



# Introduction

Education at all levels is a perennially hot topic, arousing lively debate among parents, students, politicians, journalists and pundits.



Professor Eric Thomas  
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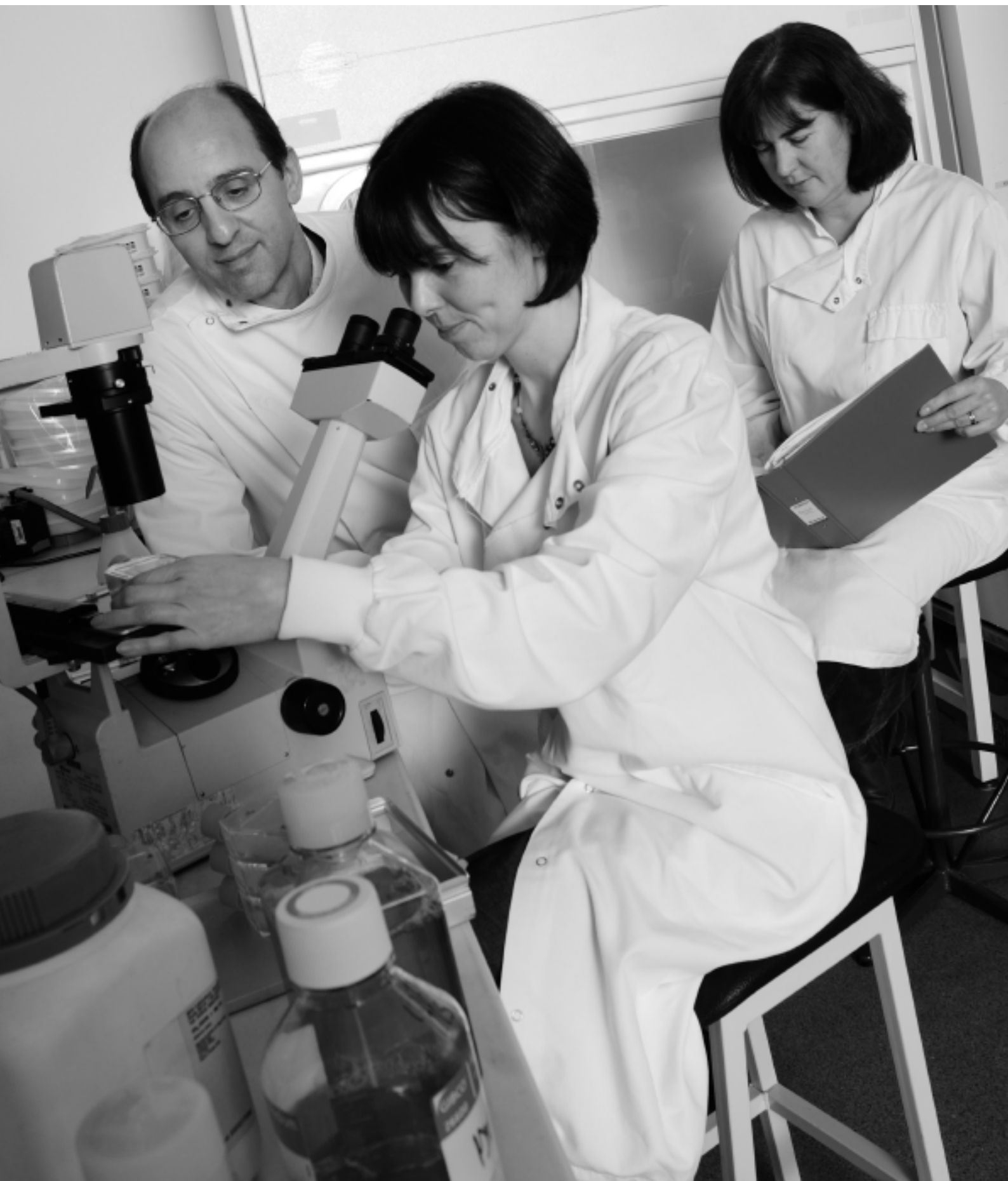
In the case of universities, the discussion at present tends to focus on entry standards (Have A-levels got easier?), admissions procedures (Are some universities biased against particular types of school?), value for money (How many hours' tuition should you get for £3,000?), and league tables (Who's up and who's down?).

Interesting though such debates may be, they usually generate more heat than light and they seldom contribute much to the understanding of what universities are and what they do. We hope that by contrast, this annual report will illuminate effectively many of the core activities of the University of Bristol. It offers a succinct overview of a year of exemplary work by all categories of staff, as well as by our brilliant undergraduates and postgraduates.

As well as thanking all of them, we should like to pay tribute to members of Council – the University's governing body. This report looks back over a year's achievements, but Council has to keep its eye principally on the future and make sure that whatever controversies about education flare up in the world at large, the University maintains a steady course that reflects its own values and is sensitive to the real needs of scholarship and society.

We have no doubt that given this University's formidable strengths – particularly the talents of its people – the progress recorded in this report is just a foretaste of what is to come as the institution moves towards its second century.

# Research and enterprise





Research at Bristol is increasingly characterised by collaboration across disciplines, and the same is true of enterprise activities.

### Cutting-edge hope for rare heart condition

A team led by Professor Jules Hancox and Dr Harry Witchel has identified a possible treatment for a newly discovered heart condition. Short QT syndrome (SQTS) arises from a defect in the regulation of the electrical currents that control heart muscle contraction. This causes changes in heart rhythm, including the often fatal 'ventricular fibrillation'.

## Heart research at Bristol made several advances in 2006/07

SQTS was first diagnosed in 1999, and medical treatments are very limited. But the team's research, funded by the British Heart Foundation, suggests that an existing heart medicine called disopyramide may be able to correct the molecular defect in one type of SQTS, making it a life-saving medicine for sufferers if the research is borne out.

### Lighting up the heart

Work by Dr Elinor Griffiths and Professor Guy Rutter in the School of Medical Sciences, with colleagues from Imperial College and Cambridge University, has illuminated the inner workings of the heart after a heart attack. The team measured the energy produced by mitochondria inside living heart cells, using a protein called luciferase which causes fireflies' tails to glow.

Mitochondria convert energy from food into chemical energy called adenosine triphosphate (ATP). Normally they can make ATP very rapidly when the heart is stressed (eg during exercise). But the team discovered that, if the cells have to beat suddenly from rest (which happens when the heart is re-started after cardiac surgery or a heart attack), the supply of ATP drops before mitochondrial production starts again, preventing the heart from beating properly. They were able to see this after introducing luciferase (which lights up in the presence of ATP) into heart cells and observing the drop in energy levels. This new method should pave the way for a fuller understanding of ATP production and could lead to improved recovery of the heart after a heart attack or cardiac surgery.

### Rolls-Royce selects Bristol for composites research

Rolls-Royce, a world-leading provider of power systems and services, opened a new University Technology Centre (UTC) in Composites at the University in April. Composite materials are increasingly used in aero-engine design and manufacturing, and the company hopes to develop this technology for future products across its aerospace, marine and energy markets. The new UTC forms part of the University's Advanced Composites Centre for Innovation and Science (ACCIS), launched the same week by Malcolm Wicks MP, the UK Minister for Science and Innovation. The Centre's academic team is headed by Michael Wisnom, Professor of Aerospace Structures and Director of ACCIS, and incorporates post-doctoral researchers and PhD students, in addition to dedicated technician, project management and administrative support.

## Earth's first rainforest unearthed

Dr Howard Falcon-Lang from the Department of Earth Sciences, with US colleagues, has discovered a fossilised forest that has transformed our understanding of the ecology of the Earth's first rainforests.

The 300-million-year-old forest, in the underground workings of a coalmine in Illinois, USA, is populated by a variety of extinct plants, including club mosses over 40 metres high, a sub-canopy of tree ferns, and tree-sized horsetails. The forest was preserved following a major earthquake 300 million years ago which caused the whole region to drop below sea level, burying the forest in mud. Nowhere else can one walk through such an extensive swathe of Carboniferous rainforest.

## Light is twice as precise

Research by Dr Jeremy O'Brien from the Department of Electrical and Electronic Engineering and colleagues in Japan has demonstrated a way to almost double the precision of measurements by using photons of light to gauge distances. The shorter the wavelength of the light used, the more precise the measurement; by using a group of four photons in two pairs, the team achieved a much shorter wavelength than in previous experiments that used a single photon. 'This is rather like using a ruler with spacing four times as fine,' said Dr O'Brien.

## How to catch a mosquito ...

Male mosquitoes increase their chances of mating by enhancing their ability to hear females flying past. Research led by Professor Daniel Robert from the School of Biological Sciences showed that mosquitoes' auditory cells react to, and boost, vibrations from the female's wing-beat. The sound made by female wings is extremely quiet and fleeting, and males have evolved highly sensitive acoustic sensors.

## ... and avoid a bat

Research led by Dr James Windmill from the School of Biological Sciences has shown how the Yellow Underwing moth changes its sensitivity to a bat's calls when the moth is being chased. Work involving engineers, biologists and physicists produced biological measurements and a mathematical model. Moth ears are among the simplest in the insect world, but when bats close in, these ears become more sensitive to the frequencies that many bats use when attacking moths.

## Dramatic increase in Type 1 diabetes in under-fives

A new study by members of the Department of Clinical Science at North Bristol has revealed that the number of children under five with Type 1 diabetes has increased five-fold in the past 20 years, while Type 1 diabetes in under-15s has almost doubled. The study, funded by Diabetes UK, looked at Oxford's population of 2.6 million people between 1985 and 2004.

Co-researcher Professor Polly Bingley said that the likely explanation could be 'that we are being exposed to something new, or that we now have reduced exposure to something that was previously controlling our immune responses. We now need to work to identify what these changes might be.'



Above, left to right: Detail of a pteridosperm, an extinct seed-producing, fern-like plant; the Yellow Underwing moth; pensions are an increasingly urgent topic.



## Pensions under scrutiny

Several studies at Bristol have tackled the increasingly urgent topic of pensions. Here are two examples:

*In Britain's pensions crisis: history and policy*, co-edited by Dr Hugh Pemberton from the Department of Historical Studies, a range of contributors argue that the Government's recent White Paper on pensions risks perpetuating a century-old cycle of complex and muddled reforms.

Six months after the Pensions Commission made its recommendations in May 2006, there had still been little reflective scrutiny of its proposals. In December, Sarah Smith from the Department of Economics was among the contributors to the journal *Research in Public Policy* (published by the University's Centre for Market and Public Organisation) drawing attention to the implications of, for example, the proposal to raise the state pension age. She points out that unskilled workers tend to die younger than professionals, so receiving the pension later would mean that the total value of the pension they received would be much lower. Second, by the age of 60 about one third of people report health problems that limit their ability to work. In the absence of a pension, many of these people will potentially claim incapacity benefits instead.



## Award for pioneering obesity clinic

A team of specialists in the Care of Childhood Obesity Clinic at the Bristol Royal Hospital for Children received the BUPA Foundation's Clinical Excellence Award for its groundbreaking work. The clinic, headed by Dr Julian Hamilton-Shield from Clinical Science at South Bristol, looks at medical, dietary and exercise factors and focuses equally on the children and their families. Eighty-three per cent of those attending the clinic reduced their Body Mass Index.

Their revolutionary approach includes the Mandometer, in which the patient fills a set of scales with food. A computer then records and stores the weight loss from the plate as the patient eats and shows when they are eating more than they should be.

## Cancer cells' 'survival tactics' uncovered

Professor Chris Paraskeva and colleagues in the Department of Cellular and Molecular Medicine have made an important advance in understanding bowel cancer.

Bowel cancer cells produce an excess of a protein called Beta Catenin which links with another protein (TCF) to stimulate uncontrolled growth. As the tumour grows and outstrips the blood supply, its cells halt their growth and produce a new protein which allows them to grow new blood vessels to feed the enlarged tumour.

The Bristol research, funded by Cancer Research UK, the Citrina Foundation and the John James Bristol Foundation, discovered that when the tumour cells 'sense' they are deprived of oxygen and nutrients, Beta Catenin abandons the TCF protein to bind with the new protein, called HIF-1, to form a chemical messenger, stimulating a new blood supply for the tumour. 'We hope to use this information to try to interfere with the tumour's survival tactics and thereby kill it off,' said Professor Paraskeva.

Above: A photograph of the river in Shanghai, 100 years ago, from the Historical Images of China project, which aims to locate, archive and disseminate photographs of pre-Revolutionary China. The Anglo-French project is led by Professor Robert Bickers and Jamie Carstairs from the Department of Historical Studies, with funding from the Arts and Humanities Research Council, John Swire and Sons and the University's Centre for East Asian Studies.



The University attracted a total of £110 million in grants during 2006/07. This included the following:

**£3.65 million** to the Particle Physics group from The Particle Physics and Astronomy Research Council, for four areas of work at CERN's new Large Hadron Collider (LHC) and the Rutherford Appleton Laboratory.

A total of £350,000 from the British Heart Foundation for three projects:

**£124,825** to Dr Rebecca Sitsapesan from the Department of Pharmacology for an investigation into the role of two molecules, FKBP12.6 and cADPR, in regulating the protein channels through which calcium ions flow. Understanding more about these molecules could help in the design of medicines to prevent or correct irregular heart rhythms;

**£87,258** to Professor Julian Hancox and his team in the Department of Physiology for research into Short QT syndrome (see 'Cutting-edge hope for rare heart condition', p3);

**£145,451** to Dr Russ Jago and his team in the Department of Exercise, Nutrition and Health Sciences for a study of the exercise habits of 500 10- and 11-year-olds in Bristol.

**€200,000** to the Bristol Institute of Greece, Rome and the Classical Tradition from the Cassamarca Foundation in Italy to fund a Junior Postdoctoral Fellowship, to be called The Cassamarca Foundation Fellowship in Latin Language and Literature and its Reception.

**£892,774** from the Engineering and Physical Sciences Research Council to Professors Andrew Orr-Ewing and Mike Ashfold in the School of Chemistry to develop optical sensors based on the low-cost diode lasers used in telecommunications. Applications include the study of plasmas used to grow materials such as diamond films, and analysis of trace constituents of human breath for specific medical conditions.

**\$2 million** from the National Institutes of Health in the USA to Professor Howard Jenkinson in the Department of Oral and Dental Sciences to explore the causes of infections involving the fungus *Candida albicans*. Such infections are becoming increasingly prevalent in hospital patients and the elderly, and are difficult to control.

**£314,411** from the Leverhulme Trust to continue a project in the Department of Archaeology and Anthropology, directed by Professor Timothy Mowl, which aims to document all the historically significant gardens of England.

**\$1.5 million** from the National Institute of Drug Abuse, USA to Professor Graeme Henderson and Dr Chris Bailey in the Department of Pharmacology to investigate the intracellular mechanisms underlying tolerance to opiates like morphine and heroin. This is in collaboration with colleagues at the Virginia Commonwealth University, USA.

## Improving the search for research resources

Staff at the Institute for Learning and Research Technology (ILRT) are working with colleagues at the University of Manchester to help researchers find online resources from conferences, workshops and seminars. The project will embed new technologies into a variety of research settings, including health sciences research, university portals and Intute (see p11).

## Cannabis increases risk of psychotic illness

Using cannabis could increase the risk of developing a psychotic illness such as schizophrenia later in life, according to a Bristol-based study funded by the Department of Health and published in *The Lancet* in July. The study drew widespread media attention and appeared on the front pages of many UK newspapers.

Dr Stanley Zammit from the Department of Community-Based Medicine and Professor Glyn Lewis from the Department of Psychiatry, with colleagues at Bristol and Cambridge Universities and Imperial College London, analysed 35 recent studies for evidence of a causal relationship between cannabis use and mental health disorders. They found that cannabis users were 41 per cent more likely to develop psychosis than those who had never used the drug.



### Forecasting catastrophes

Bristol is a key partner in a new collaboration between academia and the insurance industry to forecast the risk from climate and extreme events. The Willis Research Network, created by global insurance broker, Willis Group Holdings, includes seven leading UK university research groups with expertise in meteorology, geography, engineering, architecture and the earth sciences.

Pioneering work in the School of Geographical Sciences and the Department of Civil Engineering has produced advanced remote sensing and other techniques that will be used to create a detailed predictor of flood risk, especially for towns in the low-lying east of England.

'Flooding costs the UK about £1 billion each year,' said Professor Paul Bates, who is leading Bristol's contribution along with Professor Colin Taylor. 'The partnership with Willis is an opportunity for the University to use its expertise in flood risk analysis to help insurance companies control their exposure to flood claims while providing cover for homeowners and businesses.'

The UK group is part of a wider network of Willis-funded research by more than a thousand scientists in Asia, Europe and the Americas.

### Breast cancer test wins engineering award

Micrima, a University of Bristol spin-out company, won an award for innovation in the Institution of Engineering and Technology's (IET) annual Innovation Engineering Awards. The company won the Electronics award for its early-stage breast cancer test, which allows women to be tested regularly without over-exposure to radiation, a problem with existing X-ray tests.

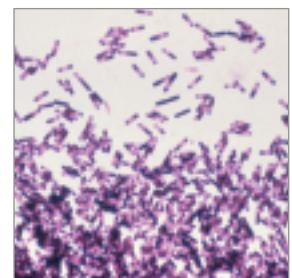
The technique is based on an innovative radar system developed by a team at Bristol led by Dr Ian Craddock, Reader in Electrical and Electronic Engineering and Alan Preece, Professor of Medical Physics. The project evolved from Professor Ralph Benjamin's pioneering work on microwave focusing in landmine detection.

### Odor-Reader wins New Enterprise Competition

The University's 2007 New Enterprise Competition was won by Odor-Reader, a device that could help over four billion people suffering from infectious diarrhoea in the developing world and reduce outbreaks of hospital 'superbugs'.

Odor-Reader is the result of a collaboration between Dr Chris Probert, Professor of Gastroenterology at Bristol, and Professor Norman Ratcliffe at the University of the West of England, to establish chemical profiles for diseases such as ulcerative colitis, *Campylobacter jejuni* and *Clostridium difficile*. The new device can rapidly diagnose gastrointestinal disease by 'reading' the odour of biological fluids.

Early treatment of *Clostridium difficile* gives patients a much better chance of survival and fewer complications. It could also save millions of pounds in NHS costs.



Above, left to right: Cannabis could increase the risk of psychosis; a satellite image of Hurricane Isabel off the coast of Puerto Rico; the bacterium *Clostridium difficile*.