Imperial Bioengineer

November/December 2016

International iGEM success

By the Imperial iGEM team 2016

The winning Imperial iGEM team

Our iGEM journey started at the end of June where 12 of us were thrown into a room and told to come up with an original idea. Turns out coming up with original ideas is hard – light encoded DNA synthesis, genetic Turing machines and Pavlov's cell were all considered in (too) much detail. But it turned out that most of our ideas were so complex that one cell would not be able to survive the amount of genetic circuitry that would have been required to bring these ideas to fruition.

So instead of simplifying our ideas, we decided to use two cells. However, this came with its own myriad of problems and a spark was ignited. After speaking to researchers at Imperial's Centre of Synthetic Biology and Innovation about the problems surrounding growing two cell types to together (known as co-culture) – ecolibrium was born.

We wanted to develop a framework for synthetic biologists around the world so they could develop their own co-culture experiments.

The project consisted of two major parts:

1) We proposed a genetic circuit dubbed G.E.A.R (Genetically Engineered Artificial Ratio) as a method for synthetically biologist to control population ratios within co-cultures is a robust manner.

2) We developed a repository dubbed A.L.I.C.E (Advanced Logging Interface for Culture Experiments) as a central source that we hope synthetic biologists will use to store and access growth data for both monoculture and co-culture experiments.

Our parts were then designed at the beginning of July and the wait for DNA synthesis began. In the following weeks, we started the development of our models, game and human practices. Lots of hours were spent shouting at computers and towards the end of July as the first bits of DNA started to arrive, rough prototypes of the game GO CULTURE and model had been developed.

Then the world of Biobrick assembly awaited us and cloning began as we divided into two teams (Dry lab and Wet lab). Good progress was made and by the end of August, confidence levels were high – the game was almost ready, the models were (finally) working and our human practice elements were coming together thanks to the help of Dr. Rob Smith and members of the Royal College of Art.

September began and the time pressure started to seep in. We only had a month to go before wiki-freeze. Lab time increased and it began commonplace to trek to South Kensington at 8pm for a quick snack before finishing up the last experiment of the day. The routine sunk in and progress was made.

October marked the start of university for some and the lab emptied out somewhat. However, the tireless efforts of Gear (our only full timer at this point) and those who decided that lectures could be skipped (that's what Panopto is for) allowed us to obtain many useful results that would prove invaluable.

Wiki freeze arrived before we knew it resulting in the team moving into the library on graduation night, the hours of frantic coding and content writing paid off and by the 5 am deadline – we had a website that we were immensely proud off.

Lab work continued as normal until the 27 October where we flew to Boston Logan international airport. We were finally ready to show the iGEM community what we had achieved during the summer. The next few days passed as a blur and after our initial presentation on the Saturday, we were sat in the hall where the finalists were about to be announced and … we had done it – Imperial College, SCAU and the Sydney University were the 3 undergraduate finalists of iGEM 2016. But another presentation loomed and the brave trio of Lisa Asher, Carter Teal and Alyssa Henderson stood up in front of thousands of people and did us proud. The awards ceremony began and Imperial College racked up prizes for Best Foundational Advance, Best Wiki, Best Poster, Best Outreach and Best Basic Part. The countdown began and SCAU gained 3rd place and Sydney placed 2nd. We had done it!!!

Fast forward to the present, the struggle to catch up on missed lectures is very real but we are immensely proud of what we achieved this summer and hope that the next batch of iGEMers will have as much of a summer as we did.

WELCOME TO THE DEPARTMENT

Welcome to new starters

- **Jacopo Bono**, RA with Dr Claudia Clopath
- **Paolo Cadinu**, RA with Dr Sylvain Ladame
- **Yin- Hao (Jason) Chang**, PDRA with Dr Sylvain Ladame
- **Zahra Mohri**, PDRA with Prof Rob Krams
- **Kostadin Rolev**, Bioengineering Laboratory Technician
- **Colin Boyle**, PDRA with Dr Claire Higgins
- **Alister Bates**, Junior Research Fellow (JRF)
- **Chee-Hau Leow**, RA with Dr Mengxing Tang
- **Aurelie Levillain**, PDRA with Dr Niamh Nowlan
- **Rushdie Abuhamdah**, PDRA with Dr Paul Chadderton
- **Sharad Patel**, Research Technician with Dr Claire Higgins
- **Chin-Hsuan Lin**, RA with Dr Aldo Faisal

This month sadly seven colleagues are leaving, we wish you all the best in her new role:

- **Nicolas Kylilis**
- **Benjamin Goislard de Monsabert**
- **Grigoris Tsolkas**
- **Ryan Pedrigi**
- **Luca Annecchino**
- **Wilten Nicola**
- **Giuseppe Zito**

GRANTS

Dr Ben Almquist awarded a Diabetes Research & Wellness Foundation grant for his project entitled "Reprogramming Diabetic Foot Ulcers to Heal". (£20,000)

PUBLICATION SPOTLIGHT

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

Mariko Yokouchi,Toru Atsugi, Mark van Logtestijn, Reiko J Tanaka, Mayumi Kajimura, Makoto Suematsu, Mikio Furuse, Masayuki Amagai, Akiharu Kubo *Epidermal cell turnover across tight junctions based on Kelvin's tetrakaidecahedron cell shape* eLife 2016;5:e19593 doi: 10.7554/eLife.19593

Rachelle T. Hassarati, L. John R. Foster and Rylie A. Green *Influence of Biphasic Stimulation on Olfactory Ensheathing Cells for Neuroprosthetic Devices* Front. Neurosci., 2016 doi: 10.3389/fnins.2016.00432

N Newell, G Grigoriadis, A Christou, D Carpanen, S Masouros, *Material properties of bovine intervertebral discs across strain rates*, J Mech Behav Biomed Mater, 2016, Vol: 65, Pages: 824-830 doi: 10.1016/j.jmbbm.2016.10.012

Merry Christmas to all staff, students, alumni and friends of the Department.

The last day of term is 16 December.

The College is closed from 24 December until 3 January 2017.

Spring term begins on 7 January 2017.

NEW ACADEMIC STAFF

Colleagues and students may have noticed the continued growth in academic staff over the last few months.

Over the last few months we have been joined by:

Dr Rylie Green

Bioactive conductive polymers

Dr Thomas Ouldridge

Biomolecular systems

Dr Nick Linton

General cardiology, heart rhythm disorders

Professor Dario Farina

Motor control and Biomedical signal processing

Rylie joins us from University of New South Wales, Australia as a Senior Lecturer, Thomas joins us from Imperial's Department of Mathematics as a Royal Society University Research Fellow, Nick joins us as our first Clinical Senior Lecturer as a joint appointment with the Faculty of Medicine and Dario joins us as a Professor from the University of Göttingen, Germany where he was the founding Director of the Institute of NeuroRehabilitation Systems. On 7 December Professor Dario Farina delivered his inaugural lecture 'The Bionic Man- interfacing the human nervous system with robotic limbs', if you missed it you can watch it on youtube.

STAFF & STUDENT SUCCESS

Congratulations to **Liam Madden** who has been awarded Fellowship of the Institution of Engineering and Technology (IET).

OUT AND ABOUT

Mohima Ahmed and Dr Jenna Stevens-Smith spoke about 'what it is like to be a bioengineer' for the Creative Quarter on 18 November.

Dr Jenna Stevens-Smith spoke about bioengineering at Imperial at Tormead High School on 6 December.

Dr Reiko Tanaka, Nele Quast and Dr Jenna Stevens-Smith delivered a taster lecture and insight to bioengineering at the Nonsuch High School for Girls and Wallington High School for Girls Taster Event.

Dr Ian Radcliffe organised a Sports Innovation Challenge exhibition held at Hogan Lovell in the city in November.

Dr Ben Almquist travelled to Chengdu, China, as a UK delegate for the British Council/Newton Fund workshop on "Healthcare Technologies for Aging Populations".

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

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***

01 Dec 2016 12:00 - 13:00 RSM 2.28
Exploiting Bacteriophage to Rapidly Detect Mycobacteria
Dr Cath Rees, Associate Professor in Microbiology, School of Biosciences, University of Nottingham

08 Dec 2016 12:00 - 13:00 RSM 2.28
The prospect of magnetic resonance microscopy to determine metabolomic rates in vivo ***Prof. Jan Korvink, Institute of Microstructure Technology, Karlsruhe Institute Technology, Germany***

15 Dec 2016 12:00 - 13:00 RSM 2.28
Manipulating ossification through chemistry ***Professor Liam Grover, School of Chemical Engineering, University of Birmingham***

Imperial Events

15 November 2016
Centre for Blast Injury Studies' 2016 annual networking event
Imperial College London
Website: http://www3.imperial.ac.uk/newsandeventspggrp/imperialcollege/engineering/bioengineering/blastinjurystudies/eventssummary/event_11-10-2016-12-8-43

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
Website: http://conferences.theiet.org/synthetic-conference/about/index.cfm

PRESENT YOUR RESEARCH TO THE PUBLIC

Passionate about communicating your research? Could you explain your research in 3 minutes? Then sign-up for the London heats of FameLab an international science communication competition for researchers. If you're interested have a look at the Famelab website.

If you would like to discuss how best to present your research to this audience please contact Jenna for further information/guidance.

CONTACT

This is Dr Jenna Stevens-Smith's last edition of the newsletter. Thanks to all those that have provided news and articles over the last three years.