

LynchPp Bristol Engineering

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Autumn 2009 • The World's Quietest Building?

• EF21 update

LynchPin Autumn 2009

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Since the last newsletter, a new term and a new cohort of students has arrived. From the stellar qualifications and my own discussions with our incoming students, I can confidently welcome what is undoubtedly an outstanding intake to the Faculty. Certainly my contact with the freshers I found invigorating and boisterous. I'd like to welcome all our new students, both Undergraduate and Postgraduate, to the Faculty and wish you well in your studies.

After the start of term, we hosted the Engineering Without Borders National Conference, during which we welcomed over 150 students from around the country who are interested in sustainable development and engineering in communities across the world. It was a truly uplifting experience and as many of you will know, it is a group that the Faculty should support unreservedly in their endeavours. There is something inspiring about seeing students with a visible commitment to solving the world's problems (it is even better to see this amongst engineers rather than bankers!).

In research, several of you will be aware that Professor John Rarity has won a European Union Research Council Fellowship for five years in Photonics. This is highly prestigious and a real feather in both John's and the Faculty's cap. Having spoken to John, I'm sure he is relishing the prospect of five years' complete immersion in research with his favourite toys in the lab. The most visible aspect of research progress has been the ACCIS build on the back of Queens Building, which is due for completion in April 2010. This will be an internationally leading facility that will also allow us some much needed space to develop other areas in the building as well.

It is also worth mentioning that after much discussion, we not only have the names of the new Schools of Engineering (Dirac and Brunel) but also our new Heads of School, Professor Canagarajah and Professor Champneys respectively. They, along with the entire Senior Management Team are working with Heads of Departments to ensure that there is a seamless transition to the University's move to schools next summer. Clearly, at the top of our list is improving the quality of our student education and the identity of the disciplines which support the programmes.

We are starting to see the benefit of greater inter-disciplinary research across the Faculties, with submissions of bids involving Science, Engineering and Social Sciences. Let's keep our fingers crossed on those but I hope to be able to give good news soon as the results of our various bid submissions come out over the next few weeks.

As seems the custom in current times, it is impossible not to mention the financial maelstrom around us. However, it is pleasing to see that Engineering at Bristol



has been unswervingly resilient in terms of financial stability and the quality of what we do. I'm sure this is a virtuous circle, welcoming a strong student cohort into Bristol encourages industry to work with us and support our research. My door has been banged on more loudly than I've ever experienced before from industry and collaborators, with enthusiasm to work with us. This can only be a good sign. Let's hope that the shenanigans in the wider context do not distract us from what is clearly an exciting time to be an engineer.

Professor Nick Lieven Dean of Engineering

O4 Newsclips from around the Faculty

The visit of the Business and Enterprise Committee and Daniel Raabe on the Royal Academy Summer Science Exhibition

D6 Student news

A round-up of the latest from our undergraduates, featuring the Mongol Car Rally 2009, and news from Engineers Without Borders

10 Prize winning students

Congratulations go to all our award winning students

12 EF21 update

Peter Foster provides an outline of the progress so far and what lies ahead

14 The Clifton Suspension Bridge Professor Bruce Drinkwater gets under the skin of this famous landmark

16 The Quietest building

How the the Bristol Centre for Nanoscience and Quantum Information gained its reputation

17 Under the Ice Sheet

Dr Steve Burrow explores the glaciers in Greenland - land of the reindeer

18 AugustaWestland UTC Professor David Ewins on the new arrival in BLADE

20 Knowledge Transfer

Partnerships Frances Frith explains the funding opportunities for research with industry

21 From the archive

The Coliseum Picture Theatre on Park Row

22 Faculty people

Dr Andrew Harrison of the Mechanical Engineering Department gets personal

24 Focus on Dynamic Designs New IDEERS from Dr Wendy Daniel













The latest news and events from around the Faculty

Artist's impression of the National Composites Centre

Dr Suby Bhattacharya

Mr Guy Pearn

STOP PRESS: Bristol to lead on National Composites Centre. A new National Composites Centre (NCC) is to be built in Bristol.

The state-of-the-art Centre will be supported with £16m of public-sector investment supplemented with funding from industry. The Centre will be led by the

The Centre will be led by the University in partnership with industry. Full details to follow in the next edition of Lynchpin.

Professor John Hogan to speak at Vancouver mathematics congress John Hogan, Professor of Mathematics and Director of the Bristol Centre for Complexity Sciences, has been selected to give an Invited Lecture at the seventh International Congress on Industrial and Applied Mathematics (ICIAM) in 2011.

The ICIAM is held every four years and attracts over 3,000 people. The 2011 meeting will be held in Vancouver. The last Bristol speaker to be invited was Professor Jon Keating, now Dean of the Faculty of Science, in 2003.

Research Reception 2009

The Faculty of Engineering will be holding its annual Research Reception on December 16th in MVB atrium starting at 12.30pm with lunch from 1pm. All are welcome to participate and find out about the research being undertaken in the Faculty and the opportunities available for collaboration.

The event aims to provide an overview and celebration of the Faculty's research activities and an opportunity to find new avenues for multidisciplinary research. During the day there will presentations from Prof Nick Lieven on the plans for the Faculty, Prof John Hogan on winning large grants and Dr Simon Gray will be leading a workshop on writing EPSRC Impact statements.

There will also be a student poster competition with a top prize of £500, and other prizes of £200 and £100. Examples and templates are available to download from the engineering research web page.

If you would like to attend or enter the competition please register at www.bris.ac.uk/engineering/research/

Strainstall prize 2008/2009

Mr Guy Pearn, Senior Research Technician, Materials Group, has been awarded the winner of the Strainstall Prize 2008/09 for the best achievement in the BSSM's (British Society for Strain Measurement) Level 1 Examinations. The prize of £250 is sponsored by Strainstall UK Ltd. Guy received his prize at the Institute of Physics 7th International Conference in Modern Practice in Stress and Vibration Analysis.

In order to take advantage of Guy's expertise we would like to develop a number of practical workshops where Guy will demonstrate Strain Gauge Application Techniques. This would be of particular value to Final Year UG's or PG'S and RA's who plan to use Strain Gauges in their project work.

If you are interested in attending a workshop please contact Dave Hooper, Materials Group Manager. (dave.hooper@bristol.ac.uk)

Battery Free Soldier

Academics from seven universities, including Dr Steve Burrow at Bristol, have been awarded £1.1M by EPSRC/DSTL to investigate reducing the burden on the infantry soldier. The team will investigate low power versions of a soldier's electrical equipment, energy harvesting, and dynamic control of rucksack loads.

New Enterprise Competition 2010

Enterprising staff and students at the University of Bristol gathered to see how their business plans could win a share of a £35,000 prize fund, as the University launched its annual New Enterprise Competition 2010.

The official launch event took place at the University on 19 November and attracted an audience of students and staff from all disciplines. The New Enterprise Competition is designed to inspire new high growth business ideas and entrepreneurial talent. Launched every autumn, the competition is open to students, staff and recent graduates of the University. There is a substantial prize fund in the region of £35,000 including cash, free professional advice and managed office space to help make businesses a commercial success.

Staff and students were asked to submit their business plans by Tuesday 23rd



February 2010. The best entries, as judged by a panel of experts from the sponsoring organisations will then be invited to submit full business plans. Winners will be announced at the prestigious Enterprise Dinner in the summer of 2010.

More information on the 2010 New Enterprise Competition, including details on how to enter, can be found at http://www.bristol.ac.uk/red/newco/ competition.

Closing date for submissions is Tuesday 23rd February 2010.

EPSRC grant

An EPSRC grant of £521k has been awarded to the universities of Bristol and Oxford (£318k for UOB) to study the interaction of pile with liquefied soil (PI: Dr Bhattacharya, CIs: Professors Taylor and Muir Wood and Dr Ibraim)

The research involves collaborations with Yamaguchi University, Tokyo Institute of Technology, Skanska (UK) and Ove Arup. A recent investigation by Dr Bhattacharya into the failure of pile-supported structures identified a fundamental omission in load consideration – essentially, axial load effects from the superstructure and dynamic considerations are ignored (2005 T.K. Hsieh Award). This grant proposal will aim to develop a simplified method of design to consider these effects.

LynchPin Bristol Engineering

04













International Scholarship Students Award Ceremony

An awards ceremony was held on 22nd October in Royal Fort House for new engineering undergraduate students from overseas who achieved 3 As at A level or the international equivalent. Professor Nick Lieven, Dean of Engineering, hosted the occasion and academic representatives from each department also attended. Professor Lieven said of the event: "Welcoming our international scholarship students to the Faculty is a great pleasure. Meeting these outstanding students who have chosen to spend their formative professional education in Bristol is something that has an air of excitement - these students will go far in every sense of the word. I have no doubt they will succeed wherever they go".



On 28th October the Department of Aerospace Engineering hosted the Parliamentary Select Committee for Business, Innovation and Skills. This Committee is currently conducting an inquiry into the Aerospace and Motor sports industries with particular focus on new innovation and research in the sector as well as the links between universities and industry.

The Committee is assessing the role of these sectors in the wider economy, the effects of the recession on these two sectors and examining the effectiveness of government policies in supporting them. The two-day Clockwise from top left:

Paul Harrod, Enterprise Network Manager at the University of Bristol launches the New Enterprise Competition 2010

Dr Sally Heslop

Dr Michael Hollingsworth

Prof Nick Lieven with the Engineering Scholarship winners The Business & Enterprise Committee visit, from left: Mark Lowenberg, HOD Aerospace Engineering; Dr Kevin Potter; Lembit Öpik MP; Peter Freaut, RED; Professor David Clarke, Deputy Vice-Chancellor; Dr lan Bond;

Dr lan Bond; Peter Luff MP, Parliamentary Select Committee Chairman; Mr Anthony Wright, MP; Michael Wisnom, Professor of

Aerospace Structures. Prof Nick Lieven with

Prof Nick Lieven with PhD students Daniel Raabe and Lin Wang at the Royal Society Summer Science Exhibition trip to Bristol involved visits to Airbus and GKN, as well as the University – the latter aimed at exploring the role that universities play in supporting these industries and helping to maintain their excellence in aeronautical engineering.

Dr Michael Hollingsworth

With sadness we report that Dr Michael Hollingsworth died at home on 29 August 2009 after an illness lasting several weeks. Michael was a leading teacher of thermodynamics in the Department of Mechanical Engineering (1959 to 1995), and the students continuously voted him as the best teacher in the Department. Michael is survived by his wife, Audrey, daughter, Paula, and son Guy.

EWB-UK trustee appointment

Dr Sally Heslop has been appointed as an EWB-UK trustee at this year's National Conference. There is a full report on the conference on page 6.

Chewing Robot Project at the Royal Society Summer Science Exhibition

During the summer beckene Exhibition During the summer the Chewing Robot Project, aimed at developing a 6 DOF dental wear simulator to evaluate and to predict the life span of dental restorative materials was successfully exhibited under the umbrella of biologically-inspired design at the Royal Society Summer Science Exhibition in London. This ambitious three year PhD project was selected as one of twenty applications in the UK for this highprofile annual event. The feedback since from academics, the media and members of the public, has been outstanding, with numerous magazine articles and interviews on radio and television.

Two awards from the EPSRC and the WellcomeTrust supported both the event and the design of a professional exhibition stand which was developed in collaboration with the Public Engagement Office and the Faculty Graphic Design unit. The stand consisted of a display unit, presenting biologically inspired design and two interactive units which complemented the main chewing robot exhibit. During the exhibition the stand was manned by PhD students and academics whose enthusiasm and knowledge contributed largely to the success of the exhibition.

This exhibition gave the Design and Manufacturing Group within the Department of Mechanical Engineering the opportunity to engage actively with the public and to promote their research and our institution to a wider audience. Approximately 5500 visitors attended the exhibition including His Royal Highness The Duke of Kent, Sir John Kingman and Professor Bill Banks.

Further information:

http://www.summerscience.org.uk/09/ http://seis.bris.ac.uk/~dr5417/

Engineers Without Borders

Ben Kyriakou of EWB Bristol reports on the latest news and events

so far this term

EWB members at the National Conference held in Bristol this year



After only a few weeks back at University there's still plenty to tell for EWB Bristol; we had a great response at FRESH with over 250 new members, some of whom took the time to send back their signup forms from as far away as China! Good job! Amongst the signups we had a smattering of scientists, and even some arts students truly showing that we have no borders. EWB isn't just for engineers you know.

Moving through the term we've had a few meetings and a talk from EWB-UK's CEO Andrew Lamb, all of which have been packed out with enthusiastic new members (and a few old ones!). Outreach is back with two new role-plays developed over the summer as part of EWB-UK's internship programme; Shelter For The World and Going The Distance. For more info take a look at **www.ewb-outreach.org.uk**, and keep your eyes peeled for upcoming Outreach activities headed by Hugo Bailey (hb7568).

In other news the Bursaries programme is putting together a new panel for this year's applications – as I'm writing this three of our members are heading to London for an all-day training course at Imperial. And the social scene's as lively as ever – always a good way to meet new people. But of course the main story is that of the National Conference – this year is the first that it was hosted at a University, and Bristol had the privilege to be selected. I spent most of my summer doing the groundwork in the EWB-UK office in Cambridge, and from what I saw at the conference it all paid off. With somewhere in the region of 160 delegates it was the biggest conference yet, and possibly the first to stay on schedule for the majority of the weekend.

The Conference started with the public lecture on Friday which I know plenty of Bristolians attended – kicking off with an opening talk from the Dean of Engineering, Nick Lieven. The Keynote was kindly given by Stephen Young from the Department for International Development, wrapping up with talks from Paul Bates (Geography) and Andrew Lamb (EWB-UK CEO).

One of the highlights was a ten minute video from graduate EWB Bristol member Miriam Niknejad, currently on placement in Ecuador, which will be up on the Bristol site sometime in the near future.

The rest of the weekend was more focussed on EWB with stalls, workshop sessions, and on Sunday the Arup Water Roleplay. Other antics included some of the more enthusiastic Exeter members taking a midnight dip in the harbour, and one member of the National Exec missing his train only to arrive halfway through the weekend!

If any of this sounds appealing then the next big event on the EWB Bristol calendar is our AGM – before Christmas we hand over the committee, which means that you have the opportunity to get a position and really make your voice heard. Keep your eyes on the e-mail to see how this develops.

And finally none of this would have happened without all the support we receive both from EWB-UK and the University of Bristol, so to both I'd like to give our heartfelt thanks. The names are too numerous to include here, but you know who you are!

If you would like to get in touch or subscribe to our mailing list, please send an e-mail to bristol@ewb-uk.org or visit our website at www.ewb-uk.org/bristol.







Last issue we reported on

a new placement in Cape

school based in the heart of Khayelitsha.

2.1 million Xhosa-speaking predominantly

Black South Africans from underprivileged

school, which is capable of providing 100

fifteen to eighteen year olds with the

education required to attend university.

Sciences and IT and motivates students

to pursue a career in the engineering and

construction industry in order to push South

Myself and Stelios Despokatis were privileged

enough to join the school for one month this

and responsibility we earned in the first week

summer to contribute during lessons.

It was surprising quite how much respect

and it was a slightly daunting experience

delivering the first A Level standard physics

The school focuses on Maths, Physical

Africa into the 21st Century.

backgrounds. COSAT is a charitably funded

The township of Khayelitsha is home to about

lesson. Fortunately the students are so highly motivated that they are a pleasure to teach, they study for approximately ten hours per day six days per week at the school. It is amusing how whilst whispering to each other as all schoolchildren do during lessons

Town. Over the summer Alex Newbound and Stelios Despokatis spent a month this exceptional school The Centre of Science and Technology [COSAT] in Cape Town is an extraordinary I will not forget the footballing skills of

I will not forget the footballing skills of Abongile Delo and his gang on Friday afternoons who play barefoot with bricks for goalposts, and how every speech by a student would be followed by an inspiring quote from Nelson Mandela. One highlight to look out for will be to see the school's Marimba band in action at the 2010 world cup opening ceremony!

> Alex Newbound Graduate in Avionic Systems MEng

Paul Harper's marathon efforts raise awareness

"In late September this year, I cycled the 240 mile Lon Las Cymru (Challenge the Dragon) National Cycle Network route from Newport to Holyhead, then ran the Anglesey Marathon, in order to raise money for Engineers Without Borders (EWB) and WaterAid. I was keen to use the trip as a chance to raise greater awareness of EWB in the lead up to their National Conference which, as you can read on this page, was a great success – congratulations Ben and the rest of the team! Although the cycling was much tougher than I'd been expecting (fully loaded panniers and steep hills are not a good combination), the scenery was spectacular and the only drawback was the shortage of places to get a reviving cup of tea. After four days of cycling, I finally reached Holyhead and despite a full day's rest on Anglesey to recover, I awoke on the morning of the Marathon with my legs still feeling like lead and thoroughly dreading the prospect of 26.2 miles of running/ crawling. My saviour was the pre-race massage I got at race headquarters, which restored just about enough freedom in my joints to get me started. I have never been so relieved to cross a race finish line and this was definitely the highlight of the trip.

I would like to say a huge thank you to everyone who sponsored me and the total currently stands at £2,150".

To read more about the trip, please visit http://seis.bris.ac.uk/~ph9258



Alex Newbound (far left) and Stelios Despokatis (second right) with students at the Centre of Science and Technology in Cape Town

Paul Harper takes a short break on the Black mountains

Crossing the finish line in excellent time



The Worldwide Universities Network

The Worldwide Universities Network (WUN), of which Bristol is a part, provides funding via its Research Mobility Programme (RMP) for research students and staff to travel overseas to participate in research at partner institutions. Over the past year, three Bristol PhD students from the Faculty of Engineering - Jawar Singh, Timothy Smith and Xiaolin Chen – participated in the programme with the Pennsylvania State University, USA as their destination. Located in rural Pennsylvania, boasting the second largest capacity stadium in the world and a crowded campus catering for over 40,000 students, PSU provided an experience far different to that encountered at Bristol. In addition, the bringing together of talented researchers from both Bristol and PSU allowed new research directions to be explored and new links to be established between the two universities. "The WUN program has been a very useful springboard for initiating ties between the University of Bristol and PSU" said Dr Robert Collins. The participating students also gained an insight into the differences in academic research between the UK and the US. During the exchange, there were also chances to participate in many events around the PSU campus such as the Pennsylvania Festival of the Arts, the International Spring Festival and attending massively crowded American football games.

More information about the Worldwide University Network and on applying for Research Mobility funding see http://www.bristol.ac.uk/wun/ Participants in the WUN RMP with their host supervisors outside Old Main at PSU. L to r: Xiaolin Chen, Timothy Smith, Dr Robert Collins, Dr Vijaykrishnan Narayanan, Dr Yanxi Liu, Jawar Singh and Masume Assaf (PSU WUN coordinator)

David Dijemeni

Ed Thrift, Stephen Parsons, John Perks and Mike Rodgers

"The vision is to create an aircraft which is capable of circumnavigating the globe powered only by the sun". This is the aspiration of ex-Bristol University student, Constant Tedder, through his EarthShipOne Airship Design Challenge, (www.earthshipone.co.uk).

Constant is an entrepreneur and adventurer, co-founding the computer games company Jagex Ltd, developer and publisher of the MMORPG RuneScape. He has a passion for adventure and has recently travelled the entire width of the Mediterranean by jetski. He would now like to complete an around the world flight with zero emissions, using only energy harvested from the sun. The craft would also need to make use of the latest technology to store energy from daylight hours to power flight through the night. EarthShipOne's purpose is to promote innovation and renewable energy whilst providing a sustainable aerial platform from which climate change effects can be monitored.

In September 2008, the Aerospace Engineering departments at six leading UK universities undertook projects to create innovative designs to meet this challenge. Design proposals were judged by a panel of eminent engineers at a Presentation Day at the Royal Aeronautical Society in London.

Fresher in Engineering

After fierce arm-twisting pressure from UCAS and A-levels, the result is a seemingly endless, lengthy wait to get started at Bristol University. My wildest imagination about the what, why, how and where of Bristol's Faculty of Engineering was blown to the uttermost extreme by the Freshers Week.

Meeting new people and making new friends was amusingly entertaining instead of challenging. These people came from totally different spheres of life; different backgrounds, cultures and nature. People were very friendly, social and out going. As we all know, Freshers Week has a special event for every day. We went ice skating, bowling, on a treasure hunt, and took part in a quiz night and toga party. The new faces and friends made the days pass very quickly, and there was no time to miss home and college friends.

The speeches and talks were incredibly motivational and inspirational. 'At Bristol University we admit the best set of students, you are the best students and the future lies in your hands...' said Professor Mark Beach, Head of the Electrical and Electronics department. The speeches ranged from the basic topics about new life at university to the top research in the Electrical and Electronics department. I loved the communication and robotic research. Doing my PhD in Bristol? Maybe..

Walking into the very laboratories where some of the world's greatest discoveries have been made, meeting a new world of people and exploring the city of Bristol, has shown me there is much more to come after my wonderful, superb and fantastic Freshers Week.

> David Dijemeni Year 1 Electrical & Electronic Engineering

Around the world on solar rays

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Final year aerospace engineering research projects by Ed Thrift, Stephen Parsons, John Perks and Mike Rodgers focussed on various aspects of the proposed aircraft's propulsion and structural requirements. Amidst tough competition the Bristol team were narrowly beaten by the twelve man team from Loughborough University. The Bristol students were particularly commended on the innovation of their proposals and it was a fitting achievement on what was, quite literally, their last day at university. Their second place share of the £3,000 total prize money was also much appreciated as they prepare to embark upon the task of paying off their student loans.

The work continues this year by aerospace engineering students Adam Russell and Tom Putman.

Peter Bunniss Department of Aerospace Engineering

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Forget about work exberience - fetch the car keys...



18th July 2009: three hundred and fifty vehicles with a collective sex-appeal of about as much as their combined horsepower pull into Goodwood race track in Sussex. Sitting quietly among the ice-cream vans, the fire-trucks, the Batmobile, the Thunderbird four, and the hoards of Skodas, is a Fiat. On the roof is a bouncy castle. A stunning spray painted dragon graces the bodywork, and whilst there is admiration from onlookers, the mood among its crew is tentative. Preparing the car are two engineers and an economist from Bristol University, having entered the rally with the aim of transporting the largest and least useful object on the journey, now carefully calculating the (poor) numerical odds of taking a bouncy castle from London to Mongolia in a previously stolen Mancunian taxi with116,000 miles on the clock, and a second gear that was left on the M6 only 25 miles after purchase.

Every car has a similar story. This is not a race. This is the Mongol Rally 2009.

The team (aptly named 'Don't Panic'), taking on this task in such an horrifically poor car were Ed Thompson (Aerospace Engineering), Leo Thompson (Mechanical Engineering) and Matt Tinsley (Economics).

Predictably, they didn't make it, but not without a bold effort. An enormous amount of makeshift field engineering took place en route but a total of 18 different mechanical faults halted progress (thanks to John Byles in the workshop for the sump guard which refused to break without first breaking the chassis). Having been pushed for 260 miles, they stopped 500 miles short of the finish line, put the bouncy castle on another car and clocked five weeks and six days.

As if six weeks of adventure were not enough, they then obtained a 4x4, and on a diet of Red Bull and baked beans returned in just six days and 19 hours, smashing the world record by a day. Here's to ditching the equations and internships, and indulging in some motoring madness.

By taking part the team raised £1,120.15 for two charities; the Christina Noble Children's Foundation and Mercy Corps Mongolia. This included £65 in donations from the staff of the Faculty.

The team would like to thank everyone in the Faculty who was involved or gave their support during the preparations and throughout the race.

For more information visit: mongolrally09.theadventurists.com/ The river was deeper than expected, and the electrics get flooded!

The 'Don't Panic team, Ed, Leo and Matt at the finish



Students scoop the top awards

Once again students of the Faculty find themselves in the spotlight

Chris Musselle, a postgraduate student in the Bristol Centre for Complexity Sciences (BCCS), has won the prestigious Best Student Poster prize at the 2009 European Conference on Complex Systems. The poster, entitled 'Malware defence using artificial immune systems', suggests a new method of detecting malicious computer programs, such as viruses, that mirrors the workings of the human immune system.

Chris is among the first cohort of students to have begun their postgraduate studies under the auspices of BCCS when it was first set up in 2007. BCCS is a highly interdisciplinary centre for training and research funded by the UK Engineering and Physical Sciences Research Council. A major collaboration across four faculties within the University, BCCS aims to nurture the next generation of scientists and engineers in the most challenging areas of the emerging sciences of complexity.

> Student poster winner Chris

Musselle

Six Bristol engineering students have won awards for the exceptional quality of their work. The awards, presented by Boeing, mark the beginning of a new relationship between the University and one of the world's leading aerospace companies. Four of the students won prizes, worth £500 each, for the best final-year or MSc projects; the remaining two both won a highly prestigious Boeing scholarship worth £3,000.

The students were chosen because of their consistently excellent academic performance and the quality of their project work. The students - Rafic Ajaj, William Costin, Richard Vigars, Corin Rathbone, Ross Turner and Alexey Likhoded - were presented with their awards by the President of Boeing UK, Sir Roger Bone, at a ceremony held in the Faculty of Engineering on Tuesday 10 November.

Dr Sally Heslop, Graduate Dean of the Faculty of Engineering, commented: "The University has a strong track record in attracting the top students making these prize winners the very best. We hope that working with Boeing will help further enrich our curriculum for students."

Simon Crowther, MEng student in the Department of Mechanical Engineering has been awarded the Vicon Prize for the best project involving the design of a Medical Device. The prize, sponsored by Vicon Motion Systems Ltd, was awarded in the 2009 IMechE medical engineering student project competition. Simon's 3rd year project involved the design and build of a system capable of precisely mimicking the flow patterns found in human blood vessels, and was presented to the University by Dr Stephen White of the Bristol Heart Institute. Dr White is interested in how the shear stresses felt by endothelial cells in human arteries are related to atherosclerosis and other life threatening vascular conditions. The problem was accurately simulating the complex shear stress variations found inside the body in a laboratory environment.

The apparatus designed follows a given shear stress pattern which repeats every 0.8 seconds and is capable of supplying flow to three separate test chambers at once. It is now being used with real human cells by Dr White in the Bristol Royal Infirmary where he is currently investigating the effects of elevated shear stresses on endothelial cells.

James Rankin, PhD student in the Department of Engineering Mathematics, won 2nd prize at the Airbus PhD Day for his excellent presentation on "Nonlinear analysis of lateral loading during ground manoeuvres". The prize was presented by Michael Schoenwetter, Head of Research & Technology Partnerships at Airbus. The annual Airbus PhD day is intended as an opportunity for Airbus-sponsored PhD students from all sites - in France, Germany, Spain and the UK - to showcase their research. Prof Bernd Krauskopf and Dr Mark Lowenberg who supervise both James and a team of researchers working with Airbus on landing gear and ground dynamics, were also pleased with the response to the poster displays of two other Airbus co-funded PhD students, on "Nonlinear analysis of airframe and landing gear interactions" by Etienne Coetzee and "Nonlinear analysis of statically indeterminate landing gear designs" by James Knowles.

Peter Baldwin and Andrew Crockett of the Department of Civil Engineering were awarded I.StructE first prize for their research project titled "Long Term Performance of pile supported Offshore Wind Turbines". The project was supervised by Dr Suby Bhattacharya. MSc student Domenico Lombardi and PhD student Sam Hayhurst are advancing the work in order to develop an analysis/design method.

Graeme Horne, a research student within the Department of Mechanical Engineering, recently won the British Society for Strain Measurement's Young Stress Analyst competition.

The competition was held at the Institute of Physics 7th International Conference on Modern Practice in Stress and Vibration Analysis. Graeme presented his research, conducted as part of his fourth-year group industrial project supervised by Dr Anton Shterenlikht, in both a main conference session and as part of the competition. Graeme graduated this summer with a MEng in mechanical engineering and is now a PhD student within the Solid Mechanics Group, supervised by Professor David Smith.

James Davies, Dimitrios Kandylakis, Francesca Draper, and Harry Crofton (3rd year Civil Engineering) in collaboration with Cujae University in Havana, Cuba, have won the Mondialogo Engineering Award, for their project 'Sheltered House Design and Construction Technology for Hurricane Vulnerable Zones in the Caribbean'. The project was chosen as one of 30 finalists from a total of 900 entries, and the team have been awarded 15000 euro to develop their ideas further.

After the 2008 hurricane season, the most damaging in a century, Cuba saw 25% of its housing infrastructure devastated. Other less prepared Caribbean countries suffered even greater losses making re-development a near impossible feat. This project is based



around the design of a 'Sheltered House' incorporating low cost, local resource and low skill construction; still providing a place of secure shelter in the most severe conditions. The houses are built around a central reinforced room, with further expansion utilising particular technologies also developed as part of the project. They allow construction with local resources, low energy demands and an un-skilled workforce. The inhabitants can therefore be self-dependent and carry out most of the construction themselves. This will be facilitated through knowledge transfer schemes in order to empower communities with the capacity to address their housing needs effectively.

The enormous potential and merit of this project can now be developed with actual implementation a not too distant goal.

For more information please contact jd7984@bris.ac.uk

Matthew Gaskin, Matthew Hand, Simon Ridley and Carlo Brancucci Martinez, four MEng Aeronautical Engineering students working on their final year projects in the field of aviation and its environmental impact made it through to the second round of the Airbus 'Fly Your Ideas' (FYI) competition this year. The challenge – open to college and university students from around the world, from bachelors to doctoral level in any discipline – was to develop "innovative and eco-efficient ideas to shape the future of aviation, and deliver a further reduction in the industry's impact on the environment".

The competition was intense, with more than 2,350 students from 82 countries bidding to win the 30,000 euro prize. Only five teams made it through to the final round of the FYI challenge – sadly none from the UK. However, students here at Bristol can put forward their projects for future competitions.

The 'Fly Your Ideas' competition is designed to attract more young people to the aviation industry, in which Airbus globally invests 2 billion euro annually in R&D. The 'Sheltered House'

Student winners of the Boeing awards (front row, I to r) Richard Vigars, Rafic Ajaj, William Costin, Alexey Likhoded, Ross Turner, Corin Rathbone with Sir Roger Bone, President of Boeing UK (centre)

Simon Crowther with Tom Shannon, Founder and Director of Vicon Motion Systems Ltd

James Rankin receives his award from Michael Schoenwetter

Graeme Horne

Stephen Williams (MP for Bristol West), Matthew Gaskin, Matthew Hand, Simon Ridley, Carlo Brancucci Martinez and Dale King (Airbus R&T Scientific Partnerships)











11

Engineering Faculty for the 21st Century

Moving Forward

An overview by Peter Foster EF21 Project manager

It is now some while since we had an article in LynchPin specifically about the EF21 programme, and much has happened since then, both within the University, and beyond. Inevitably events internal to the University have influenced how we are now able to approach achieving the strategic vision presented in that piece.

This article is a personal view on the landscape in which we are operating, an overview of what has happened in the last few months, and takes a look at what is coming up in the next 10 months or so.

From my perspective, as the project manager trying to implement the reorganisation phase of EF21, there is a key message that risks being lost against the background of how the wider University is trying to respond to the current global financial turmoil. That is, that EF21 is first and foremost an improvement programme. It was conceived before the present financial troubles began, and delivering strategic improvements in all areas that we operate remains our top level objective.

Of course financial savings have become an increasingly important by-product, but it would be wrong to think that the EF21 agenda was centred on cost cutting, which alone will not deliver the improvements we are looking for. Had that been the stated, or implied agenda when I applied, I doubt that I would have accepted this job. Our focus needs to be on operating in more effective and efficient ways to enable us to do more with the resources that we already have at our disposal. It is certainly the case that getting additional resources over the next few years, is going to be extremely difficult.

It is a little ironic that at the time of writing, and in the wake of the Vice Chancellor's most recent message, that we in Engineering are able to confidently forecast a positive financial return for 2009/2010 in a very challenging environment. This is not to risk becoming complacent, but whilst this situation prevails, it does provide us a robust platform to argue that even though we are performing well at present, through the effective implementation of EF21, we can do even better in the future.

I hear the argument 'If things are going so well, why should we persist with these changes?' Aside from simply because as an Engineering Faculty we want to be better still, it is also inevitable that to stand still will just enable the competition to catch up, or in a few cases move further ahead.

The reasons given in the Dean's previous piece, of inefficient creaking systems and processes, and an unsustainable workload for the available workforce still hold true. Those issues are now even more acute however. Notwithstanding the financial crisis, there are the justifiable expectations of the fee paying student community, the government funding agencies and industry that we provide better value for money through the services we provide. Like the terminology or not, we are moving to a model where the 'customer is king'.

Whilst there are risks associated with making changes to the way we have been operating – the risks of not making changes for the longer term strategic benefit are far greater.

October Schools Named

July Heads of School appointed

July 2009

Change is on the agenda of the University as a whole – with the rapidly assembled and executed Support Process Review (SPR) programme specifically focussed on identifying and implementing process improvement across all the support services.

We recognise that SPR poses both risk and opportunity to EF21, so have worked hard to become integrally involved in the workshops that have formed a core part of its activities to date, and have developed close ties with its management and governance. Where we have shared ideas for design and implementation for Engineering, we have found ourselves to be broadly in line with the objectives of SPR, and have found support for what we are doing.

On the basis that much of our programme is already further established than the SPR, our ideal is for Engineering to be an exemplar Faculty for many of the processes under review, and to become a pilot Faculty for others.

12



So what has been going on?

As can be seen on the timeline above, some high level milestones have already been reached – notably the agreement to establish a school structure, the appointment of heads of the new schools, and the appointment of senior administrative managers to support them.

An awayday attended by the Dean, and the newly appointed senior management team was recently held. This led to identifying and agreeing some key underlying principles and priorities to focus on in our move toward the implementation of Schools next August. As would be expected of a group of engineers, a long hard consideration of risk was undertaken.

A governance structure has been established, and members of the University Senior Management have been asked to sit on the EF21 Programme board. The benefit of securing engagement, and buy-in of senior stakeholders is the enhanced capability to help us share our experiences with other areas, and to secure endorsement from a group who have oversight of the ongoing performance of the institution as a whole.

A strategy and plan to enable extensive, timely and transparent two-way communications through as many channels as possible is starting to be rolled out. Regular newsletters, emails, the Dean's blog, and a series of lunches hosted by the senior management team are all part of the effort to inform, and to receive feedback on perceptions and practicalities of the changes proposed. It is also planned to hold regular 'surgery' sessions with senior managers in the New Year to address individual concerns as more detail of the new structures and appointments across the Faculty emerge.

What is coming up?

At a very high level the timeline above gives an indication of when significant milestones leading up to August 2010 will occur. Some of these are specific to EF21 whilst others are University wide initiatives which may impact upon us.

Our overall programme vision remains the same, and we are confident that we are on track to meet the early objective of implementing a revised organisational structure in August 2010.

What gives us this confidence?

One of the great strengths of the EF21 programme is that we are prepared to be flexible in how we go about achieving the outcome of consolidating the Faculty's position as a world leader for undertaking cutting edge world-class research and teaching over the course of the next 10 years.

This reorganisation project is just one of a series of related projects whose combined outputs will lead to the programme's ultimate outcome. Our aspirations for the BRITE institute remain, but we recognise that the timescale to secure the capital needs to be aligned with the University aspirations in this area and will be rather longer than thought even as little as 12 months ago.

We have recognised, and are committed to upholding and where possible improving our service levels. Whatever else happens we can not allow our high standards to slip during what will be a delicate period. The performance of the Faculty in the RAE was outstanding, underpinned by quality results from the National Students Survey and THES. It is critical that we move up a level and don't lose anything during transition.

We are not underestimating the challenges which lie ahead and are seeking support both inside and outside the Faculty to help us deliver, but when all is said and done the solution lies within us all.

A common observation made about strategic change programmes in the University, is that 'we aren't very good at them'. In my experience, this is a view held across a range of sectors, but that is not to say everywhere, and not to say that we can't make a better fist of things here.

We must be wary of common assumptions such as 'strategic change can be delegated from a top team', and 'the top team are focussed, and have the ability'.

Change doesn't really have a start or an end. As an individual, no-one is going to do it to you, and no one is going to do it for you. Change ultimately is made within each of us, and the major challenge for myself, within Engineering, and for the University management team as a whole, is to convince everyone else of that. The Clifton Suspension Bridge

Engineering drawing of the bridge tower saddle (Clifton side). The figure shows the centre-span chains, side-span chains, main saddle, auxiliary saddle and rollers

Bruce Drinkwater carries out the tests

Examining our links with the past

Professor Bruce Drinkwater reports on the stresses and strains on some very old chains



The Clifton Suspension Bridge, which spans the Avon Gorge in Bristol was designed in 1830 by Isambard Kingdom Brunel and completed after his death in 1864. The bridge represents the pinnacle of Victorian engineering and is one of the most prominent landmarks in Bristol. It is to this day a fully functioning road bridge and one of the busiest commuter routes into the Clifton area.

The bridge deck is suspended from chains that span between two stone towers located either side of the Avon Gorge. After nearly 150 years of use, the decision was recently taken to inspect the chain-links for signs of fatigue cracking. Bruce Drinkwater and Adam Bowler from the Mechanical Engineering Department were called in to perform this demanding ultrasonic inspection.

Bruce and Adam used a specially designed ultrasonic array, similar to those used in medical ultrasound, to produce high resolution images of the interior of the chain-links. The particular regions of interest are the points at which the chain-links are attached to large iron castings called 'saddles', located at the at the tops of the stone towers. These attachment points are thought to be critical in the bridge design so it was with some relief that the inspection showed that no significant cracking was present.

Coincidentally, whilst the chain-link inspection was underway, one of the original deck hanging rods failed. Brunel's conservative design, meant that this offered no immediate threat to the structural integrity of the bridge and the hanger has since been replaced. Bruce commented "we knew the inspection of the chain-links was important but it really focused our minds to see that components on the bridge can, and do, fail".

The same design conservatism was applied by Brunel to the chain-links, so quite large cracks can be tolerated. This means that only when cracks get to about an inch do we have to sit up and take note. However, despite this large crack detection threshold, the inspection was not trivial, due to the coarse grain structure of the 150 year old wrought iron. The course grains, as well as various small manufacturing imperfections, mean that the imaging noise due to grain backscatter is very high, potentially obscuring real significant defects. The group used an approach called the Total Focusing Method in which a large array aperture is used to produce a series of strong foci throughout the inspected region. This, at least to some extent, reduced the grain scattering effects as many of the grains become 'out of focus' which reduces their influence on the inspection region.

The other issues encountered were more down to earth. Access to the towers was slow and hard physical work as more than 25kg of equipment had to be hauled up narrow ladder channels. Once at the top of the tower, years of grime had to be removed, along with deposits from several hundred generations of pigeon. Adam commented "once we had established a working method, things moved quickly, though they did slow when my fingers became numb after several hours spent taking measurements in the bitter cold". Thanks to the kind staff at the Bridge, hot cups of tea were always available, which gave them some relief.



The World's Quietest Building?

Fred Hale, Operational Building and Resources Manager for the Bristol Centre for Nanoscience and Quantum Information thinks it probably is..

> For the Bristol Centre for Nanoscience and Quantum Information we needed a 'distortion free' environment which would provide the best backdrop for supporting nanoscale research (1 nanometre = 1000,000,000th of a meter) as well as a centre to stimulate people interactions.

Regarding vibration there are two broad ways of building stable structures; float the whole structure using isolating devices or, as in the NSQI, create a high mass structure. We chose this approach because the geology on the site is suitable (hard quartzitic sandstone) and because our investigations pointed towards potentially exceptionally low vibrations here at Bristol. The team here defined their own vibration curves which are lower than the subsequently introduced VC-G aspirational curves for nanoscale research laboratories. The main structure is cast reinforced concrete with a depth up to 2m in the basement with upper floors 450mm thick. All of the plant is isolated from the main structure using springs or dampers and even the lift-shaft is separated from the main floor structures.

Acoustically the Centre has special doors, extra quiet door closers and the laboratory noise levels for plant and fume hoods are as low as IR35. It even has a specific soundproof room. Electromagnetically the labs are foil lined to act as faraday cages, all pipes and tubes entering the labs are plastic, the computers are all fibre optics and even the emergency lighting circuits have been customised.

Well we can't be certain it's the world's quietest but it's certainly the quietest in terms of vibration levels we know of.



Bristol SETsquared Business Acceleration Centre



The Bristol Centre

for Nanoscience

and Ouantum

Information

failure rate in the UK, with as many as 1 in 2 failing in their first two years. Yet many of the reasons for their downfall could have been avoided if they had sought out a protective environment where they were free to concentrate on their product while getting advice from experts who have seen all the hazards before.

Start up businesses have a very high

The University of Bristol is at the forefront of best practice in business incubation and has a growing reputation, internationally, for its work.

The SETsquared Business Acceleration Centre in Bristol (one of four centres run by the SETsquared Partnership, a collaboration between the universities of Bristol, Bath, Southampton and Surrey) helps technology based businesses move from initial ideas into commercial viability.

Nick Sturge, Centre Director of the Bristol centre explains "We support high-growth potential ventures in many ways – from helping a start up company build a viable business plan through to providing access to the right people to develop the business. We work actively to push entrepreneurs to accelerate their business faster than if they were on their own. The Partnership has already helped more than 200 new ventures get started, find suitable partners, secure vital investment and work towards winning their first contracts."

The Centres provide serviced offices where businesses are encouraged to spend time with business development teams. Having understood the development needs of the company, the teams can arrange meetings to help them build relationships with experienced entrepreneurs and business professionals.

The Bristol Centre is in University Gate East on Park Row and last year won the prestigious 'Established Business Incubator of the Year' award from UKBI. It currently supports 35 companies, of which 7 have 'spun' out of the University. The others have come from the local community and operate in the semi-conductor, internet, instrumentation, software, medical devices, biotech, mobile services and renewable energy sectors.

Micrima is a UOB spin out company formed in 2006 by Professor Alan Preece from the Bristol Oncology Centre and Professor Ian Craddock from the Department of Electrical & Electronic Engineering. The company has developed a safer and more comfortable test to detect breast cancer at an early stage.

Renewable energy pioneer Tidal Generation Ltd (TGL) has made solid progress since swapping its finance director Tania Lake's dining room for a SETsquared office. It is developing huge submerged turbines to generate electricity from tidal flow – with each machine producing enough electricity to supply 650 homes.

To find out more about the SETsquared Business Acceleration Centre, to see how you can get involved, or see the list of ventures currently in the Centre - please visit: http://www.setsquared.co.uk/ or email Nick.Sturge@setsquared.co.uk

17









With the UN Copenhagen Climate Change Summit taking place next month, climate change is once again headline news. Melting of the polar ice-caps is one very visible example of the changes that are occurring in our environment right now, but the physical mechanisms are still a hot topic of debate between scientists.

This summer a team of Engineers from Bristol joined the Bristol Glaciology Centre at their base camp near Kangerlussuag, on the western edge of the Greenland Ice Sheet, to trial new sensing techniques for the extreme sub-glacial environment. Getting accurate data in the field is the first step to improving our understanding of the processes that are causing the ice-sheets to retreat.

The team, Dr Steve Burrow from Aerospace Engineering, Mike Salter from Electrical and Electronic Engineering, and Richard were working with Dr Jemma Wadham from the Bristol Glaciology Centre to investigate hydrology beneath the ice sheet. Surface

melt water, makes it way to the bed of the glacier via moulins (vertical rivers running through crevasses in the ice) and lubricates the ice sheet, causing so called summer 'speed-up' events where the glacier can move tens of meters in a single day. This interaction between meltwater flow and ice speed-up could become increasingly important as high temperatures cause larger melt volumes to be generated on the ice sheet surface. However, these processes are poorly understood and are not included in the models which are currently used to predict the response of the Greenland Ice Sheet to climate warming.

the moulins can be up to 100 km from the terminus (or snout) of the glacier. Hence, it is very difficult to directly measure parameters at the glacial bed which might confirm the relationship between meltwater flow and ice speed-up. Normal wired or wireless sensors cannot be used because of the great distances and difficulties in transmitting through the ice and melt-water. To overcome this, the team are developing an electronic tracing technique whereby multiple low-cost sensor packages are deployed into the ice

sheet drainage system logging data as they travel. They are then located and recovered in the vast pro-glacial floodplain beyond the terminus using RF techniques similar to those used for animal tracking.

In the field the technique proved successful, and during the main trial deployment 60% of the electronic tracers were located and 20% physically recovered after having negotiated several kms of ice-bound glacial channels. The team believes this represents the first ever successful deployment of an electronic tracing system to an ice sheet.

This pilot study was funded by the University through the water research interest group with additional support from the Department of Aerospace Engineering and EPSRC via a summer student bursary. The team are currently preparing a proposal to the Natural full scale deployment of the electronic tracers alongside other advanced chemical tracing techniques.

A paper outlining the results from the trails is to be presented at the American Geophysical Union AGM in December.

Steve Burrow and **Richard Barnes** listening for tracers on the ice sheet

Hiking out with equipment to the glacier

moulin

The edge of the Russells glacier

We have Lift-off

Professor David Ewins, Director of BLADE, reports on the AgustaWestland UTC

Artist's impression of the BLADE helicopter

The 'real' Lynx helicopter awaiting installation



Visitors to the Structures laboratory in BLADE towards the end of the year will find a new 'occupant' in residence: they will not be able to miss the carcase of a Lynx Helicopter supported at mezzanine level on a custom built frame! This newcomer symbolises the growing collaboration between the Engineering Faculty and AgustaWestland and is one of the many investments being made by both parties in the new AgustaWestland UTC (University **Technology Centre) on Vibration** Reduction.

For many years, the Aerospace Engineering Department at the University of Bristol has had close links with Westland Helicopters (now, AgustaWestland) in both its teaching and research activities.

One of the strong themes of the research collaboration has been focussed on the many vibration and structural dynamic problems which plague helicopters more than almost any other man-made structure. In most machines, vehicles and structures, vibration is an unwanted side effect of moving components which causes undesirable discomfort, noise, unreliability and - in more extreme cases - structural failure through fatigue. In the great majority of cases, it is a second-order effect, caused by slight out of balance, or non-smooth road surfaces etc. but in helicopters there is an in-built firstorder dynamic loading which results from the inherent nonsymmetry of the large aerodynamic forces on the rotor blades. This is particularly acute when the helicopter is in forward flight as well as hovering. As a result, the levels of vibration in a helicopter tend to be much higher than those experienced in other vehicles: hence the strong interest in the structural dynamics expertise that can be found amongst the many research groups who are active in the BLADE laboratories.

This is the background to the creation of a strategic partnership between the University of Bristol and AgustaWestland which is modelled on the UTC format developed over the past 20 years to a very high degree of sophistication by Rolls-Royce (and whose Composites UTC is now another major initiative in the Aerospace Department). An agreement to establish the AgustaWestland UTC in Vibration Reduction was formally signed in 2007 and over the past two years the structure, fabric, team of researchers and initial 5-year research programme for the Centre have all been assembled. Just a few weeks ago, at the end of September 2009, the first formal meeting of the UTC's Steering Committee - with representatives from Bristol, Yeovil and Cascina Costa (AgustaWestland's HQ in Italy) was held to review the first year's technical progress and to chart the way forward for the next few years.



While the UTC is primarily concerned with the prosecution of a large research programme (there will be between four and six full-time researchers, most of whom are postdoctoral RAs), it is intended that as a strategic partnership - there will be many more interactions between the University and the Company than those dealing with the core research tasks. The UTC team will become involved in other technical activities at AgustaWestland: for example, in September three of the UTC researchers participated in the vibration testing of a new helicopter - a major milestone in the development of any new aircraft and an event rarely observed by 'outsiders' to the company that builds it. Also, there will be many points of contact between AgustaWestland and the UG and PG course activities - final-year or design projects, industrial visits - even, in the next few weeks, the opportunity to experience a flight in a helicopter although not the one which will soon reside in the BLADE laboratories!

> D J Ewins Director of BLADE

Bristol Aeolus 2010: Progress Update



Bristol's 'Nirvana' Design Concept In 2010, the Faculty of Engineering will be entering the Aeolus Wind Powered Vehicle Race, being held in Den Helder, The Netherlands. This is an international competition and currently, Bristol are the only UK team out of 12 entries. Andrew Franks describes his involvement in the project through a summer vacation placement.

"Working in the Faculty for the summer on an exciting project such as this is not something many undergraduates get to do! There were eight students working on the project from various departments: Andrew Franks, Justin Hunting and Jeff Kahlon, Aeronautical; Christine Gunter and Adam Walker, Engineering Design; Salman Iqbal, Avionic Systems; Simon Knibbs, Electrical; and Tim Hutchinson, Mechanical.

We worked closely with academic and support staff on a series of design optimisation studies under the three main technical work packages of Energy Capture, Motive Power and Lofting & Structures. The final concept that evolved is an innovative two-turbine counter-rotating system with electrical transmission.

At the end of the summer placement, Garrad Hassan kindly funded a trip to Denmark for us to observe the 2009 Aeolus competition. This was a highly valuable learning experience and we were very impressed by some of the entries. Wind speeds were not high enough for two of the cars to operate but those that did proved to be very efficient mechanical transmission machines.

I hope this project will continue to use and build on the wealth of knowledge in the Faculty. We have now started manufacturing the vehicle and are always on the lookout for enthusiastic people to join the team".

For more information, please visit www.teambr1stol.co.uk.

The Faculty would like to express its gratitude to Garrad Hassan, the Bristol Port Company and Boeing for sponsoring the Aeolus project.

Success at iGEM

Synthetic Biology is a new exciting research direction which brings together Engineering and Biology. The aim is to synthesise new biological circuits using standardised parts and components similar to the early days of electronics. The challenges for engineers and biologists involved are immense. The levels of noise are usually unheard of in engineered systems (over 50%) and cells are living organisms, often reacting to environmental changes in unexpected ways. Nevertheless, it has been shown that it is indeed possible to 'engineer' cells so that novel synthetic biological circuits can be assembled to perform some desired function. Biological oscillators, switches, logic AND and OR ports, sensors and detectors have all been successfully implemented. Potential applications include in-situ delivery of drugs, cheap biological detectors of poisonous substances, engineered bacteria for the production of energy and many others.

In 2004 Randy Rettberg at the Massachusetts Institute of Technology (MIT) launched the first ever International Genetically Engineered Machine Competition (iGEM) with the aim of bringing the best students and researchers around the world to answer the question, The gold medal winning team at iGEM.1 to r: Dr Krasi Tsaneva-Atanasova, Emily Nicoli, Petros Mina (kneeling), Panayiotis Sterghides, Mattia Fazzini (kneeling), Oliver Purcell, Antos Matyjaszkiewicz, Stephen Reid, Thomas Gorochowski "Can simple biological systems be built from standard, interchangeable parts and operated in living cells? Or is biology just too complicated to be engineered in this way?". From small beginnings where only five US teams took part, interest has grown rapidly with 2009 seeing 112 entries from around the world. The competition takes place over three months and ends with each team presenting their work at a jamboree in November at MIT. Judges mark every project and the event concludes with the presentation of medals and awards for outstanding contributions.

The UK is taking an important role this year with teams from Aberdeen, Cambridge, Edinburgh, Sheffield, Southampton, Imperial and Bristol. Funding from the Bristol Centre for Complexity Sciences, the Department of Engineering Mathematics, the Predictive Life Science research theme and BBSRC, has allowed Bristol to take part for a second consecutive year. The team for 2009 were Petros Mina and Stephen Reid, PhD students at the BCCS, Emily Nicoli and Antos Matyjaszkiewicz, 3rd and 4th year students in Engineering Mathematics, Panayiotis Sterghides, 3rd year student in Biochemistry and Mattia Fazzini, a visiting student from the University of Ferrara in Italy.

Under the direction of an interdisciplinary group of instructors from Engineering (Prof Mario di Bernardo, Dr Krasimira Tsaneva-Atanasova), Biology (Prof Claire Grierson), Biochemistry (Dr Nigel Savery) and the Bristol Centre for Complexity Sciences Thomas Gorochowski and Oliver Purcell,



the team worked hard on a challenging project named 'VESECURE' with the aim of using vesicles (nano-sized containers naturally excreted by bacteria) as a form of secure digital communication. Bio-Bricks were created to allow for any protein cargo to be placed into a vesicle and the previous vear's agent based modelling framework (BSim) extended to provide a sleuth of new features. These advances in foundational tools for both the wet-lab and modelling areas resulted in a gold medal and 'Best Model' prize for a second year running! Winning such an award highlights the quality of the students and the productive atmosphere that has been built within the University.

iGEM is a great opportunity for students to enter this exciting new area of research.

For information about joining the team in 2010 contact Prof Mario di Bernardo (m.dibernardo@bristol.ac.uk) To find out more about the competition visit: http://www.igem.org LynchPin Bristol Engineering

Knowledge Transfer Partnerships

Frances Frith explains the funding opportunities for research with industry

 Government industrial collaboration schemes place increasing importance on high quality basic scientific research output. Previously, marrying your research agenda with an industrial partner led to more applied developmental projects, but this is changing. Take another look at Knowledge Transfer Partnerships (KTPs), which now ensure clearer basic research benefits for universities.

Take Nick Lieven's experience of KTP as an example. He said: "This was quite unexpected: we have already submitted four papers and are only halfway through the project. The project gives me a real buzz because it has solved a real problem now being flown on aircraft around the world."

The Technology Strategy Board (TSB) supports KTPs, and recently increased funding, aiming to double project numbers by 2011.

The scheme involves a company and academic partner jointly developing a 2-3 year, academically challenging project that provides a strategic benefit to the company. The work is primarily done by a KTP Associate, a high-level graduate, based mainly within the company, guided by an academic (you) and a company supervisor. The Associate interacts regularly with you and your research group, draws your expertise into his or her own research, and transfers the resultant knowledge into the company.

Funding is shared between TSB and the partner company, and includes the Associate's salary and overheads. The budget pays for your time (at fEC) to work on the project and supervise the Associate. Your department receives the fEC element as discretionary income that has also counted towards past RAEs. Furthermore, projects provide new undergraduate and post-graduate research themes and teaching materials, and produce journal and conference papers.

Nick Lieven and Peter Bunniss lead a current KTP between Helitune Ltd and Aerospace Engineering. Helitune needs new algorithms and analytical techniques for helicopter rotor track and balancing, and has already reduced vibration, improved reliability for customers and created new business.

Nick said "The project has given me direct access to real data from aircraft and links to

companies around the world which would not have been possible without Helitune's support. It has also produced two final year MEng projects, and the KTP Associate has started a PhD within Aerospace Engineering".

Following the success of this project, a new KTP has just been set up between Nick and Beran Ltd, a sister company of Helitune, to develop intelligent health monitoring algorithms for rotating machinery.

Duncan Grant from Electrical and Electronic Engineering recently completed a KTP with Fraser Anti-Static Techniques Ltd to create an R&D capability and develop new products, including an electrostatic voltmeter suitable for explosive atmospheres. It provided the material for three final year projects, produced three papers, and generated new collaborative research in controlling high voltage power supplies.

There are other project options. A post-doc KTP follows on from a CASE award or Eng D, implementing the results within the company for 12-18 months. Shorter KTPs are also possible, lasting 10-40 weeks.

Help and support to set up and run KTPs is available from Frances Frith and Andrew Wray in RED. They can assist in writing proposals, getting the project started, managing administration, arranging finances, and more. Frances and Andrew will happily discuss potential project ideas and KTP collaborations.

Frances.Frith@bristol.ac.uk 0117 9288039 Andrew.Wray@bristol.ac.uk 0117 9546968 www.ktponline.org

The Helitune Project

My first contact with Helitune on the KTP project we have now been running for some two years came via a rather obtuse route through the Region Development Agency. I received a phone call from one of their technology strategists saying 'Professor Lieven, do you know anything about helicopters?' Fortunately, I was able to respond positively, if a little perplexed by the question. This initial contact was followed up by Helitune's technical director, Peter Morrish, who came to visit and

walked into the dynamics laboratory to be confronted by an AgustaWestland Lynx Mk III aircraft sitting in the lab awaiting ground vibration testing. I think Bristol's credibility in rotorcraft in his eyes jumped several stories. The project was developed over a few weeks with Peter Morrish at one end of email in Torrington in Devon with me on a research secondment in Los Alamos, New Mexico. Although face to face contact during the proposal writing was a little awkward, the time difference helped us both develop thoughts on how helicopter rotors could be balanced and to provide an exciting prospect for the Technology Strategy Board to fund three years' work for two researchers.

Duly funded, we set about recruiting the two research associates, Steve Pollard and Richard Hunt, both of whom had received first class honours degrees in Mathematics and are two of the brightest, most enthused associates I have ever seen. It made the task of running this project a real pleasure. The technical challenge which involves solving an under determined dynamic set of equations to balance a helicopter rotor with minimal information is ideally suited to mathematicians and so they set about their work with due haste. The advantage for me in my own research is that this has given me access to real data from helicopters and also to visit the end customers. Normally operators of helicopters go to all possible lengths to avoid having contact with academics, as we can be seen as boffins who are unable to relate to the real world! The introductions made by Helitune on the University's behalf got us through doors that we thought were locked to us.

The work has now moved on at Helitune and Steve and Richard appear to have solved the first stages of the problem, and are now applying this on flying aircraft, which for me, is the most exciting aspect of getting involved in the KTP project, to see solutions being applied in anger – and they work! For an engineer, it doesn't get any better than this.

Professor Nick Lieven

Professor Nick Lieven at the controls of a Chinook helicopter with Peter Morrish, Technical Director of Helitunes

20



From the Engineering Archives

This photo shows the Coliseum Picture Theatre at the junction of Park Row and Woodland Road around 1912, the remains of which now form the eastern end of Merchant Venturers Building.

In 1910 planning applications were made by a Mr J.G.Rowe to erect a skating rink on this site with a café and facilities on Woodland Road, but when it was built the triangular east end of the site was separated and used as a cinema. The building was named 'The Coliseum' and was opened in October 1910 by the Lady Mayoress of Bristol.

During the First World War the building, with its spacious interior uncluttered by supporting pillars, was requisitioned for aircraft manufacturing purposes and as late as 1921 George Parnall & Co. Ltd. were designing and building aircraft there. An early design, by engineer Harold Bolas, was the naval aircraft the 'Puffin'. However it became increasingly clear that an aircraft factory in the middle of town was less than satisfactory as far as test flying was concerned, (some of the aircraft having to make their first flights from Filton), and consequently the company moved to a grassy aerodrome at Yate.

The Coliseum resumed its life as a cinema and skating rink. There was a large ballroom on the floor above for dancing and music. Al Bowlly and the Lew Stone Band performed there in 1934, when the Bristol Evening Post reported that nearly 3,000 dancers thronged the floor. Ron Cox, a pupil from nearby Bristol Grammar School, remembers regularly skiving off in his lunch hour and standing by the stage door on Woodland Road to hear the bands as they rehearsed. Ice hockey was first played at the Coliseum rink in the 1930s. Teams called The Bears and The Cubs played inter club matches and the sport became very popular, with some matches being broadcast on the West region of the BBC's Home Service.

With the outbreak of World War Two, Bristol became a target for the bombs that were falling in the Bristol Channel, It was the fifth most heavily bombed city in Britain. Only the easternmost third of the Coliseum block survived the Blitz and was initially used as a garage when the remainder of the ruined building was cleared away after the war. The School of Veterinary Science, designed by Ralph Brentnall was built on the site in 1948. This building was later demolished to make way for the Merchant Venturers Building designed by Atkins Walters Webster and completed in 1996.

Above the original entrance to the Coliseum Picture Theatre sits a statue of Nipper, the terrier who featured in the painting "His Masters Voice" which became the world famous trademark for the Gramophone Company named after it - HMV. Nipper regularly appeared on stage with his master, Mark Barraud, a set designer at the popular Princes Theatre (left in the photo next to E & R Pitt) which was completely destroyed in the same air raid that claimed the Coliseum. The Coliseum Picture Theatre on Park Row in the early 1900s



Dr Oksana Kasyutich

- Dr Sameer Rahatekar
- Dr Mike Yearworth
- Ms Susan Pywell







The Faculty is always pleased to welcome new members of staff. Here we feature a few of the latest arrivals. Oksana Kasyutich joined the Systems Centre of the Engineering Faculty in August 2009. Her new role as a Centre Manager is an exciting opportunity and a change of direction in her career within the University of Bristol, presenting her with new challenges, responsibilities and dimensions.

Oksana is an experimental physicist and for the three years prior to taking up this position she was a Research Fellow in the Physics Department.

Originally from Belarus, Oksana came to England in 1997, as a result of being awarded a Royal Society research fellowship at the University of Bristol. She has spent the past ten years in multi and interdisciplinary research and development, both in academia and industry, specialising in nanotechnology and nanoscience. Oksana was a manager of a pioneering research team with a University of Bristol spin out company, one of the first nano-biotech SME in the UK.

She is also a Visiting Research Fellow in the Physics Department and a supervisor of the PhD students at the Doctoral Training Centre in Functional Nanomaterials.

Oksana and her husband Stephen have between them five grown up children (Katya, Michail, Amy, David and Jonathon) and away from work lists her interests as all kinds of active pursuits, music and family.

Sameer Rahatekar has joined the Faculty as a lecturer in Advanced Composites for Innovation and Science (ACCIS) in Aerospace Engineering. His research interests span from multifunctional nanocomposites to natural fibre based Green Composites materials. He carried out his PhD on modelling of electrical percolation in carbon nanotube composites and studying the rheological properties of nanotube suspensions at the University of Cambridge. He continued his research as a postdoctoral research scholar at National Institute of Standards and Technology (NIST), USA. During his postdoctoral research he worked on fibre spinning on natural polymers such as silk and cellulose using ionic liquids which are environmentally benign solvents for natural polymers. He plans to continue working on natural polymer fibres based composites for applications in automotive and textile industry and applications of carbon nanotube based composites in aerospace engineering.

Mike Yearworth has joined the Faculty of Engineering as Reader in Systems. He graduated in Physics and Electronics from the University of Southampton where he also studied for his PhD and did post-doctoral work on gamma-ray imaging systems.

Mike switched disciplines in the early 90's to conduct applied research in Computer Science and worked on a diverse range of complex industry problems from healthcare to transport informatics.

Finishing his second academic career as Director of the Intelligent Computer Systems Centre at UWE, Mike then spent eight years in Hewlett-Packard's European Research Labs leading teams in diverse business areas such as service automation and integration, trusted systems, the economics of information security, and the intelligent enterprise. He has worked on some of the world's largest information systems projects developing methods to solve the problems that seem to plague their procurement. This led to connecting with the ideas of Systems Thinking whilst studying for his MBA and, on exiting HPLabs, forming his own systems consultancy.

He was delighted to find that his ideas about the industry need for engineers trained in Systems Thinking aligned well with the EngD programme of what is now the Industrial Doctorate Centre in Systems and is pleased to be part of the team teaching and supervising Research Engineers.

Mike's research interests are focussed on the development and application of systems based methods for working with complex engineering, organisational, and social problems – such as achieving a sustainable urban environment. His career has been quite diverse and he consequently enjoys networking with a wide range of people and is very committed to developing research collaborations in other disciplines across the University.

Susan Pywell recently joined the Faculty Central Services as a Finance Assistant. Although born in the UK, Susan has spent most of her life in Brisbane, Australia. She worked for 13 years in her father's engineering project management consultancy, doing the book-keeping and payroll for the business while at the same time being loaned out to other engineering firms to provide administrative support, primarily in relation to construction contract disputes. As a result she has attended a lot of very interesting negotiation meetings!

In 2005 Susan gave in to the travel bug and spent three months travelling around Australia with her partner before moving to Perth, where she worked as a payroll officer for the West Australian Government.

In 2007 Susan moved to London and, after a brief stint as a fleet car delivery driver, once again returned to payroll, this time temping for the British Red Cross Society. When her contract there ended she and her partner relocated to Stowey, a small village near the Chew Valley Lake.

After a few months temping for a recruitment agency onsite at Airbus, Susan spotted this position at the University and was ecstatic when she managed to secure it. She is feeling quite comfortable being once again immersed amongst engineers and numbers.

In her spare time Susan goes for long wanders in the Mendips, keeping an eye out for badgers and trying not to be trampled by cows. She is currently attempting to learn to cook with mixed success.

Speaking Dersonally

Andrew Harrison is a Senior Lecturer in Mechanical Engineering and Assistant Dean for Admissions

Interview by Melissa Bevan

What is your earliest memory?

Being on the deck of a huge liner surrounded on all sides by nothing but ocean. I was three and we were travelling to the States where my father had secured a job for a year at a research institute in Tennessee. I returned with a strong southern accent!

Where and when were you happiest?

On honeymoon in St Lucia. We had just moved house and my wife had just changed jobs, so it was a relief to finally be away somewhere warm and beautiful.

What did you want to be when you were a child?

Something science-y and experimental. I remember fiddling with Lego and Meccano and pondering how things naturally behave - like what happens when you kick a football or throw a Frisbee.

What was written on your school report?

I can't remember, apart from some invective related to poor performance in dull subjects.

Describe yourself in four words? Fortunate and moderately numerate.

What are you most proud of?

Passing the grade 8 piano exam when I was 16. And professionally I'm proud of having some part in increasing the number of international students in the Faculty, as they bring a new perspective on cultures and ways of living and teaching.

If you could change one thing...?

I'd have a more grown-up sense of humour and lose my penchant for rubbish puns.

What single event has most changed your life?

Having children – a cliché but true. (Andrew has two sons aged 14 and 12 and a daughter aged 7).

Which living person most inspires you?

When I was younger, I'd have said the pianist Alfred Brendel, who played intelligently and with great feeling, but without cloying sentimentality. Nowadays I would not name any individual, but many friends and colleagues have all sorts of covetable characteristics.

Sea, Air or Land?

I like all three. Sea, because I enjoy sailing dinghies and catamarans. Air, because of the sense of perspective you get from the view. And Land for running on.

What is the best piece of advice you've ever been given? Keep going!

If you could come back in another life, who or what would you be? Cats do quite well, don't they?

Which single item would you save if your house was on fire?

The insurance paperwork (the piano's a bit heavy).

Favourite place in the world?

It depends on my mood. For pure invigoration, Shanghai is hard to beat. I remember looking out of my 30th floor hotel room on my first visit there and sensing the energy, opportunity and strangeness of this city of 17 million people. For relaxing family holidays, the Helford Estuary in Cornwall is great.

Where would you rather be now?

Running up a mountain in the Lake District.

Classical, jazz or rock? Classical.

What makes you smile?

Another cliché, but my children.

What worries you?

The usual concerns about unpredictable global changes. Oh, and getting the UG admissions numbers right.

If money were no object I'd... Buy more running shoes!



Students building their models at Dynamic Designs in South Korea

Sarah Quigley (far left) and the team with their prizes at the International Earthquake Engineering Competition in Taipei

focus on

Dynamic Design IDEERS

Dynamic Designs, the new version of the IDEERS Earthquake Engineering Competition, was run for the British Council this year for teams of undergraduate students in South Korea from May through to July. Created in 2000 by Adam Crewe and Wendy Daniell, IDEERS has continued to be in demand with over 40 events having been run in the UK and internationally. Last year, Adam and Wendy were invited to develop IDEERS into a multidisciplinary project as part of the British Council's Education UK Challenge, a global initiative aimed at providing an interactive experience of a UK education to people seeking an international education.

Dynamic Designs is a two stage challenge requiring teams to put together a proposal for a new hospital building in a highly seismic region and to design and construct a scale model of the building to be tested for earthquakes on a shaking-table. The proposal has to consider not only the structural design, but also the architecture of the hospital, its cost, and its social and economic value to the region. Twenty nine teams (a total of 174 students) entered the first stage of the competition where they prepared poster submissions of their proposals. During this stage, they sought advice from Wendy and Adam through an online discussion forum. The posters were of a very good standard from which 12 teams were selected to go through to the final. At the final, the Korean students built their models and presented their proposals, in English, to a panel of judges. At the end of the day, the models were tested on one of the shaking-tables at the brand new Multi-platform Seismic Simulation Centre at Pusan National University (PNU).

The challenge attracted significant media attention for Bristol University, the British Council and PNU, with 78 articles in the national press and television coverage on KBS, the largest of the three major Korean television networks. British Council estimated the value of the resulting PR to be nearly seven times its investment in Dynamic Designs. Participant feedback was very positive too with the competition exceeding expectations for 54% of students and meeting those of another 38%. 92% of the students reported an increased interest in studying in the UK. British Council judged Dynamic Designs a "significant success" and is considering a repeat of the project in India for 2010.

Find out more at www.ideers.bris.ac.uk/ dynamicdesigns and www.britishcouncil. org/korea-dynamicdesigns-about.htm.



The International Earthquake Engineering competition in Taiwan

"The International Earthquake Engineering competition fell within a month of the 10th anniversary of the Chi-chi earthquake, an event which triggered chaos in Taiwan; a place where order now seems effortless. Two teams from Bristol entered the NCREE arena in Taipei with high hopes and also as the only UK representatives. After weeks spent wrestling with hot glue guns and MDF (in true Blue Peter style) two building designs had been decided upon, intended to match the might of the centre's shaking table. With intense worldwide competition, Bristol was delighted to "clean up" with Most Creative Architectural Design and Most Creative Structural Design whilst being placed respectably with regards to structural efficiency. Special thanks go to Dr Wendy Daniell and Dr Adam Crewe as well as Sponsor VolkerFitzpatrick for helping us on our way!'