



Department of Bioengineering Newsletter

May 2014

£40M gift for biomedical engineering at Imperial

by Jenna Stevens-Smith

EDITORIAL

This last couple of months has been another busy one for the Department of Bioengineering, Imperial College London and the discipline of bioengineering. In this newsletter we celebrate funding, academic successes, public engagement, and welcome new academics to the Department. We look forward to the next month which is full of events and the marks the end of another academic year for the undergraduate bioengineers.

Hitting the headlines this week was the notable £40m gift from Michael Uren OBE and his foundation. The donation will support the construction of the Michael Uren Biomedical Engineering Hub, a building at Imperial West, the College's new 25-acre research and innovation campus in White City, west London.

To clarify how the donation fits in with the Department.

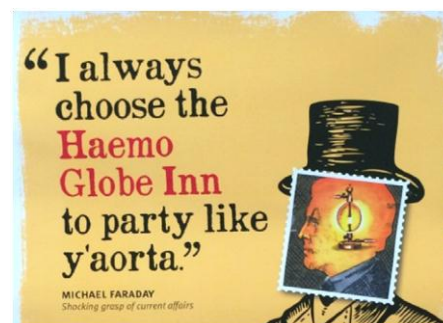
"The Biomedical Engineering Hub is a project led by the Institute of Biomedical Engineering (IBME). The Institute leads on interdisciplinary biomedical engineering research across Imperial College and includes centres such as the Medical Engineering Solutions in Osteoarthritis Centre of Excellence, the Centre for Neurotechnology and the

Royal British Legion Centre for Blast Injury Studies.

The IBME and Department of Bioengineering are closely related with education and training taking place in the Department, departmental research taking place in Bioengineering, and major interdisciplinary research taking place in the IBME. The Head of Department of Bioengineering is Director of the Institute of Biomedical Engineering."

In addition to this large donation our academics have also had a number of grant successes; the Department was well represented across the board at the Imperial Festival and is taking a leading role in the upcoming Medical Engineering Centres Annual Meeting and Bioengineering14.

IN THIS ISSUE



Festival fun

Find out what the Department got up to at this year's Imperial Festival

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The UK's largest ever gathering of Biomedical Engineers, Bioengineers and Medical Engineers with participants from leading academic centres and the MedTech industry.

MECbioeng14

Medical Engineering Centres
Annual Meeting and
Bioengineering14

10-11 September 2014 www.MECbioeng.org

The Annual Bagrit Lecture 2014

**On Thursday 5th June 2014
Professor George M Whitesides
will give the 2014 Bagrit Lecture.**

Bioanalysis: cheap, simple, medically relevant, and universally available

Abstract

Diagnosis of disease starts with observation and measurement. Biomedical analyses intended to aid diagnosis are important in determining treatment; they are also important in determining the cost of treatment (for better or worse), or of measures in public health. When diagnostics developed for use in the developed world are transferred into resource-limited environments, cost and simplicity of use are often critically important in allowing or denying their use to patients.

We are exploring bioanalytical methods that combine biomedical utility, affordability, and simplicity. The core technology uses paper patterned into hydrophobic and hydrophilic regions, to achieve control of microfluidic flows similar to (or in some cases superior to) those generated in) open-channel microfluidic systems. We also use other techniques—for example, electrochemistry, a technique with the advantage of easy connectivity to the web—for specific applications.

In this talk I will describe some of our progress in science and technology. I will also discuss a broader issue: viz., how to develop biomedical technologies whose objectives include cost and usability, and which are intended for both capitalist and socialist applications, starting with ideas in a research university.

Speaker biography

George M Whitesides received an AB degree from Harvard University in 1960 and a PhD from the California Institute of Technology (with JD Roberts) in 1964. He was a member of the faculty of the Massachusetts Institute of Technology from 1963 to 1982. He joined the Department of Chemistry of Harvard University in 1982, and was Department Chairman 1986-89, and Mallinckrodt Professor of Chemistry from 1982-2004.

He is now the Woodford L and Ann A Flowers University Professor in the Department of Chemistry and Chemical Biology.

Memberships and Fellowships: Member, American Academy of Arts and Sciences, National Academy of Sciences, National Academy of Engineering, American Philosophical Society; Fellow of the American Association for the Advancement of Science, Institute of Physics, American Physical Society, New York Academy of Sciences, World Technology Network, and American Chemical Society; Foreign Fellow of the Indian National Academy of Science; Honorary Member of the Materials Research Society of India; Honorary Fellow of the Chemical Research Society of India, Royal Netherlands Academy of Arts and Sciences, Royal Society of Chemistry (UK); Foreign Associate of the French Academy of Sciences; Honorary Professor, Academy of Scientific and Innovative Research (AcSIR), India.

Present research activities include: physical and organic chemistry, materials science, biophysics, water in biology, surface science, microfluidics, self-assembly, micro- and nanotechnology, science for developing economies, the origin of life, rational drug design, magnetic levitation, dissipative systems and emergence, complexity, and simplicity.

If you are interested in attending the event, details are below:

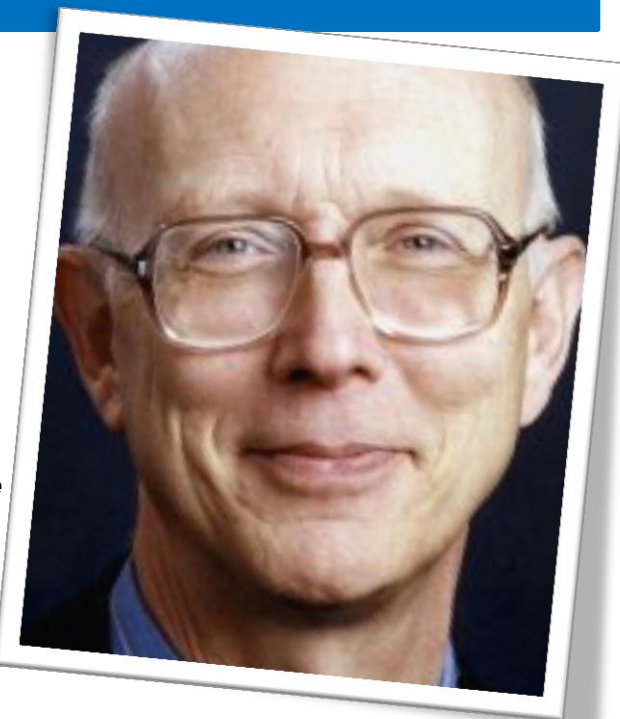
Date: 05 Jun 2014

Time: 17:30 - 18:30

Venue: G16 Sir Alexander Fleming Building

Campus: South Kensington Campus

Twitter hashtag **#BagritLecture**



Milestone for Medical Device MRes



6th June will mark an important milestone in the inaugural year of the innovative MRes in Medical Device Design & Entrepreneurship course. Students will pitch their impressive medical device business plans to the audience before networking and celebrating the first year of the course with colleagues, collaborators, industry and investors.

Professor James E Moore Jr (pictured) holds the Bagrit & RAEng Chair in Medical Device Design and the founder of the MRes in Medical Device Design & Entrepreneurship.

If you are interested in attending the event, details are below:

Date: 06 Jun 2014

Time: 18:00 - 20:00

Venue: Garden Rooms, 58 Prince's Gardens

Campus: South Kensington Campus

Twitter hashtag **#MDDEpitch**

Funding success

The Department is delighted to report the outcome of the second Imperial Confidence in Concept (ICiC) competition to support the College-wide development of novel devices, diagnostics and therapeutics for areas of unmet clinical need. A fund in excess of £1.2million was made available from the MRC (Confidence in Concept fund), NIHR Imperial BRC, Imperial Innovations, Wellcome Trust Institutional Strategic Support Fund and as well as support from NIHR BRC at The Royal Marsden and The Institute of Cancer Research. The ICiC scheme provides vital pilot funding to bridge the potential gap between discovery research and well-developed applications for MRC Developmental Pathway Funding Scheme / Developmental Clinical Studies Funding Scheme support.

Five academics from the Department were successful in their Confidence in Concept applications:

Dr Niamh Nowlan: A wearable sensor for monitoring fetal movements
With Dr Ravi Vaidyanathan (Mech Eng) and Prof Alison McGregor (Surgery & Cancer)

Dr Spyros Masouros: To develop bespoke 3D printed grafts (implants) for bony defects.

With Professor Jonathan Clasper, & Professor Justin Cobb (Departments of Bioengineering and Surgery & Cancer)

Professor James E Moore Jr.: Lymph Node Replacement Tissue Construct.

In addition to:

Professor Etienne Burdet alongside Dr Paul Bentley (PI) from Department of Medicine) and

Professor Molly Stevens with Professor Michael Levin, & Dr Philip Howes (Departments of Materials and Medicine)



Also in the Department...

Dr Reiko Tanaka RIKEN for PhD Studentship

Dr Paul Chadderton Medical Research Foundation Equipment Grant

Dr Simon Schultz GSK grant for Bioelectronics R&D Network

Dr Tom Ellis BBSRC grant for A High Throughput Miniaturised Mass Spectrometry Tool for Profiling Synthetic Design Libraries

Dr Robert Dickinson BBSRC grant for BaseHunter: a software tool for synthetic biology procurement

Kelvin Lecture Professor Richard Kitney

IET The Institution of
Engineering and Technology

Synthetic Biology - "One of the Eight Great Technologies"

In 2012 The World Economic Forum in Davos listed synthetic biology as an area which is likely to have major impact on the world economy in the future. What is the truth of this statement and what underlies the assertion? The lecture will address this question and put it in the context of the related science and engineering - and how this can be applied in relation to industrial translation. What are some of the key drivers of the field, why has this new field arisen in the early part of this century, and how is it different from traditional biology? These questions will be addressed in the context of the molecular biology revolution which occurred during the second half of the 20th century - and continues today. Many of today's important industries are based on oil. The model for these industries and industrial process is, in turn, based on developments in synthetic chemistry during the 2nd half of the 19th century and the first part of the 20th century. The demand for oil is increasing rapidly and alternative model for industrial processes

is now being developed, based on bio-based feedstocks and synthetic biology, with wide application. Synthetic biology aims to design and engineer biologically based parts, novel devices and systems - as well as redesigning existing, natural biological systems. It is the engineering of biology through systematic design and the application of the engineering tenets of modularity, characterisation standardisation. From an economic standpoint these developments are important because the new model translates very effectively in knowledge-based industries. For countries with few natural resources, but strong science and technology base, this is attractive model, because it represents a vehicle for new economic development. The lecture will address why it is possible to consider economic growth through synthetic biology today, why a number of countries are making significant public investment in the field and what is the vision for the future?



17th June 2014

18.00-21.00

Royal Institution, London, UK

Register online:

<http://conferences.theiet.org/kelvin/index.cfm?origin=meganav>

Bioengineering is here to stay

By Professor Anthony Bull and Dr Jenna Stevens-Smith

In this second article on Bioengineering at Imperial, Professor Anthony Bull and Dr Jenna Stevens-Smith follow the last article's description of the past fifty years of bioengineering with a look at the next fifty.

The last article described the history of the past fifty years of bioengineering, placing it into context, alongside the Imperial definition of the three pillars of bioengineering: biomedical engineering, biological engineering and biomimetics (biologically-inspired design). This article focuses on the next fifty years, highlighting a few key areas of development in bioengineering at Imperial.

The Department has five main research themes covering the breadth of the discipline and, as befits possibly the largest such department in the world, is able to go into depth in most of these. In addition to the research themes, the Department also leads on some major research centres that address current biomedical challenges. These centres work across engineering, medicine and the natural sciences and examples include the Centre for Neurotechnology, Medical Engineering Solutions in Osteoarthritis, and Synthetic Biology.

The most recent addition to this list is the Royal British Legion Centre for Blast Injury Studies at Imperial College London (CBIS), whose mission is to progress understanding of blast injury through research and education, in order to improve clinical treatment and rehabilitation and influence strategies such as equipment design. It is a unique centre in that the collaboration of engineers, biologists, physicists and medics is not only embedded in the civilian research world, but also serves as a research centre directly supported by the military. The clinical lead for the Centre is the Defence Professor of Trauma and Orthopaedics, Colonel Jon Clasper, and there is currently a handful of military medical officers conducting full-time research on the South Kensington Campus. Led by the Department of Bioengineering, CBIS looks at the effect of blast injury from cellular through to



whole organ and limb level, with research looking at a range of systems including: musculoskeletal, lungs, head (traumatic brain injury), nerve, testes, and hearing (noise-induced hearing loss). Research in the Centre spans a broad remit from understanding the mechanism that causes muscle cells to turn into bone cells in a condition known as Heterotopic ossification (HO), which is the process by which bone tissue forms outside of the skeleton, to testing prescription boots and blast mats for their ability to mitigate the blast transferred to the soldier in an armoured vehicle. A recent development is the extension of the work into blast injury rehabilitation in collaboration with Headley Court, the Defence Medical Rehabilitation Unit.

The Centre's work is a very real application of bioengineering to a topical issue and has already had quantifiable societal impact through influencing standards for vehicle testing, surgical training and medical care.

As such, this high profile work has attracted public interest from HRH Prince Harry, who officially opened the Centre's new laboratories on 17th October 2013, and Anna Soubry MP, Minister for Defence Personnel, Welfare and Veterans.

The Centre also works closely with charities such as Find a Better Way, founded by Sir Bobby Charlton (who also attended the official opening), which is a charity that helps civilian communities affected by the effect of landmines. This is a reminder that although there is an emphasis of CBIS on military blast, the research and subsequent findings are applicable to civilian scenarios such as impact injuries sustained through car accidents, plane crashes and other major trauma incidents including terrorist actions. The World Health Organisation state that 15,000-20,000 civilians are

killed through landmine explosions each year and each month there are 1,000 explosions across the world.

Another expanding field of research in the Department is neurotechnology. The Department has strength in the diversity of its research in this area, from Dr Aldo Faisal's eye movement work, Professor Etienne Burdet's rehabilitative devices and Dr Simon Schultz' research on "reverse engineering" the information processing architecture of the brain to investigate the basic principles of information-processing in cortical circuits.

There is set to be further development of this area of human-machine interfaces as our knowledge of the neuronal system develops alongside advances in technology. Some of the research into biomimetics falls under the neurotechnology banner, with Dr Holger Krapp researching the neuronal system of flies. Investment by the government and industry in the £10M Centre for Doctoral Training in Neurotechnology for Life and Health led by Dr Simon Schultz illustrates the recognition of the importance of this area to funders.

What is clear from all of these expanding areas is that bioengineering has arrived and is here to stay. It's recognised in four of the eight great technologies proposed by Rt Hon David Willetts MP in 2013, which include Big Data Revolution and Energy-Efficient Computing, Robotics and Autonomous Systems, Where Dry Meets Wet – Life Sciences, Genomics and Synthetic Biology and Regenerative Medicine. All areas which have seen further investment from the current Government. But we don't have to hear from government to know that bioengineering is important. Changing demographics, lifestyle and medical care as well as opportunities in the life sciences mean that bioengineering is set to grow from strength to strength.



Thinking Digital Conference

Susan Mulcahy, PhD student in Professor Boutelle's group, was an invited speaker at The Thinking Digital Conference this week in Newcastle/Gateshead where she spoke about brain injury, data & code to a packed house of over 300 delegates consisting of digital innovators, thought leaders and tech strategists from a variety of organizations including Google, Microsoft, The Open Data Institute and more.



Gates Cambridge Scholarship for Vasa, MSc Neurotechnology 2013

Congratulations to Frantisek Vasa who graduated from the MSc in Neurotechnology earlier this month. Frantisek has been awarded the Gates Cambridge scholarship, to undertake a PhD in Psychiatry under the supervision of Professor Edward Bullmore. You can read Frantisek Vasa's scholar-elect profile, where among other things, he mentions the Neurotechnology MSc:

<http://www.gatescambridge.org/our-scholars/new-scholar-profile.aspx?ScholarID=6130>

Investment in the future



When Graham Payton won the Caro Prize in South Africa, he didn't expect to be working alongside Professor Colin Caro himself. But the new PhD student who is the recipient of one of the prestigious Imperial PhD Scholarships has recently joined the Department to pursue his PhD with Professor Martyn Boutelle and Dr Emmanuel M Drakakis.

Professor Colin Caro gave a seminar by invitation on 10th March at Laboratoire d'Hydrodynamique, Ecole Polytechnique, Paris, entitled 'Haemodynamics and Vascular Pathology'.

Professor Colin Caro and Dr Jenna Stevens-Smith spoke at Harrow Boys School on Thursday 27th March. Colin spoke about 'Bioengineering, Arterial Fluid Mechanics and Arterial Disease' and Jenna more generally about bioengineering.

Success at Combined Services Orthopaedics Society Annual Meeting

This month at the CSOS annual meeting the Centre for Blast Injury Studies came away with prizes for best trainee, best paper and the first honorary civilian membership to the Combined Services Orthopaedic Society.

- James Singleton (MDRes) won best trainee
- Ed Spurrier (MDRes) won best paper
- Professor Anthony Bull awarded Honorary Membership of CSOS

UPCOMING EVENTS



There are a number of events coming up in the next month which may be of interest.

Women in Bioengineering Network lunch for PhD, Postdoc and Academic staff
23 June

Undergraduate open day is on 26-27 June

Headstart workshop 2-3 July

If you're interested in attending, volunteering or being involved in any of these events please contact **Jenna Stevens-Smith**.



Martina Wicklein inspires

Martina Wicklein and her team inspired the public with the wonders of flies at their stand in the Research Tent.



Robot Café talks enthused public

In addition to the activities on show in the Robot Zone throughout the Festival there was also two pop-up café talks by academics on each day.



Radcliffe stimulates sports innovation interest

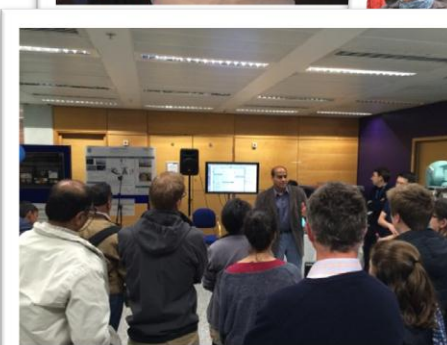
Projects from the IDE and undergraduate bioengineers were on show in prime location of the research tent. With Ian Radcliffe and some



Bioengineering Bang at Imperial Festival

The Department was heavily involved in the Imperial Festival this year, with three stands in the Research Tent, the RobotZone, Talkaoke and a number of talks.

Huge thank you to all of the activity leaders and volunteers who helped out at the festival.



FOR MORE INFORMATION

If you would like to be involved in future public engagement or outreach activities please contact Jenna Stevens-Smith

JENNA STEVENS-SMITH
j.stevens-smith@imperial.ac.uk

Festival Experience

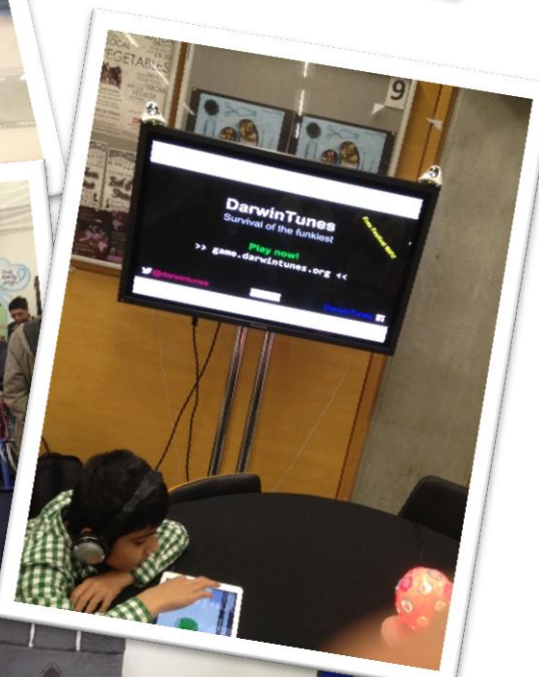
By Zahra, Marium & Zak Mohri

I visited the Festival with my 7 year old twins, Marium & Zak, for the first time on Saturday.

They really enjoyed the activities at the Skempton Building and were particularly fascinated when extracting DNA from strawberries and making wiggly jelly worms, which they found to be messy and fun. After making a water molecule with marshmallows as the atoms and spaghetti pieces as the chemical bonds, Marium said "can we eat the marshmallows now?"

Zak used a microscope to look at rock surfaces and was amazed at how an antibiotic tablet on a petri dish can get rid of germs (let's not talk about the sources of germs on various petri dishes which brought lots of giggles and laughs to their faces). They both found it very interesting to take a journey inside the human nose and make musical notes following Darwin's Tune (Survival of the Funkiest).

There was lots more to do, but we ran out of time. I am very grateful to the organisers and we will be back next year from the start of the event in order to play/learn more fun facts about science, human body, engineering and biology.



Success for Stevens



Congratulations to Professor Molly Stevens and her group who have had award winning success in the last couple of months.

Molly won the **Corday-Morgan Prize** from the Royal Society of Chemistry for her research in the field of biomedical materials, especially her development of nanoparticles and diagnostic platforms that can detect biomarkers corresponding to specific disease states such as cancer and infectious disease.

The Stevens Group has been named 2014 Research Group of the Year by the **European Life Science Awards**. The awards recognise the efforts/contributions of those in the life science field, and this award is given to the group that has demonstrated an unparalleled ability of excellence. The award recognises the fantastic achievements of the multidisciplinary Stevens group members in biomaterials development.

Professor Stevens was also recognised as one of **Cell's top 40 under 40** in the 40th Anniversary of the Journal. Molly was asked a number of questions as part of this recognition, including:

"Who are the scientists, living or dead that you admire? If you could, who would you work with?"

There are so many scientists that I admire—I think it's a little hard to list them here! If I am to really go back in time, then Leonardo da Vinci's polymath contributions were absolutely incredible and centuries ahead of his time. He was of course an amazing painter, amongst a myriad of other talents, but it is his innovative engineering designs that I like the best. He would be very high in my list of top scientists/inventors.

I'm also full of admiration for successful women in science that have transformed their fields while balancing a family (such as Athene Donald FRS and Uta Frith FRS) and then have taken the time to mentor other women.

I also love research into biomaterials that uses very elegant design principles—for example, research by Robert Langer, Jeff Hubbell, David Tirrell, and Chad Mirkin, amongst many others. I found the CLARITY procedure recently developed by Karl Deisseroth (to enable light microscopy mapping of connections in the intact human brain) to be a great contribution because it is so useful and so enabling.

I have many amazing collaborators around the globe. The research that my team does is so multidisciplinary that collaboration is an integral part of it.

I performed my PhD in the Laboratory of Biophysics and Surface Analysis at Nottingham University and received a great training in a multitude of really useful analytical techniques that have served me well since.

For my postdoc at MIT working in Professor Robert Langer's laboratories, I became exposed to the fascinating work of biomaterials design and regenerative medicine. I consider myself extremely privileged to have worked in such great places with terrific mentors.



Molly Stevens is a Professor in the Departments of Materials and Bioengineering at Imperial College and the Research Director for Biomedical Materials in the Institute for Biomedical Engineering. She joined Imperial in 2004 after a postdoctoral training at the Massachusetts Institute of Technology (MIT). Prior to this she graduated from Bath University with a First Class Honours degree in Pharmaceutical Sciences and was then awarded a PhD in biophysics from the University of Nottingham (2000).

LONGITUDE PRIZE 2014

Can you solve antibiotic resistance, paralysis, food, access to safe clean water, enable zero-carbon flight, help people with dementia live independently for longer?

One of these six challenges will be the focus of the Longitude Prize 2014.

How does the prize work?

Of the six challenges shortlisted by the Longitude Committee, the public vote for the challenge they think should become the focus of Longitude Prize 2014.

The vote takes place between **22 May and 25 June**, and will be held by the BBC on its Horizon website and by text.

The winning challenge will be announced on 25 June and will become the focus of the **£10 million prize fund**.

The Longitude Committee will then finalise the criteria for how to win the prize, and from September you will be able to submit your idea to win it.

The Longitude Prize will run for five years, or until the prize is won.

www.longitudeprize.org

£40M gift to create new biomedical engineering hub at Imperial

Imperial is to build a pioneering biomedical engineering centre thanks to an unprecedented £40m gift from Michael Uren OBE and his foundation.

The donation will support the construction of the Michael Uren Biomedical Engineering Hub, a building at Imperial West, the College's new 25-acre research and innovation campus in White City, west London.

The centre will house life-changing research into new and affordable medical technology, helping people affected by a diverse range of medical conditions. Imperial's world-class engineers, scientists and clinicians will work together in the new space and facilities alongside spin-out companies, helping to create a vibrant innovation district at Imperial West. The Hub will also incorporate clinical areas, providing patients with direct access to innovations in healthcare.

The building and its location will cement Imperial and the UK's position as world-leaders in biomedical engineering research and application.

Sir Keith O'Nions, President of Imperial College London, said: "Imperial is profoundly grateful to Michael Uren and his Foundation for this remarkable gift, the most generous it has ever received. It will create a wholly new building and set of facilities for engineers and medics to come together and make new discoveries and innovations on an unparalleled scale. It provides enormous impetus to the development of Imperial West as an

innovation district."

Michael Uren OBE said: "It is an honour for me to be able to help this great university. Medical teaching and research didn't exist at Imperial in my day, but it has evolved into an institution where the work between engineering and medicine is today one of its outstanding strengths. Imperial has always applied academic excellence for the greater good, and I am thrilled by the prospect of this Biomedical Engineering Hub doing exactly that.

"What I find so exciting about this project is that here is Imperial building one of the biggest research centres in the world within a few miles of the City of London, which itself has become the biggest financial centre in the world today. By putting the two together, what is quite clear is that the investment world will be watching for, and waiting for, the research and inventions which will create tomorrow's great companies.

"It seems to me that, in effect, what we are creating here is a new Silicon Valley London, which is bound to succeed. Imperial was inspirational when I first joined it as a young engineering student in 1940, when London was under attack every night, and it is inspirational today. May it continue to be so forever."

Michael Uren OBE, a 1943 Imperial graduate in Mechanical Engineering, founded Civil and Marine Ltd and built it into one of the UK's foremost innovators in cement manufacture. He is already regarded as one of the UK's most generous philanthropists in the fields of medical research, education, the armed forces and conservation of wildlife.

His previous multi-million support for Imperial includes the College's MSk Lab under the leadership of Professor Justin Cobb, whose focus is joint disease and the surgery needed to restore function.

Transformative impact

Professor Justin Cobb, Director of the MSk Lab at Imperial College London, said: "As a beneficiary of Michael Uren's generosity, I can attest to the transformative impact such support can have on biomedical research. The philanthropic vision that Michael Uren and his trustees hold for this new Biomedical Engineering Hub is laying the foundations for an exciting series of innovative partnerships.

"From our original narrow focus on joint disease and its huge societal burden, we are expanding to address other areas where human tissues fail. Engineering is now essential in this enterprise - it encompasses everything from writing computer code for neurotechnology devices, to the 3D bio-printing of replacement parts. The Michael Uren Biomedical Engineering Hub will create the environment where we work together to engineer these solutions. Our challenge is that of affordable healthcare - restoring patients' quality of life at a sustainable cost. The benefits of this donation will be felt for generations."

Imperial is already world-renowned for excellence in biomedical engineering research. Its Institute for Biomedical Engineering, founded in 2004, draws together expertise from across the College's Faculties of Engineering and Medicine, incorporating a wide range of collaborative networks and research centres.



Game-changing

The Mayor of London Boris Johnson said: "I am absolutely delighted at this extremely generous donation that will push forward research in an exciting and crucially important area of medical science. Biomedical engineering is improving treatments and quality of life for people affected by a diverse range of medical conditions and this new centre has the potential to benefit millions in the UK and around the world. This donation, coming so soon after the launch of MedCity, demonstrates unquestionably that London and the South East is one of the leading regions in the world for game-changing science."

The Legacy Challenge

By Elisha Chauhan

SportBusiness International Magazine

Two years on from the 2012 London Games, Elisha Chauhan finds out how medal supplier Rio Tinto's co-operation with Imperial College London is making positive waves for the Paralympic community.



Mining company and London-headquartered medal manufacturer's five-year partnership with Imperial College London, signed before the games, is steeped in CSR (corporate social responsibility).

Dubbed the Rio Tinto Sports Innovation Challenge, the partnership requires Imperial students to design and create equipment for disabled athletes to use in sports training and competition. The Challenge has been integrated into the existing curriculum for engineering students, with lectures and workshops organised each year with external speakers that include elite athletes, sports technicians and industry professionals.

"When the decision was made to take a sponsorship of London 2012, the question of legacy came up," Felicity Dunn, Rio Tinto's project lead, told SportBusiness International. "The benefits of the project are creating innovations in a completely different way, and also promoting awareness of Rio Tinto as a potential employer to Imperial students.

"We have a whole series of partnerships with universities around the world, but most of them focus on our mining industry, whereas the Imperial partnership was a conscious decision to do something different."

Professor Peter Childs, head of engineering design at Imperial College London, says the innovations that have already materialised from the project could have wide-ranging uses for the general public, let alone elite athletes.

"By working with the Paralympians, you set yourself a more challenging task because they are the extreme user," he says. "The likelihood is that any innovation for them could then cascade down into the wider disabled community.

"Any Paralympian will tell you that it's too expensive to buy sports equipment; because they are not mainstream, any products that are available to them are bespoke and super expensive. Also, when there are so many disabilities and each product is so niche, manufacturers haven't necessarily put in the effort to develop a solution for each."

One such of these developments is an underclothing full-body white suit that blotches pink dye in areas where an athlete has incurred a possible trauma due to the impact of a fall. This could also be used by the any paralysed person who may fall and is unaware of the extent of damage they have incurred.



Probably one of the most notable projects from the partnership is a bionic arm that was tested by Paralympic silver-medal cyclist Jon-Allan Butterworth (pictured), who has been able to shave up to three seconds off his lap times with the innovation during testing.

Another successful prosthetic that has evolved from the project is Murr-ma, which aids amputees to walk on the beach, in addition to allowing them to swim and surf.

"We would love to see innovations make it into the Paralympics, and one of our cycling projects is likely to do so," adds Childs. "I would also love to see a brand new sport in the Paralympics because of this project, such as the ice rower that allows a blind athlete and a paralysed or enabled person to compete alongside them because it is a two-person cart.

"We've had such a positive reaction from athletes and commentators in the press that we're building a slightly improved

version to compete with the first prototype. We will use elite athletes for that competition to generate a publicity storm to see if there's wider interest."



Engineering and Physical Sciences
Research Council

Have your say on EPSRC Grand Challenges In Healthcare Technologies

EPSRC's Healthcare Technologies Theme has invited the UK's research and user communities to help them develop a number of Grand Challenges. These Grand Challenges will be used to inform the future strategy and direction of the Theme.

They are interested to hear the views of researchers from all disciplines and career stages, as well as clinicians, industry and other relevant stakeholder groups.

They have launched web surveys to collect feedback on their initial list of ten Grand Challenges. You are welcome to complete as many of the ten surveys as you wish. The deadline for completion of the surveys is **09 June 2014**.

The initial ten Grand Challenges on which we are gathering input are:

1. Data analytics and digital infrastructure for healthcare;
2. Enabling technologies for regenerative medicine;
3. Engineering healthy behaviours;
4. Functional enhancement for safe and independent living;
5. Infection prevention and control;
6. Patient specific treatment;
7. Prediction and early diagnosis;
8. Smart surgeries and therapies;
9. Systems to support and improve healthcare provision;
10. Understanding and interventions in neurological function.

To feed into the survey go to:

<http://www.epsrc.ac.uk/research/ourportfolio/themes/healthcaretechnologies/strategy/grandchallenges/Pages/default.aspx>

Welcome to new academic

The Department is delighted to welcome Dr Claire Higgins to the academic staff.

Dr Higgins was appointed as a Lecturer in the Department of Bioengineering in April 2014. She joined Imperial after postdoctoral training in the laboratory of Prof. Angela Christiano, in the Department of Dermatology, at Columbia University in New York. At Columbia she received a Career Development Award from the Dermatology Foundation to research the 'Molecular basis of human hair follicle induction'. Claire obtained a Ph.D. in Skin Developmental Biology from Durham University in 2007, and holds a B.Sc. in Natural Sciences.

The main focus of the research group is to understand mechanisms of tissue development, and regeneration, both in normal conditions, and in response to disease or injury. The hair follicle is used as a model, as it is an accessible and elegant system to study organ regeneration.

Research into developmental, and regenerative processes means we can try and recreate them in a lab setting, and exploit the inherent properties of interacting cells to engineer new tissues and structures.

Hair follicles contain specialised cells located in a small mesenchymal compartment at the base of the follicle, termed the dermal papilla. Interaction between the dermal papilla and the bulge (the epithelial stem cell compartment of the follicle), drives the hair follicle cycle.



Work in the lab encompasses understanding how these cells acquire their specialised ability to instruct hair growth, in addition to elucidating the role of these cells in response to traumatic injury, and their behaviour during skin repair.

Recent Visibility of the Bioinspired VLSI CAS Group - "Circuits for/from Biology"

By Dr Emmanuel M. Drakakis

Drs. Drakakis and Georgiou of the BIOCAS Group were invited to give plenary keynote lectures on memristor research at the Torino "Memristor-based Systems for Neuromorphic Applications" organised by IEEE societies (Sep 2013). Their research on an alternative original mathematical framework for non-linear memristor dynamics was presented alongside recent research of Prof. Leon Chua, the genitor of the memristor field and a worldwide eminent circuit theorist who, among others, has introduced the famous Chua oscillator and the Cellular Nonlinear Network (CNN) computational paradigm. Miss Koymen from the BIOCAS Group also presented part of her research. Memristors are nanoelectronic components benefiting from synapse-like properties which may lead to the realisation of engineered brain-like circuits. The field has undergone explosive growth since the fabrication of a practical nanoelectronic memristor from Hewlett-Packard Labs in 2008. The Group's memristor research was also presented, following invitation by Dr. Karin Strauss-Head, at the Microsoft Research Center at Cambridge (Nov 2013). Drs Georgiou, Yaliraki, Barahona and Drakakis submitted Special Session memristor research (by invitation only followed by lecture presentation) to the IEEE International Conference on Electronics, Circuits and Systems (ICECS) – Abu Dhabi-Dec 2013.

An invitation by the Microelectronics Journal –Elsevier for the submission of a journal contribution to a Special Issue on Memristors followed. The paper has been accepted (May 2013), is led by Dr Georgiou and is the first one examining the reciprocity properties of memristors.

Dr. Drakakis delivered invited research lecture (Nov. 2013) and offered expert advice at the Dept. of Bioelectronics of Marseille-Center of Microelectronics in Provence which under the Headship of Profs. Malliaras and Owens specialises on novel nanomaterials and chemical principles for biosensing.

Dr. Drakakis delivered invited research lecture (Nov. 2013) at the Dept. of EEE of TU-Dresden-Germany following invitation by the Vice-Dean Herr Prof. Dr. phil. nat. habil. R. Tetzlaff, a world-renowned CNN expert. TU Dresden belongs to the Ivy League of German Universities.

Dr. Drakakis was invited (Jan 2014) by Prof. M. Sawan to contribute a chapter on "Oxygen Sensors and Circuits" for the Handbook of Biochips-Springer.

Drs. Rogers and Glaros from the Boutelle and Drakakis Groups took the lead on realising this. Dr Glaros (former PhD and current VR with the BIOCAS Group who currently works as a Senior IC Designer in industry) boasts the world's lowest power and best performance Pulse Oximetry front-end.



Dr. Yue (former PostDoc and current VR with the BIOCAS Group) and Dr. Drakakis organised a visit to the Dept by the Sharp Labs of Europe Ltd. – Health and Medical Devices Group, Chris Brown (Head) and Ben Hadwen (April 2014).

Dr Drakakis has acted as Review Committee Member (RCM) for IEEE International Symposium on Circuits and Systems (ISCAS 2014) (Nov-Dec 2013), as Scientific Committee Member (SCM) for IEEE Cellular Nanoscale networks and Applications (CNNA) 2014 (Spring 2014) and Organising Committee Member (OCM) for the Biosensors & Bioelectronics Conference San Antonio Texas where he will be delivering an invited lecture in August 2014.

Recently (May 2014) Dr. Drakakis was invited to join the Editorial Team of Frontiers for Neuromorphic Engineering as Associate Editor, following invitation by Prof. Giacomo Indiveri of the Institute of Neuroinformatics-ETH-Zurich.

Dr Drakakis is already an AE for IEEE Trans. On BioCAS and has been in the past AE for IEEE TCAS-1, AE for IEEE TCAS-2, AE for the International Journal of Electronics and Guest AE for IET El.Letters.



Congratulations

Congratulations to **Professor Peter Weinberg** who has been awarded the President's Award for Excellence in Research Supervision 2014.

Congratulations

Many thanks to the Staff-Student representatives for seeking nominations from the student cohort regarding this years Departmental awards.

A total of 53 GTA's were nominated for the GTA of the year award. The winner was **Yesna Yildz** who polled the greatest number of nominations and was endorsed by numerous positive comments.

The student cohort were also asked to nominate their Lecturer of the year. This led to three candidates for the award and a second round of voting. Despite more than 100 votes being cast **Martin Holloway** and **Dr Darryl Overby** could not be separated numerically. Therefore for the first time the Lecture of the year will be jointly held.

Congratulations to Yesna, Martin and Darryl who will receive their awards at the end-of-term on Research day.



Congratulations

Congratulations to all the postgraduate students who graduated on 7th May. The Department was delighted to here what you are now up to.

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