violence against women and crimes in the name of honour.

Bristol New Enterprise Competition
The winner of the University of Bristol’s 2011 New Enterprise Competition (organised by Research and Enterprise Development to inspire new business ideas and entrepreneurial talent among students, staff and recent graduates) was Avishem Banerjee, a teaching assistant in the Department of Mechanical Engineering, for SunHil, which aims to provide sustainable lighting to the poorest communities in rural India. Small solar panel charging stations can provide enough electricity to charge low-power LED lanterns, giving customers a higher quality lighting service at a lower price than the existing kerosene lamps.

The second-place winners were Spyglass Technologies Engineering Mathematics PhD student Oliver Payton, and Dr Loren Picco and Professor Mervyn Miles from the School of Physics, for a novel Atomic Force Microscope, considerably cheaper than the nearest competitor, which requires no special training to operate.

In joint third place were William Goodwin, a final-year civil engineer, for EventBand, which uses Radio Frequency Identification wristbands to provide proof-of-identity and cashless payment systems for festivals; and Mark Caldwell, a final-year computer scientist, for ChipID, a smartphone application that identifies bird species from audible birdcalls.

This year’s competition entries were judged by a panel of industry experts from sponsoring organisations including Bristol City Council, Deloitte, EADS, Jones Lang LaSalle, IP Group, Motorola, Osborne Clarke, Santander, SETsquared Business Acceleration Centre (Bristol) and Wyvern Seed Fund.
Research continued

Grants

The University attracted a total of £105 million in grants during 2010/11. This included the following:

- Over £2 million from the European Research Council for a project in the School of Physiology and Pharmacology looking into the neural network basis of learning, memory and decision-making in health and disease. The majority of the grant will fund Dr. Matt Jones’ research into the use of electrical stimulation techniques to control the brain’s electrical signalling and improve cognitive performance in patients with schizophrenia and other disorders.

- Over £800,000, from the European Commission’s 7th Framework Programme, a project led by Professor Nigel Smart in the Department of Computer Science for an examination of the various methods designed to ensure that cryptographic protocols are secure. Cryptography is widely used to hide information and applications include cash machines, computer passwords and internet communications. The project will focus on advanced cryptographic protocols, which enable various security-related functions, such as identifying who you are, securing data, or performing a given operation securely. The protocols to be examined include those currently underlying mobile phone and internet communications, as well as in emerging areas such as electronic voting.

- Almost £30.5 million to a team led by Professor Mark Duffield from the University’s Global Insecurities Centre in the School of Sociology, Politics and International Studies and Dr. Sarah Collinson of the Humanitarian Policy Group, Overseas Development Institute, London, for a project on risk management in conflict-affected states. The two-year project, which began in October 2010, is funded by the Department for International Development and the Economic and Social Research Council as part of its Security, Conflict and Development theme.

- £8 million over six years from the Engineering and Physical Sciences Research Council to a team from the University’s Advanced Composites Centre for Innovation and Science (led by Professor Michael Winsom) and the Composites Centre at Imperial College London (led by Professor Alexander Bismarck) to develop a new generation of high-performance, fibre-reinforced polymer composites. Current materials, though strong and stiff, are inherently brittle, and failure can be sudden and catastrophic. More robust materials will provide greater reliability and safety, reduced design and maintenance requirements, and longer service life.

- £1.2 million from the National Institute for Health Research for a survey of the types of treatment available for pre-school children with speech and language difficulties. The study – the first of its kind in the country – will be led by Professor Sue Roulstone (Research Fellow in the School of Clinical Sciences and Clinical Research Director at the Speech and Language Therapy Research Unit at Frenchay Hospital) and carried out by North Bristol NHS Trust in partnership with the universities of Bristol and the West of England and Manchester Metropolitan University. Barnardos and Aslatic England are also supporting the project.

- £1 million to Dr Morag McDermont at the Law School by the European Commission’s 7th Framework Programme, a team led by Professor Alexander Bismarck to develop a new generation of high-performance, fibre-reinforced polymer composites. Current materials, though strong and stiff, are inherently brittle, and failure can be sudden and catastrophic. More robust materials will provide greater reliability and safety, reduced design and maintenance requirements, and longer service life.

- £0.5 million to a team led by the University’s Advanced Composites Centre for Innovation and Science (led by Professor Michael Winsom) and the Composites Centre at Imperial College London (led by Professor Alexander Bismarck) to develop a new generation of high-performance, fibre-reinforced polymer composites. Current materials, though strong and stiff, are inherently brittle, and failure can be sudden and catastrophic. More robust materials will provide greater reliability and safety, reduced design and maintenance requirements, and longer service life.

- £8 million to the University’s Global Insecurities Centre in the School of Sociology, Politics and International Studies and Dr. Sarah Collinson of the Humanitarian Policy Group, Overseas Development Institute, London, for a project on risk management in conflict-affected states. The two-year project, which began in October 2010, is funded by the Department for International Development and the Economic and Social Research Council as part of its Security, Conflict and Development theme.

The University’s priorities in this area are to:

- ensure a fair and transparent system of student representation that provides students with the opportunity to shape their educational and extra-curricular experience;
- support a vibrant, active and democratic Students’ Union;
- ensure the provision of learning and skills opportunities that enhance students’ future employability;
- offer a rewarding extra-curricular experience that provides for students’ health, well-being and personal development;
- provide advice and support for students’ personal welfare and ensure effective integration into the University and local community.

Good works: Bristol students in the charitable and voluntary sector

The Students’ Union emphasises to its members the importance of escaping the ‘student bubble’ and engaging with the local community in a positive way. The Union’s Raising and Giving (RAG) and Student Volunteering (formerly Student Community Action) programmes offer a tremendous range of opportunities for charitable work, along with related training and personal development courses to help students complement their academic work and enhance their CVs.

RAG

In the year 2010/11, RAG activities raised a total of £109,573 through a varied programme that included street collections, stall work at local events around the city and in streets of Bristol. Two undergraduates set a new record in the annual RAG Jailbreak Challenge: Physics student Emma Bollt and Music student Mary Spender made it all the way to Perth in Australia – a journey of 9,113 miles – in 36 hours, comfortably beating the previous record (Arizona, USA).

Student Volunteering

During 2010/11, Student Volunteering ran 31 student-led projects involving over 1,000 students, and ran 10 different training programmes, reaching over 400 new volunteers. A new initiative has established a student self-help group for those suffering from eating disorders, and is to be followed with a new programme of student peer mentoring. Other developments include a wider range of support to older and isolated people, and an employability and training programme for young adults with learning disabilities (run by students together with MENCAP).

The organisers of one Student Volunteering project, the Daycentre Lunch Club, received ainspired award (from the UK’s young volunteers’ service) in January for their volunteering and community engagement work. The Lunch Club organises events and trips for the city’s senior residents.

Jonathan Board, a medical student at Bristol, was awarded the 2011 Matt Spencer Award from Volunteering England, an independent charity committed to supporting and celebrating volunteering. Jonathan’s community engagement work includes taking musical entertainment into residential homes and teaching English at a refugee centre. He also established Foodcycle, a project in which students collect surplus food from shops and deliver it to people affected by food poverty.

PhD student fronts UK science and engineering campaign

Owen Rackham, a PhD student in the Bristol Centre for Complexity Sciences, has been chosen to lead a nationwide campaign communicating the impact of science, engineering and maths on our everyday lives. He will attend festivals and events around the country as part of NOISE (New Outlooks In Science and Engineering), a UK-wide campaign funded by the Engineering and Physical Sciences Research Council. He will also talk to the public about his own research, which examines whether it is possible to re-programme human cells for a range of medical applications.