MANCHESTER 1824
The University of Manchester

your manchester

For Engineering and Physical Sciences Alumni

Spring 2013

Brian Cox on Manchester and his amazing year

UK school children get animated

Science with a global reach

£1billion campus master plan

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EPS people

The Faculty is led by the **Vice-President and Dean, Professor Colin Bailey**, and comprises **nine academic Schools** and **four Research Institutes**. The Faculty Leadership Team also includes **six Associate Deans** who support key areas of activity, including **Research, Teaching and Learning, Graduate Education**, **Social Responsibility, Internationalisation** and **Business Engagement**, the **Head of Faculty Administration**, who is responsible for leading the administration across the Faculty.

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Professor Mike Sutcliffe

School of Chemistry
Head of School,
Professor Christopher Whitehead

School of Computer Science
Head of School,
Professor Jim Miles

School of Earth, Atmospheric and Environmental Sciences
Head of School,
Professor Hugh Coe

School of Electrical and Electronic Engineering
Head of School,
Professor Tony Brown

School of Materials
Head of School,
Professor Paul O'Brien

School of Mathematics
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Professor Peter Duck

School of Mechanical, Aerospace and Civil Engineering
Head of School,
Professor Andy Gibson

School of Physics and Astronomy
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Professor Andrew Sherry

Manchester Interdisciplinary Biocentre
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Professor Richard Winpenny

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Acting Associate Dean (Internationalisation)
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Rachel Brealey

Head of Faculty Finance
Pauline Morgan

Head of Faculty HR
Sue Field

Front cover: Professor Brian Cox during filming of his TV series Wonders of Life ©BBC

Welcome from the Vice-President and Dean

Welcome to the latest edition of the Your Manchester: Faculty of Engineering and Physical Sciences Alumni newsletter, which offers us another opportunity to share with you the latest news about the Faculty and we hope, prompt some happy memories of your time here in Manchester.

The Faculty of Engineering and Physical Sciences has had another busy and eventful year. Back in April 2012, we won the Queen's Anniversary Prize for our applied research and skills training in the nuclear industry. More recently, we had the honour of the School of Physics and Astronomy being awarded the prestigious Regius Professorship by the Queen. The inaugural Regius Professor of Physics at Manchester will be conferred on Professor Sir Andre Geim, who won the Nobel Prize for Physics in 2010.

Many of you will no doubt have seen Brian Cox, Professor of Particle Physics, in a new series, *Wonders of Life*, on the BBC. This series has focused on biology and the formation of life and is the product of significant collaboration with colleagues across the University, most notably the Faculty of Life Sciences. You can read more about Brian's reflections on an exciting year and his return to teaching first year undergraduates on page 18.

In October, the Board of Governors approved The Estates Master Plan that creates a single campus, involving significant investment in the development of new teaching and research buildings for the Schools of Chemical Engineering and Analytical Sciences (CEAS); Mechanical, Aerospace and Civil Engineering (MACE); Electrical and Electronic Engineering (EEE); The Foundation Year and Materials. The project is complex but hugely exciting, and offers us a unique opportunity to develop a facility which offers the best environment possible for teaching and research, and which supports our long-term strategic goals. The new development will sit on the site of the current Materials Science Centre and adjacent to the new James Chadwick Building, which was formally opened in October. The Schools will not move until 2018 - but we will keep you updated on developments through this magazine and events over the coming months and years.

Since its foundation the University of Manchester has always been open to all students, who have the academic ability, irrespective of their religion, class, or position in society. A fact that remains true today and forms the bloodline of this Faculty and University. I'm therefore delighted that we are able to feature our Foundation Studies Programmes on page 24, which allows students from more disadvantaged communities, and those students who do not have the correct entry grades for whatever reason, a chance to come to Manchester to study. Students who successfully complete the foundation year are usually much better prepared for the first year of study on their chosen course and often excel during their studies. As we plan to increase the number of places available on our foundation courses we hope to increase the number of scholarships we can offer to provide the opportunity to more students, especially those from disadvantaged communities. If you are able to help in supporting scholarships in this important area, we would love to hear from you.

In July, we were delighted with the announcement that BP had awarded a $100 million international research centre, known as the BP International Centre for Advanced Materials, or BP-ICAM, to the University. The Centre will work as a "hub and spoke" structure, with the Faculty of Engineering and Physical Sciences as the hub and the University of Cambridge, Imperial College London, and the University of Illinois as the "spokes". The investment programme will span ten years, and will include many of our core academic strengths to carry out research into areas of direct interest to industry. You can read more about this announcement on page 30.

We've also presented news of further exciting developments for Graphene, including the new National Graphene Institute (NGI) building and the production by Professor Sir Kostya Novoselov and his team of a landmark 'Graphene Roadmap' paper. The potential opportunities from this exciting development are numerous and the University is well placed to capitalise on these from the wide range of skills in place across the four faculties. These include touchscreen devices and rollable e-paper, as well as potential anticancer drugs and computer chips (as a replacement for silicon) in the longer term. More details on these developments, including a first look at the design of the new NGI building are shown on page nine.

Of course, no alumni magazine would be complete without a focus on current students and our Alumni, all of whom we are very proud. In this edition we have articles focusing on Gerry Pennell, who was Chief Information Officer for the London Organising Committee for the Olympic and Paralympic Games; Alan Charlton, who is currently the British Ambassador to Brazil; and Angela Strank, who is BP's Vice President and Head of Group Chief Executive's Office; as well as profiles of some of our more recent graduates.

I hope you enjoy this magazine. If there are any specific areas of activity that interest you and you would like to hear more about, or if you would like to be more engaged and involved with the Faculty and the University, we would love to hear from you.

Professor Colin Bailey
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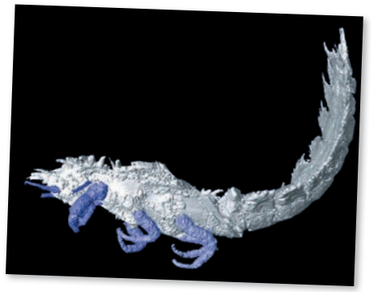
A springtale and mayfly, captured in amber

3D images reveal secrets from millions of years ago

Two teams at the University have used a pioneering approach using a CT scanner to reveal fascinating insights into life millions of years ago.



3D image of a spiney, an early amphibian that lived by eating insects

300 million-year-old insects brought to life

A team led by Dr Russell Garwood in the School of Materials has published research in the journal *PLOS ONE* which has used 3D imaging to reconstruct 300 million-year-old insects. The paper 'Tomographic Reconstruction of Neopterous Carboniferous Insect Nymphs' was written by Russell Garwood, Andrew Ross, Daniel Sotty, Dominique Chabard, Sylvain Charbonnier, Mark Sutton and Philip J Withers.

The 3D digital reconstructions created provided unique information, shedding light on the lifestyle and biology of the insects, and their ability to survive.

The research has implications across scientific disciplines as the scientists reconstructed a new species and genus which does not exist today. The other is a predecessor of the cockroach and is one of the best examples of this age ever seen by insect palaeontologists.

Both are members of a group called the Polyneoptera – which includes roaches, mantises, crickets, grasshoppers and earwigs. Analysing the exact relationships of the insects will be difficult for the researchers as insects have a habit of dramatically changing appearance as they develop.

Dr Garwood said: "The most dramatic change is seen in insects like butterflies, which change from a larva, to chrysalis, to adult, but relatively few people look to the fossils to try and work out how such a life cycle may have evolved.

"We are hoping that work like this will allow us to better understand the biology and development of these early insects.

"Around this time a number of early 'amphibians' were insectivores – they lived by eating a lot of insects. The spiney creature was a sitting duck, as it couldn't fly, so the spines probably made it less palatable. It is bizarre – as far as we're aware, quite unlike any members of the Polyneoptera alive today.

"This is very much a first step, and I'll be spending the next few years looking at other fossil insects to build on this work."

Scans of amber show 16 million-year-old hitchhiker

Elsewhere in the University, scientists from the School of Materials and Faculty of Life Sciences have teamed together to produce stunning images of a creature using a mayfly for transport. This activity has never before been recorded, but researchers believe it is indicative of activity that still takes place.

Entombed in amber the tiny springtail can be seen resting in a v-shaped depression at the base of one of the mayfly's wings. It appears to have secured itself for transport using its prehensile antennae.

The 3D images of the springtail, made with a high-resolution scanner, are helping accurately analyse its behaviour.

Dr David Penney from the Faculty of Life Sciences says: "The images are really impressive. This pioneering approach to studying fossils has allowed us an insight into the behaviour of one of the world's most prevalent organisms."

Springtails are minute 1-2 mm long creatures that are related to true insects, and they are usually found around the world in great numbers, including here in the UK. They readily colonise newly-formed islands but very little is known about how they manage to migrate. One of the reasons is that they are incredibly nervous creatures and have an astonishing ability to leap away from danger using a springing organ (the furca) on the underside of the abdomen, which makes observing them in life very difficult.

Interestingly, when the 3D image of the springtail in amber is magnified it's possible to see that the springtail is very slightly detached (by just 50 micrometres) from the mayfly. This suggests it was attempting to spring away as the amber set around it.

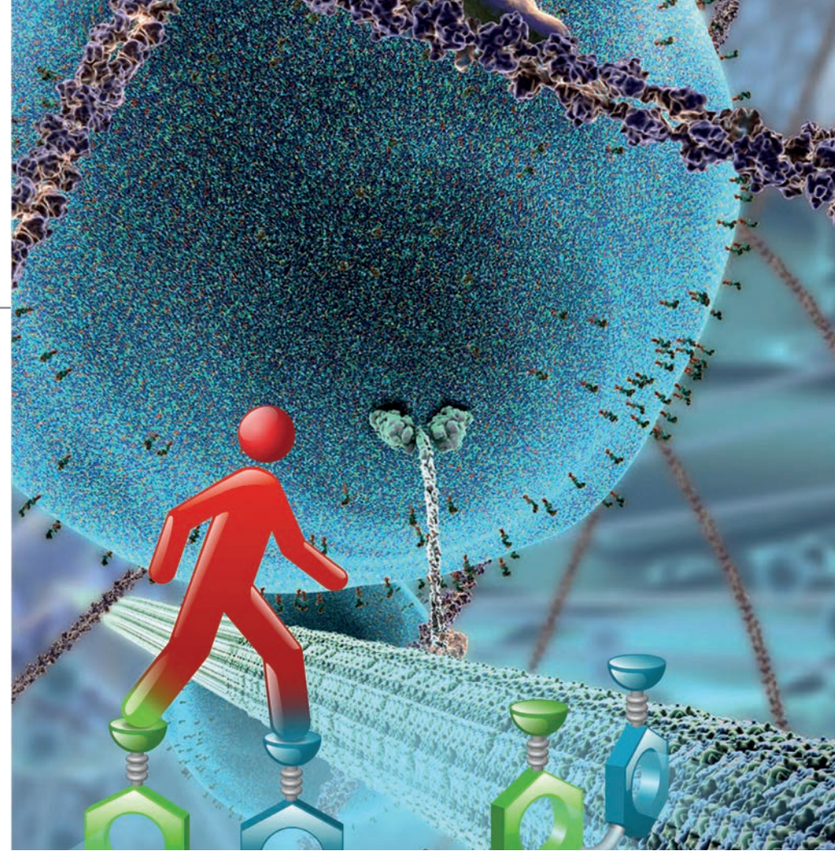
Only one previous case of phoresy (the transportation of one organism by another) has been recorded for springtails. This was found in a piece of Baltic amber where five springtails were hooked in a row on the leg of a harvestman arachnid.

It was this discovery in 2010 which prompted Dr Penney to take a closer look at his own specimen. "I had initially thought the creature on the mayfly may have been a tiny nymphal pseudoscorpion, as they are known to use other creatures for transport, and this behaviour is not uncommon to see in amber. I was interested in the fact that this was the first time a creature had been found on an adult mayfly but I didn't truly appreciate the significance of my find until I used the CT scanner and was able to identify the animal as a springtail."

Phoresy in adult mayflies has never before been recorded. They live for just a short period of time from one hour to a few days depending on the species. The primary function of the adult stage is reproduction and they are unable to feed. This makes it very difficult to study mayflies in their natural habitat and record instances of phoresy.

The amber specimen encasing the mayfly and the springtail provides an accurate snapshot of behaviour that scientists would not otherwise be able to record.

Details of the research have been published in the journal, *PLOS ONE*, and more analysis of amber using CT scans is continuing.



Have you ever seen a molecule walk?

Professor David Leigh and his research group in the School of Chemistry have made the first synthetic walking molecules that move directionally along molecular tracks.

Chemists have previously made small-molecule rotary motors, but this is the first example of a synthetic small-molecule linear motor. Even this simple first generation system possesses some of the important characteristics (processive and directional walker transport) that are a feature of biological motor proteins. The goal of such research is to produce artificial molecular vehicles that can transport cargoes and perform other complex tasks at the nanoscale.

Professor Leigh explains: "What we ultimately want to do is have molecules that can walk along polymer chains and on surfaces, carrying molecular cargoes (e.g drugs, chemical building blocks, samples for analysis). We know that this sort of thing is possible because it's how biology moves cargoes around in the cell; the challenge is to learn how to do it!"

If we can learn to build these artificial strucures Professor Leigh says the implications are far reaching. "Trying to predict specific applications is a bit like asking stoneage man when he's just invented the wheel to predict motorways! Perhaps the best way to appreciate the technological potential of molecular machines is to recognise that there already is a workiing nanotechnology: biology. Molecular machines lie at the heart of every single biological process.

Over billions of years of evolution Nature has not repeatedly chosen this solution for achieving complex task performance without good reason. When we learn how to build artificial structures that can control and exploit molecular level motion, and interface their effects the outside world, it will impact on every aspect of functional molecule and materials design."

'Magic carpet' could help prevent falls

A 'magic carpet' which can immediately detect when someone has fallen and can help to predict mobility problems has been demonstrated by University of Manchester scientists.

Plastic optical fibres, laid on the underlay of a carpet, bend when anyone treads on it and map, in real-time, their walking patterns.

Tiny electronics at the edges act as sensors and relay signals to a computer. These signals can then be analysed to show the image of the footprint and identify gradual changes in walking behaviour or a sudden incident such as a fall or trip. They can also show a steady deterioration or change in walking habits, possibly predicting a dramatic episode such as a fall. Falling is the most serious and frequent accident in the home and accounts for 50% of hospital admissions in the over 65s.

Presenting their research to the Photon conference, the scientists believe the technology could be used to fit smart carpets in care homes or hospital wards, as well as being fitted in people's homes if necessary. Physiotherapists could also use the carpet to map changes and improvements in a person's gait.

The interdisciplinary team, from the Schools of Chemical Engineering and Analytical Science, Electrical and Electronic Engineering and Nursing, Midwifery and Social Work along with the Photon Science Institute used a novel tomographic technique similar to hospital scanners. It maps 2D images by using light propagating under the surface of the smart carpet.

One of the team, Dr Patricia Scully from The University of Manchester's School of Chemical Engineering and Analytical Science, said: "The carpet can gather a wide range of information about a person's condition; from biomechanical to chemical sensing of body fluids, enabling holistic sensing to provide an environment that detects and responds to changes in patient condition.

"The carpet can be retrofitted at low cost, to allow living space to adapt as the occupiers' needs evolve – particularly relevant with an aging population and for those with long term disabilities – and incorporated non-intrusively into any living space."

Professor Krikor Ozanyan from the School of Electrical and Electronic Engineering added: "We pioneered this new kind of tomography here at The University of Manchester in 2005. Now we are delighted to show how achievements in maths, science and engineering can bring together this exciting new application in healthcare."

Kasparov vs Turing

Chess grandmaster Garry Kasparov completed a game of chess started more than 60 years ago by Alan Turing. For the first time in public, Mr Kasparov played a match against Turing's chess program live on stage at The University of Manchester's Alan Turing Centenary Conference.

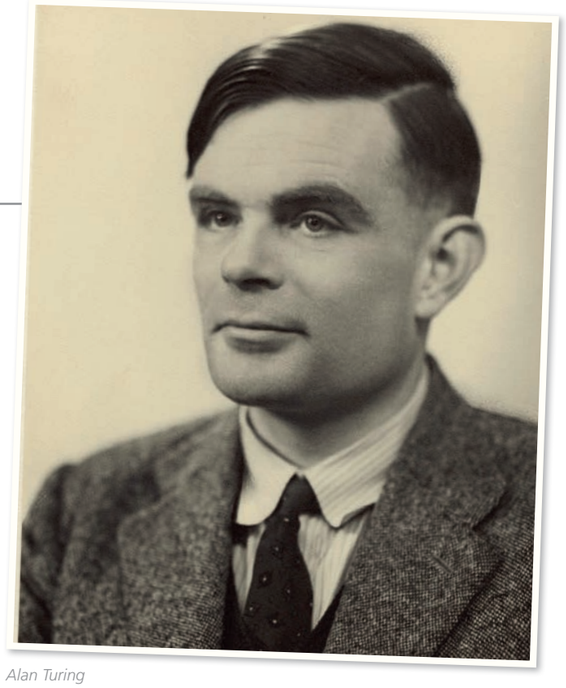
Although he won in just 16 moves, Mr Kasparov praised the prototype program called Turochamp, which was created by Turing without using a computer.

Turing is considered to be the father of the modern computer and the eponymous conference was held as a celebration of his life, and to show how his legacy has endured in the fields of computing and computer science.

Turing designed his program to play semi-intelligently using rules of thumb to pick smart moves. He tried to implement his program in 1950 as soon as the Manchester Ferranti Mark 1 computer was constructed at the University, but never managed to finish the work.

Turochamp was designed to play two moves ahead, calculating the hundreds of potential moves available, whereas Mr Kasparov is more used to thinking at least ten moves ahead – which explains his simple victory.

Nevertheless, the Russian grandmaster was full of praise for Turing's research. He said: "He wrote algorithms without having a computer - many young scientists would never believe that was possible. It was an outstanding accomplishment.



Alan Turing

"Although it's only thinking two moves ahead, I would have thought it would give the amateur player some serious problems.

"Alan Turing is one of the very few people about who you could say that if he had
lived longer the world would be a different place."

Mr Kasparov also unveiled a plaque commemorating Turing on the building at the University where he used to work.

University scientists first to analyse asteroid samples

A team of European scientists, led by Dr Henner Busemann of the University's School of Earth, Atmospheric and Environmental Sciences are among only eleven international scientific teams selected to analyse minute asteroid fragments which could shed light on the origin and evolution of the solar system.

Teams at the University have already analysed Apollo/Luna samples from the Moon and 'Stardust' samples from comet Wild 2, and Itokawa is only the third planetary body from which samples have been returned to Earth.

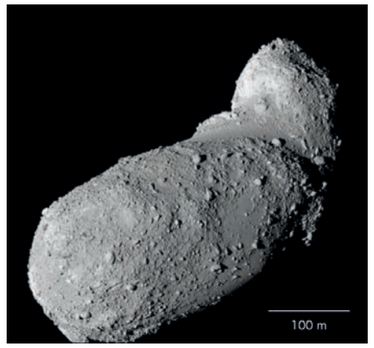
The tiny pieces of rock – at 50-100 micrometres smaller than a human hair – have been captured from asteroid Itokawa by the Japanese mission Hayabusa. It is the first time samples from an asteroid have been returned to Earth.

The Hayabusa mission is part of a continuing effort to understand how asteroids, which are leftovers from the formation of planets like Earth, formed and evolved. It recovered fragments from the 500 metre-long asteroid Itokawa in 2005 and returned them to Earth in 2010. The team includes researchers from Germany, Sweden and Switzerland and was selected because of two unique devices for analysing the samples – Manchester hosts the most sensitive system in the world for analysing the rare gases xenon and krypton.

The team hopes to find out how rapidly, and by what processes, the asteroid's surface is being changed, and whether asteroids like Itokawa could have delivered material to the Earth early in its history. The work will provide a glimpse into the early history of the Solar System and the formation of the planets more than 4.5 billion years ago.

Dr Busemann said: "Meteorites are samples of asteroids that fall to Earth, and we've learnt a lot by studying them.

"However, these grains are unique because we know which of the millions of asteroids they came from and they haven't been exposed to the Earth's environment. We stand to learn a huge amount about how asteroids formed and evolved".



An image of the asteroid Itokawa captured by the Hayabusa mission ©JAXA Digital Archives

UK school children get animated

The School of Computer Science is running its sixth UK Schools Computer Competition – Animation 13. Launched in 2008, the competition was originally part of Digital60, an event that celebrated the 60th anniversary of 'The Baby', the world's first stored-program computer, which was built at The University of Manchester.

The annual competition aims to get schoolchildren excited about computer science, and is open to UK pupils aged seven to 19. In order to enter the children have to create an original computer animation, no longer than one minute in duration, and can use a number of eligible computer packages, including Alice, Blender, Flash, KoolMoves, Scratch, Serif: Draw Plus, SWiSH Max4.

Children can enter individually or in small teams, and prizes are awarded in several age categories. The Animation13 Awards Festival and Inspirational Computer Science Day will be held at The University of Manchester's Martin Harris Centre on Friday 12 July 2013. The Animation Festival is open, free of charge, to all schools, subject to space.

Last year's competition was very popular, with 870 entries from 180 schools, and 58 students from 31 schools winning prizes. Since 24 September 2012, 577 schools have registered, ensuring that this year's competition will be as popular as ever.

Toby Howard, Director of Undergraduate Studies at the School of Computer Science and chair of the competition explains what the children get out of animation, "We want to inspire school kids to use computers creatively, and at the same time understand some of the principles of Computer Science, and computer animation fits the bill! Many teachers are using the competition for classroom and extra-curricular activity, and the quality of the work we receive is exceptional, and frequently outstanding."

See **animation13.cs.manchester.ac.uk** for more information.

School children enjoying the Animation 12 Awards Fesitval at the University

£1 billion campus Master Plan to include a new engineering campus

The University of Manchester is to invest £1 billion over the next ten years to create a world-class campus for our staff and students.

The Estates Master Plan, which was approved by the University's Board of Governors in October will create a single campus and will involve the construction of new teaching and research buildings, student facilities and major improvements to the public realm.

The first phase of the plan, costing around £700 million, will be delivered over the next six years. It includes the building of a new engineering campus, as well as new centres for the School of Law and Manchester Business School, a major refurbishment of the University Library, a bigger and better Students' Union and a new Medical School for our students in Dover Street. There would also be investment in a Combined Heat and Power Facility, as well as a new car park and the refurbishment of the telescope at Jodrell Bank.

The University will also spend several million pounds to improve the University's public realm and landscaping in order to capitalise on the future improvements to Oxford Road, which will see wider pavements, tree-lined boulevards and the removal of all cars during 2015. Students will benefit from major IT upgrades, a new teaching block, refurbishments of several teaching rooms and extension to the Students' Union Building.

Outline plans have been drawn up for a second phase which is expected to cost a further £300 million and would begin in 2018 and end in 2022. This second phase includes refurbishments in the Schools of Computer Science, Earth, Atmospheric and Environmental Sciences, Mathematics and Chemistry.

Director of Estates and Facilities Diana Hampson said: "Since the merger of the two universities in 2004, it has been our ambition to bring all of the academic activity together on a single site south of the Mancunian Way, which will improve efficiency, improve the student experience and reduce the University's carbon footprint.

"This visionary building programme will give us one of the most modern campuses in the world, where the vast majority of our students will be studying in brand new or refurbished buildings."

The new investment is in addition to the £750 million spent since 2004 which has already seen the completion of ten new buildings and many large scale refurbishments.

The completion of Phase One of the Master Plan will see the University moving out of most of the buildings on the North Campus, although it will retain some of the buildings to the west of Sackville Street, including the Manchester Interdisciplinary Biocentre. The University is already working with partners from the City Council and New Economy to identify a suitable use for the buildings on the North Campus, which will be vacated by 2018.

The majority of schools will not move out of their present base on the North Campus until the new engineering campus is completed in 2018 and the University will continue to invest in and maintain the North Campus to a high standard, with significant investment over the next six years.

President and Vice-Chancellor of The University of Manchester, Professor Dame Nancy Rothwell, said: "For the first time, we will deliver a single site for The University of Manchester, where engineering, arts, biomedicine, business and all of our other activities live side by side, and our students will be at the real heart of a campus.

"Our long-term aim, as restated in our Manchester 2020 Vision, has been to create a world leading university that would compete with the best universities in the world and would occupy a single, outstanding campus, where some of our beautiful old buildings would stand alongside the very best in modern facilities for our research and our students."

The Alan Turing Building completed in 2007 is home to the School of Mathematics, the Photon Science Institute and the Jodrell Bank Centre for Astrophysics

Celebration for new Chemical Engineering building

The School of Chemical Engineering and Analytical Science (CEAS) has a new home in the James Chadwick Building (pictured above), the first phase of what will be a five-storey, 11,500 square metre building, on the corner of Booth Street East and Upper Brook Street, is now complete. The final £30 million building will see further expansion of the School to house its outstanding research facilities, teaching laboratories and enquiry-based learning (EBL) facilities.

Named after Sir James Chadwick, the Manchester alumnus and English Nobel laureate in physics awarded for his discovery of the neutron, the building will also house a sophisticated industrial pilot plant.

The Chemical Engineering programme at Manchester has been growing steadily, underpinned by its outstanding reputation and excellent job prospects of graduates.

President and Vice-Chancellor Professor Dame Nancy Rothwell and Faculty of Engineering and Physical Sciences media star Professor Brian Cox joined the Head of School Professor Mike Sutcliffe and the CEAS team at the celebration to mark the completion of the first phase.

Professor Sutcliffe said: "I would like to say thanks to our fantastic team, within the School and in Estates, who have been working very hard to make this happen.

"This ambitious and modern building gives Chemical Engineering staff and students the environment they deserve. As one of a small group of elite Chemical Engineering departments within the UK, it is vital we have the facilities to match.

"Our broad research base in which engineers and scientists work seamlessly together enables us to study the design, operation and integration of different complex systems - particularly industrial, biological, and instrumentation – and apply Chemical Engineering in a 21st century context.

"The new building will significantly enhance the student experience - allowing us to further develop cutting edge teaching methods underpinned by state-of-the-art laboratory equipment coupled with a modern, enabling learning environment."

The graphene-paved roadmap

A landmark paper by The University of Manchester claims that graphene – as well as dominating the electronics market in the near future - could also lead to a huge range of new markets and novel applications.

Writing in *Nature*, Nobel Prize-winner Professor Sir Kostya Novoselov (pictured above) and an international team of authors, has produced a 'Graphene Roadmap' which for the first time sets out what the world's thinnest, strongest and most conductive material can truly achieve.

The paper details how graphene, isolated for the first time at The University of Manchester by Professor Sir Novoselov and colleague Professor Sir Andre Geim in 2004, has the potential to revolutionise diverse applications from smartphones and ultrafast broadband to anticancer drugs and computer chips.

One key area is touchscreen devices, such as Apple's iPad, which use indium tin oxide. Graphene's outstanding mechanical flexibility and chemical durability are far superior, and graphene touchscreen devices would prove far more long-lasting and would open a way for flexible devices. The authors estimate that the first graphene touchscreen devices could be on the market within three to five years, but will only realise their full potential in flexible electronics applications.

Rollable e-paper is another application which should be available as a prototype by 2015 - graphene's flexibility proving ideal for fold-up electronic sheets which could revolutionise electronics.

Timescales for applications vary greatly upon the quality of graphene required, and researchers estimate devices including photo-detectors, high-speed wireless communications and THz generators (for use in medical imaging and security devices) would not be available until at least 2020, while anticancer drugs and graphene as a replacement for silicon is unlikely to become a reality until around 2030.

The paper also details the different ways of producing graphene - processes which have evolved hugely from the sticky tape method pioneered by the Nobel Laureates.

The paper asserts that there are three main methods for making graphene:

Liquid phase and thermal exfoliation – exposing graphite to a solvent which splits it into individual flakes of graphene. This method is ideal for energy applications (batteries and supercapacitors) as well as graphene paints and inks for products such as printed electronics, smart windows and electromagnetic shielding. Adding additional functionality to composite materials (extra strength, conductivity, moisture barrier) is another area such graphene can be applied.

Chemical vapour deposition – growing graphene films on copper foils, for use in flexible and transparent electronics applications and photonics, among others.

Synthesis on silicon carbide – growing graphene on either the silicon or carbon faces of this material commonly used for high power electronics. This can result in very high quality graphene with excellently-formed crystals, perfect for high-frequency transistors.

Professor Novoselov said: "Different applications require different grades of graphene and those which use the lowest grade will be the first to appear, probably as soon as in a few years. Those which require the highest quality may well take decades.

"Graphene is a unique crystal in a sense that it has single-handedly usurped quite a number of superior properties: from mechanical to electronic. This suggests that its full power will only be realised in novel applications, which are designed specifically with this material in mind, rather than when it is called to substitute other materials in existing applications.

"One thing is certain – scientists and engineers will continue looking into prospects offered by graphene and, along the way, many more ideas for new applications are likely to emerge."

His co-author Professor Volodya Falko, from Lancaster University, said: "By our paper, we aim to raise awareness of engineers, innovators, and entrepreneurs to the enormous potential of graphene to improve the existing technologies and to generate new products.

"To mention, in some countries, including Korea, Poland and the UK, national funding agencies already run multi-million pound engineering-led research programmes aiming at commercialisation of graphene on a large scale."

The paper was written with colleagues from Lancaster University, Texas Instruments Incorporated, AstraZeneca, BASF and Samsung Advanced Institute of Technology.

Artist's impression of the National Graphene Institute

World-leading graphene institute

A new £61m world-leading graphene research institute is to be built at The University of Manchester. The National Graphene Institute (NGI) will be the UK's home of research into the world's thinnest, strongest and most conductive material, providing the opportunity for researchers and industry to work together on a huge variety of potential applications.

It is hoped the centre will initially create around 100 jobs, with the hope that the number will rise to many thousands more in the North West and more widely in the UK.

Funding for the NGI will come from £38m from the Government, as part of £50m allocated for graphene research, and the University has applied for £23m from the European Research and Development Fund (ERDF). The NGI will operate as a 'hub and spoke' model, working with other UK institutions involved in graphene research.

The 7,600 square metre building will house state-of-the-art facilities, including two 'cleanrooms' - one which will take up the whole of the lower ground floor - where scientists can carry out experiments and research without contamination.

The Institute will also feature a 1,500 square metre research lab for University of Manchester graphene scientists to collaborate with their colleagues from industry and other UK universities.

Some of the world's leading companies are also expected to sign up to work at the NGI, where they will be offered the chance to work on cutting-edge projects, across various sectors, with Nobel Laureates and other leading members of the graphene team.

Professor Novoselov said: "The National Graphene Institute is fundamentally important to continue the world-class graphene research started in Manchester. We are delighted that the Government have chosen to invest in graphene, which has the potential to change technology in so many ways.

"Our researchers and scientists will be able to collaborate with colleagues from other universities and from some of the world's leading companies, which can only serve to enhance scientific research."

Professor Colin Bailey, Vice-President and Dean of the Faculty of Engineering and Physical Sciences, added: "The National Graphene Institute will be the world's leading centre of graphene research, combining the expertise of University of Manchester academics with their counterparts at other UK universities and with leading global commercial organisations.

"The potential for its impact on the city and the North West is huge, and will be one of the most exciting centres of cutting edge research in the UK."

Work on the NGI began in March 2013, and is expected to be completed in early 2015.

www.graphene.manchester.ac.uk

£50,000 for new graphene ideas

An enterprise competition for doctoral and postdoctoral students with new graphene ideas was launched in February. The Eli and Britt Harari Graphene Enterprise Award will help establish further enterprises in graphene at the University. The £50,000 award aims to encourage the development of an entrepreneurial culture across the University's doctoral and postdoctoral research base.

The competition is co-funded by the North American Foundation for The University of Manchester, through the generous support of one of the University's former EPS students, Dr Eli Harari, and his wife Britt, and the UK Government's Higher Education Innovation Fund. The award judging panel will be chaired by Professor Sir Andre Geim.

The competition is open to final year PhD students and Postdoctoral Research Associates at the University. It will be awarded to the candidate who demonstrates outstanding potential in establishing a new enterprise related to graphene.

The award becomes seed funding to allow the winner to take the first steps towards realising their plan. It recognises the role that early-stage financial support can play in the successful development of a business targeting the full commercialisation of a product or technology related to research in graphene.

Polymer teaching spans continents

A lack of resources and expertise in Ghana has historically led to difficulties in tackling such issues, and academics from The University of Manchester's Faculty of Engineering and Physical Sciences were approached for help.

African polymer scientists and technologists are looking at ways to develop polymer science and technology programmes that can lead the way in the sustainable production and use of polymers. Ubiquitous in many countries, polymers such as plastic and rubber are not easily degradable, so cause serious problems in the developing world.

Academics and students from the School of Chemistry have been contributing to a masters programme at the Kwame Nkrumah University of Science and Technology in Kumasi, in order to train the polymer scientists of the future in Ghana.

Peter Budd is a professor in the School of Chemistry and, along with his team, carries out fundamental research on polymers. He has been working closely with Ghanaian students and academics, and talks to us about the relationship that spans the continents.

"There are many issues in Ghana that involve polymers, particularly environmental issues. In simple terms, for example, there are vast numbers of polythene bags that go to waste, but these are a potential polymer resource. There are also natural polymers that could be exploited with better training and research. The country's oil industry and the associated petrochemicals it produces could be of beneficial use, but would be lost to Ghana without trained polymer scientists.

"Academics in Ghana are acutely aware of the importance to their country of training and research into polymer science. In this instance there was a need from colleagues in Kumasi for trained polymer scientists in Ghana. We were brought in by those academics to enable them to enhance their knowledge and expertise."

At the beginning of this project Ghana possessed virtually zero capabilities in polymer chemistry, with a few individuals with interests in this area, but no co-ordination around that work in terms of effort or training. With support from the British Council through the DELPHE Project (Development Partnership in Higher Education), as well as input from Paul O'Brien, Professor of Inorganic Materials at The University of Manchester, scientists from Kumasi were able to submit a proposal, and were successful in securing funds to get an MSc course off the ground. The course funding was the first step in training masters level students in polymer science and technology, and the establishment of expertise in Ghana.

Professor Budd continues "Our involvement came through Jahanas Awudza, who was then Head of the Chemistry Department in Kumasi. He had studied for his PhD in Manchester, so it was an obvious choice for him when he began his search for collaborators. Here we have run a very successful MSc for many years, and we have experts across the Faculty.

Left, some of the delegates from the conference during a trip to a cultural centre

Far right, Professor Peter Budd with the masters students

Right, Cristian Menzel delivering his talk at the conference

"There are two sides to our input; training and research. Professor O'Brien has an active research programme with Kumasi which involves its staff and students coming to spend time at Manchester, and returning to Ghana with increased knowledge. My input was in training, and we worked together to establish masters training in polymers in Kumasi through the design of a new syllabus. We had a finite amount of funding which paid for us to travel to Ghana and help with teaching the new syllabus in its early stages.

"During 2011 I spent an intensive week helping to teach some of the material to students, and colleagues were able to do the same. I taught a course on polymer characterisation, which was adapted from an MSc module we teach here in Manchester. Last year I continued to deliver some teaching but this time via Skype, which went remarkably well, given the problem of frequent power cuts; it was never possible to tell how long a connection would last! In fact one of the major issues faced by Kumasi in building a research infrastructure is the unreliability of technology. The climate is hot and humid and the power supply is not always reliable, making the running of sophisticated instruments quite difficult. It's one of the many challenges they face, all of which they are approaching in a sensible manner- getting to grips with the simpler issues rather than what is unrealistic at the early stages.

"The course is now up and running so we have helped to make a difference. As things go forward it will be about developing specific research programmes."

What's the impact of this partnership? "In the future it has the potential to have an enormous impact, but the project is still in its infancy. So far two groups of students have been taught with the new material, and in that time they have gone from zero to having a lab and some equipment, although they still need more. We are helping with some of our older equipment, and one of our technicians will go over to help set it up.

"Much of the early stages of work involved and still involves information gathering, such as what are the major waste streams in a city like Kumasi? Also important is building links and partnerships with Ghanaian industry to establish, for example, how to deal with and use waste in a useful manner. This information will allow the academics and researchers in Ghana to build a picture of the needs of the area and a real knowledge base which will hopefully inform their research in the future."

A major initiative during 2012 was the organisation and delivery of the 1st Kumasi International Conference on Polymer Science, which was held in Ghana. Professor Budd gave a plenary lecture during the event. Cristian Menzel, a PhD Chemistry student at Manchester, also attended. "Cristian had a tremendous experience and got on really well with the students. I think it was nice for them to be able to relate to someone at their level rather than an academic figure, and he is still Skyping with the students.

"For me, the main insight that came from the conference is that there are similar problems across a number of African countries. Importantly, there is a tendency by the West to see African countries as needy and requiring intervention from the West. However, there's lots of scope for African to African interactions, so that similar issues across countries can be addressed by forming alliances and sharing best practice, and making better use of cross-African connections. We hope that our input can help to make this happen, but we have been equal partners.

"We hope to be involved in another conference which will try to establish more pan-African networks to deal with polymers. There are several isolated individuals in different African countries that have their own links with the West, often through connections with universities where they completed their PhDs, but there needs to be more coordination. Bringing these researchers and scientists together might make accessing these resources easier than looking to the West when faced with challenges. Our work is trying to establish this in a sense.

"Ultimately it's important that this is African led, as their scientists best know their own issues and challenges. Where we can help, advise and contribute we will, but African researchers are the people who understand the real issues on the ground, and about how to use science in a way that's appropriate in their particular context."

Although funding for this project has now come to an end, Professor Budd is still involved. He will continue to interact with masters students in Kumasi via Skype. In addition, PhD students from Ghana are carrying out some of their research in Manchester.

Strategically, all UK universities need to interact with premium universities across the globe, but partnerships and alliances with smaller institutions can be vital. As Professor Budd explains, "Working with the top universities in the world is of course essential, but working with smaller universities gives us access and insight into interesting problems. It's good for our researchers and academics to help to find solutions for the challenges faced by other global communities, and we in turn benefit from a flow of students and opportunities to establish research partnerships that can have a global influence, and this can only add to our standing as a truly global university".

For more information visit ***www.manchester.ac.uk/chemistry***

WHAT IS A POLYMER, WHAT ARE THEY MADE FROM, WHAT CAN THEY DO?

A polymer is a substance composed of large molecules (macromolecules) made up of repeating units. Some polymers, such as natural rubber, occur in nature, whereas others are man-made. At present, most synthetic polymers are synthesised from petroleum, but they may also be derived from natural feedstocks. Almost everything we use involves polymers: the textiles in the clothes we wear, the plastics in the products we buy, the paints we coat onto our walls. As researchers, we are interested in ever more sophisticated polymers, which emit light, or conduct electricity, or perform other functions.

London calling

How would you fare if you were responsible for nearly a quarter of the total budget of the Organising Committee for the London 2012 Olympic Games? Gerry Pennell was Chief Information Officer for LOCOG - the London Organising Committee of the Olympic and Paralympic Games - as well as a Manchester graduate. He was awarded an OBE in 2013. We find out how he got to where he is, and how his studies at The University of Manchester influenced his career choices.

Gerry graduated from The University of Manchester in 1980 with a BSc in Mathematics. Gerry was drawn to the challenging nature of the subject. "I chose mathematics because I found it a demanding subject, and it was important to me that I chose something that stretched me. There were other disciplines that I found easier, but mathematics was difficult and oddly I liked that."

He remembers student life as academically tough and thought provoking, but with a positive social ambience, "I enjoyed my time at Manchester, and many things stand out for me, but the most important is that I met my wife here!"

Gerry began his career by working for a firm that provided consultancy for mathematical modelling within the defence industry. "At the time mathematics was very much an in demand subject – as it still is – so securing my first role wasn't hard. The skills and knowledge I gained from my degree, and the courses I took in computer science, were essential, and were the reason I was able to find work quickly. Initially I worked in software development as a mathematician, working on statistical modelling, so I was practicing what I had learnt from the start."

After this, Gerry spent time working in the banking sector, where he specialised in planning and project management of electronic banking systems for clients across the world. He then moved to PricewaterhouseCoopers (PwC) where he worked as a management consultant within the financial services sector, and he then secured the role of Director of Technology for the XVIIth Commonwealth Games that were held in Manchester during 2002.

Part of the role was to create and maintain the technology infrastructure needed to run the Games, which included finding suppliers and sponsors and overseeing the delivery of its IT and telecommunications. "It was great to contribute to the success of Manchester 2002 – not only important for Manchester but a fundamental pre-requisite for the country's later successful Olympic bid."

"The pressure went up a level with six weeks to go before the opening ceremony, and we were ensuring that the IT provision in each venue was running smoothly."

Before his role with LOCOG Gerry worked as Chief Information Officer at Cooperative Financial Services and the Cooperative Group, where he led a far-reaching programme of modernisation which included reorganising the organisation's IT provision through outsourcing and off-shoring. Gerry managed to fit in the role of Visiting Professor for the Information Systems Institute at the University of Salford.

In 2008 Gerry joined LOCOG as Chief Information Officer, where he was responsible for delivering the £500 million technology programme that underpinned the Olympics. In particular measuring athletic performance and delivering results to broadcasters, journalists, the Olympics' own website and as a service provider to many other organisations. He and his team led on all IT, telecommunications, audio visual, and all digital technology required to maintain the Olympic Games in London.

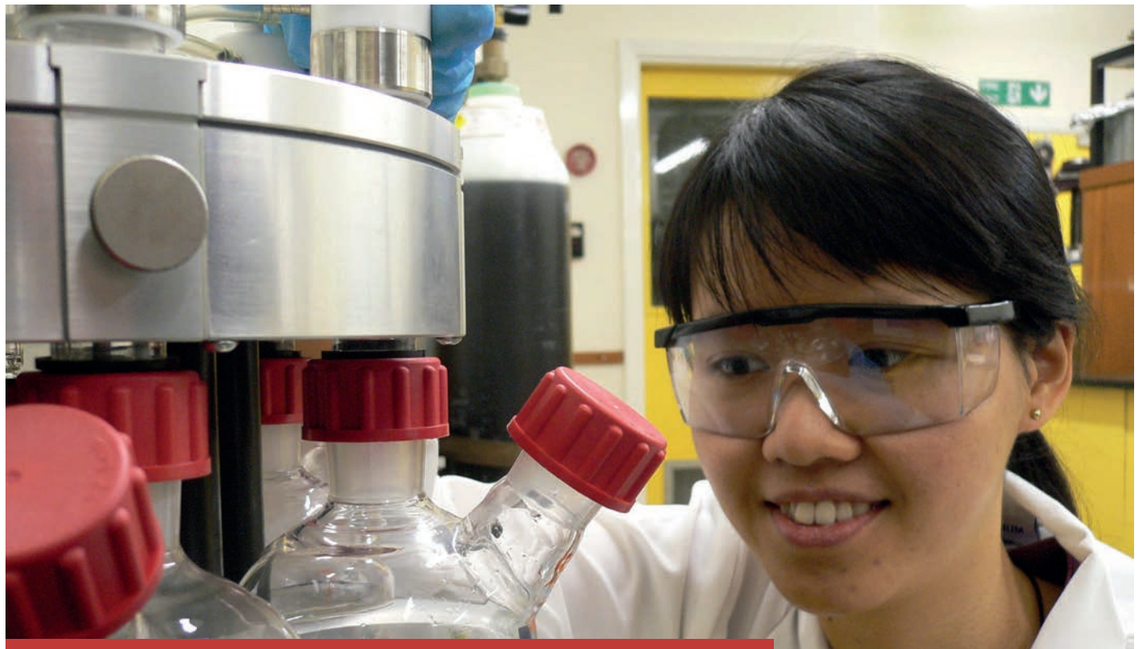
He and his team of more than 500 processed a third more results data than the Beijing Olympics in 2008, and was the most digitally connected Games so far. "The pressure went up a level with six weeks to go before the opening ceremony, and we were ensuring that the IT provision in each venue was running smoothly." In fact he and his team were responsible for the deployment and management of more than 100,000 pieces of IT equipment in 30 venues, monitoring 900 servers, 1,000 network and security devices and 9,500 PCs.

The hard work paid off as Gerry and his team delivered outstanding IT results for the Games, and were awarded numerous accolades, including the Outstanding Contribution to IT Award from BCS, The Chartered Institute for IT and Computing; best consumer app award; and an Outstanding Contribution Award at the International Sports Management Awards.

Gerry is now looking for his next challenge. He was awarded an OBE in the 2013 New Year Honours for services to the London Olympic and Paralympic Games, and sees the award as a team honour: "It was a privilege to lead the team that delivered the technology for the Games and I am delighted to see our success recognised in this way."

"Grasp every opportunity with both hands and work as hard as you can."

For recent graduates, Gerry has a few words about how to successfully carve out a career: "Grasp every opportunity with both hands and work as hard as you can. There's also an element of luck; I like to think my career success was down to hard work, but there was definitely some luck involved!"



Following in the footsteps of the best minds

More than 100 young research minds have begun a journey to follow in the footsteps of leading researcher, and President and Vice-Chancellor of the University, Professor Dame Nancy Rothwell, through receiving a prestigious President's Doctoral Scholar Award.

These prestigious annual scholarships, awarded for the first time in 2012, are open to potential PhD candidates from all nationalities and research areas, and offer the selected recipient exclusive access and close interaction with the President and senior members of the University's research community. Importantly, the award covers the full costs of studying at doctoral level for the duration of their PhD programme.

The scheme, which recruited 41 outstanding PhD students to the Faculty of Engineering and Physical Sciences in 2012, aims to give the brightest scholars from the UK and around the world a foundation in research training, with access to the people and facilities they need to make a difference in the international research arena. The bold ambition of this scheme has already won the support of alumni in the UK and further afield.

"The scheme aims to give the brightest scholars from the UK and around the world a foundation in research training."

Alumnus Robert Clews (MSc Refinery Design and Operation 2009) chose to fund a Presidents Doctoral Scholar Award in Chemical Engineering which went on to support a talented young researcher whose project promises tangible practical and social impact. Robert said: "I strongly believe in the promotion of science and engineering education in the UK, especially in areas of useful research for wider society.

"I benefited enormously from my studies at Manchester and I was keen to give something back to the University.

"I looked at a number of alternative ways to support chemical engineering and decided that funding for doctoral research would be the best option for me. I am delighted to give something back to Manchester by supporting a President's Doctoral Scholarship in Chemical Engineering and Analytical Science. I am extremely pleased to be regularly in touch with the department and wider University alumni community through my support of this Scholar Award."

The scholarship holder, Sin Yuen Chang, is investigating ways in which waste water can be treated more efficiently and in a more environmentally friendly way. Utility companies spend a significant amount of money and energy treating waste water; a process which Sin Yuen believes could be significantly improved. "My project aims to remove toxic contaminants from the flow of wastewater using a process which is more energy efficient than existing technologies. The milder operating conditions translate into more sustainable usage of heat and energy, and hence a lower carbon footprint, and a cleaner environment.

"The goal for my PhD is to generate the fundamental molecular-level understanding required to make this process a reality."

"It is essential for those who have benefited from our system of education to contribute where they can."

In time, it is hoped this will translate into savings for everyone: "The lower energy usage of utility companies should reduce operating costs, and lower water bills for consumers."

Robert acknowledges that constraints on public funds are intensifying and it is becoming increasingly difficult for society to bear the costs of higher education, but believes it is important to contribute to the next wave of scientists and engineers, "To ensure that science and engineering get the funds which are needed to maintain and increase our standard of living, it is essential for those who have benefited from our system of education to contribute where they can. Contributions should not become in any way "compulsory", but for those with the ability to help maintain strong institutions like Manchester there is no better time to provide support."

Sin Yuen acknowledges that without the support of the Presidential Doctoral Scholar Award, none of this would have been possible: "Without the scholarship it would have been impossible for me to pursue this project. I would have had to pursue a PhD elsewhere, for example in the EU, in the US or in Singapore, where support for the tuition fees of international students is not as restricted."

This is a situation Dame Nancy hopes this scheme will help to address: "It is an absolute priority for The University of Manchester to support and develop tomorrow's global research leaders. This investment will help Manchester to retain and attract the very brightest PhD students in the face of increasingly fierce competition from the USA, China and India."

Alumnus Robert Clews is supporting talented young researcher Sin Yuen Chang, seen at work in the lab, left

Below left, Professor Dame Nancy Rothwell hopes the Doctoral Scholar Awards will help the University attract and keep the world's best scientists and researchers

If you are interested in finding out more about supporting the President's Doctoral Scholar Awards contact andrew.d.young@manchester.ac.uk

For more information about the Awards visit www.mdc.manchester.ac.uk/funding/pdsaward

From Geology to BP VP

Angela Strank from the series ***First Women*** *by Anita Corbin*

Angela Strank is BP's Vice President and Head of Group Chief Executive's Office. Angela joined BP in 1982 as a geologist and biostratigrapher after gaining a BSc and PhD in Geology at Manchester. She spoke to us about her wide-ranging career and why she is happy to have stayed in touch with the University personally and professionally.

"I'd never been north of Watford and I was absolutely enthralled by the beauty of the Peak District and by the industrial heritage and stature of the city of Manchester when I came to visit from Leigh-on-Sea. I went to the Whitworth Hall and I thought it typified what a great university should look like."

Angela arrived in Manchester to study chemistry but a subsidiary module in geology turned her head. "Early in the first term we went on a geological field trip to Castleton in the Peak District. I collected my first fossil and for the first time began to really understand what I was looking at in the landscape. I fell in love with this thought provoking and magical subject that beautiful day in a beautiful place."

Angela switched to geology and stayed on at Manchester after graduating. "I was asked to be a research assistant for a year. It soon became clear to me that unless, as a woman in the man's world of geology, I could differentiate myself I would probably always stay a research assistant or a lab technician. I knew I wanted to work either for the Institute of Geological Sciences, BP or Shell and I was determined I was going to do that. So after a year as a research assistant I decided I'd do a PhD that would help me get in to the oil industry."

Accepted to study for a PhD in micropalaeontology, part sponsored by the Institute of Geological Sciences, Angela spent a couple of years trekking to and fro across the Pennines between the Institute in Leeds and Manchester.

"I was looking at the microscopic fossils that come out of rock cuttings when they're drilling wells. It was perfect – I got to work with the Institute of Geological Sciences and also to develop a skill that's very unique to the oil industry."

Angela was soon lured away. "I was very happy at the Institute but I could see that the prospects in BP were much greater. I was very fortunate to get a lot of experience very quickly in exploration areas all over the world, from the Middle East to Alaska, and US and South America to China. And I was one of the first, if not the first, female geologist to go off shore."

How was a woman welcomed on to an oil rig in the 80s? "With surprise! I had to sleep in the medical consultation room because there was no accommodation for women. But once they got over the shock we just got on with the job."

Angela's leadership skills were soon spotted and she was quickly made a technology manager. She was promoted to head up a new exploration technology team looking at satellite technology, airborne and new drilling methods before being asked to become New Ventures Manager in the Far East.

Her next role marked a sharp departure when her manager spotted a gap in her quickly lengthening CV and made her a financial analyst, a job she describes as "one of the most frightening things I've ever done".

"Women want to see are role models at senior level, it's important to know that it's possible to get to the top."

"I can remember the feeling in the pit of my stomach and thinking 'Oh my goodness, do I have to do this?' and yes, I did have to do it! In my previous jobs I was the expert I knew exactly what I was doing. Here, I hadn't got a clue. But luckily with good training and a good team around me within the two years I was there I'd pretty much learnt all the accounting, planning and performance basic skills that I needed."

Another couple of leaps up the ladder later, Angela was made Business Development Manager for Angola: a big step up and an enormous challenge.

"The big prize there was to acquire new acreage for BP to explore. It took about four years of relationship building and negotiation and sharing our expertise in exploration.

"I was also reputation manager in Angola, making sure that what we did in the country was in line with BP ways of working and our values as a company. It was a difficult time because the civil war was still on. I saw and did things I never thought I'd see. It was very successful from a business point of view but it was also incredibly successful for my personal growth. We did very rewarding work with orphaned children and I saw first hand the impact war has and that makes you think differently about everything."

Angela moved on from Angola to New Jersey as Chief Financial Officer, where she headed up the integration of Castrol into the BP group when it was acquired in 2000.

Her deep technology background came into its own again when she was invited to become Technology Vice President for Lubricants back in the UK. Three years later she became responsible for fuels as well, with a team of about 800 engineers and scientists based in 15 technology centres around the world. "That was an iconic and fantastic job. We transformed it into a world-class unit and part of the challenge was making sure we had the latest technology and the best talent coming through from all the universities. That's what got me back in touch with Manchester professionally."

Her last job move (but don't hold your breath) was in April 2012 when she moved to become Vice President and Head of the Group Chief Executive's Office – working with the Chief Executive on all the day-to-day elements of running BP's business. Reflecting on her wide-ranging career at BP Angela says: "I've touched so many parts of the organisation. Looking back on it, it was quite strategic although early on in my career I don't think I knew what 'strategic' meant!"

"BP has a strategic relationship with Manchester mainly because of its strengths in science and technology."

Angela was recognised for her inspirational and pioneering work in the oil industry when she was given the UK First Woman's Award for Science and Technology in 2010. "It was a great surprise and a big thrill. It recognised that it's very difficult for a woman to get into an oil company. When I joined BP there was a major recession and hardly anyone was getting into the oil industry. Staying in was challenging at times too, because there have been lots of downsizings and mergers and acquisitions along the way."

Does she feel a responsibility to the women hoping to follow her? "I do a lot of work with women's groups in BP and one thing women want to see are role models at senior level. Let's assume the practical issues – balancing family life, children and career, the emotional side of things – can be managed, it's important to know that it's possible to get to the top."

Angela has enjoyed keeping in contact with The University of Manchester both personally and professionally over the years. "My daughter graduated from Manchester three years ago. She had the room next to the room I had in Owens Park as a student! My son's studying medicine there now. They both love Manchester.

"I wouldn't be in this position today if it wasn't for The University of Manchester. It's such an inspiring and encouraging place to study. It made me feel I could do whatever I wanted and coming out of university with that feeling is more than half the battle."

Angela is equally positive about BP's relationship with Manchester. "BP has strategic relationships with a number of universities around the world and Manchester is one of those, mainly because of its strengths in science and technology.

"We decided that it would be good to have a senior executive tagged to each of these universities to manage the relationship in a more strategic way, so I volunteered to do that at Manchester with our Chief Financial Officer, Brian Gilvary, who's also a Manchester PhD."

The relationship has developed from small projects and PhD sponsorships to a set of strategic activities, culminating in the announcement last year of the $100 million BP International Centre for Advanced Materials (BP-ICAM) Centre, BP's biggest investment at Manchester ever.

When she comes back to visit the university does she ever hanker after a career in academia? "I never really left!" she laughs. "Although the University looks amazing now with all the new developments and buildings, it feels exactly the same to me. Maybe when I retire I could come back and be an academic for a while. That would be wonderful!"

The wonders of life at Manchester

Brian Cox came to Manchester to study physics as an undergraduate. He's still here 20 years later as Professor of Particle Physics, working with his research group on the ATLAS experiment at CERN in Geneva. His latest of three major TV series, *Wonders of Life*, has recently aired on BBC2 to great acclaim. David Attenborough has even dubbed him his unofficial successor.

Brian returned to teaching undergraduates at the University in the autumn term after a four-year gap. We caught up with him after a lecture on quantum mechanics and relativity to talk about a busy 2012, his plans for 2013 and why the University feels like home.

"Lecturing first years is a superb way of enhancing your understanding of the subject. It really makes you think and it's great to meet all the first year students.

"One of the good things about when I'm lecturing is that it marks out time. I lecture once a day and that means for the rest of the day I'm in Manchester so I can do physics. I'm not up a mountain in Namibia or wherever I might be!"

Brian's new series *Wonders of Life* was recently broadcast on BBC2. This time he tackles the fundamental question 'What is life?' from a physicist's point of view. Filming took him from the Philippines to the US, and Mexico to Madagascar, to reveal, in his trademark accessible style, how a few fundamental laws gave birth to life 3.7 billion years ago.

"Virtually everyone that presents science on the BBC has a PhD and most of them are active academics."

As well as filming monumental TV series Brian is also involved in what he calls 'other bits and pieces'. "I'm playing with Gary Barlow tomorrow night at the Bridgewater Hall so I've got to learn 'Back for Good' this afternoon!"

As his media career has grown he hasn't slowed down as a physicist. He is a Royal Society University Research Fellow based in the Particle Physics group at the University. His work at CERN in Geneva with his research group focuses on the upgrading of the ATLAS experiment.

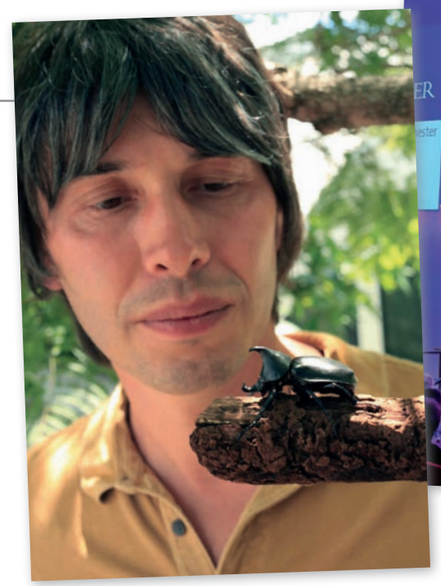
Are people surprised that he still does research? "The BBC are very good at getting academics to present TV programmes, such as Ian Stewart, Alice Roberts and Jim Al-Khalili, and all of them say that people tend to think that if you're on telly you don't do science, when in fact virtually everyone that presents science on the BBC has a PhD and most of them are active academics."

Why does he think that his programmes in particular have sparked people's excitement and interest? "If you knew precisely what made programmes popular you'd do that all the time! I'd done lots before it but it was *Wonders of the Solar System* that changed a lot and broadened the appeal of the BBC's science programming. We've been able to build on that, particularly with *Stargazing Live*, which we do from Jodrell Bank and is tremendously successful around the world.

"The idea that you could do a prime time live astronomy programme over three nights would have been laughed at a few years ago. But it turns out that people are interested in astronomy. How surprising is that?"

Left and below, during filming of ***Wonders of Life*** *©BBC*

Right, delivering the 2012 Cockroft Rutherford Lecture at The University of Manchester



Stargazing Live 2013, broadcast at the beginning of January, attracted 3.8 million viewers and made a real contribution to the study of Mars when viewers were given a chance to explore their own unchartered area of the planet. Amazon reported a leap in sales of telescopes of almost 500 per cent during and after the programme.

He makes it sound simple but although many other scientists have followed the Professor on to the TV, the 'Cox effect' isn't easy to replicate and he was recognised for 'excellence in communicating science' when he was awarded the Michael Faraday Prize by the Royal Society in 2012.

On the *Infinite Monkey Cage* on Radio Four in December Brian talked about the Ig Nobel Prizes, which 'honor achievements that first make people laugh, and then make them think'. Part of his appeal is his unwavering enthusiasm. How does he manage to hang on to his infectious sense of fun and wonder in his subject? "Just by remembering what it is that I am doing. If you are doing research, as I did way back, into supernova explosions, just remember it's a star that's blown up, shining brighter than a galaxy for two weeks!

"The University values education beyond its walls as much as it values education within its walls."

"That's what's nice about making TV programmes and giving popular lectures. You have to find the language that got you interested in the first place."

It was Carl Sagan who first inspired the budding physicist. "I was interested in astronomy and watched Patrick Moore on *Sky at Night* but it was watching Carl Sagan's *Cosmos* when I was 11 or 12 that confirmed to me what I definitely wanted to do.

"The University has helped me immeasurably because it values education beyond its walls as much as it values education within its walls. A university should be outward facing. It's part of the community, it's part of the economy, it's part of the world and that's central to the ethos of Manchester. Its academics and its students and alumni are encouraged to spread the joy of learning and knowledge."

Brian regularly lectures to a range of audiences at the University. He presented the Alumni Association's Cockcroft Rutherford Lecture in 2012, when he shared his experiences as 'A Scientist in the Media' and explored the importance of making science accessible to everyone.

This year he'll be contributing to a lecture series, Physics and the Grand Challenges of Today, with long term collaborator Geoff Forshaw, as part of Manchester's new interdisciplinary University College's programme which lets students broaden their knowledge and interest outside of their degree subjects.

Watching Professor Cox come out of his first year lecture and being set upon by his enthusiastic students it's clear to see what a great role model he is. What does he say to young physicists who want to follow in his footsteps?

"The first thing is to learn physics! People do ask how you get a career in the media and I say 'get a PhD first'. You change completely when you do a PhD because the point of it is to understand what research is. If you're going to speak about science, you need to understand what science is."

Is the recent popularity of science being backed up with money and support?

"Yes, you only have to look at the autumn statement which announced £600 million capital funding in science. Everybody understands that it's a good investment and it's known that we're very efficient at spending money quickly and efficiently. It's also a popular move and that is undoubtedly important in politics. Governments need to know that they're doing the right thing and that they'll get credit for doing it."

What difference is that making to students thinking about coming to do physics? "One of the side effects of investing in research is that you show students that if they want a career in research then there are places to go, such as CERN, or the European Space Agency or Jodrell Bank. This matters in the long term because we're producing knowledge, but it matters in the short term too because we need more scientists in the economy now. That's irrespective of what else scientific research does, which is to underpin every part of human civilisation but that's another story!"

2012 was a busy year for Professor Cox. He says he's planning to have a slightly more relaxing 2013, but it doesn't sound overly laid back. "I'm excited about getting down to doing research on some esoteric bits of quantum theory and I'll be back lecturing first years in the autumn. Oh, and we're starting another big series which is almost a Civilisation type series."

And with that he's off, with a big smile, to "do some physics".

Our man in Brazil

Alan Charlton studied linguistics at The University of Manchester. He has been in the Diplomatic Service for 34 years and the British Ambassador to Brazil since 2008. We caught up with him in Brasilia to find out about the burgeoning science and innovation links between Brazil and the UK and how the Olympics have strengthened the countries' relationship.

What are the milestones that stand out in your career?
To choose one thing would be to suggest that the others weren't amazingly important, but you can't have lived in the period I've lived in and not regard the fall of the Berlin Wall as an absolutely seminal event. To have been working in Berlin before, during and after that was an amazing experience. It seems incredible to me that it's over 20 years ago and there are people now at The University of Manchester who weren't born then!

Being Ambassador in Brazil and having a role in creating something new between the UK and Brazil is also really important to me. The UK has a great history in Brazil. We were important in helping Brazil to become independent and to develop in the 19th century. As with a lot of other areas we tended to draw back after the Second World War, but in recent years we've been having a push to put Britain back in the forefront in Brazil. We're now regarded as an important partner and I hope this will be a good legacy when I leave here in a few months' time.

How important are the links between the UK and Brazil in science?
It's well known that the UK has very strong science links with countries like Germany and the US but it's perhaps not so well known that Brazil has world-class science in many areas, particularly in fields such as agricultural research, and we have been trying to make the most of that.

> "As an Embassy we're in a position to improve the science co-operation between the two countries."

As an Embassy we're in a position to improve the science co-operation between the two countries. It's not just an academic issue; it's also an innovation and business matter. The Brazilians see us as a country that is not only very good at doing science but also at implementing it. Lots of our universities, including Manchester, have been doing a great deal recently to improve their links with Brazil.

Bridging the gap – the Embassy works hard to improve science links between Brazil and the UK. Brasilia Bridge, Brazil

We have been working very hard to support Brazilian and the UK universities and research councils and also British business develop partnerships. We now have an innovative framework with São Paulo, which means that universities and research institutions in São Paulo and UK can put forward joint projects to be assessed by joint peer review. In other words they don't have to go through one system in the UK and another in São Paulo. The state of São Paulo is vitally important as it represents a third of the whole economy of Brazil (worth more than Argentina and Chile put together) and has one percent of its revenues hypothecated to scientific research. The UK is the leader in the world in joint projects with the science body of São Paulo.

Another fantastic project is the Science Without Borders (SWB) programme, which the Brazilian President herself launched. SWB encourages larger numbers of Brazilian students of science and engineering, maths and related disciplines to go abroad to good universities around the world. We're working hard, together with Universities UK, to make sure that we get the benefit of this. The Brazilian government and private industry fund all these students. It's also a launch pad for universities like Manchester to strengthen their connections with Brazilian universities and to build up valuable contacts for the long term.

We're definitely in expanding mode here in Brazil. It's not only through things like SWB. There's much more we can do to improve our links and The University of Manchester has been innovative in this. The Manchester Business School, for example, has a course in Brazil. It's not straightforward to do business here, but they've found a way of doing it! I'm always very happy to see delegations from Manchester and elsewhere and support them in any way that I can.

> "I can't possibly get over to you the strength of the relationship that's built up because of the Olympics."

You're in the middle of the UK Brazil season of the GREAT campaign which is showcasing the best of UK in Brazil. How's this going?
I can't possibly get over to you the strength of the relationship that's built up because of the Olympics. People in Brazil have been looking to London as a model for their Olympics and we've been working with them in every possible way in the spirit of the Games.

We had a hand over event in November with all the senior people from LOCOG and the Olympic Delivery Authority. And it's not just about sport; a lot of our companies have won business as a result.

It's enabled us to branch out into all sorts of unexpected areas. In our UKBrasil season following the Olympics we had a touring science exhibition, for example, and Anthony Gormley came over which was great fun: some of his statues can be seen standing around Brasilia at the moment.

Has the Olympics changed the relationship between Brazil and the UK?
It's been very important indeed. I was standing next to Dilma Rousseff, who is now President, when the envelope was opened saying Rio De Janeiro had won the bid for the next Olympics. We decided there and then that we were going to devote ourselves to making the most of the co-operation.

The Brazilians have appreciated it and were impressed by what we did in London. This impacts on science and innovation too because they've seen a lot of the work that made possible the innovative games we created. It's been good for the UK reputation and it's been great for the relationship between the UK and Brazil.

A reception held for University of Manchester alumni, as well as current students on the MBS Worldwide Global MBA programme, in the British Centre (Centro brasileriro britanico) in São Paulo

Science Without Borders - EPS goes global

***Manchester 2020*, the University's strategic vision, sets out the ambitious next stage in its strategy to become one of the top 25 research universities in the world. High on the agenda is Internationalisation, and the Faculty of Engineering and Physical Sciences has appointed Professor Stephen Flint, pictured below, to ensure it has a global reach in its research, teaching and social responsibility.**

"Internationalisation is an interesting word in a university context; ask a room full of people from across the University what it means and you get a range of answers. Some think about international student numbers, others about a more international staff base and internationalising the campus. Others see it as increasing our research income from international sources, and moving away from such a reliance on UK research councils is one of my priorities, as it's unlikely that the UK funding pot will grow. When you start to put these different threads together you begin to come up with coherent plans.

"When I joined the University in April 2012 the role as Associate Dean for Internationalisation was part of my job, and from the beginning it was an appointment with half of my time spent as a Professor of Geology and half as Associate Dean. I was drawn to the role because my own research as a geologist has always had an international focus. I work with many international PhD students too, so forging global links has always been part of my job.

"Growing research income from overseas is a high priority for the Faculty and the University as a whole, and we are forging new partnerships in order to realise this ambition. Take Brazil as an example; its government has imposed a levy on the energy industry, so 1% of its turnover has to go towards research and development, and that's a big number. It also wants 100,000 of its students to go abroad for international experience, so we've been trying to work together to build something unified.

"The idea is that we build research links with Brazil's top universities and academics and in November 2012 I travelled to Brazil with 13 academics from the Faculty, where we started this process. We want to get research projects off the ground, and to do this we need PhD students. A Brazilian government project called 'Science Without Borders' pays for Brazilian research students to come to the UK for four years, and we see this as a way to build long term research links; once students and academics begin to work together they will perpetuate that relationship.

"These trips gave us a unique opportunity to build links. Five minutes with the right person can save months of email correspondence!"

"Science Without Borders is an initiative that's been personally championed by the President of Brazil, Dilma Rousseff.

"Our link came about through an initial Faculty mapping exercise to establish which academics already had links with institutions in Brazil. We were able to identify the best universities in Brazil in terms of strategic partnerships, but also we were able to utilise UK government policy and ministerial visits to which universities were invited.

"In 2011 Deputy Prime Minister Nick Clegg and Universities Minister David Willetts travelled to Brazil and were joined by Dean of the Faculty, Professor Colin Bailey, and during a follow up ministerial trip in 2012 I was able to join Colin and the Prime Minister, David Cameron. These trips gave us a unique opportunity to build links with government agencies, companies and universities. Five minutes with the right person can save months of email correspondence!

"We've focussed on a small number of universities in Brazil which have complementary profiles to Manchester. Initial partners include the University of São Paulo, Campinas University, the Federal University of Rio de Janeiro, the Federal University of Rio Grande do Sul and the Federal University of Minas Gerais. In a number of areas we are forging triangular partnerships that include an industrial partner such as Petrobras and Embraer. In good EPS manner, all of our initial research proposals are cross-School, many involving our interdisciplinary Institutes.

"Of course different countries have different challenges, and the trick is to have a portfolio that's not too broad. Like all universities we have many successful collaborations with China, but strategically we need to ensure we are not too reliant on any one country because things change."

Professor Flint is clear on the benefit of these relationships for Manchester students "In an increasingly globalised world we have a responsibility to our own students to turn them into good global citizens. How do we do that? With our taught degrees we need to make sure our curriculum is internationalised, so having more international staff here and visiting staff via these links exposes our students to that. Important too is having students from other countries in the mix, which gives our students the opportunity to spend three years or more in a very mixed global community."

"A global university like Manchester needs to ensure it is looking for the best minds wherever we find them. If not employing them here, then we are forging links with them and their institutions or industry to form long lasting and mutually beneficial partnerships."

Professor Flint is also involved with other internationalisation priorities across the Faculty and University. "I work closely with International Development colleagues at the University and see myself as supporting them as they are the experts in large scale recruitment.

"I'm able to lend a hand where necessary in the Faculty's transnational education projects, such as Professor Andy Gale's project management distance blended learning course. This MACE course is supported by Rolls Royce in Manchester, Chicago and Singapore.

"It's less than a year since I began in this role, and we are definitely concentrating on the research side of things at the moment, but I do see the role as covering all aspects of internationalisation. Wherever possible it's important to knit everything together as there is a chain reaction; today's Brazilian student abroad might be one of our PhDs in three years."

"In an increasingly globalised world we have a responsibility to our own students to turn them into good global citizens."

With academic and research staff at the University working hard on their respective projects it can sometimes be difficult to begin new strategic projects and gain 'buy in'. "There are not many people sitting around the University waiting for something to do; their lives are already so full, but we point out the opportunities, and Brazil ticked many boxes for many colleagues. If each School in the Faculty has three or four staff that can take hold of a project we can be up and running quickly. Our 2012 visit was really positive, and all of the staff came back and began immediately working on the next stage. By Christmas we had a range of follow-ups already planned, booked and funded for early 2013, so we have managed to keep the momentum going."

Is Manchester leading the way in internationalisation? "I think we are catching up with some institutions that hit this road earlier. Our projects are going well and I think our approach is the right one. There's no point in travelling to other countries if there's no commitment to see things through – that's how the real success will come.

What's the impact of this role on Professor Flint's research? "It's had an impact, but for the good. Sometimes I'll be the face of the University and I have to remind myself that I am the face of a subject area too, and I am allowed to talk about that! When I visited Rio Grande do Sul, I was able to slot right in as my research has taken me there before, and I had a morning on geoscience! My research has a real international bias, so the two roles slot together perfectly."

What's next? "In spring 2013 I will be part of the first UKTI mission to Libya since the war, and we will be looking to rebuild links that were put on hold by the conflict. The Schools of Materials, Chemistry and EAES have worked on projects with Libyan counterparts in the past, and part of my role will be to re-establish these links, and forge new ones. I am also representing EPS on a University level working group to develop our strategy on the USA – a crucial but very different challenge!"

Laying the Foundations for Success

This year more that 330 EPS students are studying on a foundation studies programme. This is likely to grow to 400 in the next couple of years. The programmes are designed for students who haven't got quite the right qualifications to be accepted directly onto an EPS course. If they are successful in their foundation year they are guaranteed a place on an undergraduate course. Dr Claire Nedwell has been the Director of Foundation Studies for 12 years. She tells us in her own words, why foundation courses are so important to the University.

There are two strands to foundation studies at Manchester: Engineering with an integrated foundation year and Science with an integrated foundation year. The engineering course leads on to all our engineering programmes and the science one leads on to any of our physical science programmes.

The purpose of the foundation year is to give students an opportunity to come into this Faculty who would not otherwise be able to be offered a place. So, for example, we have students who have taken all arts A-levels, have done very well but have then decided that they want to become an engineer or a physical scientist. We have a lot of students who've taken physics to A-level but have no Maths beyond GCSE and they can't be offered a place on first year courses. It's still very much for academic high flyers.

About a third of the course are international students, who finished their education at the end of our Year 12 and they are not, therefore, as geared up as an A-level student would be who finished their education at the end of Year 13.

I've been Director for 12 years. When I started at UMIST the programme only had 39 international students. I was appointed to revive it. We redesigned the whole programme, opened it up to home students and it quickly proved to be very popular and successful.

One of its specific roles this year is widening participation. It's likely that students who come under the widening participation banner won't get the grades to go into our first year because our first year entry standards are so high. The foundation year is a very good option for them.

> **"The focus is on making the students feel valued. They get exactly the same experience as any other undergraduate student ."**

Foundation years are not unusual but the way we do it at Manchester is unusual. Other universities have agreements with local FE colleges, which deliver the foundation year. We take a completely different approach and deliver the courses ourselves. The School of Maths, for example, teach all the maths units, the School of Chemistry teach all the chemistry units. We take it very seriously.

The focus is on making the students feel valued. They are taught by the University, on the University campus and, as such, they get exactly the same experience as any other undergraduate student within the University. And we believe that's really important.

Once the students move on to the first year of their degree they progress very well indeed, which is why the admissions tutors welcome them with open arms.

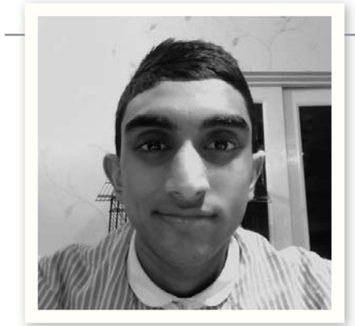
In these difficult times, this is an excellent source of good students, who perform well when they get onto their degree programme. I thought when the £9,000 fee came in that my home student numbers would suffer dreadfully, but not at all. I could have got many more than 330 foundation studies students this year.

Generally, an ex-foundation year student is better prepared for first year than an A-level student. They are more rounded, they've been at university for a year already, they know their way around and they're confident.

We don't teach the students just to pass exams. We teach them to think and apply their knowledge. When they go into first year and the level of work notches up, they've got the right mind-set to deal with it.

It's wonderful to see the students move on. They drop in to the office to see us and that's a massive buzz. One young man emailed me a few months ago to tell me he'd been made first-year undergraduate of the year for computer science. He said "I thought I'd let you know because when you interviewed me you said you were going to take a risk on me. Please take a risk on somebody else as well." That was lovely.

Three scholarship students describe their experience of foundation studies and how it helped them fulfil their potential.



Usman

BEng (Hons) Engineering with an Integrated Foundation Year

I chose The University of Manchester because it is one of the most recognised universities in the world and it has some of the world's leading research. The University gets better every year and it gives me the best university experience. Also, diversity is highly valued at Manchester University so no one feels discriminated against in any sort of way.

Without the Foundation Year I would not have been able to study here as I had no maths A-level. The foundation year helps students without the correct qualifications to solidify their study. I was very grateful for this opportunity as it's preparing me for my desired career.

Being a foundation year student feels like being any other student. All the staff and students make you feel this way and this really helps to give you the motivation to succeed.

The scholarship makes a vast difference to my university experience. It gives me the ability to spend more hours on university work rather than earning money. It helps with transport, food and even socialising with friends.

The foundation year covers more than core studies of the required field e.g. science for engineering. It also focuses on giving presentations in class and getting used to software. It's definitely giving me a head start, as well as an insight in to what to expect from the course next year.

Each of my teachers has had huge experience in their field and many have their own unique teaching methods. They are always on hand for support in class or by email to provide detailed solutions to questions or just give general advice.

Mohammed

BEng (Hons) Aerospace Engineering with an Integrated Foundation year

I am from Oldham and was a student on the Manchester Access Programme. This gave me a taste of university life and encouraged me to apply to Manchester as it was close to home as well as being highly regarded in my chosen discipline.

The foundation course is allowing me to enter my chosen discipline with a guaranteed conditional offer. The material is closely related to my intended degree, and will be very beneficial when the time comes to apply my knowledge. Also, I won't have to adjust to university life next year so I hope to be able to focus fully on my course.

Doing the foundation year programme has made me feel a lot more confident about university and it's great that I can make friends who I might collaborate with later on in my degree.

I can prepare myself for exams a lot better now that I've become accustomed to learning in the lecture and tutorial format rather than a classroom format.

The scholarship is such a big boost. It gives me a lot of flexibility to be able to try and enjoy new experiences at Manchester.

Although it has taken some getting used to the lecturers' methods of teaching, they are not just experts in their fields, but also very passionate about the subject they teach.

I'm a student ambassador, which is great because it allows me to connect with prospective students and encourage them to consider applying to The University of Manchester.

I want to do the best in my degree and carry it on till at least a Masters, but I'm also contemplating doing a second degree in a completely different field.

Haider

MEng (Hons) Electronics System Engineering with Industrial Experience

Without the foundation year I would not have got a place here even with the Opportunity Manchester Scholarship. It was much more useful than I originally thought it would be.

As well as the necessary science, the Foundation Year also introduced me to non-science subjects such as Communication Skills, which encouraged us to work in teams, to make presentations, and write reports etc. Not having done essay based subjects since GCSE, it helped me to build a steady foundation and gave me more confidence in referencing, structuring essays.

From the very first day the staff at the Foundation Year Studies emphasise the point that they designed the course so that you feel like a real undergraduate student at the University.

The scholarship helped tremendously in all areas of life; academic, social life etc. I was able to buy tools to help me advance in my studies such as a laptop.

It also helped me to fund my trip to China for an internship, which in turn helped me apply my knowledge from lectures in real life as well as giving me experience to secure another work placement over the summer. It's given me opportunities I could not have dreamt of.

I recently joined the Manchester Entrepreneurs and The Manchester Trading and Investment Society. This has given me a whole new outlook to life and what I can do with my engineering degree. I'm also the Vice Chair of the EEE Society. We put together socials and come up with ways to engage the student body by putting on trips, sport tournaments, an Annual Ball and industry visits.

I am hoping to get some experience with big Engineering companies in the UK as well as internationally. Ideally, eventually I'll start an Engineering consultancy or engineering based business.

Where are they now

Our 2007 graduates left the University during a time of economic uncertainty as the recession was about to hit hard. By the end of the year unemployment levels in the North West were at 4%, house prices fell, repossessions soared, and we had the wettest summer on record, but how did they fare after graduating?

Kate Berry

Kate graduated from her BSc Design Management for Fashion Retailing with industrial experience degree in 2007, and was offered a job with Debenhams. She decided to defer and go travelling, and when she returned to the UK she took a different path. Kate became a trend researcher for design agency FITCH in London, but after two years took the brave decision to go freelance as a photographer.

Although I hadn't planned to, I went travelling just as the recession hit, and returned as the country was emerging from it. When I got back to the UK I was offered my current position, but initially it was on a temporary basis.

I'm from Liverpool and wanted to stay up north and study in a big city, and I knew that Manchester had one of the largest student populations in the country.

I loved Manchester and my degree course which came with a balance of creativity and the nitty gritty of business management. I look back with fondness; the amazing and affordable city, knowledgeable staff with commercial experience, and a degree that helped me to get straight out in to the working world. They were the happiest days of my life so far!

In the next five years I want to continue building my photography portfolio and to begin working in editorial, with some travel thrown in. Hopefully you'll soon find my photographs in the glossies!

Owen Tonks

The idea of coming to a big university in a big city drew Owen to Manchester, as well as being able to study BSc Geography and Geology in combination. He knew of the University's good reputation, so travelled from London to study here.

After graduating I was unsure of my exact career path and began by applying for jobs within the marketing, PR and communications industry. I got a job in the communications division with the Department of Health, after which I embarked on a Postgraduate Diploma in Journalism in London.

I then undertook several paid and unpaid roles as a journalist at *Star* magazine, *Digital Spy, MSN* and the *Croydon Guardian*. I'm now working at the *Daily Mail's MailOnline* as a showbiz reporter, and I also work freelance for a number of other organisations.

It was difficult for me getting a job as there was lots of competition. I just had to be patient and determined; there were lots of redundancies in the media industry, and so more people were competing for fewer jobs. Given my time again though, I would have made the same choices.

My degree gave me many transferable skills, not least essay writing, in preparation for a career in journalism. Doing a degree helped me to plan and be organised; skills that are prerequisites in journalism where the work is pressured and often to tight deadlines.

Manchester still holds a place in my heart. It's a vibrant and friendly city and university, and I'm still in touch with several fellow students.

Riaz Akhtar

Riaz moved from Birmingham to study both his MEng in Biomedical Materials Science with industrial experience (2003) and his PhD in Materials Sciences (2007). The University's reputation and vibrancy were what drew Riaz to the city and the University. His brother studied here too.

I started my working life at The University of Manchester in 2007 as a postdoctoral research associate, and secured a British Heart Foundation Research Fellowship. This gave me the opportunity to gain additional skills in cardiovascular medicine, whilst using my engineering and physical sciences experience to address clinical problems related to arterial stiffening and diabetes.

The collaborative nature of research at Manchester meant I was working with scientists and researchers from across all sciences. I also did some teaching which prepared me well for my current role as a lecturer at The University of Liverpool.

I decided to stay in Manchester and commute to Liverpool, partly because I've got lots of friends here, which were made throughout my time at the University. I'm still a visiting scientist here, and come back for regular meetings, and I'm also involved in some research projects here.

The University has given me such great opportunities and it's an exciting place to learn. Over the next five years I hope to continue my academic career and remain involved in cutting-edge research.

Patrick Griffith

Although born in Stockport, Patrick spent his childhood in Dubai and returned to his native Manchester to study. He chose to study both his BEng Mechanical Engineering (2007) and MSc Nuclear Science and Technology (2009) at The University of Manchester because of the quality of education. He currently lives in Paris where he is employed by EDF as a nuclear safety case engineer involved in EPR projects in both France and the UK.

After graduating with my MSc, I was recruited by EDF to work in Paris at one of five offices that make up the engineering division of EDF in France. I'm due to rotate to a new position in the next twelve months which could take me back to the UK or elsewhere in Europe.

During my undergraduate studies I didn't give much thought to life in the real world outside of university. However, during my MSc I began to think seriously about my future and the impact the recession might have on my career choices. The economic climate at the time resulted in more graduates competing for fewer jobs, so competition was fierce. Fortunately the nuclear renaissance was beginning and the nuclear industry was starting to grow again after years of stagnation, so I felt lucky to secure a job with a large and respected organisation in a growing industry.

Manchester is where I met lots of my friends with whom I will be friends for life. The best moment of my time at Manchester was when I had the opportunity to use a small test reactor. It was a real vindication of everything I had learnt up to that point. My worst moment was when I graduated, and realised I was no longer a student! My time at Manchester definitely marked my transition from child to adult.

2007 was the year that…

Apple Inc's CEO and founder, Steve Jobs, announces the first generation iPhone.

Graphene is born - Nature magazine reported that physicists at The University of Manchester had created a new kind of a membrane only one atom thick.

The final book of the Harry Potter series, *Harry Potter and the Deathly Hallows*, is released and sells more than 11 million copies in the first 24 hours, becoming the fastest selling book in history.

Dr Brian Cox helps director Danny Boyle (whatever happened to them?) bring sci-fi film *Sunshine* to the big screen.

India won the inaugural 2007 ICC World Twenty20 Cup, beating Pakistan in the final.

Manchester United retain the Premier League title, winning the competition for the tenth time and becoming champions of England for the seventeenth time in all.

Britain's leading novelist Martin Amis is appointed as a Professor of Creative Writing at The University of Manchester in his first teaching post.

Roger Federer wins his 5th straight Wimbledon Men's Singles title.

CEAS's Aline Miller receiving the Award from Professor Dame Julia Higgins

Equality Achievement recognised by major award

The School of Chemical Engineering and Analytical Science (CEAS) was presented with its Athena SWAN Silver Award by Professor Dame Julia Higgins at an awards ceremony in Belfast in September.

The Athena SWAN charter recognises the commitment to gender equality, good management practice and the advancement, and promotion, of careers of women in science, technology, engineering, maths and medicine (STEMM) in higher education. The achievement of CEAS is particularly outstanding as it went straight to Silver – illustrating that the School not only "talks the talk" (Bronze) but it also "walks the walk".

One of a small group of elite Chemical Engineering departments within the UK, CEAS's success capitalises on the diverse range of activities and development of good practice initiatives. These have produced a culture change beneficial for all staff within the School – helping promote a healthy work-life balance and helping staff manage their workload alongside caring responsibilities, while improving the teaching and research quality – and include:

- aiming to schedule all meetings and seminars between 10am and 3pm;
- introducing a postdoctoral forum;
- ensuring female representation during student and staff recruitment;
- establishing a workload model and a return to work policy to help those returning after maternity leave.

CEAS has a buoyant cohort of female UCAS applicants, undergraduates and postgraduates, which is either equal to or above the national average for the discipline. It also has good representation of female staff at all levels, in particular the proportion of female professors is twice the national average.

The School is committed to further strengthening and supporting its female representation at all levels – achieved by, for example, expanding outreach activities, ensuring gender balance in all promotional material, encouraging participation in development opportunities, offering strong support for flexible and family friendly working practices and helping those who return from maternity leave by ensuring they have protected research time.

Royal honour for School of Physics and Astronomy

The University of Manchester's School of Physics and Astronomy has been awarded a prestigious Regius professorship by the Queen. Regius professorships are rare, and are awarded to institutions that have demonstrated an exceptionally high quality of teaching and research in a specific discipline area.

The School of Physics and Astronomy, which also operates the Jodrell Bank Observatory in Cheshire, is one of the leading physics departments in the world with more than 1,000 students, leading research projects in physics, astrophysics and astronomy, and significant public engagement activities. The School boasts world-leading staff in all areas of modern physics and has produced nine of the 25 Nobel prize winners associated with The University of Manchester, two of whom are among the current staff.

The inaugural Regius Professor of Physics at Manchester will be conferred on Professor Sir Andre Geim (above), who was awarded the 2010 Nobel prize for his work on graphene. Professor Stephen Watts, Head of the School of Physics and Astronomy, said: "Physics at Manchester has a proud tradition, starting with Rutherford and the discovery of the atomic nucleus, to the recent discovery of graphene. The School is proud of its world-class research, its impact on society, and dedication to passing that knowledge to the next generation. We are delighted these accomplishments have been recognised by the award of a Regius professorship by the Queen."

Professor Colin Bailey, Vice-President and Dean of the University's Faculty of Engineering and Physical Sciences, said: "It is a great honour to be bestowed a Regius professorship in recognition of the excellent education and research activities carried out by our staff in the School of Physics and Astronomy. Andre's passion for scientific research and education, together with its impact on society and the economy, is truly inspirational."

Professor Dame Nancy Rothwell, University President and Vice-Chancellor, added: "The University of Manchester has a proud and illustrious heritage in physics and astronomy teaching and research, so we are delighted that our past and present world-changing achievements have been recognised by such a prestigious honour bestowed by the Queen. Manchester remains at the heart of exciting new developments in science that have the potential to change the world."

Commenting on the honour, Professor Geim said: "The Regius professorship reflects the tradition of exceptionally strong physics at The University of Manchester. I am most honoured to play a role as the current figurehead for this century-long effort. I would like to express my deep appreciation to the University and School leadership for their efforts in gaining this hallmark."

A total of 12 Regius professorships were awarded by the Queen to mark her Diamond Jubilee. In the past, Regius professorships were created only when a university chair was founded or endowed by a Royal patron; each appointment is approved by the Monarch on ministerial advice.

Shirley award for outstanding scientific achievement

Carl Percival has received the 2012 Shirley award from the Advanced Light Source (ALS), Berkeley Laboratory for outstanding scientific achievement.

The award was given in acknowledgement of Professor Percival's team's achievement for making the first direct measurements of the reactions of Criegee intermediates, which showed that their impact on tropospheric chemistry and climate may be significantly larger than previously assumed.

Professor Percival worked with Dudley Shallcross from the University of Bristol, and Craig Taatjes and David Osborn, from the Sandia National Laboratories in the USA, to conduct studies of gas phase Criegee using a multiplexed photoionization mass spectrometer at Sandia. Although the atmospheric importance of these Criegee intermediates has long been postulated, this was the first direct measurement of the rates and products of their reactions.

The team's research was published in *Science*.

Royal Academy role for Colin Bailey

Professor Colin Bailey, Vice-President and Dean of the Faculty of Engineering and Physical Sciences, has been elected a Fellow of the Royal Academy of Engineering.

Professor Bailey is internationally renowned in the field of structural fire engineering, and was the lead expert in reviewing the structural fire design of iconic buildings in London, such as The Shard, The Pinnacle, Heron Tower and Leadenhall. He has also been an expert on a number of other projects, including explaining the collapse of the World Trade Centre following the terrorist attack in 2001.

In addition he has published 99 research papers and 11 design guides and has been awarded eight prizes for his work. He has developed the 'Bailey/BRE' design method, which utilises membrane action of floorplates to allow the optimum specification of protection to steel beams, within the fire safety design of buildings. The method has been used on a number of projects, with its use growing throughout the industry. The method was first presented in a research paper in 2000 and is now presented in industrial guides.

Professor Bailey entered academia from industry at the age of 35, when he was offered a chair in Structural Engineering. He has provided strategic leadership in the area of engineering in various roles. In his current role, as Vice President and Dean, he is responsible for 1,913 staff, 10,477 students and an income of over £200 million. He has been responsible for turning an operating deficit of £14.6 million into a £6.9 million surplus within two years. One of his major strengths is his understanding of all disciplines allowing him to bring together expertise to address the grand challenges facing society and the ever-changing needs of industry.

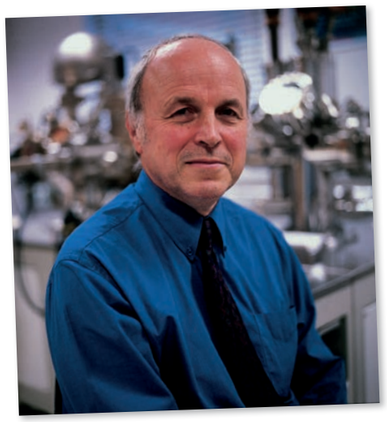
Professor elected President of The Mineralogical Society of America

David Vaughan, Professor of Mineralogy and Director of the Williamson Research Centre for Molecular Environmental Science at The University of Manchester, has been elected as the 2013 President of The Mineralogical Society of America.

This prestigious role has rarely been given to anyone outside of North America, and adds to Professor Vaughan's previous roles as President of the European Mineralogical Union and the President of the Mineralogical Society of Great Britain and Ireland.

As well as having a mineral named after him – Vaughanite – Professor Vaughan has been the recipient of many fellowships in mineral and geochemical societies across the world.

David was appointed to the Chair in Mineralogy at the University in 1988 and has presided over the School of Earth, Atmospheric and Environmental Sciences (SEAES) continuing international research and teaching in the Mineral Sciences – he was the principal investigator of the grant that led to the opening of the Williamson Centre of Molecular Environmental Science in 2002.



BP International Research Centre

President and Vice-Chancellor Professor Dame Nancy Rothwell with Chancellor of the Exchequer, George Osborne, and Bob Dudley, BP Group Chief Executive, at the BP-ICAM launch

BP is to establish a $100 million international research centre, known as the *BP International Centre for Advanced Materials*, or BP-ICAM. The centre will lead research aimed at advancing the fundamental understanding and use of materials across a variety of industrial applications.

The BP-ICAM will be modelled on a "hub and spoke" structure, with the 'hub' located within The University of Manchester's Faculty of Engineering and Physical Sciences, which has core strengths in materials, engineering, characterisation, collaborative working, and a track record of delivering breakthrough research and engineering applications that can be deployed in the real world. The "spokes" and other founder members, all world-class academic institutions, are the University of Cambridge, Imperial College London, and the University of Illinois at Urbana-Champaign.

BP's investment programme will span ten years, and will support around 25 new academic posts alongside 100 postgraduate researchers and 80 postdoctoral fellows.

The BP-ICAM will carry out research into areas of direct interest to industry; structural materials, smart coatings, functional materials, catalysis, membranes, energy storage and energy harvesting. Initially its work will focus on:

- Structural materials, such as new metal alloys and composites for deepwater production, and high pressure/high temperature reservoirs;
- Smart coatings, for increased protection from the elements and improving a structure's usable life, protecting pipelines and offshore platforms from corrosion;
- Membranes and other structures, for separation, filtration and purification of oil and gas, water and chemicals in production, refining and biofuels processes and petrochemicals.

This will allow BP to change the way it builds, operates and maintains its equipment; manufacture cleaner and more efficient products; develop imaginative energy sources and then store that energy for when it is needed most; and increase the use of lighter metals and composites for structures and products.

The UK Chancellor of the Exchequer, George Osborne, said: "We are ensuring the UK maintains its competitive edge in science and we are creating an environment where innovation can flourish. That's why top businesses such as BP are investing in the UK and supporting our world-leading universities in delivering cutting edge research. And as an MP for the North West of England I particularly welcome the fact that BP's International Centre for Advanced Materials will be based at The University of Manchester."

Bob Dudley, BP Group Chief Executive, said: "Advanced materials and coatings will be vital in finding, producing and processing energy safely and efficiently in the years ahead, as energy producers work at unprecedented depths, pressures and temperatures, and as refineries, manufacturing plants and pipeline operators seek ever better ways to combat corrosion and deploy new materials to improve their operations.

"Manchester has world-leading capabilities and facilities in materials and was chosen after a global search to act as the 'hub' of the centre, working with other world-class university departments. We look forward to deepening further the very productive partnership that already exists between our professionals in BP and the academic team at Manchester."

BP's Chief Scientist, Ellen Williams said: "We're very excited by the vision of taking advanced tools that were developed for fundamental research to the real-world application of materials used for energy production. Our engagement with these four universities demonstrates the importance both of research and of the innovation which can lead to advanced technologies."

Colin Bailey, Vice President and Dean of the Faculty of Engineering and Physical Sciences said "I am really pleased that BP has chosen The University of Manchester to be the Hub for the new BP-ICAM following a rigorous global review of expertise. The work we do on advanced materials underpins all our activities in engineering and science, covering all sectors. What makes Manchester distinctive is that we seamlessly work across disciplines, bringing together the skills and resources needed to address the challenges facing industry and society at large."

Saudi Arabia and Jodrell Bank collaboration

A collaboration has been formed between the King Abdulaziz City for Science and Technology (KACST) in Riyadh, Saudi Arabia and the Jodrell Bank Centre for Astrophysics, part of the University's School of Physics and Astronomy. KACST is an independent scientific organisation administratively reporting to the King of Saudi Arabia and is both the Saudi Arabian national science agency and its national laboratories.

Jodrell Bank has had a long-standing connection with Saudi Arabia, with a number of students studying at The University of Manchester to gain their PhDs in astronomy. The current collaboration formally began in 2008 when Dr Yaser Hafez, Head of Astrophysics at the National Centre for Mathematics and Physics at KACST and a Manchester alumnus, invited Dr Clive Dickinson, STFC Advanced Fellow and Reader in astrophysics here at Manchester, to Riyadh to discuss radio astronomy projects. During this visit, Dr Dickinson met His Excellency Dr. Mohammed Al-Suwaiyel (President of KACST), and His Highness Prince Dr Turki bin Saud bin Mohammad Al Saud (Vice President for Research Institutes) who has supported the official collaboration between KACST and University of Manchester.

"This is a unique opportunity to collaborate with Saudi Arabia, who are keen on supporting science and technology", said Dr Dickinson. "I am keen to foster the links between the UK and Saudi Arabia – we have a lot to offer each other. We have a great working relationship with Dr Hafez and Dr Hamoud Alharbi at KACST."

Two projects are almost completed and future projects are being planned, based on radio astronomy and applications of both science and technology. The first project, originated by Dr Hafez and Dr Hamoud Alharbi, is the design, construction and implementation of a small radio dish for observing solar system bodies very close to each other in the sky (for example, the Moon and Sun a few degrees from each other). The telescope will also be used for monitoring bright astronomical objects and training students and technicians in Saudi Arabia. The receiver consists of a 10.7-12.75 GHz satellite receiver coupled to a 3.8m radio dish that can measure continuum radiation from any location in the sky. The receiver and telescope were built and tested at Jodrell Bank Observatory by two teams led by Prof Lucio Piccirillo at Manchester and Dr Yaser Hafez from KACST. The telescope has recently been installed at its final location at the Solar Village, near Riyadh, Saudi Arabia.

The second project, led by Dr Dickinson and Dr Hafez, is the construction of an ultra-sensitive 5 GHz broadband polarization receiver that will be installed on a 7.6m radio telescope located in the Karoo, South Africa. This is part of the southern survey for the C-Band All-Sky Survey (or C-BASS), which will ultimately produce high signal-to-noise full-sky maps of intensity and polarization. The maps will be essential for cosmic microwave background (CMB) polarization experiments that aim to detect gravitational waves from the early universe. C-BASS is a collaboration between The University of Manchester, University of Oxford, the California Institute of Technology (U.S.), the Hartebeesthoek Radio Observatory (South Africa) and KACST (Saudi Arabia).

For more information about C-BASS, KACST or Jodrell Bank Centre for Astrophysics see www.astro.caltech.edu/cbass/, www.kacst.edu.sa, www.jb.man.ac.uk

Dual site for Square Kilometre Array

An agreement on the dual site solution for the SKA has been reached, marking a crucial step towards the development of the world's largest and most sensitive radio telescope.

Scientists, engineers, and industry partners from around the world are participating in the SKA project which is driving technology development in antennae, data transport, software and computing, and power. The SKA project has its headquarters at the Jodrell Bank Observatory in Macclesfield. The project has the potential to impact skills development, employment and economic growth in science, engineering and associated industries globally.

The majority of SKA dishes in Phase I will be built in South Africa combined with MeerKAT. Further SKA dishes will be added to the ASKAP array in Australia. All the dishes and the mid frequency aperture arrays for Phase II of the SKA will be built in Southern Africa while the low frequency aperture array antennas for Phase I and II will be built in Australia.

Minister for Universities and Science, David Willetts, said: "The decision for a dual site maximises the use of the investments already made in both locations. It also ensures that all the great experience already gained can be put to best use designing and delivering the next phase of the project, in which UK scientists will play a key role."

Richard Schilizzi, Professor of Radio Astronomy and Head of the SKA Group at the University, added: "The SKA will be one of the top global science projects of the 21st century. The findings of this project will benefit many other areas, such as information and communication technologies (ICT), wireless communication, sensor technology and renewable energy."

The Science and Technology Facilities Council (STFC) is providing funding for the UK's involvement in the project's detailed design phase. STFC also provides funding to support operation of the SKA Project Office, based at Jodrell Bank Observatory.

New centre to develop nuclear decontamination technologies

The University is to become home to a new £1.2 million centre to research the decontamination and safe storage of nuclear waste.

The centre will support Sellafield Ltd's Decontamination and Effluent Treatment Centre of Expertise by complimenting the University's existing research work at the world leading Dalton Nuclear Institute. It will also build on the research programmes at the University's Centre for Radiochemistry Research and the Research Centre for Radwaste and Decommissioning.

The aim of the collaboration is to develop new technologies, as well as enhance current understanding of key existing nuclear technologies and develop effective and sustainable decontamination approaches.

The establishment of this industry leading centre demonstrates the commitment of the University to support industry research and development needs.

Professor Andrew Sherry, Director of the Dalton Nuclear Institute said, "We are delighted to be working strategically with Sellafield Ltd in this important area. The research excellence in our laboratories at Manchester and at our newly opened Dalton Cumbrian Facility at Westlakes will provide the new understanding needed to deliver step changes in decontamination and effluent treatment technologies".

Some of the most complex engineering programmes in the world are taking place at the historic facilities at Sellafield as they are prepared for or are in the process of being decommissioned.

Alex Jenkins, technical specialist at Sellafield Ltd, said: "Sellafield Ltd is striving to significantly reduce the time and cost of the multi-billion pound decommissioning programme for the site by new developing technologies. We are looking at improved methods of decontamination and treating effluents and are working with The University of Manchester to develop research in this area and to efficiently focus skills and expertise in a bid to close the potential future skills gap in the nuclear industry."

Glove box at the Sellafield Ltd Decontamination and Effluent Treatment Centre

Over the next few years, 10 PhD students will be recruited to interdisciplinary research projects that will address important challenges for the UK, particularly in the areas of nuclear decontamination and effluent treatment. The students will benefit from the taught programme of the EPSRC Nuclear FiRST Centre for Doctoral Training.

Renewed EDF collaboration agreement

The University of Manchester has signed a global framework agreement with EDF, the leading electricity producer in Europe.

The agreement, between EDF Research and Development, EDF Energy and the University's Dalton Nuclear Institute, was signed in a joint meeting and provides a new framework for strengthening and extending the existing research collaborations.

The research partnership between the various divisions of EDF (EDF R&D, EDF Energy Nuclear Generation and EDF Energy R&D UK Centre), and The University of Manchester has developed over a number of years, incorporating a long-term collaboration in the field of computational fluid dynamics, extended later to research and development within the University's Materials Performance Centre and also the establishment of the Modelling and Simulation Centre in 2011, broadening the collaboration in solid mechanics with the joint appointment of a Professor and a Research Fellow.

The signing of this new collaboration agreement brings these strands together and demonstrates both parties' commitment to strengthen these activities and to extend R&D into related areas over the long-term.

Research covered under the new agreement will be managed through the Dalton Nuclear Institute, with R&D carried out within the Schools of Materials, Mechanical Aerospace and Civil Engineering and Electrical and Electronic Engineering.

Collaborative research will continue to focus on nuclear energy, concentrating on the extension of the life of existing nuclear power stations and the building of new reactors for the future, but will broaden into other areas of energy such as renewables.

To reinforce collaboration at strategic level two EDF Energy R&D UK Centre employees have been currently seconded into the University to facilitate the sharing of scientific knowledge and technical expertise to meet industrial needs. The agreement also includes PhD scholarships, post-doctoral research associates and internships.

Following the signing of the agreement, Professor Colin Bailey, Vice-President and Dean of the Faculty of Engineering and Physical Sciences said: "We greatly value our interactions with industry and have enjoyed our outstanding collaboration with EDF in the nuclear field. We look forward to building on this success and extending the collaboration into other areas of energy".

L-R, front row: Paul Spence, EDF Energy Director of Strategy and Corporate Affairs; Colin Bailey, Vice-President and Dean of the Faculty of Engineering and Physical Sciences and Bernard Salha, Senior Vice-President of EDF SA, President of EDF Research and Development, at the signing event

Great sadness at the death of Sir Bernard Lovell

Sir Bernard Lovell, Emeritus Professor of Radioastronomy, died on 6 August 2012 aged 98. He was the founder and first Director of The University of Manchester's Jodrell Bank Observatory in Cheshire.

Sir Bernard Lovell at the University

Born in 1913 in Oldland Common, Gloucestershire, Sir Bernard studied at the University of Bristol before coming to Manchester to work in the Department of Physics in 1936. During the Second World War, Sir Bernard led the team that developed H2S radar, work for which he was later awarded the OBE.

Sir Bernard returned to the Manchester Physics Department in 1945 and began work on cosmic rays using ex-military radar equipment. He brought this equipment to a University botany site at Jodrell Bank in late 1945, founding the world-famous Observatory.

Jodrell Bank is dominated by the 76-metre Lovell Telescope, conceived by Sir Bernard. He worked with engineer Sir Charles Husband to build the telescope which has become an icon of British science and engineering, and a landmark in the Cheshire countryside.

A hugely ambitious project, the telescope was by far the world's largest when it was completed in 1957 and within days tracked the rocket that carried Sputnik 1 into orbit, marking the dawn of the space age. It is still the third largest steerable telescope in the world and a series of upgrades mean it is now more capable than ever, observing phenomena undreamt of when it was first conceived.

Today the Lovell Telescope plays a key role in world-leading research on pulsars, testing our understanding of extreme physics including Einstein's General Theory of Relativity.

In person, Sir Bernard was warm and generous. He is survived by four of his five children, 14 grandchildren and 14 great-grandchildren. He retained a keen interest in the development of science at Jodrell Bank and beyond. Indeed he continued to come in to work at the Observatory until quite recently, when ill health intervened.

Outside the world of science he was an accomplished musician, playing the organ at the Swettenham Church for many years. He was also a keen cricketer, captain of the Chelford Cricket Club and past President of the Lancashire County Cricket Club. He was also renowned internationally for his passion for arboriculture, creating arboretums at both The Quinta and Jodrell Bank itself.

Sir Bernard's legacy is immense, extending from his wartime work to his pioneering contributions to radio astronomy, and including his dedication to education and public engagement with scientific research. A great man, he will be sorely missed.

President and Vice-Chancellor of The University of Manchester, Professor Dame Nancy Rothwell, said: "We are all greatly saddened by Sir Bernard's death. He was a towering figure, not just in Manchester or the UK, but globally. Sir Bernard leaves a fantastic legacy at the University's Jodrell Bank Observatory which is a world class centre for astronomy research, an iconic science monument, and a centre that attracts thousands of visitors and inspires scientists of the future".

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