

RESEARCH FORUM

The magazine for Oxford Brookes research | June 2014



Ukraine

The complex issue of
Russian influence in 2014

PLUS PLANNING FOR FLOODING | MEET ARTIE - THE ROBOTHESPIAN

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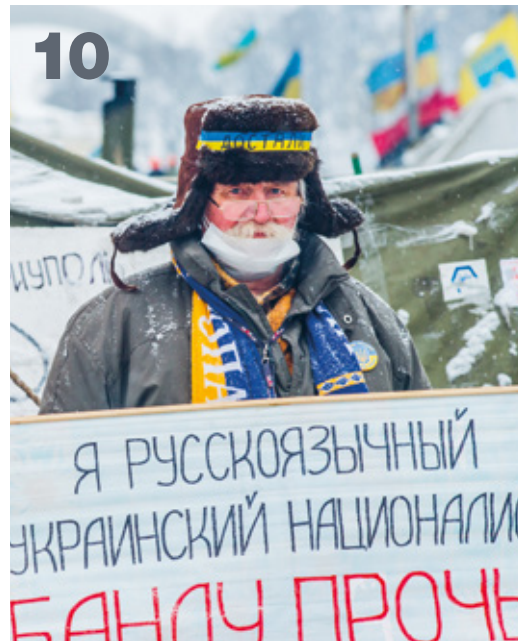
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This issue and back copies of Research Forum are available at www.brookes.ac.uk/about/publications/research



Hello and welcome...



...to June 2014's edition of *Research Forum*, Brookes' magazine that showcases our research. I hope you'll agree it is further proof of the breath of our research activities here at the University.

It has been an incredibly busy academic year for us, and with the REF submission now behind us, we're planning for the results to be announced in December.

In this edition we lead with the complexities of the current situation in Ukraine. We also have some excellent analysis and insight into current areas of concern across all of society, such as the vital work Brookes is doing in the area of flood defences; how we're contributing to a government report into hate crime; we also look into press regulation laws given the Leveson Inquiry; explore artificial intelligence with Artie - our resident Robothespian, and finally, I explain my research into gambling.

We always welcome your comments and suggestions, so do please email us at researchforum@brookes.ac.uk

**Alistair Fitt,
Pro Vice-Chancellor,
Research and Knowledge Exchange**

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researchforum@brookes.ac.uk

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RESEARCH NEWS



The John Radcliffe Hospital

Could inhalers help heart patients?

A grant of over £250,000 has been awarded to Brookes' Cardiorespiratory Research Group (CRG) to study potentially ground-breaking treatments for breathlessness in patients with advanced heart failure.

The funding, awarded by the British Heart Foundation, will support clinical trials led by the CRG's Dr Shakeeb Moosavi, and are being run in conjunction with departments at local hospitals and the University of Oxford.

Lasting two years, the trials aim to understand whether the inhalation of a vapourised form of frusemide can relieve breathlessness and avoid some of the current side effects of administering the drug in a pill form.

The work makes use of partnerships that have recently been strengthened with the launch of the Oxford Academic Health Science Centre (AHSC).

The centre brings together expertise and skills in different areas of healthcare within a number of Oxford's healthcare and educational institutions including Oxford Brookes, Oxford Health NHS Foundation Trust, Oxford University Hospitals NHS Trust and the University of Oxford.

The Department of Health recognised five other AHSCs in the UK, which join many more worldwide. The official designation remains in place for five years and the partnership focuses on research for new treatments, as well as improving education and patient care.

The work of the Oxford AHSC will focus on six core themes, including the use of 'Big Data', chronic disease epidemic management, as well as infection and antimicrobial resistance.

Childhood eye disorder research gets a boost

The work of Nicola Ragge, Professor of Medical Genetics at Brookes, into the genetic causes of structural abnormalities in the eyes of children has received a recent financial boost.

The research, in Brookes' Department of Biological and Medical Sciences, is part of a global collaborative effort looking into the role of genetics on the abnormal development of the eye in children. With the co-operation of 350 families of children with structural eye disorders, she is seeking to find a genetic diagnosis for these conditions which would enable families to understand why and how the abnormality has occurred, whether it is likely to be passed on to future generations and possible preventative measures to decrease that risk.

The funding, from a range of sources including children's eye health charities, totals around £120,000.



£120,000 to fund research into the genetic causes of structural abnormalities in the eyes of children.



Alex Flynn

Crossing the Pacific with Parkinson's

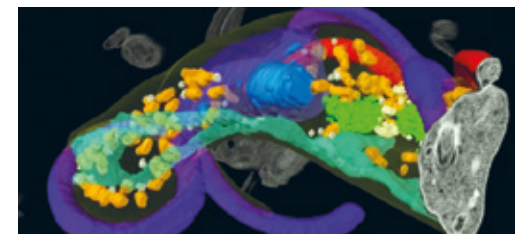
The Movement Science Group (MSG) at Brookes will monitor a local man with Parkinson's disease as he rows 2,100 nautical miles across the Pacific Ocean, in order to gain insights into the effectiveness of medication on reducing symptoms of conditions like Parkinson's.

Alex Flynn was diagnosed with Parkinson's six years ago and is now taking part in Pacific Row 2014 – which sees solos, pairs and fours row from California to Hawaii.

The team will also monitor his rowing partner Darren Taylor who does not have the condition and can thereby act as a control.

You can find out more on Alex's website, and support his campaign at:

www.alexflynn.co.uk



New microscope opens up 3-D world

A new 3-D scanning electron microscope has been installed at Brookes as part of a £10 million national investment to help keep the UK at the forefront of biological sciences research.

Brookes was awarded funding in partnership with the Sir William Dunn School of Pathology at Oxford University.

The state-of-the-art microscope will enable the team in the Department of Biological and Medical Sciences to take extremely high resolution 3-D images of cells. It will support cell biology research at Brookes and Oxford University as well as other research communities around the UK.

Professor Chris Hawes, Research Lead in the Department of Biological and Medical Sciences added: "This award to Sue Vaughan [Senior Lecturer in Cell Biology] and myself reflects the commitment the BBSRC has shown over the last few years in support of high quality cell biology research at Brookes."



Government recognition for group's research

Research led by Brookes' Low Carbon Building Group (LCBG) has been recognised in a Department of Energy and Climate Change (DECC) report as an example of good practice of how to put communities at the centre of energy policy.

DECC's *Community Energy Strategy* report highlighted the research project, Evaluating Low Carbon Communities (EVALOC) noting that "the researchers have developed a robust approach to evaluating the impacts and effectiveness of community-led renovations of homes and behaviour change initiatives on household energy use."

The EVALOC project will be developing a community energy toolkit that includes methods for monitoring and evaluating household energy use as well as carbon mapping tools to help groups identify, action and monitor energy projects in their communities.



Making fuel out of rice straw

A team of Brookes biologists have won a share of £1.4 million to investigate whether a biofuel can be made from the waste products created during rice harvest.

The research, which uses expertise at Brookes and other universities in the UK and India, aims to create a usable biofuel out of the rice straw – while also reducing the amount of waste. The disposal of rice straw is hugely problematic for farmers: its low nutritional value makes it unsuitable as an animal feed and burning the straw as fuel produces high levels of ash.

The funding, from the Biotechnology and Biological Sciences Research Council, will enable Professor David Fell and Dr Mark Poolman of the Cell Systems Modelling research group to create metabolic models to further the research.

It is hoped the methods will be able to be adapted for use with waste straw products created during the harvesting of wheat crops in the UK and beyond.

British Academy fellowships for Brookes researchers

Professor of Sociology, Tina Miller and Dr Alexandra Wilson, Reader in Music, have both been awarded mid-career fellowships from the British Academy - two of only 38 such awards given by the Academy this year.

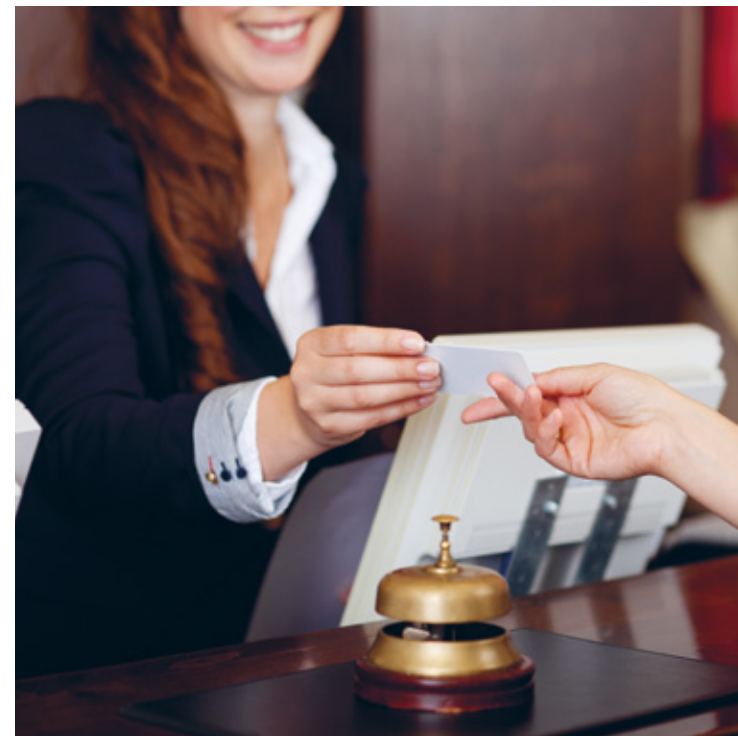
The fellowships last for an academic year and support research in the humanities and social sciences, giving researchers dedicated time to further their work.

Tina, whose research interests focus on parenting, caring and working, intends to use the award to carry out workshops with young fathers, fathers of older children, and single mothers as part of the project. Alexandra Wilson meanwhile, plans to analyse a series of 'encounters' between opera and popular culture in 1920s Britain to demonstrate how opera defied easy categorisation as highbrow or middlebrow. Both will write books based on their findings.

Being the best in business

Oxford School of Hospitality Management has been graded best in the UK for its hospitality management teaching for the second year running – and was the only UK provider to feature in the global top ten. The rankings come following a survey of senior managers from worldwide luxury hotels by Taylor Nelson Sofres.

In addition, the Brookes Global MBA was ranked seventh in the world in the recently published QS Distance Online MBA Rankings 2014. The MBA can be studied online from anywhere in the world, but also offers those registered the unique opportunity to study part of the course on-campus.



Exploring renewable public transport systems

Brookes' Sustainable Vehicle Engineering Centre has received funding from the EU's Renewable Public Transport Enterprise project to develop and encourage the use of renewable energy in public transport. The research group aims to develop a guide to new and

existing renewable technologies for use in the sector. Brookes is one of nine European institutions awarded an overall research grant of some £1.2 million which has been awarded to investigate the application of renewable energy within public transport systems.

Support for fatherhood research network

The Oxford Fatherhood Network, a group set up by Oxford Brookes' Professor of Sociology, Tina Miller, has received £25,000 in funding from a Swedish research foundation.

The network, which brings together researchers from 12 Universities in the UK, Italy, Sweden and Denmark, will use the grant to produce a special edition of the journal *Families, Relationships and Societies* early in 2015.

Correcting errors in computer hardware

Dr Abusaleh Jabir has secured a grant from the Ministry of Defence Science and Technology Laboratory to fund research into a new way of correcting errors in computer hardware.

The techniques studied may also have other applications including lessening the chance of certain types of attacks on some circuits and are designed to be used in hazardous environments.

Improving students' understanding of assessments

Berry O'Donovan (right), Principal Lecturer in Student Experience in the Faculty of Business, will be using a recently awarded £30,000 Higher Education Academy grant to improve students' understanding of assessments. Focusing on combined honours degree courses, the research will aim to create a practical toolkit for students and will involve current undergraduates in the development process.



Professor Ray Ogden, Associate Dean, Research and Knowledge Transfer, explains how work at Brookes in various areas, including the €4.6 million FloodProBE project, is finding ways to make buildings more resistant to flood damage.

An estimated one in six of existing properties in England and Wales is at risk of being flooded.

Keeping your head above water

Floods are predicted to become more frequent and severe. As flood defences are difficult and expensive to upgrade, what can be done to improve the resilience of buildings?

The complex and changing pattern of flooding, from rivers, rainfall, groundwater and the sea, means that an estimated one in six of existing properties in England and Wales is at risk of being flooded. The media coverage of the recent flood events has reflected a highly politicised discourse, but rather than identifying blame there is a need for properly focused strategic research. Brookes is operating both at policy and implementation levels to find solutions to the pressing problems.

Research published by Reader Elizabeth Wilson, has addressed the responses of local planning authorities to flood-risk. She is a member of the Town and Country Planning Association-led Planning and Climate Change Coalition, which, in 2012, published guidance for local authorities on planning for climate change.

The Architectural Engineering Research Group (part of the Oxford Institute for Sustainable Development) was a core partner in the recently completed four year Framework Seven research project, 'FloodProBE', which had the objective of providing cost-effective solutions to flood risk reduction in urban areas.

FloodProBE developed technologies, methods and tools for flood risk assessment and for the practical adaptation of new and existing buildings, infrastructure and flood defences, leading to a better understanding of vulnerability, flood resilience and defence performance. The work was

undertaken in close partnership with industry, and utilised pilot sites across Europe, to help provide practical industry guidance and cost effective construction solutions.

Building for resilience against floodwater has become an increasingly important target for new construction as a means of complementing formal flood protection measures provided by municipalities, relevant authorities or organisations with responsibility for flood defences. Such measures are important where there is a residual or local risk of flooding, or where a large scale, publicly-funded flood defence scheme is not feasible.

Obviously, achieving flood resilience in new builds is easier than for retrofit; this stems often from a lack of regulatory or legislative imperative, but also from the fact that older buildings have more technical limitations for methods and materials, and owners can have a more defined aesthetic view of what can or cannot be achieved.

However, for critical building infrastructure, retrofitting opens up major opportunities to implement preventative flood protection measures. It was this aspect that was the focus of Brookes' research within FloodProBE.

Resilience at property level can be achieved by the use of adequate construction materials and methods of construction, layouts and flood protection products, combined with careful site considerations that minimise the potential for exposure to floodwater. However, an important

first step in order to understand the nature and scale of flood threats is to estimate the vulnerability of individual buildings and examine the possible types of flood damage that the building will suffer.

The Brookes team, led by Dr Nicholas Walliman, developed a prototype flood damage assessment tool related to individual buildings, which took into account the wide range of possible constructions and building materials, and estimated the direct costs of flood damage to each, depending on the characteristics of the flood event. The ability to reliably estimate the costs of flood damage and repair for individual buildings makes it possible to make cost/benefit analyses of installing flood mitigation measures to the building and/or its surroundings in relation to the risk factors. By using the prediction tool on the design of the protected building, owners can test whether their intended investment in the selected mitigation measures is worthwhile.

This tool is likely to be of interest to property owners of every kind, insurance companies, infrastructure organisations and government agencies.

To find out more about FloodProBE, please visit <http://www.floodprobe.eu/>

You say you want a revolution?

In 2014, Ukraine has undergone a revolution resulting in the ousting of President Yanukovich and led to Russian troops seizing control of the Crimean Peninsula. Brookes' Senior Lecturer in Politics, **Sarah Whitmore**, specialist on Ukrainian politics, writes for *Research Forum* on the complexities of Russian influence in Ukraine. Photography by **Dmytro Sanin**.



I first became interested in Ukraine 20 years ago. As a new graduate, I wanted to experience life in the former Soviet Union first-hand. I was initially looking for a job teaching English in Russia. However, as a bus ticket to Ukraine was £100 cheaper, off I went with very little knowledge of this newly independent country.

Now, as a specialist on Ukrainian politics, I explain to anyone who will listen about Ukraine's complex, variegated and emerging identities and how these complicate Ukraine's future status. This year's dramatic events mean I have had the opportunity to speak to even greater numbers of people via global media, in Whitehall, as well as to students and academics.

In recent months, the media has displayed countless maps showing proportions of Russian and Ukrainian language speakers, as well as figures giving proportions of various nationalities, purporting to 'explain' Ukraine's regional divisions.

Much of this has been misleading and indicates more about the media's desire for convenient binaries that unhelpfully conflate language use, ethnicity, regional identity and political preferences.

In reality, Ukraine's social cleavages are overlapping and more closely resemble a continuum, a factor that has often been crucial to Ukraine's post-Soviet stability.

However, they retain the potential for exploitation by local, national and external politicians during power struggles such as the one that erupted in late 2013. It is true that during the economic collapse of the 1990s, many eastern Ukrainians were ambivalent about Ukrainian statehood. However, studies consistently showed declining support for joining Russia - even in the 'anomalous' case of Crimea.

For example, the media has stressed Crimea's difference from the rest of Ukraine, due to its majority of 'ethnic Russians' (58 per cent), the siting of the Russian Black Sea Fleet base there, and the peculiar way in which it was incorporated into the Ukrainian SSR in 1954.

However, while it is true that a majority of Crimean residents did not support the Maidan revolution, the political situation is a lot less clear cut than is often acknowledged.

Yes, a significant proportion of Crimeans supported



being part of Russia. However, recent pre-annexation polls showed it was not a majority. In fact, polls for the last five years have shown around 41 per cent of the population support being part of the Russian Federation.

These sentiments were encouraged by local elites whose separatist aspirations resurfaced in times of political tension in Ukraine, and simultaneously agitated by politicians from Russia. Yet almost 60 per cent of Crimeans supported being part of Ukraine, including some ethnic Russians. In part this is due to the age dynamic. People who have been born and grown up in independent Ukraine tend to prefer to remain as part of Ukraine. The other dimension is that Crimean Tatars and ethnic Ukrainians are strongly supportive of remaining part of Ukraine, and together they constitute over 35 per cent of the population.

Given that these populations boycotted the famous 'referendum', the 83 per cent official turnout and 97 per cent vote in favour of joining Russia are not remotely credible. The position of the Crimean Tatars is particularly salient because they are an indigenous population who suffered deportation (one third of the population died during the transportation of May 1944) and forced exile until the 1990s who have many unresolved issues with the Crimean authorities and remain fearful of renewed repression as part of the Russian Federation.

Local prejudice towards the Crimean Tatars requires careful monitoring, as the danger of ethnic cleansing is real. So the situation in Crimea is ambiguous, complex and one which Putin successfully exploited in the aftermath of the Maidan revolution.

Russia's annexation of Crimea sought to destabilise Ukraine and to make the country more amenable to Russia's interests. The 'restoration' of Crimea to Russia offered short-term boost to Putin's status - his domestic popularity soared to 80 per cent - while making it harder for the interim government in Kyiv (Kiev) to assert its authority, begin reforms or hold elections necessary to legitimise the change in power.

This policy was then continued in the regions of eastern Ukraine, where minority separatist movements that suited local elites' interests received covert Russian backing.

However, a Russian invasion of Ukraine's eastern regions on the pretext of protecting Russian speakers would entail much greater risks for Putin than in Crimea.

Although these regions are predominantly Russian speaking and support greater autonomy from Kyiv (Kiev), polls consistently show that less than 20 per cent of the population of these regions support joining the Russian Federation and so, unlike Crimea, Russian forces would face popular resistance.

Rather than annexation, Putin's aim seems to be destabilisation in order to achieve a loose confederal constitutional arrangement in Ukraine that would permit eastern regions joining Putin's Custom's Union. However, the stirring up of ethno-nationalism could spin out of control and Russia could yet find itself drawn into a military conflict that would have much wider reverberations.

There have been shocks for scholars, experts and especially Ukrainians in the past few months.

First, that a popular revolution could spontaneously mobilise, sustain itself and force out the corrupt and, after violence was used against protesters, widely-considered illegitimate president. Second, that in the wake of this revolutionary change, Russian forces would mount an occupation and rapid annexation of Crimea, effectively tearing up the post-Cold War order. Finally, that Russia would engage in covert military operations to foment instability in Eastern Ukraine with the aim of ensuring a settlement that would anchor Ukraine irreversibly in to Russia's orbit.

This is a complex and fast-moving situation as the map of Europe is redrawn before our eyes. Since independence in 1991 Ukrainian identity has been developing, albeit unevenly. Ukraine is a diverse nation, but no more so than many other European nations. Ukraine always defined itself in relation to Russia and the emergence of the latter as existential threat is reshaping individual Ukrainian citizens' perceptions of identity in concentrated time in not always predictable ways.

I do not know what the country will look like in 20 days' time, let alone in the next 20 years.

Criminalising hatred: where do we go from here?

Chara Bakalis, Senior Lecturer in Law, outlines her views on tackling hate crime in the UK and her contribution to the current government review.

The horrific murder of Stephen Lawrence in April 1993 and the subsequent bungling of the investigation into his death brought to the public's attention once again the difficult relationship between the police and ethnic minorities. Stephen's parents fought tirelessly for justice for their son, and in 2012, two of Stephen's attackers were eventually convicted for his murder.

The circumstances of Stephen Lawrence's death also led to an increased awareness of the number of racist incidents which occur on a daily basis across the UK. Even before Stephen's death, it had been an offence to incite racial hatred. However, the unfolding revelations in the media about the Stephen Lawrence murder investigation, and the conclusions of the Home Office report into race relations in 1997, painted a less than rosy picture of racial violence and harassment in this country.

It was felt that the offences covering the incitement of racial hatred were insufficient, and that new legislation was needed to protect victims of hate. This has led to various pieces of legislation which have increased the penalties for offences motivated by hatred – 'hate crime' – and has compelled sentencing judges to treat any such motivation as an aggravating feature when deciding punishment for an offender.

Whilst these offences were initially enacted to protect race, at various stages the law has been extended to apply also to religion, sexual orientation, disability and transgender identity. However, the law has developed organically and in a piecemeal fashion which has resulted in unequal protection to these five characteristics.

Tackling hate crime has become a key government priority. In March 2012, the Hate Crime Action Plan was launched which pledged to help victims and to review the current legislation. As part of this, the Ministry of Justice has asked the Law Commission – the reform body of England and Wales – to examine the case for extending the current offences so that they apply equally to all five characteristics. On this, I responded on behalf of the Society of Legal Scholars to a consultation paper published last summer stating that whilst the current position of unequal protection is unfair, I believe extension of the law cannot occur without a wider review.

The law needs to find a principled way of deciding which victims should be given protection under 'hate crime' legislation. This is a crucial issue as there are a number of social groups seeking protection. For example, the Sophie Lancaster Foundation is campaigning for the inclusion of 'alternative subcultures and lifestyle and dress'. The law needs to find a way of explaining which characteristics are justified and which should be excluded.

As a result of my consultation response, I was invited to join a small academic advisory group at the Ministry of Justice, set up to discuss the issues raised in our responses. The Law Commission was particularly interested in my view of hate crime as part of the equality agenda, and the need for further review.

Our contributions will go forward into the final report which will be used as the basis for any future reform of legislation and it was very rewarding to be part of the policy-framing process in such a direct way. The final report was published in May 2014.

For more information on the review and the Government's Hate Crime Action Plan, please visit:
www.gov.uk/government/publications

Press regulation: does it have a future?

Michele Paule, Senior Lecturer in Media, Culture and Education, examines the current issues surrounding press regulation and whether, ultimately, it will have a role to play in the media of the future.

In November 2011, Lord Justice Leveson opened an inquiry into 'the cultures, practices and ethics of the press' with the following words: "The press provides an essential check on all aspects of public life. That is why any failure within the media affects all of us. At the heart of this Inquiry, therefore, may be one simple question: who guards the guardians?"

At the end of 2012 the first part of Leveson's 16-month long public enquiry was published. We now are in the midst of a criminal trial of those whose behaviour prompted the enquiry. Among them are the former chief executive of the UK's most powerful news group, News UK - Rebekah Brooks - and the prime minister's former director of communications - Andrew Coulson.

The charges include conspiracy to intercept communications in the course of their transmission, conspiracy to commit misconduct in public office, and conspiracy to pervert the course of justice.

The notion of the press as the 'rooters-out' of wrongdoing and corruption, and as the independent watchdogs of public morality is central to the ideal of a free press. Such a press provides a 'public sphere' for debate within a healthy democracy.

The findings of the Leveson inquiry, and the almost daily revelations from the Brookes/Coulson trial, of payoffs, hacking, and trades of political influence for favourable coverage, reveal just how far the press has strayed from independence, and our democratic institutions from healthy behaviours.

Regulation is held by many to be the answer, but others resist with equal conviction. The arguments can be broadly split along principles/practice lines.

The 'principles' argument

This takes the view that the press should never be subject to government, since one of their key functions is to hold government to account. Newspapers have not been subject to statutory regulation since 1695 and to put them under parliamentary control would be setting a dangerous precedent that could amount to political censorship, and be open to hostile and restrictive future amendments.

It is also argued that the activities uncovered by Leveson—such as hacking, bribery, falsification of evidence, harassment, libel—are already, in themselves, illegal, and therefore redress for wrongdoing can be sought through the courts.

The 'practice' argument

Self-regulation through the Press Complaints Commission has manifestly failed, it is claimed, and the Leveson enquiry has revealed malpractices so shocking that self-regulation is not strong enough to restrain the powerful interest groups — both commercial and political — involved in the wrong-doing.

However, the desired separation of press and parliament may be hard to achieve. Political institutions are increasingly dependent on, and shaped by, mass media; news management has become a central political activity. At the same time, the deregulation of media ownership over the past 20 years has led to the development of vast monopolies in which there is no pretence of journalistic objectivity. This is a cause for concern in itself, as the press set the scene for an increasingly tabloid-ised and biased public perception of politics.

...new forms of journalism have, for the young, replaced the daily newspaper. For them, the old, one-way streams of information, from press to population, are redundant, and they themselves decide on what is newsworthy.

All this has left the press, politics and the police in a state of reduced public confidence. Youth, in particular, report cynicism with regard to institutions that traditionally have been regarded as key to upholding democratic processes. My research focuses on ways in which young people draw on media, popular and virtual realms to shape their engagement with the world around them and their understanding of themselves.

While traditional civic participation among the young is at an all-time low, the 21st Century has seen an explosion of internet news sources, of blogs, of hackers and leaks on an industrial scale, and of social networks that herald what some see as a new age of citizen journalism.

These new forms of journalism have, for the young, replaced the daily newspaper. For them, the old, one-way streams of information, from press to population, are redundant, and they themselves decide on what is newsworthy. Their sense of themselves as 'selectors' and consumers — even as non-participants — is strong.

Unlike the traditional press, the 'wild west' of internet journalism escapes regulation, and may ultimately render the issue of traditional press regulation and relationships with politics irrelevant.

To shape the new, digital public sphere we need to focus on issues of internet privacy and freedom, on the ethics of data management, and on the ways in which the ownership and control of digital worlds shapes public consciousness.

For more about the Leveson inquiry findings, please visit
www.levesoninquiry.org.uk/

Introducing Artie – our new resident robothespian

Head of Computing and Communication Technologies, **Nigel Crook**, introduces a new member of his team, who is helping the study of interaction between humans and robots.

He stands nearly 6ft tall and is equipped with a fully articulate upper body, LCD eyes and internal coloured lights that leave you in no doubt about the emotion he is expressing.

We are talking about Artie - a Robothespian humanoid robot who joined Brookes' newly formed cognitive robotics laboratory in the Department of Computing and Communication Technologies last summer. Manufactured by Engineered Arts Ltd, Artie is here to support research into human-robot interaction (HRI).

The uses for robots are no longer restricted to the factory floor or the research laboratory. They are now being employed in schools, hospitals, homes and other public spaces in significant numbers. And as more complex robots become available for use by the public it is becoming increasingly important to improve the way in which humans interact with them. Our researchers are using Artie as a means of examining this topic, and the long term aim of the research programme is to develop robots that can communicate with humans in more natural ways, using speech and gestures.

Currently, Artie interacts mainly through a touch screen that enables simple control of him as well as through the selection of some pre-programmed control sequences, such as the enacting of scenes from popular movies. He can also identify faces, gender, age and emotion using a camera in his forehead.

Artie's design makes him a good platform for our research as his upper body is very articulate. He has 30 joints that can be moved independently, giving him 30 degrees freedom of movement, and his LCD eyes are very expressive.

There are, however, some technical challenges with using Artie for HRI research. The main one being that he combines three different types of movement control (actuation) - pneumatic 'artificial muscles', servo-motors and LCD (for the eyes). This is unusual in robot construction and leads to challenges in robot control because pneumatic actuators behave differently to servo-motors, making it difficult to co-ordinate movements that involve both types of actuation.

Our first two projects with Artie seek to introduce some natural modes of interaction with the robot. The first will add a simple 'point and tell' feature that will enable Artie to recognise when a person standing in front of him is using a pointing gesture towards an object. The robot will then use its depth camera and computer vision techniques to identify the direction in which the person is pointing and which object is being pointing at as well as responding with gestures that are appropriate for this interaction, such as turning and looking, point at the object, talking about it and turning back to look at the person.

The second project will use directional microphone arrays to allow Artie to identify a sound source in a noisy environment, pinpoint the direction it is coming from and apply selective filtering in order to analyse the source in isolation.

This will enable the robot to exhibit behaviour that can detect multiple sound sources, such as several people speaking, and selectively give attention to one of them, to indicate that it is listening and engaging in conversation.

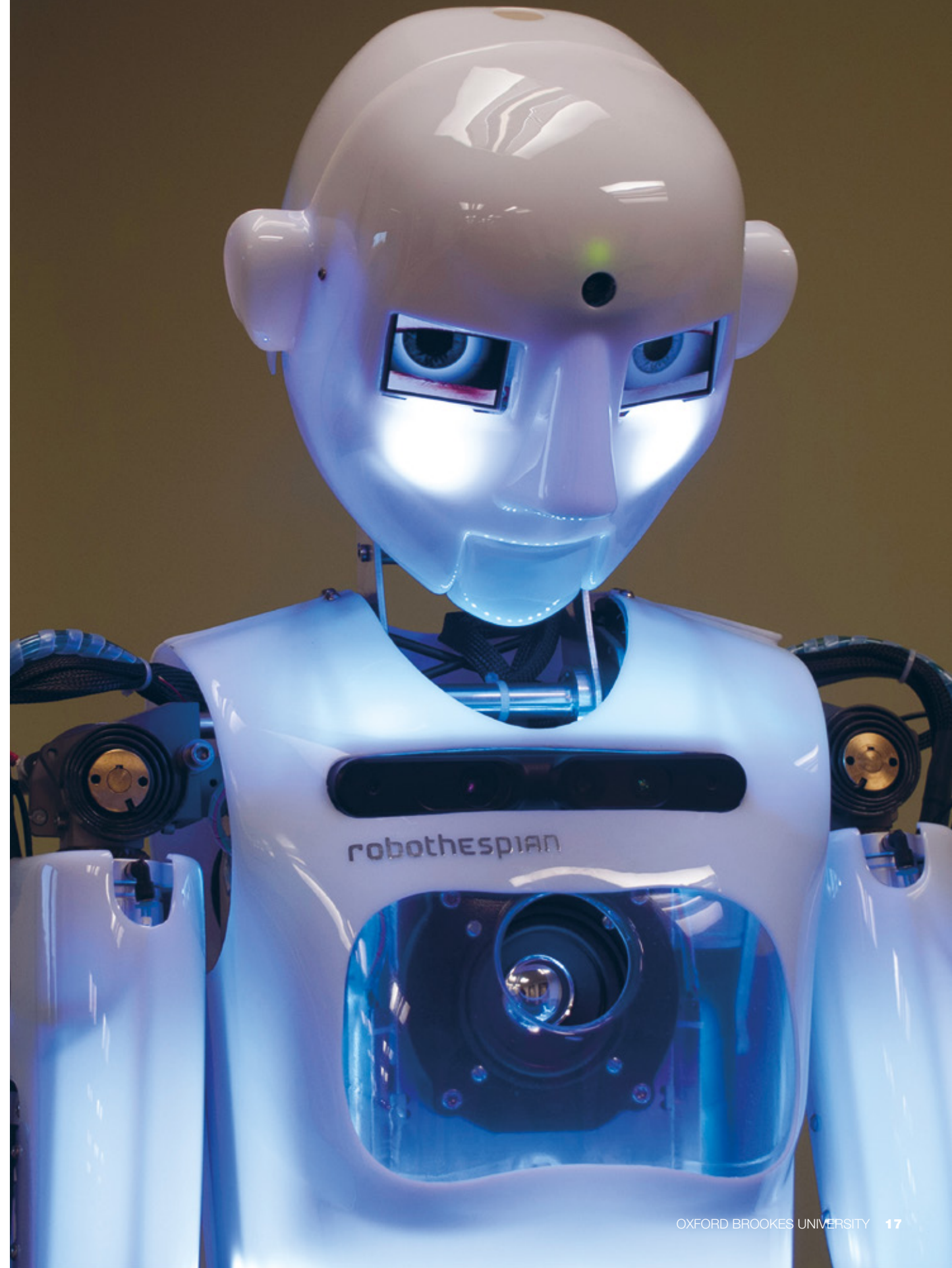
We believe that Artie's full potential for more natural HRI has not yet been fully realised - although we anticipate that there will be strict limits to this robot's ability to accurately replicate human bodily movements, due mainly to the nature of its pneumatic actuators.

Artie and Nigel recently appeared on BBC Breakfast, which you can view here:
www.live.bbc.co.uk/news/technology-26512171

They also appeared on CNBC:
<http://video.cnbc.com/gallery/?video=3000271737>

To learn more about the work of the cognitive robotics, please visit

www.cct.brookes.ac.uk



Place your bets

With general betting on the increase, Pro Vice-Chancellor, Research and Knowledge Exchange **Professor Alistair Fitt** explains his mathematical research behind it.

In my “real” research life I am primarily a fluid dynamicist, but I am also part of a group that carries out mathematical research into betting. (Note: for obvious reasons we never say who “we” are, or how much we’ve won or lost.) When people realise this, their normal reaction is to say either “well you can’t be very good, or you’d have retired”, or “great – tell me who’ll win the Derby”:

So allow me to try and deal with both of these questions. Firstly, we don’t ever bet with bookmakers. Bookies give poor odds, but more importantly they normally decline your business if you win. Our only interest is in betting exchanges like Betfair and Betdaq. These are sites that, just like the stock exchange, simply match the orders of buyers and sellers and make their profit by taking a small commission. Exchanges not only allow backing (betting to win) but also laying (betting NOT to win): laying makes the exchanges mathematically interesting. Basically, we do two kinds of mathematical wagering: ‘arbitraging’ (arbing) and ‘expected win betting’ (EWB) – these will be explained further below. Of course, we have no interest in the event itself, and never ‘predict a winner’ or ‘take a punt’ – this is emotionless, mechanised gambling.

What is Arbing?

Arbing involves identifying special combinations of odds where with bets of just the right size, a profit is guaranteed whatever the result. Using racing as an example (other markets are also relevant) the simplest arb occurs when it is possible to back a horse each way, and simultaneously lay the win and the place. Such opportunities (which may be identified by examining a fairly simple

odds inequality) occur surprisingly frequently, and if one is suitably imaginative there are many other, more mathematically complicated arbs that can also be investigated. The practicalities are the main problem. How do we find when these opportunities occur and then make the right wagers in time? The answer: robots. We write bots (normally in Java or Python) that roam the net, ‘scrape’ information off exchange sites, and do the required calculations. Then, when circumstances are right, they spawn another bot that automatically makes the exchange bets. All this happens in a few milliseconds.

What is Expected Win Betting?

If we can identify bets that have positive expected winnings (a mathematical definition) then though many will lose, enough will win to make an overall profit. One way of doing this is to make certain mathematical assumptions about “limit order books” where orders for bets at specific stakes arrive in a probabilistically predictable manner. The mathematical details are complicated, and the theory was originally designed for futures and Forex markets, but there is a technical reason why this works very well for betting exchange markets. Work on this is currently underway, and looks very promising.

As you can see, the betting that we do involves a combination of mathematics and computer science. That makes it both interesting and novel. But finally, why am I not a millionaire? The reason is that though both arbing and EWBs provide genuinely ‘free money’, the sums that can be won are limited by the size of the amounts that are available to match on the exchanges.

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