

Synthetic Biology Research Centre Newsletter

University of Nottingham

Issue 1 October 2014

Nottingham Synthetic Biology Research Centre Creates cross-disciplinary jobs

The £14.3million Synthetic Biology Research Centre (SBRC) will use synthetic biology to engineer microorganisms that can be used to manufacture the fuels and chemicals that modern society needs, in a cleaner, greener way. The SBRC has created 23 new jobs at the University and has embarked on a recruitment campaign to attract talented scientists for its research programmes. It draws together researchers from the Schools of Life Sciences, Chemistry, Mathematics, Computer Science, Pharmacy, Biosciences, Social Sciences and the Faculty of Engineering.



***Centre for Biomolecular Sciences, University of
Nottingham, home of the SBRC - Nottingham***

**Biologists- Chemists -
Mathematicians-
Computer & Social
Scientists required**

**Be part of one of the
largest and most
dynamic synthetic
biology research
teams in the UK.**

A core aim of the SBRC is to generate new knowledge in a coherent, multi-disciplinary environment that ultimately leads to optimised production processes to generate sustainable chemicals and biofuels from microbial systems.

The SBRC has a wealth of dedicated new equipment, bespoke facilities, cohorts of PhD studentships and many existing international research and industry connections.

We seek talented 'wet' and 'dry' scientists to work at research fellow, post-doctoral and technician levels to make this ambition a reality.

The University won the funding from the Biotechnology and Biological Sciences Research Council (BBSRC) and the Engineering and Physical Sciences Research Council (EPSRC). The SBRC - Nottingham is one of three dedicated new centres in the UK, along with the University of Bristol and a joint venture between the University of Cambridge and The John Innes Centre.

Professor Saul Tandler PVC-Research at Nottingham noted that *“Synthetic biology together with the broader area of industrial biotechnology are research fields in which Nottingham has strong track records, not just in carrying out basic research but also applying new knowledge to solve real-world problems. This new award further strengthens the University’s position as a beacon for biotechnology”*.



As the world’s population grows ever bigger, there is an increasing burden on petroleum and natural gas, which are needed for fuel, plastics and medicines.

Led by the University’s Professor Nigel Minton, the SBRC hopes to address the increasing gap between supply and demand by innovating and solving serious scientific challenges using a synthetic biology approach.



Professor Minton, Professor of Applied Molecular Microbiology, said: *“The world needs to end its reliance on fossil fuels to provide the chemical feed stocks that we need for our everyday lives. This new centre gives us the opportunity to create sustainable routes for the production of medicines, plastics and fuels, which will have benefits for the environment and society, as well as economically and politically.”*

Synthetic biology is an emerging scientific discipline, fusing core areas of science principally biology, engineering, chemistry and mathematics and information communication technology (ICT), to create new products and processes. This is achieved by understanding how bacteria grow and synthesise chemicals and subsequently tuning their metabolism so that they

become, in effect, mini-factories that accumulate products which we all need.

The new centre is looking to attract the best research talent to the University and there are currently several opportunities for technicians and for a range of post-doctoral researchers, for more information and how to apply please visit:

<http://www.nature.com/naturejobs/science/jobs/462645-biologists-chemists-mathematicians-computer-social-scientists>

In order to fully exploit the industrial applications of synthetic biology, the SBRC is collaborating with a number of partners, including Lanzatech – a world leader in gas fermentation

Mr Ian Shott chair of the SBRC Strategic Advisory Board said *“modern synthetic biology and industrial biotechnology give the world an opportunity to seize waste as a resource and convert it cost effectively to valuable fuels and chemical building blocks for onward conversion to a huge and diverse range of high value materials. This grant gives The University of Nottingham a distinctive research centre capable of achieving a game changing impact.”*

“By working closely with industry, we will get a much clearer understanding of industry’s needs and we will dynamically adjust our research programmes, so that we are not only solving challenging academic problems but we are tailoring the results to be of benefit to the real world,” added Professor Minton.

Case Study – LanzaTech

LanzaTech is a leader in gas fermentation technology. It provides novel and economic routes to fuels and high value chemicals from industrial wastes and residues such as industrial flue gases from steel mills and other processing plants; syngas generated from any biomass resource such as municipal solid waste, organic industrial waste and agricultural waste and reformed methane residues. LanzaTech's unique microbial process provides a sustainable pathway to produce ethanol and hydrocarbon fuels as well as platform chemicals that are building blocks to products that have become indispensable in our lives such as rubber, plastics and synthetic fibers. LanzaTech’s technology solutions mitigate carbon emissions from industry without adversely impacting food security or causing indirect land use change. Currently operating a second pre-commercial facility in China using steel mill off-gases for ethanol production, LanzaTech, a company founded in New Zealand is now a global organization with offices in USA, New Zealand, Europe, China and India. Full commercial operation is targeted for 2015.

The SBRC – Nottingham is carrying out collaborative research funded by BBSRC and Lanzatech to enable more efficient fermentation of waste materials into fuels.



CALENDER

Of Key Synthetic Biology Events

31 October 2014

"Syngas production and biotechnological application", Instituto Nacional del Carbón (INCAR, Oviedo), Spain
<http://www.synpol.org/>

17-19 November 2014

BBSRC-EFB "Focus on Frontiers in Industrial Biology", London
Louise.Horsfall@ed.ac.uk

18-20 November 2014

Natural Product Biotechnology, Inverness
<http://icnpb.org/>

9 December 2014

BBSRC Media Course, London
Free to NIBB scientists
<http://www.bbsrc.ac.uk/funding/awardholders/media-training.aspx>

15-19 December 2014

C1net Workshop, Oxford
<http://www.bbsrc.ac.uk/funding/awardholders/media-training.aspx>

14 January 2015

Launch Events BBSRC/EPSRC Synthetic Biology Research Centre Nottingham
<http://www.c1net.co.uk/Events-conf-1.html>

14-16 January 2015

C1net Conference, Nottingham
<http://www.c1net.co.uk/Events-conf-1.html>

11-12 February 2015

Industrial Biotechnology Showcase, London
<http://ibts.meeting-mojo.com/>

25-26 March 2015

ACI Gasification Conference Prague, Czech Rep.
<http://www.wplgroup.com/aci/conferences/eu-ecg4.asp>

News and Events

Horizon 2010 Success - Clospore International Training Programme

An Horizon 2020 Marie Skłodowska-Curie Initial Training Network has been awarded to The Clospore International Training Programme, led by Professor Nigel Minton, examining the Clostridium spore.

CLOSPORE: Fighting Infection - Curing Cancer - Saving the Planet

CLOSPORE's structured, high quality doctorate training programme is multi-faceted, multidisciplinary and intersectorial. It will bring together otherwise disparate and isolated early stage researchers into a single, coherent unit to focus on scientific excellence, industrial relevance and mobility. By the coalescence of 'early stage' talent, CLOSPORE will address the pillars of Horizon 2020 including:-

EXCELLENT SCIENCE: by combining the interdisciplinary skills and expertise of Europe's leading academic/industrial clostridial experts, CLOSPORE will ensure progress will be made in understanding the complexities of the developmental processes of the clostridial spore – the single most important feature of the genus. More importantly, by training a new cadre of 15 ESRs to become skilled in the art of Clostridial spore biology, CLOSPORE will nurture the talent needed to enhance the future level of excellence in Europe's science base to deliver world-class research.

SOCIETAL CHALLENGES: Clostridium resides at the heart of some of the greatest Challenges facing society. Thus, only by understanding the spore can we more effectively tackle the devastating intoxications caused by Clostridial pathogens such as *C. perfringens*, *C. difficile* and *C. botulinum* - scourges of European healthcare systems and the food and dairy industry. On the other hand, Clostridial spores have the potential to cure cancer (one of humankind's greatest killers), a spore product has tremendous potential in tackling the rising antibiotic resistance of infectious bacterial diseases while the regulation of spore production in those clostridia being used to make biofuels from biorenewables could lead to process improvements that would ultimately help reduce greenhouse gas emissions and global warming.

News and Events

FREE C1net CONFERENCE CHEMICALS FROM C1 GAS 14-16 January 2015, Hilton Hotel, Nottingham

About

Hosted by C1net a BBSRC-NIBB this FREE two-day, conference will bring together academic and industrial partners to identify and address key challenges in the study of those organisms able to grow on C1 compounds and commercially exploit them as platforms for chemical manufacture. The programme will include talks from selected submitted abstracts, as well as from key academics and industry representatives. Confirmed expert speakers so far include Sean Simpson (LanzaTech), Peter Duerre (University of Ulm), Michelle Gradley (BioSyntha) and Auxiliadora Prieto (National Spanish Research Council). There will also be plenty of opportunities for networking.

Details

What: **FREE** participation & full board for two nights and 2 days.
When: 19:00, Wednesday 14 January – 17:00, Friday 16 January 2015
Where: The Hilton Hotel, Nottingham, NG1 3PZ

Application

Open to C1net members ONLY. So Join today! **REGISTRATION IS FREE!** Participation and full board are provided free of charge (thanks to BBSRC funding), but, with limitations on funding, attendance will be on successful application only and priority will be given to presenters.

APPLICATION AND ABSTRACT DEADLINE 31 OCTOBER 2014

A limited number of travel bursaries, up to £50 are available for young researchers (in first 5 years of research) on application.

FOR MORE DETAILS OR TO APPLY

visit: <http://www.c1net.co.uk/Events-conf-1.html>
email: jacqueline.minton@nottingham.ac.uk



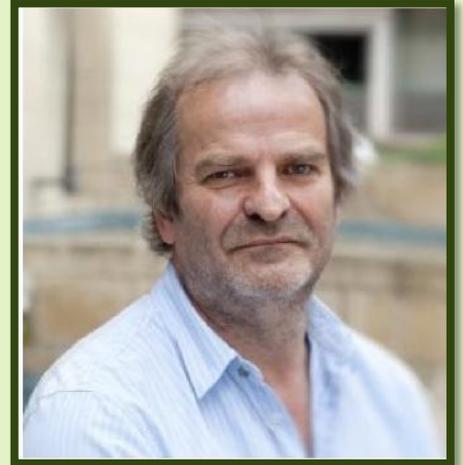
**Application and
abstract Deadline:**

31 October 2014

Meet the Team

Professor Nigel Minton SBRC Centre Director

Nigel P Minton established the Clostridia Research Group (currently 50+ researchers) in 2004, following 25 years of service in the applied environment of the Centre for Applied Microbiology and Research (CAMR), Porton Down. He has filed 15 patents and secured in excess of £40Million in funding since arriving at Nottingham. He led one of the six programmes that together comprised the BBSRC Sustainable Bioenergy Centre (BSBEC) and is the Principle Investigator of a UK-India partnership involving 3 other UK Universities (York, Newcastle and Oxford Brookes) concerned with converting rice straw into advanced biofuels. The partnership includes the two principle centres in India focused on Bioenergy and Synthetic Biology, the DBT-ICGEB Centre for Advanced Bio-Energy Research at the International Centre for Genetic Engineering and Biotechnology (ICGEB) in New Delhi and the DBT-ICT-Centre for Energy Biosciences at the Institute of Chemical Technology in Mumbai. He is the PI of a £2.9Million BBSRC/ LanzaTech sLoLa in Synthetic Biology, leads a new £1.6Million BBSRC Network in Industrial Biotechnology and Bioenergy (NIBB) focussed on Gas Fermentation and is the Director of a newly awarded BBSRC/EPSRC £14.3Million 'Synthetic Biology Research Centre' (SBRC) focussed on Sustainable routes to platform chemicals from C1 feedstocks. He is on the LanzaTech Scientific Advisory Board and is the scientific lead on *Clostridium difficile* research within Nottingham's NIHR Biomedical Research Unit on Gastrointestinal disease (£7.5Million over 5 years). Building on BSBEC, past and current BBSRC Industrial Partnership Awards and several ERANET programmes, he has in recent times amassed a £2.4Million portfolio of industrial contracts and partnerships to use Synthetic Biology approaches to generate company-specific chemicals.



Dr Alan Burbidge SBRC Centre Manager

"Recently I migrated within the university to the Synthetic Biology Research Centre (SBRC). My role in the SBRC is Centre Manager. Before taking on this role, I was a Licensing Executive in the University's Technology Transfer Office where I was responsible for commercialising technologies developed from academic inventions. I was involved in setting up several spin-out companies and in closing commercial licensing deals relating to a number of different technologies generated in the schools of Biosciences, Life Sciences and Pharmacy. Prior to all that I was a research fellow working on the molecular genetics of tomato in the School of Biosciences at Sutton Bonington"



Meet the Team

Jan Sablitzky SBRC PA

"On 1st September, I moved from a role providing practical support and institutional sign-off for grant bids and awards across the Faculties of Arts and Social Sciences (as part of University of Nottingham Research and Graduate Services) to be PA to Nigel Minton and Alan Burbidge in their roles as Director and Centre Manager respectively of the new Synthetic Biology Research Centre. I have also worked in University of Nottingham Student Services and in the School of Psychology for the then Dean of the Graduate School. Altogether, I have now studied/worked at 5 Russell Group universities (and in other sectors) over the years and am enjoying this next challenge here at University of Nottingham



Louise Dynes SBRC Outreach and Communications Officer

I recently joined the Synthetic Biology Research Centre (SBRC) as Outreach and Communications Officer, my role is to coordinate all outreach and communication activities for the SBRC. Prior to this I worked for 4 years as an Outreach Officer for the BBSRC funded lignocellulosic Conversion to Ethanol - LACE programme on the Sutton Bonington campus, where I organised and facilitated a number of bioenergy related outreach activities for schools and the public. I am very much looking forward to working with everyone and getting colleagues involved in many outreach activities!!

Responsible Research and Innovation

What is RRI?

Responsible Research and Innovation (RRI) is concerned with the nature and trajectory of research and innovation: what it can do for society and who gets to decide. According to Research Councils UK, it is:

"The process that helps researchers understand the benefits and risks of emerging technologies early on in the innovation process. It includes public engagement, risk management, life cycle analysis, ethical approval and regulation".

RRI has been embedded by research funding institutions such as the EPSRC (Engineering and Physical Sciences Research Council), the BBSRC (Biotechnology and Biological Sciences Research Council), the European Commission's Horizon 2020 programme and in major funding calls from other organisations. The EPSRC has RRI as a key strategic element of its funding programme, highlighting four important dimensions of RRI, namely: anticipate, reflect, engage, act (AREA).

RRI, Synthetic Biology and the University of Nottingham

RRI has been a key feature of the synthetic biology research and innovation process for many years. In 2008 Andrew Balmer and Paul Martin, then working at the University of Nottingham, wrote a report for the BBSRC entitled Synthetic Biology: Social and Ethical Challenges. In 2012 TSB (Technology Strategy Board) published a Roadmap for Synthetic Biology which embedded RRI. The new Synthetic Biology Research Centre at the University of Nottingham has RRI at its core. Professor Brigitte Nerlich, who directs the Making Science Public programme and works at the Institute for Science and Society (School of Sociology and Social Policy), a new research fellow, and Dr Kate Millar, who heads the Centre for Applied Bioethics within the School of Biosciences, will coordinate engagement with RRI and social science research into RRI theories and practices as they develop within the SBRC, at the University of Nottingham and beyond. This means engaging in work that crosses natural and social science disciplines and connects science with society.

Blog all about it

Professor Brigitte Nerlich has recently written a blog, entitled: Fermenting thought a new look at synthetic biology:

<http://blogs.nottingham.ac.uk/makingsciencepublic/2014/08/20/fermenting-thought-a-new-look-at-synthetic-biology/>

For other blogs on RRI please visit:

<http://blogs.nottingham.ac.uk/makingsciencepublic/2014/09/24/responsible-research-and-innovation-infohub/>

Outreach Activities

SBRC 'Knock out' 3 Outreach Events

Science Wow Day Firbeck Academy, Wollaton

On Thursday 9th October, members from different schools of the University of Nottingham visited Firbeck Academy, to deliver a 'Science Wow' day.

Four different workshops were delivered these included: Electricity – making an LED light, DNA structure – extracting DNA strands from fruit and making a DNA strand with liquorice and marshmallows, Changing states – exploring bubbles, surface water tension and how solids change to liquids by making jelly snakes as well as Chemical reactions - looking at how yeast reacts with different sugars to blow up balloons. Volunteers from The Synthetic Biology Research Centre at the School of Life Sciences were involved in running workshops; Louise Dynes, Michelle Kelly and Lorna Finch.

The day was completed by a presentation Assembly in the afternoon when the KS2 children were able to share what they had learnt with the rest of the school. The day was a great success, enjoyed by both pupils and teachers and as one child commented; *"When's the next one?! We hope we don't have to wait too long!"*



Big Biology Day



On Wednesday 15 October, we welcomed fifty Year 10 and 11 students from 3 local schools into a teaching laboratory in the Medical School to take part in a Big Biology Day 2014, which is part of the Biology Week run by the Society of Biology. Louise Dynes SBRC Outreach and Communications Officer coordinated an activity from the Synthetic Biology Research Centre that was delivered by PhD students Bart Pander, James Millard and Lorna Finch. This involved comparing aerobic and anaerobic respiration in yeast and a microscopy session to identify different species of bacteria, which tested the students observation and reasoning skills. The aim of the day was to raise attainment as well as aspirations. The students were also offered two other activities from the School of Life Sciences. This event, was part of the University of Nottingham's 'Curriculum Links' programme with the Mansfield Learning Partnership.



Outreach Activities

Pub PhD, Public Talk at the Vat and Fiddle, Nottingham

On Wednesday 22nd October Bart Pander PhD Student gave a ten minute talk and a 20 minutes question and answer session for 35 people.

"In my ten minutes talk I discussed the evolution of early life and how Clostridial acetogens give us a glimpse of how early life could have used carbon and energy metabolism. Then I talked a bit about the modern problem of rising carbon dioxide levels in air and how it could be partly solved by using Clostridium autoethanogenum to turn wastes into valuable chemicals. The final 3 minutes I talked about how we try, by using synthetic biology



techniques, to optimise the bacterium to do this.

In the Q&A, I got questions about first and second generation biofuels, genetic modification, how deleting genes can improve a bacterium, economy of the biofuel problems, Lanzatech and other companies, the genetics of the organism and other questions about the bacteria.

I believe the impact was that these 35 people heard, for the first time, about the usage of clostridial acetogens in industry to produce valuable chemicals from waste, and the research

we in Nottingham do. As well as that there is a whole research community doing related research. Many people were enthusiastically discussing it afterwards and I guess they will discuss this with friends and family. The day after I've got very positive thank you messages from the organisers and people attending".



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