

Synthetic Biology Research Centre Newsletter

University of Nottingham

Issue 3 - August 2015

Synthetic Biology Research Centre – Nottingham Collaboration with CHAIN Biotechnology Ltd.

CHAIN Biotechnology Ltd. (CHAIN) is a new Industrial Biotech (IB) company founded in September 2014 by Dr Edward Green. The company's primary focus is on the development of advanced fermentation technology for the production of high value chemicals, particularly speciality chiral products for nutraceuticals and pharmaceuticals applications. Working closely with academic partners, the Company aims to build a unique, differentiated and world leading capability for microbial strain development.

CHAIN has formed a strategic partnership with the Synthetic Biology Research Centre (SBRC) at the University of Nottingham to help commercialise the molecular biology roadmap for fermentation. The technology will be used for internal collaborative projects but also marketed externally to academics and industry to build links and promote research collaborations. Currently, CHAIN has a team of four working at the SBRC. These include the founders; Dr Edward Green and Dr Basil Omar and two bench scientists; Dr Dana Heldt and Dr David Kirk. Dr Edward Green comments "We are excited to work with the SBRC led by Professor Nigel Minton and to get the opportunity to access world class science, research expertise and capability. The integration of a company within an academic research centre is a new way to work and one that should accelerate the commercialisation of research outputs" Dr Alan Burbidge, Centre Manager SBRC-Nottingham added: "these are exciting times for synthetic biology and having a close relationship with CHAIN gives us the opportunity to build closer links between academia and industry to exchange knowledge and to translate new techniques and materials in microbial synthetic biology to the industrial base for real-world applications."

For more information please visit: www.chainbiotech.com



SBRC - Nottingham

Position Available:

Senior Research Scientist – Molecular Biologist

We seek an experienced post-doctoral scientist or research fellow who has the ambition to build an academic career in synthetic biology. The post-holder will be a senior research fellow in our Synthetic Biology Research Centre and the post will (subject to academic performance) convert into a permanent academic position.

For more information and how to apply please visit:

<http://www.nottingham.ac.uk/jobs/currentvacancies/ref/MED271014X3>

*Closing date for this position is **Friday 16th October 2015**

www.sbrc-nottingham.ac.uk

[@SbrcNottingham](https://twitter.com/SbrcNottingham)

Research News

Case Study

Chemistry in the SBRC - Nottingham: Adding value to the products of fermentation

The Chemistry work package is threaded into the activity of both wet and dry scientists within the SBRC. Products are identified as a result of direct discussion between all parties and strategy developed through onwards consultation and work. The general drive to develop chemical processes with increased efficiency is part of the University Research Priority Area (RPA) entitled "Atoms-to-products" and as such is cross-disciplinary and involves direct communication with colleagues in Social Science including those active in the RRI work package.

Aims:

The chemistry informed work package is an integral component of the SBRC delivery plan, its principle aims are packaged into 2 key thematic parts:

Part 1: Development of in-situ analytics to inform fermentation productivity. State of the art Process Analytical Techniques (PAT) will be applied to enable SBRC scientists to study and monitor the composition/concentration of fermentation products in real time. PAT data will not only provide crucial data to biologists such that organisms can be optimized and cultured to deliver specific products, but also inform process engineers to enable early interaction and timely design of scale-up reactors, short-cutting the handover of laboratory-based systems to semi-tech demonstration processes.

Part 2: Accessing the petrochemicals tree; value-added products *via* chemical modification and catalysis. Colleagues from across the School of Chemistry will work with SBRC researchers to identify fermentation products that offer synthetic opportunity with respects to functionalization and upgrade into more valuable synthetic intermediates. Strategies currently under development include transition metal mediated catalytic transformations (including C-H activation, C-C coupling and REDOX based processes) and enzymatic processes including transamination and cyclization.



Professor Pete Licence
(School of Chemistry – GSK Carbon Neutral Laboratories,
University of Nottingham)
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Research News

Grant Success

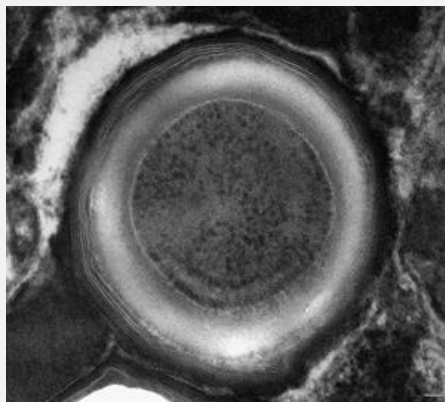
Professor Nigel P Minton has been awarded:

A BBSRC International Partnership Award for £51,000: "Accelerating Synthetic Biology Approaches to Renewable Chemicals and Fuels" to develop fermentation technology with several UK and Brazilian university and company collaborators.

An ERA-1B 6 award: "Biological conversion of CO₂ to the platform chemical 3-hydroxypropanoic acid" for £520,000

An H2020 ITN "Understanding the Clostridium Spore, A prerequisite for disease interventions and exploitation (Clospore)" for £752,000 to establish a European network to train PhD students.

The University of Nottingham is part of an international team awarded more than \$3.2 million from the US National Institute of Allergy and Infectious Diseases to prove the effectiveness of a new treatment for Clostridium difficile Infection, one of the most common hospital-acquired infections. C. difficile causes diarrhea and more serious life-threatening intestinal conditions as a consequence of the release of devastating toxins by actively growing bacterial cells in the gut. The infectious form of C. difficile is, however, the spore, one of the most highly resistant life-forms on earth. These seed-like, dormant structures can survive on hospital surfaces for extended periods. Following their accidental ingestion, spores revert back to toxin-producing, actively growing bacteria in the gut through a process called 'germination'. Prevention of spore germination would effectively eliminate the disease. This is precisely what the funded project seeks to achieve - the synthesis and evaluation of compounds that stop the bacterium from growing in the gut by preventing spore 'germination'. Some highly effective lead candidates have already been identified. The five-year grant is led by two USA-based principal investigators, Ernesto V. Abel-Santos of the University of Nevada Las Vegas and Steven Firestone of Wayne State University and Nigel P. Minton at the University of Nottingham, UK.



The project has the potential to drastically decrease the spread of a dangerous infection, and improve the safety and well-being of hospital patients and residents in nursing homes and extended care facilities. In the USA alone, there are approximately half a million C. difficile cases annually, with a mortality rate greater than 2.5% and at an annual cost of \$3.2 billion.

For more information about the US National Institute of Allergy and Infectious Diseases please visit:

<http://www.niaid.nih.gov/Pages/default.aspx>

An Electron Micrograph of a Clostridium difficile spore – courtesy of Dani Heeg

Other News

Manchester SBRC - SynBioChem Launch

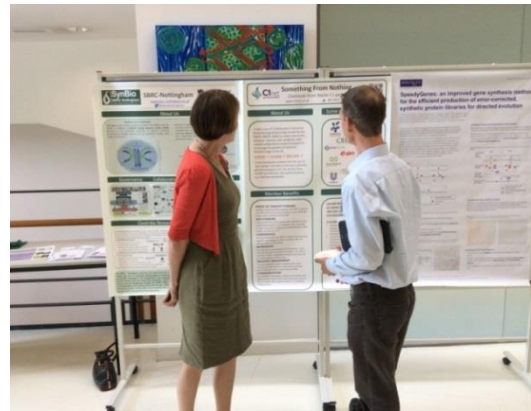
Prof Nigel Minton (SBRC-Nottingham Director), Dr Alan Burbidge (SBRC-Nottingham Centre Manager) and Mrs Jacque Minton (C1net NIBB Manager) attended the Manchester SynBioChem kick-off event on 11th and 12th June. It was a well-attended launch event with most of the other BBSRC/EPSRC SBRCs represented. Although synthetic biology research has been evolving for some time, the establishment of six Synthetic Biology Research Centres in the UK along with Foundries and the Innovation and Knowledge Centre mean that there is now a formalised research strength in this emerging area. It was evident at the meeting that there is a strong UK synthetic biology research community spirit forming with both academic and industry interest, which is really positive.

We look forward to working closely with colleagues at the Manchester SBRC - Synbiochem and wish them every success. For more information please visit:

<http://www.mib.ac.uk/research/syntheticbiology/>



Prof Nigel Minton, giving a talk at the launch event



C1net Manager Jacque Minton explaining the C1net poster

Visitors to the SBRC- Nottingham

We welcome:

Dr Angel Pech-Canul from Universidad Nacional Autónoma de México, Mexico City. He has been granted a postdoctoral fellowship to work in the SBRC-Nottingham for 12 months and is working on "improving butanol production of *Clostridium pasteurianum*"

Dr Rosa Lidia Solis Oviedo from Universidad Nacional Autónoma de México, Mexico City. She has been granted a postdoctoral fellowship to work in the SBRC-Nottingham for 12 months and is working on "Succinate Production from Lignocellulosic Biomass Using a Thermophilic Chassis"

Two Interns from Germany visiting the SBRC until October 2015

Vanessa Kienzle and Arlen-Celina Lücke: *I am 25 and I am doing an Internship in the C.difficile group of Nigel Minton as part of the Masters programme "Biomedicine" of Hanover Medical School in northern Germany (Lower Saxony). I will probably finish my Masters next year.*

Conferences and Workshops

CALENDER

Of Key Synthetic Biology Activities and Events

1 – 3 September 2015

Synthetic Biology UK 2015
Charles Darwin House,
London, UK
<http://www.biochemistry.org/Events/tabid/379/MeetingNo/SYNBIO/view/Conference/Default.aspx>

7-11 September 2015

Clostrpath 2015
Freiburg, Germany
<http://www.clostrpath2015.org/>

28 September – 2 October 2015

C1 net Workshop 2 on
Metabolic Modelling -
Introduction to Kinetic
Modelling, Oxford
<http://www.c1net.co.uk/Events-workshop-2.html>

20-21 October 2015

2nd Synthetic Biology
Congress, London
<http://www.globalengage.co.uk/synthetic-biology.html>

27-29 October 2015

European Forum for
Industrial Biotechnology,
Brussels, Belgium
<http://www.efibforum.com/>

C1net/Metals in Biology Partnering Meeting



University of Nottingham 23-24 June 2015

The elusive summer sun finally came out to welcome 46 industrial and academic delegates from all parts of the world to the University of Nottingham campus, for the C1net* Partnering Meeting "Metabolism and Enzymology of C1 Organisms". The event was held in the well-appointed new School of Humanities building and the accommodation in halls of residence allowed delegates to revisit and reminisce about student days.

The meeting mixed inspirational talks from academia and industry with pitching, networking and project building activities. Special guest speakers included Stephen Ragsdale (University of Michigan), Rolf Thauer (Max Planck Institute), Volker Müller (Goethe-University), Tom Smith (Sheffield Hallam), and Frank Sargent (Dundee) and industry representatives from Calysta, Lanzatech, ZuvaSyntha and Ingenza. By the end of two days of caffeine and creativity, with skillful catalysts Amy Tayler and Simon Baty of the KTN, there emerged 9 embryonic projects which it is hoped will develop into Proof of Concept applications for the £250K funding available this year.

Delegates gave good feedback for the event. They appreciated the high calibre of invited speakers, the mix of academia and industry, the pitching, and the ample opportunity to network. "Thanks for the excellent and well organised event!" said Rahman Pattanathu TeeGene Biotech Ltd



* C1net is one of 13 Networks in Industrial Biotechnology & Bioenergy (NIBB) funded by BBSRC to create interaction between industry and academia and initiate collaborative research projects to encourage the growth of Industrial Biotechnology in the UK. Operating out of the CBS building, under the management of Jacque Minton, C1net is the outward face of the new BBSRC/EPSRC Synthetic Biology Research Centre, which champions research into the use of "gas-eating" microbes to ferment polluting greenhouse gases (CO, CO₂ & CH₄) from landfill and industry, into useful products e.g. biofuels and plastics. You can join C1net or find out more here: <http://www.c1net.co.uk/>

New to the Team

Dr Anja Wiechmann

*I grew up in a small town close to the Baltic Sea in Germany and moved to Hamburg to study Biology. While doing a Masters I decided to do an internship in York and moved to England. For my PhD I came to Nottingham where I studied quorum sensing regulation in *Yersinia pseudotuberculosis* here in CBS. Three months ago I started working as a technician in Nigel's lab and currently work in the bioenergy group on biofuel production in *C. acetobutylicum*. In my free time I enjoy playing squash, reading and going to the pub.*



Dr Nicole Pearcy

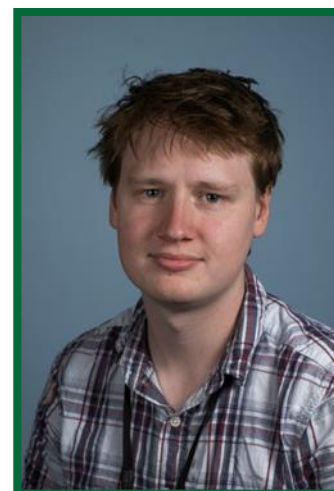
I have recently joined the School of Life Sciences as a Research Associate in the Synthetic Biology Research Centre. My research interests lie in the modelling of complex systems using a network/systems approach. More specifically, my PhD research, which I recently completed at Nottingham Trent University, involved the topological analysis of a large cohort of bacterial metabolic networks, in order to better understand their underlying evolutionary design principles. Here, my work will involve the development of mathematical/computational tools for analysing genome scale metabolic models, which can be employed to make predictions of metabolic behaviour. I am really looking forward to further developing my research skills, whilst working within a multidisciplinary research team on this project.



Dr James Gilbert

James is a computer scientist working to develop novel mechanisms for the analysis and visualisation of large scale biological networks. His PhD focused on network module extraction algorithms for complex networks with a particular focus on plant gene expression and protein interaction datasets.

James hopes to bring his knowledge and experience to develop new computational approaches that aid the design of new pathways into microbial organisms.



Outreach Activities

Student Placement

From the 13th to 17th of July, the Synthetic Biology Research Centre Nottingham (SBRC) had the pleasure of offering insight into actual research on gas-fermenting bacteria to a student from the Friesland School in Derbyshire. During his Work Experience Placement, Rhys Denner has supported the Gaschem team in its efforts to study a candidate gene encoding for carbonic anhydrase in the industry-relevant bacterium *Clostridium autoethanogenum*. Under the supervision of PhD Student Bart Pander, Rhys carried out laboratory experiments, to produce data which he subsequently analysed under the guidance of computer modeller Dr Thomas Millat. By the end of the week Rhys was able to conclude that the gene under investigation indeed encodes for an active carbonic anhydrase in *C. autoethanogenum*. Rhys said *"I think these few days might change my life, at first I wanted to do something more chemistry, but now I might want to go for molecular biology or biochemistry"* Rhys really enjoyed his time with us and gave the impression that this experience had boosted his interest in studying at University.



Rhys Denner and PhD Student Bart Pander working hard in the lab



Rhys Denner receiving his Student Placement Certificate from Dr Thomas Millat



Young Careers Day – 15 April 2015

A high-flying group of year 10 school pupils from Cambridge listened intently while PhD students Lorna Finch, Christian Arenas and Bart Pander explained their varying career paths into Science. They then experienced what it was like to be a scientist when they extracted DNA from strawberries. Bart then gave a short talk about his research area and the pupils also got to "design their own plasmids" in a synthetic biology game.

Most of the pupils already seemed to have a good idea about the areas which they wanted to study, and not all were committed to a scientific path. However we believe we helped open their eyes to the breadth of scientific careers available and the importance of Science to the world around them.

Outreach Activities

MayFest 2015

On Saturday 9th May, the University of Nottingham opened its doors to the public at the annual Mayfest event. More than 5,000 people flocked to The University of Nottingham for the weekend of fun. Students, alumni, friends of the University as well as members of the public from all over the county gathered together for a range of scientific displays, interactive activities, topical debates and the chance to find out about working or studying in Nottingham. The SBRC-Nottingham and C1net hosted an activity stand called "Synbio Bugs". Demonstrators from the group engaged younger children with making model microbes from plasticine which they took home in Petri dishes. They went away happy with a "I ♥ Microbes" sticker and the message that not all microbes are bad. They also had a go at "streaking" bacterial plates in our new mock anaerobic cabinet. Older children learned about gas fermentation from the gas fermenter demonstration and used Molymods to turn simple carbon molecules into more complicated ones. *"We estimate that 450 children visited our stand. It was a fun action packed day, and many thanks go out to all those who volunteered at our stand and helped make the day so successful."* Louise Dynes (SBRC Outreach & Communications Officer)



Social Science Lecture

As part of the Widening Participation agenda, the University offers week-long residential summer schools for 'high-achieving year 12 students to experience higher education and receive support for the application process'. One of these residentials is the Sutton Trust Summer School. Part of the experience is a series of taster lectures/sessions across a week. On Thursday 23 July Prof Brigitte Nerlich (Responsible Research and Innovation) gave a 90 minute session entitled 'In Frankenstein's Footsteps: Nanoscience, Bioscience and Culture'. Brigitte provided the students with an overview of how cultural narratives shape our understanding of science. She talked about stories of fear, epitomised by Mary Shelley's Frankenstein, written in 1816 in the context of the eruption of Mount Tambora, the raising interest in galvanism and anatomical dissection, which still informs discussions in the biosciences today.

She also discussed stories of hope, such as the 1966 film Fantastic Voyage, a Jules Verne inspired story of a miniaturised submarine injected into the human body, which is still evoked at nanoscience conferences dealing with drug delivery today. At the end of the session she told students about the work we do in Nottingham here at the SBRC and how we make what could be seen as 'monsters', such as the Clostridia and *E. coli* bacteria work for us to produce medicines and energy.



Prof Brigitte Nerlich giving the lecture

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SynBio
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