



Imperial Bioengineer

April 2015

Engaging Engineering

by Dr Jenna Stevens-Smith, Outreach Manager

The Department is the most well represented at the **Imperial Festival** this year, with seven separate activities and over 70 researchers, students and staff working together on 9-10 May to engage others with the wonders of engineering, and specifically bioengineering.

But engaging others with our research is not limited to the public. This month has seen researchers in the Department get front covers of *Nature Materials* and *Nature Methods* for research as diverse as the impact of synthetic gene expression on the growth and viability of engineered cells and porous silicon-based "nanoneedles" capable of efficiently inducing angiogenesis in living tissues.

This is alongside our students who are excelling in commercializing their research including iGEM team members UG students Gabi Santosa, Xenia Spencer-Milnes and Henrik Hagemann presenting to Imperial Business Partners and GSK and PhD student Oshi Agabi, co-Founder of Koniku who alongside his Koniku team won the top prize at MIT Global Startup Workshop.

Getting into the hackathon spirit prior to the live Super crutch hackathon led by Dr Ian Radcliffe at Imperial Festival PhD student Esuabom David Dijemeni and his team came second at the NAO interfaces 2015 Hackathon for developing a program to make a robot sense a patient's motion, heart rate and blood oxygen level during sleep.

If you are interested in finding out what the **Imperial Festival** has to offer come along to the free Festival on Saturday 9 May (12.00-18.00) or Sunday 10 May (12.00-17.00)



Francesca Ceroni, Rhys Algar, Guy Bart-Stan and Tom Ellis published a major paper in *Nature Methods* describing how to measure and model the impact synthetic gene expression has on the growth and viability of engineered cells. Synthetic biology and biotechnology rely heavily on placing synthetic genes into living cells, so for both fields it is significant breakthrough to be able to assess how much of a cell's resources these genes take up. Measurement and modelling also allows researchers to identify easy ways to change the DNA of their engineered genes to improve their performance in cells.

A recent report by Dr Ciro Chiappini, a post-doctoral researcher within the group of Prof Molly Stevens, and their collaborators announces the design of porous silicon-based "nanoneedles" capable of efficiently inducing angiogenesis in living tissues. The nanoneedles puncture cells directly to deliver within the cytosol yet, due to their nanoscale dimensions, they are not destructive for the cells. This report is published in the latest issue of *Nature Materials* (May 2015), was highlighted by the *Nature Materials News and Views* and is featured on that issue's Front Cover. They have also shown the needles can perform live intracellular pH sensing, as reported in *ACS Nano* this month as well.



WELCOME TO THE DEPARTMENT

The Department are delighted to welcome the following new staff and researchers:

- **Dr Mariea Brady**
Department Secretary until begins graduate entry to medicine from September
- **Dr Yu Liu**
Lab Technician for Simon Schultz
- **Dr Matthieu Toulemonde**
Research Associate in Tang and Weinberg groups
- **Dr Xiao Chen**
Visiting Researcher for Mengxing Tang

The Department is very sad to see some of our researchers leaving us this month and wish them all the best in there next ventures

- **Ryan Pedrigi**
- **Leila Towhidi**
- **Claire Donoghue**

PUBLICATION SPOTLIGHT

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

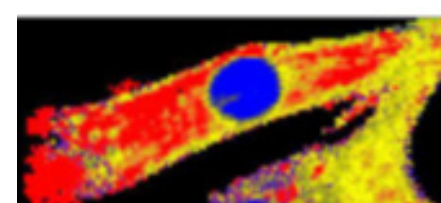
Leiming Chen, John Toner and Chiu Fan Lee
Critical phenomenon of the order-disorder transition in incompressible active fluids.
New Journal of Physics 17, 042002. (2015)

Francesca Ceroni, Rhys Algar, Guy Bart-Stan and Tom Ellis
Quantifying cellular capacity identifies gene expression designs with reduced burden
Nature Methods 12, 415-418 (2015)

C. Chiappini, E. De Rosa, J. O. Martinez, X. Liu, J. Steele, M. M. Stevens & E. Tasciotti
Biodegradable silicon nanoneedles delivering nucleic acids intracellularly induce localized in vivo neovascularization
Nature Materials 14, 532-539 (2015)

Hélène Autefage, Eileen Gentleman, Elena Littmann, Martin A. B. Hedegaard, Thomas Von Erlach, Matthew O'Donnell, Frank R. Burden, David A. Winkler, and Molly M. Stevens
Sparse feature selection methods identify unexpected global cellular response to strontium-containing materials

PNAS 2015 112 (14) 4280-4285; published ahead of print March 23, 2015



Dr Hélène Autefage et al from Stevens group have shown that strontium ions upregulated metabolic pathways in human mesenchymal stem cells, which has large ramifications in the applications of strontium-based biomaterials.

SynBioBeta to Lean Launchpad

by Dr Helen Findon, Outreach & Communications Manager, CSynBI

SynBioBeta conference

Last week SynBioBeta took place at Imperial. SynBiCITE, Imperial's synthetic biology Innovation and Knowledge Centre, led by Professors Richard Kitney (Bioengineering) and Paul Freemont (Medicine), was proud to sponsor the event. The conference is one of the world's leading synthetic biology conferences and prides itself on being dedicated to joining thought leaders, entrepreneurs and the academia together to discuss the latest topics and advancements in the synthetic biology industry.

Lean LaunchPad – Bright ideas

Last week saw the first Lean LaunchPad programme draw to a close. The teams came together to present their business models and share the lessons they learnt, the skills they developed, and the customers they discovered to an audience of hundreds of academics, industry professionals and investors at



SynBioBeta; a synthetic biology conference. Team Cellibero, made up of postdoctoral researchers Dr Richard Kelwick, Dr James MacDonald, and Dr Lorna Ravenhill presented their range of science education kits based around molecular biology. The innovative kits use a cell-free based system - which is a freeze-dried mix of non-living cellular machinery, derived from harmless bacteria, and DNA, which can be activated by adding water to produce colourful proteins or enzymes that generate scents.

It goes without saying that we are immensely proud of what the teams have achieved and we look forward to running Lean LaunchPad again in the autumn. Anybody interested in participating should contact Helen Findon.

OUT AND ABOUT

Dr Jenna Stevens-Smith spoke at Chelmsford High School for Girls on 22 April, giving the students an insight into bioengineering.

Liam Madden and Dr Jenna Stevens-Smith spoke at Ilford County High School to students from this and neighbouring schools Trinity High School and Beal High School on 23 April giving Y12 students considering medicine or engineering an insight into bioengineering and tips on applying to university.

Professor Richard Kitney gave the Annual City and Guilds Fellowship Lecture on 26 March about at Barber Surgeons' Hall about "Synthetic Biology – Engineering Biology to Build the Bio economy".

Professor Etienne Burdet gave a lecture on "Impedance control and learning: in humans, for robots" in the context of the SAPHARI NMMI winter school which took place in Rome, and Etienne also took part in the kick-off meeting of the EU-H2020 Cogimon project (<http://cogimon.eu>) in our department of Bioengineering, with groups from the Universities of Bielefeld and Tuebingen in Germany, EPFL in Switzerland, the Italian Institute of Technology and Foundation Santa Lucia in Rome, the University of Birmingham and Imperial in the UK. Cogimon aims at investigating the interaction between humans and robots.

STAFF & STUDENT SUCCESS

Simon Schultz has been elected to a Fellowship of the Institution of Engineering and Technology (FIET).

Atsushi Takagi, a PhD student of Etienne Burdet, won 2015 scholarship from Society for the Neural Control of Movement (NCM) for attending 25th NCM Annual Meeting (April 21-24, 2015, Charleston, South Carolina, USA) where he presented his research entitled "Effect of multi-human interaction on motor performance"

Aldo Faisal was appointed to the NSF review panel for ICT grants in Neural Engineering & the US BRAIN initiative.

Recently the **BICV research group** hosted a CUDA training course (sponsored by NVIDIA), and with resources from the Neurotechnology CDT. NVIDIA's CUDA is one of the popular systems used for parallel programming. With little work, algorithms can be parallelized to run on as many as 3,000 cores. The course was run over two days in collaboration with Plymouth University's Centre for Robotics & Neural Systems. Attendees included more than 30 people from across the College. The CUDA systems for the course were funded by the Neurotechnology CDT, set up and run by **Kai Arulkumaran**. A second advanced course, scheduled for July is fully booked, but there are still some spaces on a repeat of the basic course in July (13 & 14). Contact Kai for more info.

MEDIA MENTIONS

The BBC's election coverage focussed on the use (and abuse) of Twitter, and relied for impact on the expertise of the Tavares & Faisal algorithm for social media human decision making analysis (DOI: 10.1371/journal.pone.0065774) Dr Faisal was interviewed by the BBC to explain: <http://www.bbc.co.uk/news/blogs-trending-32248658>

Dr Faisal's team featured in **Al Jazeera English's technology TV show** "Downstream" reporting on the labs natural-gaze-controlled Wheel-Chair Technology:

Dr Faisal was interviewed by the **Financial Times** (and their TV channel) on the role of personal service robotics and specifically highlighting his European project grant on Eye-controlled robotic orthotics ENHANCE.

GET INVOLVED

Female mentors needed for Engineering Summer School

Contact Jenna to express interest.

Free IPem membership for students

Free student membership now available for undergraduates and full time postgraduate students.

More info: <http://www.ipem.ac.uk/AboutIPem/JoinIPem.aspx>

I'm a Engineer/ Scientist

Want to get involved in outreach, but haven't got the time to travel to schools? Then sign up to take part in the I'm a scientist or I'm a engineer where which scientists and engineers talk to school students online via imascientist.org.uk/scientists or imanengineer.org.uk/engineer

Application deadline: 3 May 2015

Blackwood Design Awards 2015

Following the success of MEng graduate Kirubin Pillay in the Blackwood Design Awards 2014. Students are encouraged to enter their projects to the 2015 competition.

http://www.bespoken.me/forum/topics/blackwood-design-awards-2015?xg_source=activity

Deadline is 20 June 2015

UPCOMING EVENTS

Departmental Seminars

Thursdays 12.00-13.00

7 May 2015 12:00-13:00 RSM2.28

Dr Alexander Easton from Durham University

What is the relationship between the responses of place cells and behaviour?

14 May 2015 12:00-13:00 RSM2.28

Professor Sabine Werner from ETH Zurich

Fibroblast growth factor signaling in homeostasis, repair and disease of skin and liver

21 May 2015 12:00-13:00 RSM2.28

Dr Markus Kretz from the University of Regensburg

Roles of long non-coding RNAs in regulation of epidermal tissue differentiation

26 May 2015 12:00-13:00 RSM2.28

Professor James Hudspeth from Rockefeller University

The role of mechanoelectrical-transduction channels in the ear's active process

For more information, visit:

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

Science Friday Seminar Series

Fridays from 16:20

Imperial Events

9-10 May Imperial Festival www.imperial.ac.uk/festival

27 May Centre for Neurotechnology Colloquium series Dario Farina, University Medical Centre, Gottingen

4-5 June BME-IDEA/BioDesign EU Symposium

24 June Centre for Neurotechnology Colloquium series Richard Wade-Martins, University of Oxford

20-25 July Engineering Summer School for 11-14 year old girls

External Events & Conferences

Physics of Emergent Behaviour II- from molecules to planets

9-10 July

Science Museum, London, UK

<http://peb2015.iopconfs.org>

Contact: Dr Chiu Fan Lee for further information

9th annual PGBiomed conference

14-16 July

University of Liverpool, Liverpool

Abstract submission deadline is 15 May

<http://ewh.ieee.org/sb/ukri/embs/pgbiomed15/>

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/>

BMES Annual Conference

7-10 October

Tampa, Florida

<http://bmcs.org/annualmeeting>

BAGRIT LECTURE 2015



Professor Mina Bissell

Distinguished Scientist, Lawrence Berkeley National Laboratory, University of California, Berkeley

Why Don't We Get More Cancer? The critical role of extracellular matrix and the microenvironment in modelling metastasis and dormancy.

Date: Monday 18 May 2015

Time: 17:30

Venue: G16, Sir Alexander Fleming Building

www.imperial.ac.uk/bioengineering/about/bagritlecture

CONTACT

Send news for the next issue to:

Dr Jenna Stevens-Smith

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