



# Imperial Bioengineer

July 2015

## Team Imperial is going for Gold at the Cybathlon

by Dr Aldo Faisal, Senior Lecturer and Team Imperial Captain

The Cybathlon, or "bionic Olympics", is a unique sporting event for people living with severe disabilities due to amputations or paralysis, who have previously been unable to participate in sport. Cybathlon enables them to compete in a range of challenges, with the help of the latest assistive technologies.

The first Cybathlon is taking place in October 2016 and among the 45 international teams, we have Team Imperial, led by the Department of Bioengineering. In the spirit of a Formula 1 team, our team consists of pilots, with a variety of disabilities and "pit crews" that develop, refine and prepare state-of-the-art biomedical technology to help the pilots succeed in the various disciplines: such as wheelchair races, Brain-Computer-Interface race, leg and arm prosthetics races and exoskeleton races for the paralysed.

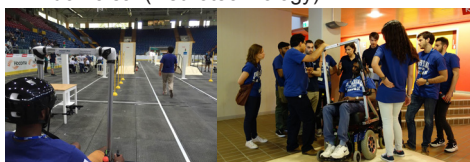
Among the 45 international teams Imperial have adopted a unique approach; involving both pilots and taught students in the development process from the start. This has led to three rather powerful experiences:

1. Our students were exposed to the challenges of movement impaired users and through the interaction gained valuable insight on how to focus and apply their skills to help the pilots and an appreciation of the value of Biomedical Engineering.
2. Our technology and pilots came together at the start of the process and this led several of our design choices, which made for better more targeted engineering.
3. We met teams from all around the world (Australia, Japan, US) and engaged in a friendly competition between students and academic staff in a very un-academic way! Thus this year and next year we will offer taught student Cybathlon projects.

Thanks to the support of Dr Ian Radcliffe, Project Manager, Sports Innovation Challenge we were able to field the largest team competing in the most disciplines out of 45 international competitors.



In July we had the unique opportunity to attend the Cybathlon rehearsal in Zurich. The team consisted of our two movement impaired pilots, Sivashankar and Jonathan, 12 taught students from the Faculty of Engineering including our very own 2nd year UROP's (Carys Moller, Biyuan Wang), 3rd year group project (Giuseppe Gava), MEng (Maria Freitas da Silva) and MSc students (Charlambos "Harris" Konnaris, Eduaro Gonzales Ponferrada, Guillem Single Buxarrais) and bringing together expert academic staff from diverse areas of Bioengineering, Dr Spyros Masouros (Trauma Biomechanics), Professor Etienne Burdet (Rehabilitation Engineering) and Dr Aldo Faisal (Neurotechnology).



The long-term goal is to use the championships as a platform to further develop assistive technologies for people living with physical disabilities, engage users and the public. It gave us a unique opportunity to link diverse areas of bioengineering together and engage students and users of bioengineering technology from the start, extending the Olympic spirit of participation. The team are off to a good start achieving "Bronze" with a wheel-chair designed for gaze-based control, while all other competitors used joysticks, not bad for a start!

## CSynBI and SynbiCITE UPDATE

by Dr Helen Findon, Outreach & Communications Manager, CSynBI

This week **Professor Kitney** spoke at the Activate! conference in Cambridge. The event, 'Reprogramming Life with Synthetic Biology', was presented by SynbiCITE and SynBioBeta and Professor Kitney spoke in a panel session which discussed how the UK is building an industry based on biological, instead of petroleum based feed stocks. Earlier in the month **Professor Kitney** travelled to Taormina in Sicily for the *Synthetic Systems Biology Summer School 2015* where he delivered sessions on engineering approaches to synthetic biology design. July also saw the 4th Annual Sc2.0 and Synthetic Genomes Conference in New York, where **Dr Tom Ellis** presented status updates on the ongoing Synthetic Yeast Genome Project, Sc2.0. Now well underway, the Sc2.0 international consortium is building 16 designer synthetic chromosomes encompassing ~12 million base pairs of DNA.

A productive day was had by representatives of both CSynBI and SynbiCITE at a recent meeting of the Synthetic Biology Leadership Council (SBLC). It is now almost 3 years since the original UK strategic roadmap for Synthetic Biology was published in 2012 and headway has been made against many of the short and medium-term recommendations. This meeting reviewed progress, updated recommendations, and shaped future priorities to support and develop synthetic biology in the UK.

Synthetic biology is certainly expanding at Imperial and to reflect this, we have been working hard on a new website. Now known as the **Synthetic Biology Hub** at Imperial College London, website launches on 31 July

Visit: [www.imperial.ac.uk/synthetic-biology](http://www.imperial.ac.uk/synthetic-biology)

## WELCOME TO THE DEPARTMENT

The Department are delighted to welcome the following new staff:

- **Kealan Exley**  
Research Assistant with Richard Kitney
- **Dr Nicolas Newell**  
Research Associate with Spyros Masouros
- **Mr Yann Aodh Sweeney**  
Research Assistant with Claudia Clopach
- **Dr Amy Birch**  
Research Associate with Simon Schultz
- **Dr Shou-Han Zhou**  
Research Associate with Etienne Burdet
- **Samantha Kemp**  
Student Administrator

## PUBLICATION SPOTLIGHT

Be sure to check out the Department's recently published works below:

Masahiro Ono and Reiko Tanaka *Controversies concerning thymus-derived regulatory T cells: fundamental issues and a new perspective*  
Nature: Immunology and Cell Biology June 2015 doi: 10.1038/icb.2015.65

Jason Chang, W. Daniel Stamer, Jacques Bertrand, Thomas Read, Catherine Marando, C. Ross Ethier, Darryl Overby *The Role of Nitric Oxide in Murine Conventional Outflow Physiology* American Journal of Physiology - Cell Physiology Jun 2015, doi: 10.1152/ajpcell.00347.2014

Mario Giorgi, Alessandra Carriero, Sandra Shefelbine, Niamh Nowlan *Effects of normal and abnormal loading conditions on morphogenesis of the prenatal hip joint: application to hip dysplasia* Journal of Biomechanics June 2015 doi: 10.1016/j.jbiomech.2015.06.002

Erica M. Buckeridge, Anthony M.J. Bull, Alison H. McGregor *Incremental training intensities increases loads on the lower back of elite female rowers* Journal of Sports Sciences June 2015 doi:10.1080/02640414.2015.1056821

Sally Gowers, Vincenzo Curto, Carlo Seneci, Chu Wang, Salzitsa Anastasova, Pankaj Vadgama, Guang-Zhong Yang, and Martyn Boutelle *3D Printed Microfluidic Device with Integrated Biosensors for Online Analysis of Subcutaneous Human Microdialysate* Analytical Chemistry June 2015 doi: 10.1021/acs.analchem.5b01353

Adison Wong, Huijuan Wang, Chueh Loo Poh and Richard Kitney *Layering genetic circuits to build a single cell, bacterial half adder* BMC Biology 2015, 13:40 doi:10.1186/s12915-015-0146-0

Farah Shamout, Antonios Poulipoulos, Patrizia Lee, Simone Bonaccorsi, Leila Towhid, Rob Krams, James Choi, *Enhancement of Non-invasive Trans-membrane Drug Delivery Using Ultrasound and Microbubbles during Physiologically Relevant Flow* Ultrasound in Medicine & Biology, June 2015, doi:10.1016/j.ultrasmedbio.2015.05.003

## OUT AND ABOUT



An Institute of Physics conference entitled "Physics of Emergent Behaviour II: from Molecules to Planets" co-organised by **Dr Chiu Fan Lee**, took place at the Science Museum earlier this month. With topics ranging from the antibiotic drug cipro to sand dunes on Mars, the audience enjoyed presentations across diverse disciplines, many of which delivered by world-leading scientists and engineers. The department was well represented

with talks by **Dr Tobias Reichenbach** on active hearing and **Jean David Wurtz** (a PhD student in the Lee group) on stress granule formation, as well as two poster presentations. There were lively discussions throughout the conference and participants departed in good spirits, maybe with the thought that the existence of universal laws governing emergent behaviour is not too far-fetched after all.

**Dr Ben Almquist** was invited to give a keynote talk at the **Biomaterials and Tissue Engineering GRC** in Girona, Spain on 22 July about "Nanotechnology-Based Strategies for Healing Diabetic Ulcers"

**Professor Etienne Burdet** has been invited to give a plenary lecture at the leading robot-assisted rehabilitation conference, ICORR 2015 in Singapore on 13 August, entitled "Neuroscience-based, practical rehabilitation of hand function".



**Elisa Domínguez Hüttinger** from Dr Reiko Tanaka's lab was selected to participate at the **RIKEN Integrative Medical Sciences (IMS) Summer Program (RISP) 2015**. The RISP consists of a series of lectures by scientists in immunology and genomic medicine, oral and poster presentations of our research projects, and attendance to the RIKEN IMS-JSI International Symposium on Immunology 2015. In addition, Elisa was selected to stay for a one month internship at the **Laboratory for Integrated Cellular Systems** (PI: Dr Mariko Okada), at RIKEN Yokohama.

All my expenses were covered by RIKEN, including the travel to Japan, for which I obtained the RISP2015 Travel Award.

**Professor Etienne Burdet, Dr Holger Krapp and Dr Aldo Faisal** will participate at Imperial College Robotics Forum Day on September 25, 2015. Imperial College robotics groups will present their activities to visitors from industry, academia and funding agencies.

**Stephen Chambers, CEO SynbiCITE** travelled to Darlington this month to be a mentor to early career researchers in a workshop that explained how to develop creative research into competitive proposals and entrepreneurial ventures. The event was run by the Lignocellulosic Biorefinery Network (LBNet), a BBRSC Network in Industrial Biotechnology and Bioenergy (BBRSC NIBB).

CSynBI co-director **Paul Freemont** spoke at GenSpace, first community biolab in New York. He introduced some of the foundational ideas and newest developments in the field of synthetic biology to an audience of bio-hackers, explorers and entrepreneurs! Professor Freemont also spoke at the second CAS Conference on Synthetic Biology in Munich where he spoke about the translational aspects of synthetic biology, particularly the development of standardised processes and platform technology to establish a systematic design framework.

## STAFF & STUDENT SUCCESS

**Mohammad Jafarnejad** from Prof Jimmy Moore's lab won the best poster award for his poster entitled "Local Inflammation Increases Hydraulic Resistance of Lymph Nodes" in the Summer School organized by British Society for Immunology (BSI) in York.

**Scott Lovell** (1st year PhD co-supervised by Dr Reiko Tanaka and Prof Ed Tate in Chemistry) won the 1st Prize for his poster at the MaxQuant international summer school at **MPI Martinsreid**. This is remarkable, particularly considering that this meeting is attended by 100+ scientists from some of the top proteomics and biology groups in the world.



Last week the at the Post Doc Centre (PDC) Award Dinner the amazing achievements of the PDC Reps Network were celebrated. 5 Reps were taken forward as finalists, each of these individuals has excelled in their role as departmental reps and there is evidence that there is a real cultural change within their department as a result of their work. We are delighted that the Department of Bioengineering's very own **Dr Emma Bailey** was one of 5 finalists for this award!

**David Henson**, PhD student in Prof Anthony Bull's lab, won the silver medal in the T42 200m at the Sainsbury's Anniversary Games held at the Olympic Park on 26 July.

Recent graduates **Henrik Hagemann** and **Despoina Paschou** were successful in gaining places on the Intellectual Property Office (IPO) funded summer programme at Imperial, **IP Wise Up** for CustoMem, the start-up they formed following iGEM 2014.

## UPCOMING EVENTS

### Departmental Seminars

Thursdays 12.00-13.00

Back in September!

**3 September 2015** 12:00-13:00 RSM2.28

**Professor Robert Nibbs from Glasgow University's Institute of Infection, Immunity and Inflammation**

For more information, visit:

<http://www3.imperial.ac.uk/bioengineering/events/departmentalseminars>

### Science Friday Seminar Series

Fridays from 16:20

### Imperial Events

**4-7 August** Sutton Trust Summer School (Y12 students)

**26 August** From battlefield to Bastion to Blighty 1914-2014: an extraordinary century of military medicine 13:00-14:00 Cockburn Lecture Theatre, St Mary's Hospital

**9 September** Centre for Neurotechnology Research Symposium 13:00-17:00 CDT Suite, Level 4 ICSM Building

**24 September** Imperial Fringe: Designs for life 17:00-20:00 Imperial Union Concert Hall, Beit Quad

**30 September** Centre for Neurotechnology Colloquium series **Professor John Duncan, University of Cambridge**

Frontoparietal control systems in the assembly of cognitive episodes at 17:00, RSM 2.28.

### External Events & Conferences

**3rd International Conference on Integrative Biology**

4-6 August

Valencia, Spain

<http://integrativebiology.conferenceseries.com/>

Contact: Dr Armando Del Rio Hernandez for further information.

**CMBBE conference**

1-5 September

Montreal, Canada

Abstract submission deadline is 22 May

<http://cmbbe2015.com/>

**MEIbioeng15**

7-8 September

Leeds, UK

<http://meibioeng.org/>

**MPEC2015 (IPEM Medical Physics and Engineering Conference)**

8 - 10 September

Liverpool, UK

<http://www.ipem.ac.uk/ConferencesEvents/MPEC.aspx>

**BMES Annual Conference**

7-10 October

Tampa, Florida

<http://bmes.org/annualmeeting>

## INNOVATION UPDATE

**Cortexica, Dr Anil Bharath's** spin-out from the Biologically-Inspired Computer Vision group (BICV) in the Department, gets an honourable mention in the Evening Standard (21 July). Cortexica uses scalable models of visual neurons. These models act on pixel data, allowing two images to be compared for their visual similarity. The search results that are obtained from Cortexica's algorithms give it an advantage, being better aligned with human perception than competing technologies. The company recently graduated from the **Imperial Incubator**.

Co-directors of CSynBI **Professors Paul Freemont and Richard Kitney** defined synthetic biology and described its applications and economic potential this month in an article in International Innovation: 'Shaping Synthetic Biology'. In the same article, CEO of SynbiCITE **Stephen Chambers** outlined SynbiCITE's progress in removing the roadblocks that can inhibit the effective translation of synthetic biology discoveries into commercial applications. One strategy for removing these roadblocks is to offer training in entrepreneurship to SynbiCITE's academic and industrial partners. Applications are now open for **SynbiCITE's Lean LaunchPad for Synthetic Biology training programme**. For more information on this 11 week intensive customer discovery based initiative visit the training pages of **SynbiCITE's website**.

**Government are leading the Accelerated Access Review into innovative medicines and medical technologies, if you are interested in contributing to the review, please do so via their website.**

**Stanford Biodesign Innovation Fellowship**

Application deadline is 31 August 2015

## CONTACT

Send news for the next issue to:

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