CELEBRATING ALAN TURING CENTENARY

QUEEN’S ANNIVERSARY PRIZE FOR NUCLEAR WORK
ENGINEERS WITHOUT BORDERS
GREEN MARINE POWER FROM THE DEEP BLUE SEA

CELEBRATING ALAN TURING CENTENARY
Welcome to the second issue of the Faculty of Engineering and Physical Sciences magazine. I hope you find the contents interesting and that the presented articles provide you with an indication of the wide range of work and activities we are involved in.

This year marks the centenary of Alan Turing – code-breaker, mathematician and founding father of computer science, who was at the Victoria University of Manchester from 1948 until his untimely death in 1954. We are planning to mark his centenary with activities for all ages. This will include a Cryptography Competition run by the School of Mathematics for secondary school students, the Alan Turing Centenary Conference from the 22 – 25 June 2012 and an exhibition at the Manchester Museum celebrating his fundamental impact on the development of the computer and to our networked digital culture.

This special year also brought news that Professor Andre Geim and Professor Konstantin Novoselov, who demonstrated the properties of graphene, have been knighted in the New Year Honours list. Konstantin Novoselov, who demonstrated graphene laboratories and took the opportunity to make graphene himself. The Prince had the chance to meet some student technology entrepreneurs, as well as visiting NanoCo, in the University's Innovation Centre, as an example of a successful spin-out company which grew from a proof-of-principle project to a £100M+ stockmarket listed company in six years.

The University had another royal engagement in February, as a delegation of senior academics, senior University officers and a group of PhD students attended the 'Diamond Jubilee' presentation ceremony at Buckingham Palace to receive a Queen’s Anniversary Prize for Further and Higher Education for our global work in Civil Nuclear. The prizes recognise and celebrate winners’ outstanding work, which is making a real and practical impact for the benefit of human progress.

A recent report commissioned by our Dalton Nuclear Institute identified opportunities for the North of England to become one of the world’s leading nuclear manufacturing hubs, creating thousands of new jobs and generating substantial economic growth for the UK. The fall out of the global financial crisis of 2007-8 continues to reverberate and will dominate the news and the minds of our students for many years to come. To help boost the employability of our students and prepare them for the challenging job market we have embarked on a number of initiatives to enhance our award winning careers support. One such event held in February was ‘Stand out from the Crowd’ hosted in association with the Students’ Union with the aim of providing students with guidance and support on where to find jobs, internships and placements as well as making a difference through volunteering opportunities and student societies.

We are very proud of our commitment to social responsibility and contributing to global issues. Our work on landmine detection with football legend Sir Bobby Charlton and the Find a Better Way charity follows on from our research and innovation around advanced screening and scanning technology, developed in response to 9/11 with security firm Rapiscan Systems. Working with key academic and industry groups, we hope to reduce the time it takes to rid the world of unexploded landmines from 100’s of years to just 10’s of years. Our students also embrace their role as global citizens through a wide number of initiatives including the Engineers without Borders scheme which is profiled on page 23.

I hope you enjoy this magazine, which we intend to publish every six months. If there are any specific areas of activity that interest you and you would like to hear more about, we would love to hear from you.

Professor Colin Bailey
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A deal worth over £400 million has been signed between Rolls-Royce and AREVA, which will pave the way for The University of Manchester to further facilitate industrial nuclear up-skilling in the UK.

The University's Dalton Nuclear Institute is continuing to support the country's future nuclear energy strategy through maximising the impact of research and skills development for industry.

Hundreds of highly-skilled jobs will be created in the North West, as a result of the deal between Rolls-Royce and French company, AREVA, which comes as the nuclear industry prepares for construction of new nuclear power stations at Hinkley Point, Somerset and Sizewell, Suffolk.

Rolls-Royce will provide AREVA with engineering and technical services for the first of the new power stations as well as supply a variety of complex components.

Professor Timothy Abram, Director of the Centre for Nuclear Energy Technology (C-Net) at The University of Manchester, said: "This is an important announcement. The UK is pressing ahead with new builds at Hinkley Point and at Sizewell, and with Rolls-Royce supplying some very high value engineering into those projects we can hope to see this bring a lot of investment into the region."

Professor Michael Burke, Director of the University’s Nuclear Manufacturing Technology Research Laboratory, said: "As a result of the UK-French partnership we will be seeing an increasing flow-down which will benefit smaller UK businesses. There will be several tiers of supply, with a roll up of components and sub-components from contractors to Rolls-Royce and eventually AREVA."

Rolls-Royce and AREVA announced the deal as the UK, and France declared a new cooperation agreement on civil nuclear development, which is estimated to be worth £600 million and could create around 30,000 UK jobs.

"As part of the DIAMET project, atmospheric scientist Dr Keith Bower boarded the research aircraft for the mission, while Professor Gerard Vaughan monitored the incoming measurements from the ground. Flying the FAAM (Facility for Airborne Atmospheric Measurements) plane from Exeter to Stornoway, the team dropped specialist instrument packages through the eye of the storm to measure winds, temperature, humidity, and cloud particles. The data from these instruments was relayed back to Exeter via satellite link.

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"This announcement was clearly a response to a number of factors, including the Livingstone-Hope review, Eric Schmidt’s McTaggart lecture, and also the Royal Society’s report on computing in schools which, though launched two days later, was already known by the Department for Education. Behind all of these reports, lectures and announcements are the same uncomfortable facts - that somehow here in the UK, where the world’s first programmable computer was built just over 60 years ago, we have arrived in a position where pupils in many schools are being turned off from an interest in the technology that now underpins so much of everyday life by dull, repetitive ICT lessons."

I was personally involved in the excitement of the 1980s when the BBC Micro and similar machines introduced computing into schools for the first time, and influenced so many lives and careers. But in the 1990s the BBC Micro was displaced by the PC, a machine designed for business and office use, not for education. The excitement was replaced by more utilitarian teaching of digital literacy skills, which while vital in the modern world, do not inspire or engage pupils to see themselves as users rather than creators of technology.

The Royal Society report, which I chaired, concludes that ICT has effectively become a damaged brand, and should be replaced with digital literacy as compulsory core skill alongside Computer Science (how computers work, programming and such like) and Information Technology (how computers are used in business and commerce) as rigorous academic subjects that go far beyond basic skills for those who wish to study these subjects.

In his speech Michael Gove looked forward to 11 year-olds being able to write simple 2D computer animations. For the last five years the School of Computer Science has been running a national schools computer animation competition, and we really have been getting 11 year-olds writing 2D computer animations! Several hundred schools submit their animations for judging, and we have a big prize-giving event with hundreds of pupils from the winning schools present. But of course there are 5,000 secondary schools in the UK, and we are only reaching 10% of them. It is to the very last 90% that we must now extend this opportunity.

March saw the launch of the Raspberry Pi, a new very low-cost computer for educational use. What really impressed me, above all else, is the buzz of excitement the launch created. I spoke on Radio 4’s World at One and Radio 5 Live’s Drive programmes about this, and the launch even made the BBC TV 10 o’clock News!

If we can sustain that excitement and translate it into a new and richer experience for pupils in schools, we will be well on the way to delivering what everyone from Michael Gove down is hoping to achieve here – a re-engagement of bright young minds with the world-transforming technology that is now all around them as creators, and not just users, of that technology.

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ATHENA SWAN AWARD FOR GOOD EMPLOYMENT PRACTICES
The School of Chemistry's continued commitment to addressing gender inequalities has received a boost in the form of an Athena Swan bronze Award. The awards recognise the work the School is involved in to advance and promote the careers of women in science, engineering and technology in higher education, and its commitment to tackling the unequal representation of women in science. Professor Christopher Whitehead, Head of the School of Chemistry commented: “Everybody in the School is delighted by the Bronze Athena Swan Award which recognises our commitment to providing a supportive working environment for women scientists and encouraging their career developments at every stage. We are doing all that we can to correct the unequal representation of women in chemistry.”

The School’s Athena Swan policies are also having a positive side effect for male staff too; male staff with young families may benefit from flexible working hours. Athena SWAN is run by the Equality Challenge Unit, which is a registered charity funded by grants from the UK higher education sector funding bodies, with contributions from Universities UK and GUSHE.

WATERS CHAIR OF MASS SPECTROMETRY
The University and Waters Corporation have strengthened their strategic relationship by creating the Waters Chair of Mass Spectrometry, focusing on research that utilises mass spectrometry technology. The first commercial mass spectrometers were created in Manchester in 1948, and the University has been a world leader in this exciting, interdisciplinary field ever since. The Waters Chair will help the University to continue its pioneering work into such technology, and to explore new challenges in the development of chemistry and instrumentation.

Professor Christopher Whitehead, Head of the School of Chemistry, said: “Mass spectrometry is an enabling tool. Thirty-one groups work using this tool around the University. They range from atmospheric sciences to medicine to life sciences, so it’s a very versatile technique.”

The academics, along with their research groups at the University found that a bacterium, Actinobacillus succinogenes, can convert glycerol into succinic acid, used in a variety of products from medicines to food flavours to plasticisers.

The team studied Actinobacillus succinogenes under a variety of conditions and nutrients and developed predictive computational models for the process and for relevant integrated biorefinery designs. This process will add significant value to this byproduct stream leading to the construction of integrated biorefineries with significantly improved economic sustainability, which co-produce fuels and chemicals.

University of Manchester Intellectual Property (UIMP) funded the development of the scale-up of the processes through its Proof-of-Principle (PoP) funding programme and has protected the intellectual property by patent filing.

Dr Theodoropoulos said: “We are very happy to have won this notable award, for our research, which combines experimental and theoretical biotechnological advances.

“A good proportion of the Waters Corporation research and development people are former students of the University and Waters are a major local employer in high-tech science instrumentation. To have an organisation like that in Manchester is quite special and we are looking forward to getting an internationally-leading researcher into the post soon.”

Brian Smith, VP Waters, with members of the EPSRC. “Winning an IChemE award is a real achievement. Our awards are globally recognised and attract entries from all over the world. To be deemed the best in a particular area of chemical engineering like this is something worth celebrating and in past years, has proven to be the launch pad to even greater successes.”

“With the University’s goals of being a leader in scientific research and technology innovation, and look forward to an exciting and creative partnership”.

FACULTY APPOINTS ASSOCIATE DEAN FOR SOCIAL RESPONSIBILITY

The University is working towards a challenging agenda with its Strategic Vision 2020, which sets out to ensure that it is one of the top 25 research universities in the world.

A major part of this vision is the University’s desire to continue to contribute to the social and economic success of the local, national and international community through the use of its expertise and knowledge to solve some of the major challenges faced by society in the 21st Century. The Faculty has risen to this challenge, and has recently appointed Dr Tim O’Brien as Associate Dean for Social Responsibility. Tim will be responsible for the development and implementation of a comprehensive social responsibility strategy that aligns with the University’s strategy, and will provide academic leadership to ensure that the strategy is embedded as good academic practice.

A major aspect of Dr O’Brien’s role will be to promote the Faculty’s reputation for excellence in teaching and research, and to ensure that its research addresses key social, economic or environmental challenges. He will also oversee the Faculty’s interactions with schools and its public engagement, working to raise the aspirations of local people to progress to higher education.

Dr O’Brien is understandably excited about his role: “I’m very much looking forward to taking on this new role. Its creation reflects the importance which is being given to Social Responsibility within the overall University strategy. There is already a wide range of excellent work going on in this area within the Faculty. I hope to be able to celebrate and highlight these activities whilst also developing the Faculty’s strategy in this area and supporting some new strategic initiatives.”

NEW APPOINTMENTS IN NUCLEAR RESEARCH

Nuclear research at the University has been further strengthened with two strategic appointments. Professor Mike Burke was appointed as Director of Research and Technology at The Nuclear Advanced Manufacturing Research Centre (Nuclear AMRC), and Professor Grace Burke has taken up the post of Director of the Materials Performance Centre within the School of Materials.

Mike Burke joins the University from Westinghouse’s Material Center of Excellence in the US, and brings more than 30 years’ experience in materials and manufacturing process research in the power generation industry. Mike will lead the University’s collaborative industry-focused research across the Nuclear AMRC’s facilities in Manchester and Sheffield.

Grace has been appointed as Director of the Materials Performance Centre. The Centre is a strategic research alliance with BNFL, and is the largest nuclear material research centre at a UK university. It is renowned globally for nuclear materials research and training. It also sustains strategic research partnerships with EDF, EDF Energy (formerly British Energy), National Nuclear Laboratory, Rolls-Royce, Serco and Westinghouse.

Grace comes to Manchester from the Bettis Laboratory in Pittsburgh, where she was a Consultant in Materials Technology.
MATHS RESEARCH AWARDED WITH ADAMS PRIZE

Dr Françoise Tisseur, a EPSRC Leadership Fellow in the School of Mathematics, has been awarded the Adams Prize by The University of Cambridge for her research into numerical linear algebra.

The Adams Prize is awarded annually to two, young UK-based researchers by the Faculty of Mathematics and St John’s College Cambridge for first class international research in the Mathematical Sciences.

This year’s topic ‘Computational Mathematics’ also saw Dr Sheehan Olver from The University of Oxford (currently University of Sydney) as a deserved joint recipient. The Adams Prize, named after the mathematician John Couch Adams, is worth approximately £14,000, and commemorates Adams’ role in the discovery of the planet Neptune, through calculation of the discrepancies in the orbit of Uranus.

Dr Tisseur said: “Past winners of this prize form an illustrious list and it is an honour to join them. "The School of Mathematics has been very supportive of my research and I’m proud to be working in one of the biggest and best numerical analysis groups in the world.”

Professor Arieh Iserles, Chairman of the Adams Prize Adjudication, said: “Dr Tisseur engaged with one of the outstanding computational challenges in linear algebra, the calculation of the spectra of polynomial eigenvalue problems. Her work has had wide impact in many applications and will soon be incorporated into the leading software packages for numerical algebra”.

ENGINEERING & PHYSICAL SCIENCES
APPOINTMENTS & AWARDS

STAR ORGANIC CHEMIST APPOINTED

Professor David Leigh FRS, one of the world’s foremost organic chemists, is to join the School of Chemistry.

The appointment of Professor Leigh, a pioneer in the design and synthesis of artificial molecular motors from first principles, brings the University a step closer to fulfilling its aim of being a world leader in Organic Chemistry.

In order to support Professor Leigh’s appointment, the University is undertaking a £4.1 m state-of-the-art refurbishment within the Chemistry Building.

Professor Leigh and his team of thirty, most of whom will be making the move to Manchester from The University of Edinburgh, are interested in developing advanced artificial molecular machine systems. The work they will conduct at the University has the potential to fundamentally alter the approach currently taken to molecule and material design.

Professor Leigh said: “Cutting edge science requires state-of-the-art facilities, and we’re delighted to be moving to Manchester to join other world class groups, and where the University can provide the infrastructure we need for this research.

“We hope to be able to add to the fantastic work already going on in the School of Chemistry, and the whole of physical sciences in Manchester in general, and we look forward to collaborating with many other groups there.”

MATHS THEORY BRINGS INVISIBILITY CLOAK PROTECTION TO BUILDINGS CLOSER

Dr William Parnell’s team in the University’s School of Mathematics has been working on the theory of invisibility cloaks which, until recently, have been the subject of science fiction.

The team’s work has focused on the theory of cloaking devices which could eventually help to protect buildings and structures from vibrations and natural disasters such as earthquakes.

Dr Parnell has shown that by cloaking components of structures with pressurised rubber, powerful waves such as those produced by an earthquake would not ‘see’ the building – they would simply pass around the structure and thus prevent serious damage or destruction.

This ‘invisibility’ could prove to be of great significance in safeguarding key structures such as nuclear power plants, electric pylons and government offices from destruction from natural or terrorist attacks.

AREVA AND THE UNIVERSITY WORK TOGETHER TO FURTHER NUCLEAR RESEARCH

AREVA, the global nuclear power industry leader, has signed a collaboration agreement with the University’s world-leading centre for nuclear research and education, the Dalton Nuclear Institute.

AREVA will sponsor two PhDs in Materials research, followed by other collaboration and participation in a pan-European network of academic nuclear research. The doctorates will involve studies in France and Manchester, and also in West Cumbria where the University has established the Dalton Cumbrian Facility with experimental capabilities for radiation science research.

Professor Colin Bailey, Vice-President and Dean of the Faculty of Engineering & Physical Sciences said, “The University of Manchester is delighted to sign the collaboration agreement with AREVA, with the partnership underpinning the research and development required to deliver the global need in civil nuclear”.

Alain-Pierre Raynaud, Chairman of AREVA UK, said “AREVA now has a major presence in the UK both in the design and construction of new nuclear power stations and in the treatment of used fuel. We are delighted to be linking up with the UK’s largest academic centre of nuclear expertise and look forward to expanding our links as part of growing Anglo-French nuclear collaboration.”
FIND A BETTER WAY – UNIVERSITY WORKS WITH SIR BOBBY CHARLTON TO RESEARCH NEW WAYS TO DETECT AND CLEAR LANDMINES

The University and BP have been working in partnership since 2003, and following the signing of a Memorandum of Understanding in 2007, what began as pockets of activity has developed into a strategic relationship covering research and development, executive education, recruitment and increased funding opportunities for students.

A group of executive sponsors comprising senior leadership from both BP and the University, including the VP and Dean of the Faculty of Engineering and Physical Sciences (EPS), Colin Bailey, provide guidance on the strategic relationship, identifying new collaborative opportunities, and facilitating the interactions that are already taking place. As explained by Sarah Dobson, BP’s Relationship Manager for Manchester with responsibility for overseeing activity within the relationship: “A key driver for BP is ensuring it has the technical capability to stay at the leading edge of its field through collaborating with the right partners, and ensuring access to talented graduates.”

SCHOLARSHIPS AND RECRUITMENT
BP recruits more than 300 graduates and interns into its UK business each year, and hosts a number of presentations and workshops on campus to increase awareness of careers in the oil and gas industry, and specifically opportunities within BP. It also provides students with guidance on the type of application and interview process they will experience when applying to any employer.

The competition has been running students from Manchester have made it through to the final, and has been running in the city for the past three years. This year BP/RAE also supported the university with a range of topics and speakers, provides data and topics for inclusion in the curriculum by providing industry expertise.

RESEARCH COLLABORATION
In the area of research and development BP supports a cross-section of activity across the University, ranging from the provision of data, samples and the funding of smaller scale, highly targeted projects to more substantial investments. The largest of these is the collaboration programme with the School of Materials to undertake research in the fundamental science of corrosion. The collaboration will be further strengthened with the opening of a new world class BP funded research laboratory in corrosion and a BP/Royal Academy funded Chair Professor Bob Akin took up this Chair in March 2012.

EDUCATION EXECUTIVE
Another substantial element of BP’s relationship with the University is the Projects and Engineering College which is a key component of the career development programme for BP’s leaders in engineering and project management. Since 2008, more than 600 BP staff have attended the Manchester based programme, which is designed and delivered in collaboration with the university, utilising its unique capability and expertise to ensure that the subject matter is geared towards BP employees.

ADDITIONAL ACADEMIC SUPPORT
Finally, BP also supports the university curriculum by providing industry expertise to ensure course content is relevant to today’s industry. It offers BP staff as guest speakers, provides data and topics for students to use in course projects and sponsors course prizes. As Sarah explains “Our relationship with Manchester is important for all concerned; BP, the University and ultimately the students.”

Professor Lionheart and Rapiscan responded to an appeal from Sir Bobby Charlton. Professor Lionheart explained: “We wouldn’t be working on anything like this if it wasn’t for 9/11. There has been significant funding into screening across the University. It has grown from more or less nothing to become a significant area of research.” He added: “Our target is to reduce the time it will take to clear the mines currently in the ground to tens of years rather than hundreds. It is a very ambitious target but it will make a huge difference to people who risk serious injury or death”.

John Eades, Chairman of the Find A Better Way Trustees understands the importance of the partnership: “The University has been at the heart of our activity from the inception when Sir Bobby set out his hope to find a better way of clearing landmines. The FABW relationship with the University and the constant enthusiasm and support of both their academics and their students has brought our vision a little closer”.

Professor Tony Peyton and Sir Bobby Charlton at a “Find A Better Way” display showing the inherent problems of humanitarian landmine detection using a standard metal detector.

Under the umbrella of the newly-formed charity Find A Better Way, the University is collaborating with the University of the Punjab, the Mines Advisory Group (MAG) and security firm Rapiscan Systems to develop new technologies to accelerate the detection and clearance of landmines. Landmines are a global problem, with more than 65 countries being affected by landmines or explosive remnants of war. Towards the beginning of the 20th century most victims of landmines were from the military, but today 90 per cent of victims are civilians. In 2009 there were around 4,000 casualties of landmines with UNICEF research suggesting one third of victims are civilians. In 2009 there were from the military, but today 90 per cent

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Recognising the financial considerations of embarking on a university degree, BP offers a number of scholarship schemes. These include scholarships aimed at 1st and 2nd year EPS students who can apply for a £2,000 bursary based on an essay submission and their 1st semester exam results. There are also one-off awards linked to BP’s graduate and intern recruitment programmes of £5,000 and £2,000 respectively.

Most recently BP announced 100 scholarships worth £3,450 each for students on Integrated Masters science and engineering courses to contribute to fourth year fees. The scholarships are focused on supporting the education of the next generation of engineers and scientists. Colin Bailey, Vice President and Dean of the Faculty commented: “The four-year courses are important from a professional perspective, as well as providing graduates with the skills they need to address the challenges ahead. It is important that students are not put off this route purely on the basis of cost. We are delighted with the support we continue to receive from BP”. BP’s scholarship investment at the University now tops £1 million.

BP also gives 1st and 2nd year students the chance to learn more about working in the oil and gas industry through its ‘Find A Better Way’ display showing the inherent problems of humanitarian landmine detection using a standard metal detector.

Professor Tony Peyton and Sir Bobby Charlton at a “Find A Better Way” display showing the inherent problems of humanitarian landmine detection using a standard metal detector.

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**UNIVERSITY WINS QUEEN’S ANNIVERSARY PRIZE FOR ITS NUCLEAR WORK**

The Dalton Nuclear Institute was awarded the Queen’s Anniversary Prizes for Further and Higher Education in February at a presentation made by Her Majesty The Queen at Buckingham Palace.

The Prizes recognise and celebrate outstanding work within UK Higher and Further Education Institutions and the impact that they have on society.

They are the UK’s most prestigious form of national recognition open to a UK academic or vocational institution.

The Dalton Nuclear Institute comprises around 110 academic staff and more than 300 research staff and students. It provides world-leading applied research to support government, regulators, and industry in the delivery of safe and secure nuclear energy, both in the UK and globally.

The University’s leading academics, under the direction of the Dalton Nuclear Institute, also provide a wide range of education programmes across all civil nuclear fields to both full-time and part-time students.

The close links established with the nuclear industry, both in the UK and overseas, ensure that research and education programmes address real nuclear issues, and that the skills are taken up by the industry.

The University’s staff also deliver various public programmes to engage children, equip teachers, and improve public understanding of nuclear technology.

Professor Dame Nancy Rothwell, President and Vice-Chancellor of the University was delighted to hear about the award “This is a fantastic testament to the world-leading research carried out under the direction of The Dalton Nuclear Institute and the expertise and professionalism of all staff associated with this award.”

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**HOW SUSTAINABLE IS NUCLEAR POWER FOR THE UK?**

Research carried out by a consortium led by Manchester into the sustainability of nuclear and other electricity options in the UK shows that nuclear power could make a significant contribution to reducing greenhouse gas emissions by 2035.

However, reaching this target would require doubling the contribution nuclear currently makes to the electricity mix. Given that most nuclear power stations are due to close in this period, this scenario seems unfeasible to the report’s authors.

The SPRing research consortium comprises City, Southampton and Manchester Universities, as well as partners from industry, government and NGOs, and is led by Professor Adisa Azapagic from the School of Chemical Engineering and Analytical Sciences at the University of Manchester. The group examines the techno-economic, environmental, social and ethical sustainability of nuclear power in the UK.

SPRing found that meeting UK carbon emissions targets will only be possible with a huge expansion of both renewables and nuclear electricity. By 2020, renewables would have to contribute 55% to the UK electricity mix by 2020 and nuclear 35% by 2035.

The research also shows that even when the radiological consequences of a large accident are taken into account, nuclear power remains one of the safest sources of electricity.

Nuclear power does pose complex ethical questions regarding its intergenerational impact as future generations will have to bear both the risks and costs of nuclear decommissioning and waste management.

What’s clear from the research is that there is “no ‘best’ electricity option overall”, said Professor Azapagic. “The Government should ensure that decisions on the future of nuclear power and other electricity options in the UK take into account a range of sustainability criteria rather than be based solely on a market-led approach dominated purely by economics.”

www.springsustainability.org

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**THE NORTH COULD BECOME THE WORLD’S NUCLEAR BASE**

A report commissioned by the University’s Dalton Nuclear Institute, has revealed that the North of England has the opportunity to become one of the world’s leading nuclear manufacturing hubs, creating many thousands of new jobs and generating substantial economic growth for the UK.

The report, undertaken by a partnership within the university between the Manchester Business School, the University Business Relations Team and the Dalton Nuclear Institute highlights the opportunity for the Government to invest in the vast potential of the region to meet the demands of the UK’s nuclear new build and use this as a springboard for providing goods and services to the £300bn global nuclear sector.

Already a world-leading centre for the nuclear supply chain with more than 50% of the UK’s nuclear workforce, the North also contains the UK’s full fuel cycle capability, uranium conversion and enrichment, fuel fabrication, generation, spent fuel reprocessing, waste treatment and storage and decommissioning.

The report argues that the Government needs to adopt a policy that will realise an effective supply chain within the next 18 months and should mobilise agencies and trade bodies to equip teachers, and improve public understanding of nuclear technology.

Despite the repercussions from Fukushima, the nuclear new-build renaissance continues in countries such as China, India and the UK, with 60 reactors under construction, 155 planned and a further 338 proposed.

Nuclear energy is being backed in many countries to provide low carbon energy solutions, energy independence, security of supply and protection against price volatility from fossil fuels.

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**ENGINEERING & PHYSICAL SCIENCES NEWS**

**NUCLEAR UPDATE**

Postdoctoral researchers using state-of-the-art X-ray facilities to investigate the surface chemistry of reactor materials.
In the year that would mark Alan Turing's 100th birthday, the University of Manchester celebrates a scientist who changed the world.

It could well be that a tribute to Alan Turing is staring you in the face right now. Unofficially, his suicide by a cyanide-laced apple is honoured in the icon of a very famous computer brand. A well-deserved compliment, as Turing is the widely acknowledged ‘father’ of artificial intelligence and the computer.

A well-deserved compliment, as Turing is the widely acknowledged ‘father’ of artificial intelligence and the computer. Add to that his legacy as a remarkably skilled mathematician, a brilliant code breaker, and a forerunner of morphogenesis; and it’s fair to say that Turing’s tragically short life was punctuated with extraordinary achievements. Without him, perhaps we wouldn’t be checking our emails today, or even turning on a computer.

Turing’s most famous contribution, however, remained buried by the Official Secrets Act until 20 years after his death. In World War II, the young mathematician was recruited to the British Intelligence HQ at Bletchley Park. Within just a few weeks, he configured a machine to crack Nazi Enigma codes, leading to a 75% drop in allied battleships casualties, saving thousands of lives and marking a turning point of the war. Winston Churchill called his programme “the goose that laid the golden egg.”

After Bletchley, Turing became interested in artificial intelligence. His Turing Test hypothesised that if a human could not distinguish a computer from a human through dialogue, the machine could be defined as intelligent.

From 1948 until his death in 1954, Turing worked on the early computers at The University of Manchester. At a time when people knew very little about genetics or DNA, he used the early computer to understand how cells and chemicals grow into animals and plants, and specifically how patterns like stripes and spots arise. This study is attributed to the birth of the Chaos Theory, and once again, Turing’s work proved to be groundbreaking.

University Historian, John Pickstone said: “Turing was hugely important for the concept of computability, the idea of a universal computer, and for framing all subsequent debates about machine intelligence.

“And of course, one can add his vital war-time work on code-breaking, and his highly original work in Manchester on the creation of form in animals and plants.

“He was a key player in the reconstruction of the University of Manchester after the second world war. With his Manchester contemporaries such as Patrick Blackett, Bernard Lovell, Michael Polanyi, Max Newman, Freddie Williams, and Tom Kilburn, he helped shape our world.”

The Alan Turing Centenary Conference is hosted by The University of Manchester at Manchester Town Hall and welcomes scientists and mathematicians to celebrate and discuss Turing’s work from 22 – 25 June.

Alan Turing and Life’s Enigma exhibition runs at Manchester Museum from 24 March – 18 November.

The Life and Works of Alan Turing is on permanent display at Bletchley Park.

The Alan Turing Cryptography Competition encourages teams of children to join Mike and Ellie on a virtual secret-code-breaking race around Manchester, hunting for the long lost ‘Turing Treasure’. The competition runs until 16 April, and more details can be found at www.maths.manchester.ac.uk/cryptography_competition_2012/
There have been several exciting developments since Chancellor, George Osborne, announced in October 2011 that research on graphene was to receive a £50 million investment to “take this Nobel-prize winning discovery from the British laboratory to the British factory floor”.

Graphene, which was discovered by Professor Sir Andre Geim and Professor Sir Konstantin Novoselov in 2004, is the thinnest known material in the universe and the strongest ever measured. It conducts electricity and heat better than any other material. It’s the stiffest one too, while also being the most ductile. It has a wide range of potential uses from electronic to chemical, and from optical to mechanical. Graphene’s remarkable properties could lead to bendy touch screen phones and computers, lighter aircraft, wallpaper-thin HD TV sets, the next generation of computers and superfast internet connections.

The University of Manchester is the leader in graphene research with tens of thousands of citations for graphene papers. Demonstrating its remarkable properties won the Professors the Nobel Prize in Physics in 2010, and led to them being knighted in the 2012 New Year Honours list honours list for ‘Services to Science’.

The £50 million investment, which is funded through the Engineering and Physical Sciences Research Council and the Technology Strategy Board, will help establish the UK as a graphene research and technology hub. This will lead to the rapid commercialisation of graphene technologies in the UK. Details of how the additional funding will be spent were announced in February.

Four strands of development were outlined:

A national institute of graphene research and commercialisation activities will be established at The University of Manchester. This world-class facility will provide specialist facilities and equipment, which will enable the simulation of the manufacturing process. The institute will be accessible to both researchers and business. Professor Geim confirmed that “creating a National Graphene Institute at Manchester would allow our world-class scientists and researchers to further explore the limitless potential of graphene”.

£12 million will be invested in research equipment that can be used across disciplines and research groups and will be accessible to business.

An additional £10 million from EPSRC’s research budget will support graphene engineering research and accelerate the generation of novel devices, technologies and systems.

Fourthly, around £10 million from the EPSRC and the Technology Strategy Board will be invested in establishing an innovation centre to focus on the market development and exploitation of emerging graphene technologies. This centre will be supported by business and will help in the race to realise its full commercial and economic potential.

Meanwhile, graphene goes from strength to strength, with seemingly non-stop announcements and discoveries. Here we outline just a few of the recent graphene research developments.

**SUPERPERMEABLE**

A new property of the wonder material was revealed in January. A team led by Professor Sir Andre Geim reported that graphene-based membranes are impermeable to all gases and liquids. Water, however, evaporates through them as quickly as if the membranes were not there:

“This unique property can be used when one needs to remove water from a mixture or container, while keeping in all the other ingredients,” said Dr Rahul Nair who led the experimental work. An off-the-wall experiment with a vodka bottle sealed with graphene showed the vodka getting stronger and stronger. Although there are no plans so far to use the material in the distilling business, the researchers think these new properties could be used in the design of filtration, separation or barrier membranes and for selective removal of water.

**THE NEW SILICON?**

Graphene has been described as the next silicon, but was thought to be too conductive to be used as the basic material in computer chips instead of silicon. New research shows that a transistor may prove the answer to this problem. The potential has alerted the attention of major chip manufacturers, including Samsung, Texas Instruments and Intel.

Previously graphene transistors couldn’t be packed densely into a chip because they leaked too much current causing the chip to melt immediately. The breakthrough uses graphene vertically, rather than laterally as has previously been tried. The team made transistors by combining graphene with atomic planes of boron nitride and molybdenum disulfide.

By assembling the transistors layer by layer, like an atomic scale layer cake, they constructed an entirely new super-structure that offers endless opportunities for fundamental physics and for its application.

**GRAPHENE’S FATTER COUSIN: BILAYER GRAPHENE**

Using a double layer of graphene has opened up a new field/area for its use. Bilayer graphene, as its called, is important for its electronic properties. Doubling up the graphene could eliminate the unwanted scattering mechanisms for electrons in single layer graphene, enhancing the electron-electron interaction. This has great potential for use in electronics and establishes bilayer graphene as an exciting material in its own right.

**MAGNETIC PERSONALITY**

Graphene revealed yet another surprise in January when Manchester scientists took the material and made it magnetic. In its pristine state shows no sign of magnetism. Researchers took non-magnetic graphene and either peppered it with other non-magnetic atoms or removed some carbon atoms. The empty spaces and the added atoms turned out to be magnetic, exactly like atoms of iron for example. “It’s like minus multiplied by minus gives you a plus”, explains lead researcher Dr Irina Gregorieva. The most likely use of the phenomenon is in spintronics devices, which are found, amongst other places, in computers’ hard disks.

www.graphene.manchester.ac.uk

Graphene is a novel two-dimensional material that can be seen as a monolayer of carbon atoms arranged in a hexagonal lattice.
Climate Change Minister Greg Barker’s announcement at the end of January of the UK’s first Marine Energy Park firmly placed Britain on the international map as a world leader in developing marine renewable energy. It has also drawn attention to the work our universities are doing to help this fairly new industry achieve economically viable ways of harvesting power from the sea.

A team of marine engineering experts led by Professor Peter Stansby in Manchester is currently looking at threats to underwater turbines such as floating junk or whales smashing into them, simulating the way currents behave underwater to improve turbine efficiency, and looking at the loss of power from interference caused by having large arrays of turbines all at one site.

The University’s technical expertise in marine engineering supports close collaborations with some of the major players in the field – Rolls Royce, whose underwater turbines will form a vital part of the UK’s power generation in the future, and energy giant EDF. EDF must, like other companies, source Britain’s future electricity from lower carbon and renewable technologies, which is fueling the race to design and build successful tidal, wind and wave harnessing machines for power.

The sun doesn’t always shine, especially at night, and wind turbines cannot generate electricity from calm air, but astronomers can predict the exact movement of the earth and the moon for thousands of years into the future. Which means that our coastal tides can also be predicted with astonishing accuracy.

“Marine energy comes from tidal motion, and waves generated by the wind’s action,” says Professor Peter Stansby, Head of The University of Manchester’s School of Mechanical, Aerospace and Civil Engineering. “That predictable tidal motion means that we can use the variations in water level and large scale flows that occur twice a day to reliably generate energy. We could build barrages across estuaries with turbines embedded to cause a raised water level, or head difference, across the barrage, forcing water to flow through the turbines. The trouble with this established technology is the environmental costs as wetlands are modified. Migration may be reduced, and other disruptions.”

Peter Stansby advised the Expert Panels for both the Severn and the Mersey Barrage, two of the most promising sites in Britain for harvesting tidal energy. Unfortunately, like nuclear power stations, tidal barrages also have high initial costs and a long return on investment.

“Marine current turbines or tidal stream turbines are an alternative approach where turbines are deployed basically as standalone devices, usually in an array”, says Peter Stansby. “They extract kinetic energy from the water to generate electricity, but they don’t block the entire flow of the current, causing much less disruption to wildlife.”

Modern turbines have either horizontal or vertical axes – with horizontal axis increasingly the preferred choice, resembling an underwater wind turbine. However, the way the water moves in a tidal flow is very different from the way wind flows over a wind turbine, and the water turbine needs to stay submerged to work efficiently, limiting the turbine’s size. This in turn affects the turbulent or fluctuating nature of the flow. Tidal currents are also strongly influenced by the shape of the underwater landscape. There are strong tidal currents around headlands and islands but these also generate large scale eddies which will affect the turbines.

“Of course, we need strong currents to generate power most economically, but it comes at a cost,” says Peter Stansby. “They extract kinetic energy from the water to generate electricity, but they don’t block the entire flow of the current, causing much less disruption to wildlife.”

But accurately predicting the performance of a single turbine is only part of the story. The government’s Department of Energy and Climate Change predict that the power capacity of wave and tidal farms could be up to 27 GW by 2050 and this would generate an average power output equivalent to 8 coal-fired power stations, while helping to meet our legal obligation to reduce emissions and fight climate change.

“The University of Manchester has a specially wide flame to generate current and waves, which allows us to provide extensive and unique data sets. These can include effects due to irregular underwater landscapes which generate eddies, simulate rough beds under the sea, and to superimpose wave action,” says Peter Stansby. “We also have several postdoctoral assistants and PhD students working on specific components. This combination of computational simulation and experimentation is vital for the industry and scientific understanding to progress.”

In addition to these two projects focused on operational conditions, the University will also be investigating the effects of extreme loads on turbines and other marine devices caused by turbulence, waves, and importantly collisions with floating junk or seals, whales and other marine mammals.

The Manchester team will be leading a large Engineering and Physical Sciences Research Council project to look at the dangers of extreme loading on marine energy devices. The climate sceptic media in particular has delighted in reporting on the few times when wind turbines have to be shut down in extremely high winds to prevent damage or overheating, but no-one yet knows what will cause similarly extreme loads underwater or how frequent they are likely to be.

The project, in collaboration with Edinburgh, Plymouth and the Scottish Association for Marine Science starts in February 2012. A separate project funded by the Scottish Government, led by Capita Symonds, will investigate how often fish impacts are likely to affect turbines.

For further information about any of the projects mentioned in this article, please contact Professor Peter Stansby, Modelling and Simulation Centre, School of Mechanical, Aerospace and Civil Engineering, The University of Manchester. peter.k.stansby@manchester.ac.uk

Science and environment journalist Myc Riggulsford asks The University of Manchester’s Professor Peter Stansby from the School of Mechanical, Aerospace and Civil Engineering about the latest developments in marine renewables.
Lasers are giving industry access to a clean form of energy that can be precisely controlled and delivered using mirrors, robots and optical fibres to the point of interest, with minimum effect on the surrounding materials, and without tool wear or contamination to the material. The light energy can focus on a small area, so can vapourise material and remove it through drilling, milling, cutting, marking and engraving.

Tool geometry changes over time with tool wear which affects manufacturing resolutions, but the lasers are not subject to such wear, resulting in a higher consistency for productivity. It is also a much faster process in certain applications, much faster process in certain applications, and is one of the quickest ways to profile surrounding materials, and without tool wear or contamination to the material. The light energy can focus on a small area, so can vapourise material and remove it through drilling, milling, cutting, marking and engraving.

The Laser Processing Research Centre based within the School of Mechanical Aerospace and Civil Engineering, with primary collaboration with the School of Materials, is headed by Professor Lin Li, and conducts groundbreaking research to develop novel laser processing techniques.

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CERN – EXPLORING MANCHESTER’S KEY ROLE

Professor Fred Loebringer is the leader of The University of Manchester’s team working on the ATLAS experiment at the Large Hadron Collider (LHC) at CERN in Geneva. The CERN laboratory brings together an international cast of scientists, including another team from The University of Manchester working on the LHCb experiment, to research the nuclear and sub-nuclear world. Here, Professor Loebringer takes us through the contribution the University is making to what is arguably the most exciting project in science today.

COLLABORATIONS FORMED, HARDWARE BUILT

The University of Manchester was one of the founder members of the ATLAS collaboration. Our work began more than 15 years before the LHC was switched on in Geneva. Here in the UK we joined together on essentially a geographical basis: the northern UK universities concentrated on what are called the End Cap Detectors, while southern UK universities were involved with the Barrel Detectors.

Manchester was involved in building some of the very high precision detectors, which now sit right at the very heart of the experiment. We constructed six hundred detectors, which pinpoint the position of charged particles and the number of interactions in the ATLAS detector to microns (millions of a metre or thousands of a millimetre) in space. We track these by installing a series of detectors, one behind the other, to track the charged particles that cross the detector. From those tracks we can work backwards and deduce what the process was, whether new particles have been formed, whether particles we’re looking for are there, and any surprises that we might find.

Our detector was fully installed one year before the switch on in 2009. We now monitor the performance of our detectors and make sure everything’s working fine, but it’s by no means a 100% efficient team.

TRACKING THE ACTIVITY

Once the hardware was built and installed we began to concentrate on the trigger system. This involves working in tandem with the running of the detector, and is mainly software-based. The number of collisions at the LHC that produce particles is far, far too high for the detectors to record. So we have a three-phase decision-making system which acts on the data as fast as it can, filter out events which are of interest and dump those which are of no interest.

We had to make a ‘trigger’ that was able to cope with the overwhelming amount of events and record all the useful ones. This is an ongoing commitment, which we’re refining as our physics analyses progress and as the intensity of the beams increases. The higher the intensity, the more events we’re getting per second, and the harder the filters have to work to be able to record the interesting ones.

ANALYSIS OF THE PHYSICS

Probably our main involvement at ATLAS is in the analysis of the physics that’s emerging from the experiment. All that I’ve described so far are jobs we did to make sure the experiment was up and running, working and producing data. The next part is using that data and analysing it and getting useful physics out of it. The Manchester group is heavily involved at academic, post-doctoral and postgraduate research level and we’re producing a huge volume of papers at great speed.

The ATLAS experiment has working groups that look at wide areas of physics interests. At Manchester we selected major areas that we’re interested in and where we play a leading role, rather than spreading our work across the whole spectrum. We are major players in three main areas: top physics, the search for the charged Higgs Boson Particle and electro-weak physics. There are other areas, such as super-symmetry where we don’t have a large involvement.

As well as analysing the data we’re also involved in the day-to-day running of the experiment. We run shifts of people who, as well as doing their physics analysis, are also responsible for monitoring the experiment and making sure everything’s working fine.

UPGRADES AND THE FUTURE

At the end of 2012 the LHC will switch off for a couple of years while major upgrades to the machines and the experiment are made. This marks the University’s next phase of involvement. We have a long-term programme for the development of upgrades to the apparatus, to cope with the LHC, as it cranks up to higher energy and higher intensity (or luminosity as it’s known). This increase in luminosity will mean that lots of the actual experimental apparatus that was built near the core of the experiment (and the Manchester bit is right at the core!) will either die from radiation damage or become incapable of dealing with the higher rates that we’re going to expect.

This is all planned; it’s not a case of “it’s dying, we didn’t build it well enough!”

We knew way in advance this was going to happen but we didn’t have the technology to build the next generation.

We’re going to have to replace the old detectors with new ones which have both higher resistance to the radiation damage, and also that are more sensitive and more precise. It’s a step change upwards in quality.

We have a large group at Manchester working on potential new detectors for those upgrades. We are the leading group, probably in the world, on 3D silicon detectors, which are one of the main prospects for these major upgrades. This work of planning for the future is going on alongside the current running of the experiment.

We are almost unique in the UK in having people working across the whole spectrum of the experiment. From the accelerator, to the detector development and build, the running and the physics analysis right through to the theory and phenomenology (the interface between experiment and theory) and the more way-out theories that move study into cosmology. We are internationally well renowned across that spectrum and, as such, are a powerful group.

It can be difficult to explain to the public what’s going on at CERN. It’s not like sending a rocket to the moon, you land on the moon and say ‘hey, this is the moon’ and bring some rocks back. It’s not instant success. It’s a long painstaking process. The LHC is working perfectly despite its little hiccup in its first year when things went very badly wrong. It has outshone all its expectations and is working like a dream, producing a much higher luminosity and intensity than we ever expected.

To keep up to date with the work of the ATLAS group and developments at CERN, visit www.atlas.ch
Increasingly using their skills and broadening their minds and to university life, students are academic success is integral well-rounded graduates. Whilst the country, and takes seriously the cleverest undergraduates in the country, EWB Manchester began when a single student decided to canvas other students to join. We’ve grown over the last few years from a few students to a full branch’s current committee is all third year engineering students. Cara Mulholland is a Civil Engineering student and events co-ordinator for EWB Manchester “As with all societies at university, EWB Manchester is a student run, student led group based in Manchester, which has been instrumental in building the home. Cara is particularly proud of the work undertaken by EWB Manchester for this project “We found out about the great work at Upendo and asked what we could do to help. We were given a list of projects they needed assistance with and we decided we could help by providing engineering support for its rain catchment and solar oven projects. “We gave EWB Manchester students the ‘problem’ and worked on coming up with an engineering design or process in order to ‘fix’ the problem. This involved organising design meetings with student volunteers to establish the design team, and identifying student fundraising co-ordinators in order that we could raise enough money to send our students to Tanzania to see the issues people faced.”

Sally Hayek, a third year Civil Engineering student, and publicity officer for EWB Manchester sums it up nicely “The network was already set up in Tanzania. Upendo had great relationships with local people who all helped. We came in with the ‘brain power’ and the marriage of caring people on the ground and student volunteers has resulted in direct benefits for orphaned children in the area. Knowing that we have made a real difference to their lives is an amazing feeling.”

The branch worked to design methods of easily gaining clean drinking water. The team worked out that the water supply would have to be collected from the roof catchment and then stored until it was needed, due to the erratic nature of the rainy seasons. They then identified that a bio-sand filter would be necessary to filter the water. Not content with having a real impact thousands of miles away the EWB Manchester team is also concentrating on the engineers of the future. It is currently establishing an outreach programme which involves visiting local secondary schools to talk to children about the importance of engineering. Student volunteers, who are STEM ambassadors for the University, speak about specific engineering challenges, and ask the children to come up with solutions. “We talk to them about things they take for granted, like transport systems or water filtration systems, and ask ‘what would you do if you didn’t have them?’ We hope it opens their eyes to the importance of engineering, and gives them an insight into how integral engineering is to their everyday lives”.

Students who volunteer are also able to base their dissertation on an EWB project, enabling them to fulfil their responsibility as a student, and also fulfill their social responsibility at the same time, responsibility as a student, and also realise their social responsibility at the same time, ensuring they can contribute to their everyday lives”.

has working with EWB Manchester had any unexpected consequences? Cara thinks so “I originally started my studies with the clear aim of qualifying to work on UK building sites, but the work I’ve done with EWB Manchester has changed that. I now want to combine my engineering skills with international development; something I would not have thought about doing before I joined the organisation”.

What’s next for the organisation? Sally knows there’s a lot to do “We have many ideas for the future, but we have to remember that most of our committee and members will soon be leaving the University. In order to carry on the fantastic work we’re involved in we need to ensure we have a new committee up and running before the summer, so we are constantly looking for students, from any discipline, to get on board and keep the momentum going”.

Find out more at www.ewb-manchester.org
The University has been successfully running its Project Management Professional Development Programme (PMPDP) for twelve years, and the effectiveness of the initiative is the envy of many higher education institutions. Professionals who have completed the course report a real improvement in business processes and bottom lines.

The PMPDP is an industry-led partnership between the University and leading industrial organisations, and sets out to provide industry-based practice for project management development. Mike Brown (Head of Centre of Competence for Project and Programme Management Rolls-Royce plc) worked with Professor Gale during the programme’s initial stages. “Rolls-Royce chose The University of Manchester as a partner because they had a very active faculty interested in research, all with previous industry background, and they were really the only faculty in such shape in 1999 when we first thought about tendering for this project. The effect on staff at Rolls-Royce, from my point of view, has been an improvement in their technical skills. A rather more surprising impact has been on the behaviour of people, due to an increased confidence in their knowledge and capability, which is seen virtually without exception.”

The programme brings together academics and industry professionals from some well-known UK companies through a blended Masters programme to learn, reflect, and solve problems of real value to the participating companies. The community of expert project managers developed through the programme is highly valued by the sponsoring companies, and is delivering bottom line benefit to industry. More than 240 practitioners have graduated at MSc level since it began, as well as more than 100 at postgraduate diploma. There are currently 190 delegates on the programme, who are drawn from across industry. The programme is accredited by the UK Association for Project Management, United States Project Management Institute Global Accreditation Centre and the Engineering Construction Industry Training Board.

Ian Burgess (Rolls-Royce), Lucy Reeve (Rolls-Royce), Jean-Clavé Toussaint (Rolls-Royce), Professor Andrew Gale (PMP Programme Director), Neville Barter (Rolls-Royce) and Achen Robok (AMEC) won two internal Rolls-Royce awards for Best Practice Portfolio Management and best placement for graduates. The best blended learning programme I have ever attended”.

Programme content is set by consultation through a steering committee made up of industry leaders and University academics. Whilst the University receives invaluable insight into the needs of industry and can respond with its knowledge and research, so industry can rely on a tailored and relevant programme that suits its own and its employees’ needs. Professor Andrew Gale from the University’s School of Mechanical, Aerospace and Civil Engineering was instrumental in setting up the programme in 2000, and continues to lead its delivery. “We worked with Rolls-Royce to develop the programme, and we now also partner other industrial organisations including AMEC, Goodrich, EDS, Sellafield Ltd, E.on and ECITB as its partners. The invaluable input from our partners allows us to continually evolve the programme to ensure it is relevant and reactive to the needs of industry”.

A sister programme at Pennsylvania State University is also currently running, and this year it will also be delivered in Asia as a joint programme in partnership with Nanyang Technological University in Singapore; a development facilitated by Rolls-Royce. The programme also has links with the British University in Dubai. Ian Cotton, Professor of High Voltage Technology, outlines the history of the high voltage laboratories and of the partnership “The first high voltage lab was opened by Cockcroft at the University in the 1950s, and moved to its current home in the Ferranti Building during the 1970s. It’s grown into the largest lab of its kind in the UK, and boasts a broad range of equipment and skill set that covers the needs of National Grid in terms of power system engineering. “We’ve been working together since 2003, when National Grid looked to strategically partner with a number of universities. National Grid invested in the refurbishment of our labs; in fact it is one of the University’s largest industrial funders. Without its support we could not have built up such a broad spectrum of knowledge within our academic staff. It also funded an academic position. Our world-class facilities mean we are in a position to fully understand and respond to its future research and development needs. We don’t simply wait for a project to appear; we spend time with its engineers so we truly understand their challenges.”

Ian continues “The relationship is mutually beneficial, and although we work in a formal way to tackle challenges, we are also able to informally call upon each other for advice and opinion; we are colleagues as opposed to researcher and employer”. Current projects include a range of research that’s essential to delivering the future UK energy strategy. National Grid networks will need to change radically over the next 20 years to accommodate the increased incorporation of wind power into electrical systems, new nuclear builds, and higher demand for electricity. The University is working on a range of major projects including innovative overhead line design; to minimise visual impact whilst maintaining the amount of power that can be sent through lines (composite cross-arms); work on modern protection and control systems to reduce the risk of failures; supporting the installation of new; and off shore high voltage DC systems on the west and east coast of the UK. The composite cross-arm project is an example of one of the projects that is seeing technology developed at the University being moved into the marketplace. A new test site has recently been switched on for the first time at 400,000 volts in Scotland, and is now fully functioning, proving the cross-arm fit for deployment onto the system. The University has also recently begun work to provide strategic guidance on the future strategy for protection and control. As Ian explains “The research and development we are carrying out with National Grid gives us output; we’re not writing reports about our research which are destined to sit on a shelf. Our work is applied in a strategic way. There’s a strong technology transfer element which translates into tangible outputs and commercialisation. We’re using our knowledge, research and vital support to develop technology at a faster rate”.

Ian is aware that the partnership has also enabled the University to fulfil an important role in producing a knowledgeable workforce “When modern technology is implemented it’s important to ensure scientists and engineers understand them and how to manage them. With the help of National Grid projects and training that we provide for National Grid, we’re producing industry-ready graduates.”
ENGINEERING & PHYSICAL SCIENCES
STUDENT AWARD NEWS

COMPUTER SCIENCE STUDENTS (OVE) PROJECT IN IMAGINE CUP 2011 FINALS

Three first year students from the School of Computer Science recently won the Microsoft Imagine Cup national finals, which saw teams of students from across the world competing to solve some of the world’s toughest problems.

JP Lacerda, Damo Walsh, and Sam van Lieshout entered the competition as they thought that the theme of ‘Solving United Nations Development Goals’ presented an interesting project relevant to the challenges of the world today. It was also an opportunity for them to develop experience in real-world applications.

They developed ‘Open Volunteer Exchange’; a distributed platform to enable volunteering organisations to exchange volunteers, and were mentored throughout the project by Dr Simon Harper, Lecturer in the Information Management Group. The aim of the project was to enable people to quickly organise events requiring a group of volunteers with diverse skills.

The team used a peer to peer system which meant peers who were online could still communicate with each other if networks are affected; important in times of emergency.

Find out more about student directed activities in the School of Computer Science at www.man-up.appspot.com

ENGD STUDENT WINS YOUNG ENTREPRENEURS SCHEME

Mike Conti-Ramsden, a fourth year EngD student has led a team of four to win the national final of the prestigious Engineering Young Entrepreneurs Scheme.

The Scheme is a competition for UK-based postgraduates students and postdoctoral researchers which gives them the chance to present a business plan for an imaginary start-up company to a group of investors and industry experts.

The University team based their business case on an innovative disinfection technology, and their work won both the Peer Review and the judge’s prize during the North West heats. The final took place in Birmingham.

Mike’s team was sponsored by Ted Roberts and his School of Chemical Engineering and Analytical Science spin-out company Arvia. Ted said: “The engineering YES scheme is a great opportunity for research students to develop and demonstrate their entrepreneurial skills. To have won the national competition is a fantastic achievement for him and his team”.

AIAA NEW HORIZONS COMPETITION WINNER

Leo Teeney, a third year MEng Aerospace Engineering student, has won the 2011 runner-up prize of the New Horizons Challenge organised by American Institute of Aeronautics and Astronautics AIAA. Leo was invited to Florida to present his entry. He said: “It was a great opportunity to meet academics and professionals involved in aerospace science”.

From left to right: JP Lacerda, Sam van Lieshout and Damo Walsh

From left to right: Mike Conti-Ramsden, Leo Teeney and Eternal Boyden

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Mike Conti-Ramsden, a fourth year EngD student has led a team of four to win the national final of the prestigious Engineering Young Entrepreneurs Scheme.

The Scheme is a competition for UK-based postgraduates students and postdoctoral researchers which gives them the chance to present a business plan for an imaginary start-up company to a group of investors and industry experts.

The University team based their business case on an innovative disinfection technology, and their work won both the Peer Review and the judge’s prize during the North West heats. The final took place in Birmingham.

Mike’s team was sponsored by Ted Roberts and his School of Chemical Engineering and Analytical Science spin-out company Arvia. Ted said: “The engineering YES scheme is a great opportunity for research students to develop and demonstrate their entrepreneurial skills. To have won the national competition is a fantastic achievement for him and his team”.

AIAA NEW HORIZONS COMPETITION WINNER

Leo Teeney, a third year MEng Aerospace Engineering student, has won the 2011 runner-up prize of the New Horizons Challenge organised by American Institute of Aeronautics and Astronautics AIAA. Leo was invited to Florida to present his entry. He said: “It was a great opportunity to meet academics and professionals involved in aerospace science”.

From left to right: JP Lacerda, Sam van Lieshout and Damo Walsh

From left to right: Mike Conti-Ramsden, Leo Teeney and Eternal Boyden