University of Nottingham
UK | CHINA | MALAYSIA

Enterprise for Scientists

Embedding Business and Entrepreneurial Skills into the Science Curriculum

Dr. Trevor Farren
Director of Business and Knowledge Exchange
-School of Chemistry-

Industry

- Polymer Chemist –> Director of Development
- Interested in New Ventures & Innovation
- Enterprise Skills - Onboarding new graduates 1.5yr

COURTAULDS

University

“Embedded Industrialist” in School of Chemistry

To build and entrepreneurial culture among staff and students and increase their engagement with business and industry

Absence of Business Skills in our curriculum:
not considered a worthwhile academic activity!

Chemistry Business Partnership Unit

Provides a focus for business related activities bringing together relevant staff and projects within the School.

Ex-Industry Professionals

Post Doctoral Business Science Fellows

Students (UG/PG)

Secondees from Industry

Academic Staff

Fully Integrated

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Industry Collaborations

> 150

HEL better chemistry – faster
CDT Cambridge Display Technology
Asynt
KeTech
Lilly
syngenta
PEAKDALE MOLECULAR
AstraZeneca
Givaudan
PrometheanParticles Formulating solutions with nanomaterials
BRUKER
Charnwood Molecular
L'ORÉAL
Infineum
Mondelēz International
Unilever
synthomer
SUMITOMO CHEMICAL
LANXESS Energizing Chemistry
MERCK
bp
JM
Johnson Matthey
Key Organics Chemistry | Innovation | Quality
Pfizer
CRODA
GM
Brightwake Innovative solutions with impact
ARCINOVA
BAYER
nationalgrid
SYGNATURE discovery
Cornelius Doing Distribution Better
deb
Upperton
where skin meets fabric dartex
BASF We create chemistry
NISSAN
Roche
AkzoNobel
MARS petcare
juniper PHARMACEUTICALS
INVISTA
argenta
BIOCITY NOTTINGHAM
UNIOSIS
Boots
Thomas Swan Chemical manufacturing since 1926
ROLLS ROYCE
AESICA A Consort Medical Company
rb
DIAGEO
Reckitt Benckiser
TCG Lifesciences
sasol
devan chemicals
chalice operate your way
BPB
BritishGypsum
NOVARTIS
Lubrizol

Bringing Business and Entrepreneurial Skills into the Chemistry Curriculum

Post Doctoral Business Science Fellowships (PD)

From the Bench to the Bank Programme (PG)

MSc Chemistry and Entrepreneurship (PG)

Enterprise for Chemists (UG)

Industry Inspired Final Year and Vacation Projects UG)

Year in Industry and SME Placements (UG)

Degree Apprenticeship (UG)

CRODA Lubrizol gsk GlaxoSmithKline Boots

'Skills required by new chemistry graduates and their development in degree programmes, Higher Education Academy' – November 2010'

Enterprise for (Chemists)

Final year optional module 60-80 students (including Physicists!)

Curriculum Design

Autumn Semester – Innovation and Entrepreneurship

Spring Semester – Business Skills and Awareness

Assessment – 75% Exam, 25% Presentations

Business School Interaction

Innovation and Entrepreneurship for Scientists

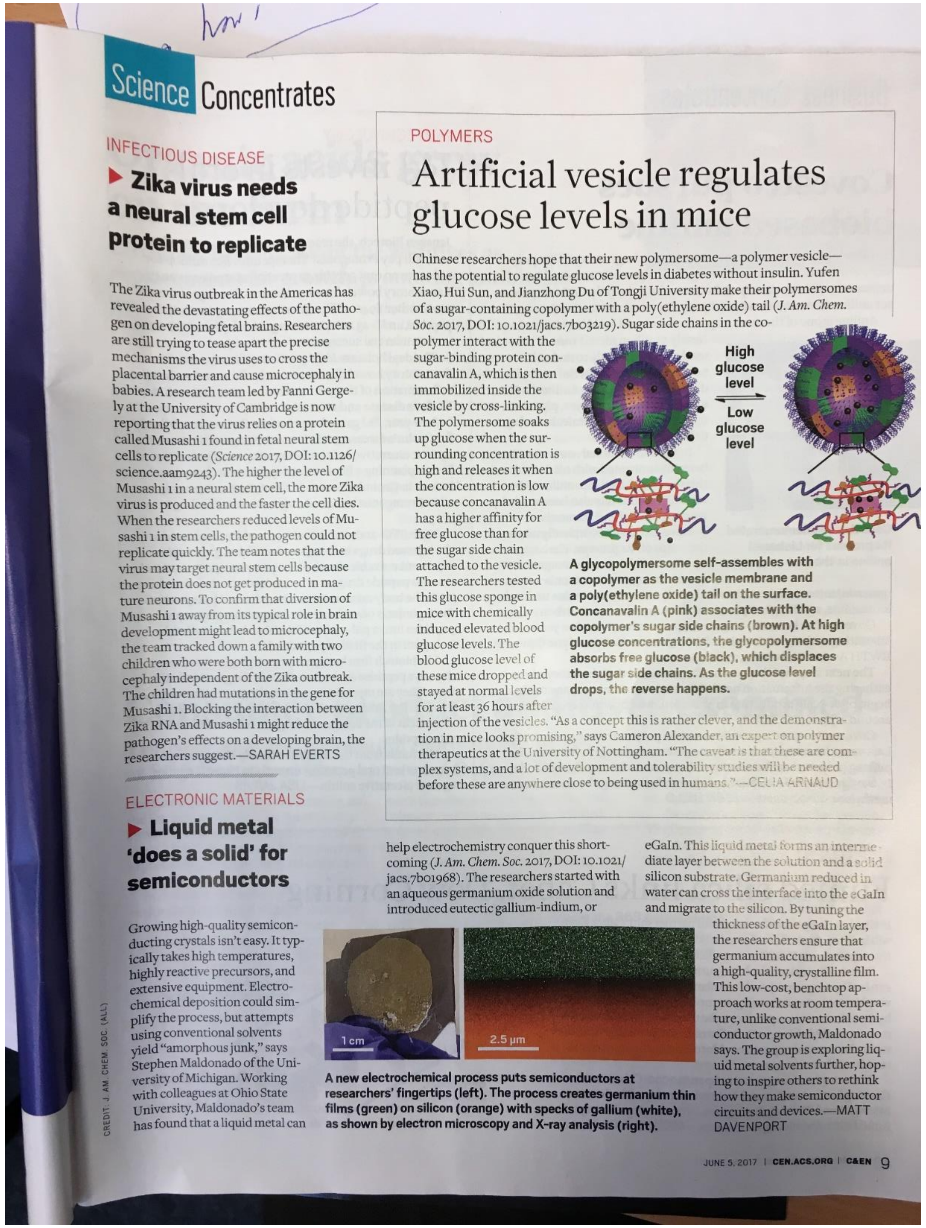
F1E4C Timetable: Semester 1

2 03/10	3 10/10	4 17/10	5 23/10 –	6 30/10 –	7 07/11-	8 14/11	9 21/11	10 28/11	11 04/12	12 11/12
Mon 3rd Oct Steve Howdle 3 pm Phys C27	Mon 10th Oct Simon Mosey Phys C27	NO LECTURE	Mon 23rd Oct Boots Phys C27	Mon 30th Oct Trevor Farren Phys C27	Mon 6th Oct Dragons Kick off Chem X-1	Dragons Den mentoring Chem X-1	Dragons Den mentoring Chem X-1	Weds/ Thurs 30 Nov 01st Dec Dragon's Den		Feedback

4 Taught Sessions on Innovation

- A Practical Overview
- Business School Model
- Company Model
- University Model

Innovation and Entrepreneurship



Science Concentrates

INFECTIOUS DISEASE

Zika virus needs a neural stem cell protein to replicate

The Zika virus outbreak in the Americas has revealed the devastating effects of the pathogen on developing fetal brains. Researchers are still trying to tease apart the precise mechanisms the virus uses to cross the placental barrier and cause microcephaly in babies. A research team led by Fanni Gergely at the University of Cambridge is now reporting that the virus relies on a protein called Musashi 1 found in fetal neural stem cells to replicate (*Science* 2017, DOI: 10.1126/science.aam9243). The higher the level of Musashi 1 in a neural stem cell, the more Zika virus is produced and the faster the cell dies. When the researchers reduced levels of Musashi 1 in stem cells, the pathogen could not replicate quickly. The team notes that the virus may target neural stem cells because the protein does not get produced in mature neurons. To confirm that diversion of Musashi 1 away from its typical role in brain development might lead to microcephaly, the team tracked down a family with two children who were both born with microcephaly independent of the Zika outbreak. The children had mutations in the gene for Musashi 1. Blocking the interaction between Zika RNA and Musashi 1 might reduce the pathogen's effects on a developing brain, the researchers suggest.—SARAH EVERTS

POLYMERS

Artificial vesicle regulates glucose levels in mice

Chinese researchers hope that their new polymersome—a polymer vesicle—has the potential to regulate glucose levels in diabetes without insulin. Yufen Xiao, Hui Sun, and Jianzhong Du of Tongji University make their polymersomes of a sugar-containing copolymer with a poly(ethylene oxide) tail (*J. Am. Chem. Soc.* 2017, DOI: 10.1021/jacs.7b03219). Sugar side chains in the copolymer interact with the sugar-binding protein concanavalin A, which is then immobilized inside the vesicle by cross-linking. The polymersome soaks up glucose when the surrounding concentration is high and releases it when the concentration is low because concanavalin A has a higher affinity for free glucose than for the sugar side chain attached to the vesicle. The researchers tested this glucose sponge in mice with chemically induced elevated blood glucose levels. The blood glucose level of these mice dropped and stayed at normal levels for at least 36 hours after injection of the vesicles. "As a concept this is rather clever, and the demonstration in mice looks promising," says Cameron Alexander, an expert on polymer therapeutics at the University of Nottingham. "The caveat is that these are complex systems, and a lot of development and tolerability studies will be needed before these are anywhere close to being used in humans."—CELIA ARNAUD

High glucose level

Low glucose level

A glycopolymersome self-assembles with a copolymer as the vesicle membrane and a poly(ethylene oxide) tail on the surface. Concanavalin A (pink) associates with the copolymer's sugar side chains (brown). At high glucose concentrations, the glycopolymersome absorbs free glucose (black), which displaces the sugar side chains. As the glucose level drops, the reverse happens.

ELECTRONIC MATERIALS

Liquid metal 'does a solid' for semiconductors

Growing high-quality semiconducting crystals isn't easy. It typically takes high temperatures, highly reactive precursors, and extensive equipment. Electrochemical deposition could simplify the process, but attempts using conventional solvents yield "amorphous junk," says Stephen Maldonado of the University of Michigan. Working with colleagues at Ohio State University, Maldonado's team has found that a liquid metal can help electrochemistry conquer this shortcoming (*J. Am. Chem. Soc.* 2017, DOI: 10.1021/jacs.7b01968). The researchers started with an aqueous germanium oxide solution and introduced eutectic gallium-indium, or eGaIn. This liquid metal forms an intermediate layer between the solution and a solid silicon substrate. Germanium reduced in water can cross the interface into the eGaIn and migrate to the silicon. By tuning the thickness of the eGaIn layer, the researchers ensure that germanium accumulates into a high-quality, crystalline film. This low-cost, benchtop approach works at room temperature, unlike conventional semiconductor growth, Maldonado says. The group is exploring liquid metal solvents further, hoping to inspire others to rethink how they make semiconductor circuits and devices.—MATT DAVENPORT

1 cm

2.5 µm

A new electrochemical process puts semiconductors at researchers' fingertips (left). The process creates germanium thin films (green) on silicon (orange) with specks of gallium (white), as shown by electron microscopy and X-ray analysis (right).

CREDIT: J. AM. CHEM. SOC. (ALL)

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Team Exercise (4)

3 weeks

3 'flipped classroom' sessions

The Business Pitch