Imperial Bioengineer

October 2016

Bioengineering the Bionic Olympics

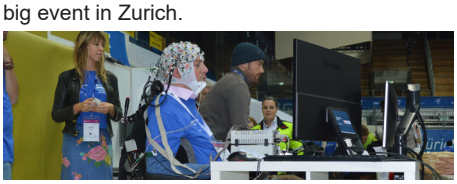
By Dr Aldo Faisal, Team Captain of Team Imperial

Team Imperial being briefed at the Cybathlon

This fall saw a unique bioengineering event, the Cybathlon, the bionic Olympics for people with serious movement disabilities. Amputees were to race in prosthetic legs and arms races against the clock through a series of tasks like setting a breakfast table; paralyzed users were to drive wheelchairs or use exoskeletons to make it across a flight of stairs; and quadriplegic users were competing against each other in Brain-Computer-Interface (BCI) races inside a video-game. Team Imperial was not only the largest team by number of disciplines we competed in but also one of the most successful ones, gaining a silver medal and making the finals in 3 disciplines. This would have not been possible without the tireless efforts of Dr Ian Radcliffe, PhD student Harris Konnaris and our colleague Dr Spyros Masouros.

How did it all begin?

Over two years ago we were contacted by the organizers and asked whether we were interested in participating. Given the global strengths of Imperial in these areas and thanks to the decisive support of the Department and the ground work laid by the Sports Innovation Challenge we formed Team Imperial in 2014. Now, together with 73 teams from 4 continents Team Imperial travelled to Zurich in the spirit of friendly competition. Competing teams were companies presenting their own products, many academic teams and some private individuals. We approached Cybathlon in our own way, deciding early on to integrate taught students into Team Imperial and make them an integral part of the development efforts offering them a unique experience. This meant that students got to interact from Day One with our disabled athletes and integrated what they learned into the technologies they were working on. Over 40 students from 2nd year design projects, UROPs, final year projects and MSc projects contributed and some 30 students attended the big event in Zurich.



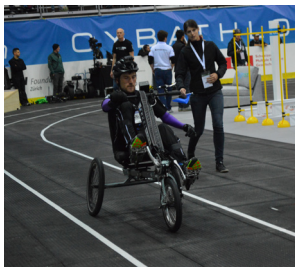
What did we compete in?

Team Imperial competed in the Brain-Computer Interface race, the Functional Electrical Stimulation (FES) Bike race, the Arm prosthetic race and the wheelchair race. We presented a number of original technologies, such as Deep Learning to power the EEG BCI or the eye-controlled wheelchair, as well as platform technologies supplied to us by our sponsors, such as a bionic arm and the FES bicycle system.

Lessons learned?

The Cybathlon was a unique and hopefully recurring experience pitting very different forms of technology against each other on a common ground and testing it in daily life scenarios – something all to often researchers fail to do.

Perhaps it was not surprising to see how the prosthetic arms race was won by a mechanical prosthesis, while Otto Bock's bionic arm came only second. Similarly it showed differences in treatment approaches, our silver medal in the FES bike pilot Johnny used electrodes slapped onto this thighs, while the gold medalist had chosen undergo the trouble of surgically implanting them into his legs.



In all, it was a fantastic experience to work closely with and see severely movement disabled people being empowered by the race and our bioengineering. We offered students a unique experience of getting into contact right from the start with end-users of bioengineering technology and we formed a unique network of charity supporters and industry sponsors. The global media attention for the Cybathlon and Team Imperial specifically meant a boost for the visibility of the College

Most importantly we were able to demonstrate to a global audience what bioengineering can already do and how much has to be done to restore movement abilities to disabled people.

https://www.imperial.ac.uk/engineering/news-and-events/cybathlon/

WELCOME TO THE DEPARTMENT

Welcome to new starters

- **Dario Farina,** Chair in Neurorehabilitation Engineering
- **Javier Cudeiro,** RA with Dr James Choi
- **Sevan Harput,** PDRA with Dr Mengxing Tang
- **Michael Bruyns-Haylett,** PDRA eith Dr Andriy Kozlov
- **Argyro Tsipa,** PDRA with Prof Paul Freemont
- **Priscilla Rajakumar,** RA with Prof Richard Kitney
- **Margherita Castronovo,** H2020 Marie-Sklodowska Curie Individual Fellow
- **Lorna Suckling,** RA with Prof Richard Kitney

This month sadly five colleagues are leaving, we wish them all the best in their new roles:

- **Shanas Choudhury**
- **Jordan Ang**
- **Francisco Hernandez-Heras**
- **Subhojit Chakraborty**
- **Ildar Farkhatdinov**

GRANTS

Dr Mengxing Tang awarded a Cancer Research UK grant for his project on 3D ultrafast ultrasound with microbubble contrast agents for simultaneous imaging of molecular targets and perfusion in cancer (£223,580)

Dr Guy-Bart Stan awarded a Engineering & Physical Sciences Research Council grant for A novel, fast and efficient resource recycling system for improving the performance of engineered bacteria (£433,903)

PUBLICATION SPOTLIGHT

Be sure to check out the Department's recent publications:

Pinelopi Andrikakou, Karthik Vickraman & Hari Arora *On the behaviour of lung tissue under tension and compression* Scientific Reports 6, Article number: 36642 (2016) doi:10.1038/srep36642

Tonghathai Phairatana, Chi Leng Leong, Sally A. N. Gowers, Bhavik Anil Patelc and Martyn G. Boutelle *Real-time detection of carboplatin using a microfluidic system* Analyst, 2016,141, 6270-6277 doi: 10.1039/C6AN01446A

Ben Hardcastle and Holger Krapp *Evolution of Biological Image Stabilization* Current Biology, Vol 26, Issue 20, R1010 - R1021 doi: 10.1016/j.cub.2016.08.059

WELCOME NEW STUDENTS!

As we begin a new academic year it is a good time to reflect on 2015/16. It has been a year of continued growth and many notible achievements by staff and students.

This month we are delighted to welcome back new and returning students to the Department. The new intake includes 113 undergraduates, 110 MScs, 40 MRes, 35 PhDs. Below are images of our new UG year groups.

STAFF & STUDENT SUCCESS

Professor Jimmy Moore's MRes in Medical Device Design and Entrepreneurship programme was featured as an innovation in learning case study by the new Provost of Education.

Our Bioengineers topped the College's academic quality table with an average tariff score on entry in October 2015 of 600 (equivalent to over 4 A*s)! Congratulations to our fantastic students. You can find out more College stats in the annual statistics pocket guide.

OUT AND ABOUT

Dr Jenna Stevens-Smith and **Dr Ben Almquist** attended BMES 2016 in Minneapolis, USA. Dr Stevens-smith also spoke at the BME-IDEA meeting about the MRes MDDE programme.

Dr Ian Radcliffe, Dr Aldo Faisal, Dr Spyros Masouros and a team of Imperial students and pilots represented Imperial at the Inaugural Cybathlon in Zurich on 8 October.

Dr Ben Almquist gave a talk at the Global Challenges Showcase on 28 October, which was part of the I-Hub opening ceremony in White City.

DESIGN THE NEXT QE PRIZE TROPHY!

The QEPrize has launched their 2017 Create the Trophy competition, complete with a brand new app. Students from around the world aged 14-24 are invited to design the trophy which is to be awarded to the winner of the 2017 Queen Elizabeth Prize for Engineering. The 2015 prize was awarded to bioengineer Professor Robert Langer from MIT.

The app is available to download from Google Play and the App Store, and you can see a short animation of the app in action on our YouTube channel.

As well as seeing their winning design brought to life by 3D printing, the competition winner will be invited to the presentation of the 2017 QEPrize in London and will take home a top of the range MacBook Pro as a prize.

UPCOMING EVENTS

Departmental Seminars

Thursdays12.00-13.00

26 Oct 2016 12:00 - 14:00 RSM 2.28
Gaussian Processes for Auditory Neuroscience + The role of inhibition in auditory cortex for encoding temporal information
Centre for Neurotechnology Mini-symposium on auditory processing

03 Nov 2016 12:00 - 13:00 RSM2.28
3D Printed Biomaterials and Cell Therapy Approaches for Repair of Peripheral Nerve Injury
Professor John Haycock, Professor of Bioengineering & Director of Centre for Biomaterials & Tissue Engineering, University of Sheffield

07 Nov 2016 12:00 - 13:00 RSM 1.31
Engineering Programmable Molecular Instruments
Professor Niles Pierce, Visiting Professor at the University of Oxford

10 Nov 2016 12:00 - 13:00 RSM 2.28
Electroanalytical Techniques: Ready for the Future
Dr Maria Tersa Fernandez Abedul, Department of Physical and Analytical Chemistry, University of Oviedo

16 Nov 2016 12:00 - 13:00 RSM 1.47
Metal Oxides Nanotechnology for Chemical Sensors
Professor Giorgio Sberveglieri, Professor at University of Brescia, Italy

23 Nov 2016 12:00 - 13:00 RSM 2.28
Low Cost Carbon Fiber and Polymer Reinforced Composites: Structure-Process-Property Relationship
Professor Dayakar Penumadu, Chair of Excellence,Tickle College of Engineering, University of Tennessee, Knoxville

Joint Bioengineering and Centre for Neurotechnology Seminar
25 Nov 2016 16:00 - 17:00 RSM G20
Sensory Processing in Larval Zebrafish: Perspectives From Whole-brain Calcium Imaging ***Dr Ethan Scott, Associate Professor, University of Queensland***

Imperial Events

05 December 2016
PG Open Day
Imperial College London
Website: http://www.imperial.ac.uk/study/pg/open-days-and-visits/

07 December 2016
Prof Dario Farina's Inaugural Lecture- The Bionic Man
Imperial College London
Website: https://live.newscientist.com/

14 December 2016
Exploiting Nature's Solutions
Imperial College London
Website: http://www3.imperial.ac.uk/newsandeventspggrp/imperialcollege/centres/securityinstitute/eventssummary/event_18-11-2016-16-11-41

Conferences

12-13 December 2016
Engineering the Upper Limb
IMechE, London
Website: http://events.imeche.org/ViewEvent?e=6414

13-15 December 2016
IET/SynBICITE Engineering Biology Conference
IET, Savoy Place, London
The programme includes major international speakers in the field, including keynote addresses from Professor Jay Keasling from UC Berkeley, and Professor Chris Voigt from MIT.
Students, researchers and academics are encouraged to attend.
Website: http://conferences.theiet.org/synthetic-conference/about/index.cfm

PRESENT YOUR RESEARCH IN PARLIAMENT

STEM for BRITAIN

Interested in presenting your research to MPs and Peers in the Houses of Parliament?

Then submit an abstract for **STEM for Britain** by **5 December 2016** to be in with a chance to do just that in March 2017. The Department has a strong track record in the poster competition with PhD students and postdocs presenting and winning prizes. If you're interested have a look at the STEM for Britain website.

If you would like to discuss how best to present your research to this audience please contact Jenna for further information/guidance as she has experience of working with MPs and Peers from previous roles.

CONTACT

Send news for the next issue to:
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