

NEWSLETTER FOR THE  
BIOPHARMACEUTICAL  
BIOPROCESSING  
TECHNOLOGY  
CENTRE

ISSUE.01.SEP.2011.



# BIO.01

INSIDE.THE BBTC  
ANNUAL ENGD  
CONFERENCE  
2011.



PLUS.06.07.ENGAGING INDUSTRY  
08.BOOST TO LOCAL MANUFACTURING  
09.SCIENCE BUSKING10.11.ACTION 2011

# BIO.01

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## + A WORD FROM THE DIRECTOR



In the current climate of economic upheaval it has never been more important to invest in innovation and skills as the basis for future prosperity.

We must be highly strategic in our thinking and be ready to drive change by doing things differently. These themes resonate with our mission to improve industry manufacturing processes and nurture the next-generation of scientists. Our expertise in mathematics together with our inter-disciplinary approach and focus on industrial relevance is what sets us apart.

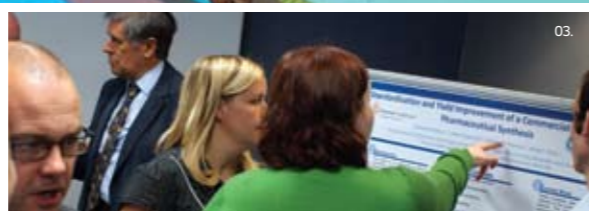
At the end of our second year we are already collaborating with a number of companies across a wide range of sectors including: consumer products, pharmaceuticals and chemicals as well as small businesses tackling horizon projects in healthcare, regenerative medicine and industrial biotechnology.

Our experience emphasises the huge unmet demand for skills in mathematics across the UK process industry, a gap we are determined to fill. The recent government investments in Technology and Innovation Centres add new capability and focus which we will support in our role as a repository of specialist expertise.

One of the few things we can be absolutely certain about in the future is change. The BBTC at Newcastle University seeks to embrace and accelerate this, creating in the process the next generation of industry leaders.

**PROF ELAINE  
MARTIN OBE**  
SCHOOL OF CHEMICAL  
ENGINEERING AND  
ADVANCED MATERIALS





# BBTC ANNUAL ENGD CONFERENCE 2011

THE BBTC HELD THEIR INAUGURAL ANNUAL ENGD CONFERENCE ON 15TH JUNE 2011.

The event was attended by researchers and industrialists from a broad range of disciplines and industry sectors.

The conference was opened with a keynote address from Mr Ian Shott CBE, Managing Director of Shott Consulting and the founder and former CEO of Excelsyn. His presentation titled "Building a Sustainable Bio-economy" provided a contextual framework for the student talks by highlighting the need to invest in renewable energy sources and industrial biotechnology in order to promote long term economic growth in the UK.

Mr David York (Procter and Gamble) provided the closing address entitled "Technical Challenges of the Process Sector: Looking to the Future." David is a Research Fellow in the area of process engineering and he has worked for 30 years creating and developing new products and processes for the global Household Care business. He discussed the current and future challenges for process engineers and the need for better process control and innovation within the process industry in order to meet the quality demands of the modern consumer market.

Our first year EngD students produced posters and delivered a three minute 'elevator pitch' to the conference delegation introducing their projects. Second year students each gave a twenty minute talk on their

industrial research projects and presented some of their initial results. At the end, delegates were asked to vote for their favorite first and second year presentation and the winners each received a prize of £100 Amazon vouchers.

A big congratulations to Elspeth Ritchie, who won the best first year EngD presentation prize.

"I think I won by cheating a little! We had just completed an introductory project so I had a finished story to tell. Getting to see what everyone else is doing was interesting because we learn a lot of the same tools but use them in very different ways, though I suppose that's the point of the EngD - to use existing tools in new ways."

Juliana Haggerty won the prize for the best second year presentation.

"I really enjoyed the EngD conference, it was great to catch up with what my fellow students had been doing throughout the year. Considering the audience was made up of so many knowledgeable and experienced people, it was a real honour to be awarded the presentation prize. "Working with images in my research makes it a little easier to make a visually interesting presentation, so perhaps that was one of the reasons people remembered my presentation when voting."

Juliana also won a poster prize at a recent conference 'PharmSci 2011 - The Science of Medicines' at The Academy of Pharmaceutical Sciences.

We received excellent feedback from delegates who attended the conference this year and contributed to making it such a success. We look forward to seeing you all in 2012!

01. David Van Alstyne shares a joke with Chris Hobbs 02. Keynote speaker Ian Shott CBE 03. Students and industrialists discuss the posters during the lunch intermission 04. Dr. Gavin Clark the Industrial Liaison Director with Daniel Smith from the Health Technology and Medicines KTN 05. The BBTC Director Prof Elaine Martin OBE provides an overview of the EngD programme at Newcastle 06. Juliana Haggerty, second year winner 07. Malcolm Skingle presents the awards 08. Plenary speaker Mr. David York of P&G 09. Elspeth Ritchie, first year winner.



## Posters. First Year EngD Students.

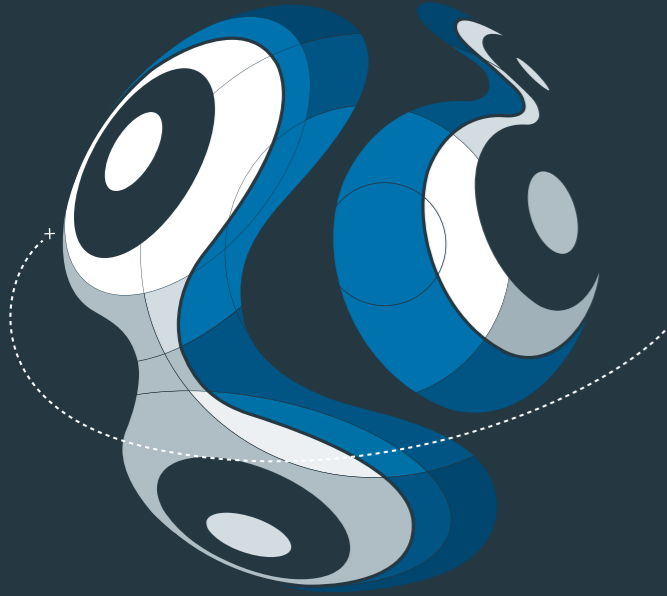
- Charlotte Atwell (Heineken)**  
Optimising Industrial Process Cleaning in the Cider Production/Brewing Industry - How Do We Know When Our Process Is Clean?
- Bernhard Kepplinger (Demuris)**  
Novel Antibiotic Compounds from Actinomycetes
- Wendy Carr (Britest)**  
An Insight into the Criticality of Plant Cleaning
- John Palmer (CEA)**  
Development of Process Systems on a Continuous Pharmaceutical Tableting Line
- Matthew Collison (GlaxoSmithKline)**  
The Role of Gut Microbiome in Health and Disease
- Chelsea Brain (Scottish Bio Energy)**  
Optimisation of a Novel Algae Photobioreactor for Wastewater bioremediation, Carbon Capture and Production of High Value Chemicals
- Kerem Irfan (Pall Life Sciences)**  
Monitoring and Control of Microbioreactors
- Elspeth Ritchie (Lonza)**  
Using Multivariate Analysis to Make Informed Choices between Competing pH Measurement Technologies
- Matthew Abbott (CPI)**  
The Application of an Oscillatory Baffled Reactor (OBR) for the Continuous Production of Platform Chemicals from Sustainable Feedstocks
- Mark Crosby (Procter and Gamble)**  
Improved Control Systems of Spray Dryers in the Dry Laundry Industry
- Stephen Goldrick (Perceptive Engineering)**  
Application of Multivariate Data Analysis to the Bioprocess Industry
- Matthew Molloy (Piramal)**  
Standardisation and Yield Improvement of a Chemical Scale Organic Pharmaceutical Synthesis

## Presentations. Second Year EngD Students.

- Juliana Haggerty (alcoymics)**  
Application of Digital Image Analysis to the Grading of Histological Skin Damage in an in vitro Assay
- Joana Figueiredo (Unilever)**  
Application of Multivariate Data Analysis Techniques to Improve Process and Product Performance
- Jodie Symington (Croda)**  
Marine Microorganism Bioactives for Healthcare
- Amin Ganjian (ABB)**  
Application of Near-Infrared Spectroscopy within xPAT Platform for Monitoring and Control of Cell Culture and Fermentation
- Keeley Stepney (Astra Zeneca)**  
Opportunities for API Milling Time Reduction
- Grace Oppong (Perceptive Engineering)**  
Design of an Integrated Monitoring and Optimal Control System for Supervisory Operation of Anaerobic Digesters
- Charlotte Bell (GlaxoSmithKline)**  
Measuring Oxidative Stability: Exploring Chemiluminescence



EngD Biopharmaceutical Process Development



# INNOVATIVE, COST EFFECTIVE AND RELEVANT TO TODAY'S INDUSTRY

Engineering Doctorate in Biopharmaceutical Process Development

## Engaging Industry

**NEWCASTLE UNIVERSITY'S BIOPHARMACEUTICAL BIOPROCESSING TECHNOLOGY CENTRE IS SERVING A VITAL ROLE IMPROVING AND ACCELERATING THE SAFE MANUFACTURE OF MEDICINES, CONSUMER PRODUCTS AND RENEWABLE INDUSTRIAL CHEMICALS.**

Led by Professors Elaine Martin OBE and Gary Montague from the School of Chemical Engineering and Advanced Materials, the Biopharmaceutical Bioprocessing Technology Centre at Newcastle University was formed as a hub to catalyse interdisciplinary collaboration between the discovery sciences – biology, medicine and chemistry – and manufacturing. Prof Martin said: "The really exciting breakthroughs tend to happen at the interfaces of conventional disciplines. With the rising complexity and cost of modern science we can no longer leave this to chance. We must actively bring together new groups of specialists."

The Centre's core capability lies with process optimisation and mathematics, a skill-set relevant to bioprocesses across diverse industry sectors where understanding must be extracted from complex experimental data. Professor Montague said: "Put simply, we accelerate the transition from information to knowledge." In this respect the Centre is serving a vital role improving and accelerating the safe manufacture of medicines, consumer products and renewable industrial chemicals.

Dr Gavin Clark, the Industrial Liaison Director, said: "Central to our value proposition is the ever-growing reservoir of practical experience solving industry problems. Our mission is to exploit and transfer that knowledge by working with industry and by training the scientists of the future."

# EMBRACING A NEW ERA OF COLLABORATION

**WITH INCREASING COSTS AND SQUEEZED PROFIT MARGINS, THERE IS AN INDUSTRY TREND TOWARDS GREATER COLLABORATION TO DRIVE INNOVATION AND GROWTH.**

Open Innovation - where industry proactively sources expertise and technology from third parties - has become commonplace. New relationships are emerging in sectors that previously worked in near-total isolation from potential competitors.

The Biopharmaceutical Bioprocessing Technology Centre's (BBTC) core academic expertise in mathematics and statistics places it in a unique position to assist with collaboration across different industry sectors, in particular for the process industries and advanced manufacturing. One focus of current activity is the science of cleaning manufacturing facilities - a huge area ripe for innovation and improvement:

Conventional plant cleaning processes can be surprisingly unsophisticated and inefficient, typically following tried-and-true practices that were developed before energy efficiency was a priority. Cleaning processes can occupy up to 50% or more of plant time, thereby compounding the issue of rising energy costs with plant inactivity and process inflexibility.

The BBTC is part of the ZEAL (Zero Emission by Advanced Cleaning) consortium that is seeking to optimise cleaning processes based on process

knowledge and the application of scientific principles. The studies include the assessment of new spectroscopic devices alongside conventional instruments as part of a practical approach made possible by the combined expertise of the consortium, including the BBTC's mathematical expertise in data processing and analysis.

Through the application of chemical engineering principles, a fully-scientific closed-loop cleaning cycle will be achieved which will reduce both cleaning time and batch-to-batch variation. The new method will enable plant cleaning to be managed on a fully rational basis, with a prediction and a confidence level. The method will be utilised by consortium partners across diverse industry sectors of pharmaceuticals, chemicals and consumer products.

Building on ZEAL and seeking to further promote and disseminate this important collaborative work, the BBTC is working with the TSB (Technology Strategy Board) funded Knowledge Transfer Networks (KTNs) to host a series of events that are open to industry and academics across the UK.

For more details contact the Industrial Liaison Director [gavin.clark@ncl.ac.uk](mailto:gavin.clark@ncl.ac.uk).



## CHEMICAL ENGINEERING IN SINGAPORE

A new undergraduate programme in Chemical Engineering has been launched this year in Singapore.

The Programme which builds on the existing partnership between Newcastle University and the Singapore Institute of Technology (SIT), is specially designed to build on the strengths of Singaporean polytechnic education; providing high quality, internationally recognised, world-class university education to polytechnic graduates. Leading academics from CEAM will teach and assess the programme and will also be conducting industry-relevant research in Singapore.

Singapore has a large pharmaceutical and research and development manufacturing base, so the Programme links with key growth sectors in Singapore's economy. It is also strategically significant for the BBTC and Newcastle University's School of Chemical Engineering and Advanced Materials (CEAM) in providing a platform for future industry collaborations.

## 8TH ANNUAL BIOPROCESSUK CONFERENCE

The 8th bioProcessUK conference will take place on Wednesday 30th November and Thursday 1st December 2011 at the Glasgow Science Centre.

The conference theme is "Advancing Next Generation Therapies" will give delegates the opportunity to learn about the latest developments in the global biological medicines marketplace and network with key contacts within the sector from the UK and abroad.

## BOOST TO LOCAL BIOPHARMACEUTICAL MANUFACTURING AS FUJIFILM ACQUIRES MERCK BIOMANUFACTURING NETWORK

The acquisition of MSD Biologics (UK) Ltd (formerly Avecia Biologics) and Diosynth RTP LLC by Fujifilm, brings together advanced biotechnology facilities at both at Billingham and in the U.S. with Fujifilm's expertise in production and quality management and its knowledge in high-molecular materials such as collagen.

These facilities are already equipped with extraction and purification process development and analytical capabilities which enable them to deliver a high yield down-stream process which will considerably enhance Fujifilm's growing portfolio of healthcare and lifescience businesses:

"We intend that Fujifilm Diosynth Biotechnologies will lead the global Biologics CMO industry through continuous innovation of technologies, service delivery and quality, contributing to the enhancement of the quality of life of people worldwide. Key to this is the very talented and experienced workforce at both Billingham and RTP, backed by world leading technologies and first class manufacturing assets."

Yuzo Toda, General Manager of Pharmaceutical Products Division, FUJIFILM Corporation

This will also provide a boost to the north east and for UK biopharmaceutical manufacturing:

"This transition of ownership to Fujifilm, and closer collaboration with our US colleagues in North Carolina will truly position us as a world leading contract biologics development and manufacturing business. We look forward to working with both existing and new customers to help bring their drug developments to market".

Steve Bagshaw, Managing Director, Fujifilm Diosynth Biotechnologies, Billingham UK.



## SCIENCE BUSKING

WHAT OUR CURRENT STUDENTS HAVE BEEN DOING TO INCREASE PUBLIC ENGAGEMENT WITH SCIENCE.

As students continue further into their EngD studies, they are encouraged not to lose sight of the wider implications that their research has on society. The EPSRC is keen for research scientists to contribute to "sustaining future people flow into engineering and the physical sciences by enthusing young people about the creative process, issues, aspirations and outcomes of research."

There are several ways the students have been approaching this, from the traditional poster presentations to newer more quirky methods such as 'science busking' and mentoring schemes. Many EngD students fulfil the role of STEM (Science, Technology, Engineering and Mathematics) ambassadors, actively encouraging young people to enjoy STEM subjects, and informing them about the unique career opportunities that are available to them. STEM ambassadors visit schools and events to promote these subjects.



"I had my first taste of STEM busking and it was fantastic. Numerous students came to the stand, asked questions and were entertained and thrilled by various demonstrations. It was a bit like a magic show where the students would ask questions like "how did you do that?", "how did you know?", and after revealing the science behind the "tricks" they were excited for more."

01. Grace Oppong, second year EngD student

EngD students have been acting as mentors supporting school groups. Activities have included studying the role of a practising engineer and improving the energy efficiency of buildings in their school as part of the Go4Set competition organised by the Engineering Development Trust. Mentors help to motivate and inform young people by providing access to information and arranging visits.

As well as attending public engagement events run by Newcastle University and Vitae, who champion the professional development of doctoral researchers, many students actively write blogs. Blogs allow potential and current students to get a glimpse of what life is like as an EngD student and learn about general topics such as career paths. Some students act as STEM reporters, which involves going out into the community to film how science is reaching out to people who wouldn't otherwise be engaged.

Another scheme that students can get involved in is 'Researchers in Residence' which organises secondary school and college placements for researchers. This enables them to work with challenging and inquisitive minds, developing communication and management skills, whilst enthusing young people about research and gaining first-hand insight into what it is like to teach.

## ASSOCIATION OF ENGINEERING DOCTORATES



Association of Engineering Doctorates

The AEngD was established in November 2010 as a 'shared service' organisation that supports Industrial Doctorate Centres (IDC), funded by EPSRC UK and sponsored by various Industries across the UK.

The AEngD aims to promote interdisciplinary collaboration; to communicate Excellence and Innovation; to give Leadership to the EngD brand; to uphold best practices across IDCs; and to support knowledge transfer.

The official AEngD launch will be marked in 2012 with a 2-day Conference for Research Engineers across all IDCs, prominent EngD Alumni, and UK Industry and Academic Leaders, details to follow.

For more information on the Association please visit: [www.aengd.org.uk/index](http://www.aengd.org.uk/index)



01.

# ACTION!

**FIVE OF OUR ENGD STUDENTS ARE TAKING PART IN AN EPSRC FUNDED COMPETITION TO DESIGN AND DEVELOP A PRODUCT RELATED TO SUSTAINABILITY.**

01. Amin Ganjian 02. Charlotte Bell  
03. Matthew Abbott 04. Chelsea Brain

**“ IT GAVE US A GOOD CHANCE TO CONSIDER HOW TO COMMERCIALISE IDEAS STEMMING FROM OUR RESEARCH AND WAS ALSO USEFUL IN TERMS OF LEARNING ABOUT HOW DIFFERENT PEOPLE WORK IN GROUP SITUATIONS, USING PSYCHOMETRIC AND PERSONALITY ASSESSMENTS TOOLS LIKE THE MYERS BRIGGS TYPE INDICATOR (MBTI). ”**

02. Charlotte Bell, second year EngD student

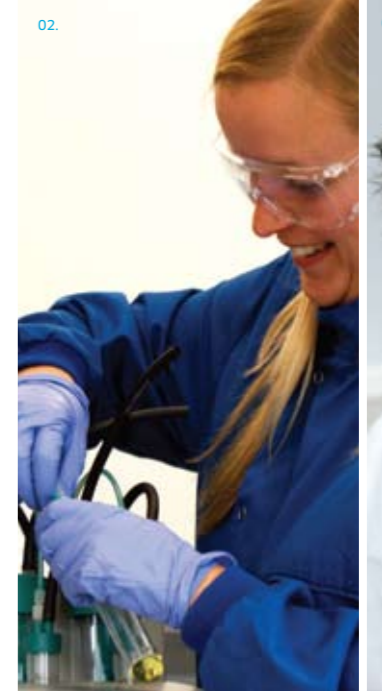
The competition is being held in conjunction with Newcastle University's 'Enough, for all, forever' campaign which aims to encourage research to solve global sustainability issues.

Teams compete for the chance to win £10,000 or a £5,000 runner up prize to develop their idea further. The EngD students have been working in teams with research scientists from different disciplines and some of the innovations to come out of this include a mobile rechargeable battery pack for portable power supply and the discovery of a novel enzyme "ZapZyme" which breaks down bacterial biofilms at low temperature.

The students attended a two day workshop in the beautiful setting of Beamish Hall Hotel, Durham where they took part in team-building activities and classes on creative thinking to enhance their entrepreneurial skills. They all thoroughly enjoyed the workshop and said that the experience had enabled them to develop skills that are relevant not only to the competition, but also for their future careers in science.

The competition runs until November when the winning idea will be chosen by a panel of judges at a showcase event and awards ceremony on the 23rd November at the Great North Museum. Good luck to all our EngDs taking part.

For more information on the competition visit <http://research.ncl.ac.uk/action2011>



04.

# A WEEK IN THE LIFE OF... JODIE SYMINGTON

SECOND YEAR ENGD STUDENT



I decided to do an EngD because of the industrial experience it offers through 'on the job' training. This experience, combined with the technical and professional skills development and mentoring you receive as an EngD student is what sets the EngD apart from a traditional PhD and also what sets you apart from the competition.

I am half way through my EngD now and the experience so far has exceeded my expectations. This is what a typical week looks like for me:

+ **Sunday.** The start of my week! I usually spend a Sunday morning at the Dove Marine Laboratory reviving strains from stores to begin the process of screening. I buddy up with a fellow Dove user so there is always someone else around. My strains are inoculated onto agar plates and left in the incubator. These wee beasties take 4-5 days to grow! Last week's revived strains are inoculated onto bijou's and ready for transfer to the Biolab on campus on Monday morning.

+ **Monday.** Quick Dove collection and off to the Biolab on campus. Last week's cultures are taken out of the incubator and I begin the chemistry aspect of my project in the Millennium Lab. Intermittently I am at the desk reading and writing up results and reports. I have an industrial update on Thursday so I check the agenda is sent out (a reminder to all also) and work on a mini presentation to send out as a visual aid during the teleconference.

+ **Tuesday.** Complete Monday's protocol and store my extracts. Equipment needs for further experiments are organised and booked out; this includes the Biolab and another laboratory up in Institute of

Cellular and Molecular Biology (ICaMB). In the afternoon I'm out of the office working with 6 students at a local school as part of my public engagement.

+ **Wednesday.** An early 6:30am start to print out agendas, results and reports for 8am supervisor meeting. Early start gives me time to gather my thoughts and write down any questions I have so I don't forget to ask them during the meeting. The rest of the morning I use to write up the minutes and chase up any outcomes of the meeting whilst they are fresh in my mind. In the afternoon I prepare culture media to be sterilised overnight in the Biolab.

+ **Thursday.** Cultures are inoculated with strains transferred from Dove and put in the Biolab incubator over the weekend. A quarterly update with my industrial partners is scheduled in for the afternoon. A pre-meeting with supervisors has been arranged and I go through the presentation beforehand and make any final amends before sending out. Minutes of the meeting are taken and sent out to all including any actions arising.

+ **Friday.** A morning at the Dove to prepare my equipment for Sunday before heading to the Biolab on campus to prepare the final step of my screen. The crux of my process and final step in initial screening is completed in ICaMB where I test my extracts on the assay! Needless to say the fruits of my labour will either be celebrated or commiserated in the pub at 5pm!!!

+ **Saturday.** My day! We have two business modules coming up - 'The Management of the Enterprise' and 'Markets and the Structure and Organisation of an Enterprise'. This will require a bit of juggling between my research project and module assignment commitments and I will need to make sure I plan my lab time around my assignment deadlines to make sure I can fit everything in.

So there you go; a typical week in the life of an EngD student and all the additional work involved in organising meetings, preparing results and reports has to fit in there somewhere as well. The EngD is definitely not for the faint hearted(!) but I am glad I have stuck with it because as well as being hard work it is also extremely rewarding. In the end, you don't choose to do an EngD because it's easy, but then nothing worthwhile ever is!

## EPSRC REVIEW SUCCESS

The BBTC has received glowing praise and the continuation of its CDT grant from the EPSRC following its mid-term review.

The Panel made the following observations:

"This is a very good centre which is recognised as a centre of excellence. There is a strong supervisory team. The students are excellent and have a wide range of backgrounds and experience. There is a good cohort mentality and mentoring of new students. The taught module is good and the training on public engagement and ethics is excellent. The Centre has really thought about the added value; it is

seen as a flagship for training and has a strong interdisciplinary nature. There is a good range of input from business. There are strong collaborations with University of Birmingham, industry and internationally."

Congratulations to all those whose hard work has been recognised as making the BBTC so effective.