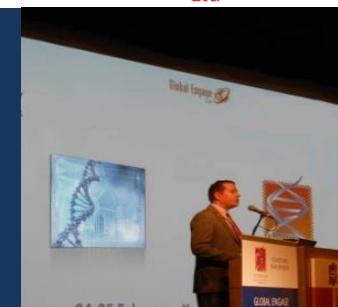


20-21 October 2015, London, UK



The 2nd Annual



Synthetic Biology Congress

**CUTTING EDGE RESEARCH, STRATEGIES, AND SOLUTIONS TO KEEP YOU UP TO DATE WITH THE LATEST ADVANCES,
INVESTMENT OPPORTUNITIES, NOVEL METHODS & APPLICATIONS OF SYNTHETIC BIOLOGY IN THE HEALTHCARE & AGRICULTURE SECTORS**

Global Engage are pleased to announce the 2nd Synthetic Biology Congress, which will be held on 20th-21st October 2015 in London, UK. The conference will be co-located with our 3rd qPCR and Digital PCR Congress and Microfluidics Congress. The combined events attracted over 400 attendees and more than 50 poster presentations in 2014.

Designed for experts working in genome engineering, technological developments, protein design, cell building, bio-manufacturing and gene editing, the Synthetic Biology Congress will examine the latest developments in these fields in both the healthcare and plant biology sectors. New to the conference will be the addition of a third stream, focusing on Investment, Start-Ups, Strategy and Bioethics, for those looking for investment opportunities and seeking to further exploit their research.

Synthetic biology is one of the most promising areas of modern science, with a wealth of potential for developments in healthcare and plant research. Consequently, investors and governments are constantly looking for new advances in the field and for companies to support.

The conference will thus provide a timely interactive networking forum offering the opportunity to take home cutting edge research, strategies, methods and solutions to allow you to keep up to date with the latest advancements, novel methods and applications of Synthetic Biology within your field.

Confirmed Speakers Include



Adam Arkin
Professor of
Bioengineering,
UC Berkeley, USA



Daniel Voytas
Director of the Center for
Genome Engineering,
Professor,
University of Minnesota



Alison Smith
Professor of Plant
Biochemistry, Department
of Plant Sciences,
University of Cambridge



Janet Bainbridge
Head of Agricultural
Technology,
UK Trade and Investment

www.globalengage.co.uk/synthetic-biology.html

Conference Synopsis

Healthcare / Drug Discovery

- Overview, introduction and impact of synthetic biology
- Academic & pharmaceutical synthetic biology case studies
- Genome engineering
 - Technology and tool development
 - Gene and genome synthesis
 - Genome and pathway design
 - Genome editing - CRISPR/ TALENs / ZFNs etc
 - Engineering cells – novel / optimising pathways
 - Programming behaviour
 - Systematic engineering for better function prediction/modeling
- Applications of synthetic biology in health research
 - Development of drugs, vaccines, antibiotics etc
 - Disease identification
 - Reprogramming stem cells
 - Synthetic DNA based therapeutics
 - Antibody / Protein engineering
 - Biosensor development
 - Gene therapy
 - Bacteria engineering
 - Drug delivery
- Synthetic biology for exploiting and designing proteins
 - Protein alteration & post-translational modification (PTM)
 - Novel screening strategies
 - Protein production
- Bottom up approaches: cell building / genome assembly / building synthetic life
- Bio-manufacturing
 - Biocatalysis and biotransformation innovation
 - Function and use of enzymes as biocatalysts
 - Enzyme engineering

Plant Synthetic Biology

- Potential of synthetic biology in plant research
- Genome and pathway design / engineering
- Natural product biosynthesis
- Genome engineering / editing – CRISPR / TALENs etc
 - Enriching plants through synthetic biology
 - Programmable behaviour
 - Metabolic engineering
- Improving DNA assembly methods
- Applications at molecular, cell and plant levels
- Plant research case studies
 - Trait design / improvement
 - Nitrogen efficiency
 - Efficient water use
 - Conservation
 - Biosensors
 - Biofuel
- Plant research for biofuels / bioproducts and pharmaceuticals
- Panel - Potential of synthetic biology in plant research

Investment, Start-Ups, Strategy and Bioethics

- Funding opportunities for synthetic biology
- VC investment
- Social and bioethics
- Start-up / small company showcase
- Challenges facing synthetic biologists
- Panel Discussion – Venture Capitalism, Biotechnology Start-ups and Partnering Opportunities

The 2nd Synthetic Biology Congress – 20-21 October 2015, London

Confirmed Speakers & Track Chairs: Healthcare / Drug Discovery and Investment, Strategy, Start-Ups and Bioethics



Andrew Ellington, Research Professor of Biochemistry, Department of Chemistry, The University of Texas at Austin, USA



Adam Arkin, Professor of Bioengineering, UC Berkeley, USA



Joyce Tait, Professor, Director, Innogen Institute, University of Edinburgh, UK



Oliver Sexton, Investment Manager, Midven, UK



Timothy Lu, Associate Professor of Biological Engineering and Electrical Engineering and Computer Science, MIT, USA



Mark Howarth, Associate Professor, Department of Biochemistry, University of Oxford



Janet Bainbridge, Head of Agricultural Technology at UK Trade and Investment, UK



Simon Warner, Chief Scientific Officer, Oxitec, UK



Jamie Davies, Professor of Experimental Anatomy, University of Edinburgh



Beatrix Suess, Professor for Genetics and Synthetic Biology, Department of Biology, University of Darmstadt, Germany



Karen Polizzi, Lecturer, Department of Life Sciences, Imperial College London, UK



Matthew Gregory, CEO, Isomerase Therapeutics, UK



Mark Isalan, Reader in Gene Network Engineering, Imperial College London



Chris Willis, Professor of Organic Chemistry, School of Chemistry, University of Bristol



Murray Brown, Global Coordinator, Innovation in Synthetic Biochemistry, GSK



Evan Thompson, Cofounder, CEO of Theraxen



Philipp Holliger, Program Leader, MRC Laboratory of Molecular Biology, Cambridge, UK



Tim Dafforn, Professor of Biotechnology, School of Biosciences, University of Birmingham



Celia Caulcott, Executive Director, Innovation and Skills, BBSRC, UK



Alistair Elfick, Professor and Director of Centre for Biomedical Engineering School of Engineering, University of Edinburgh, UK



Jonathan Lewis, CEO and Chairman, Molecular Ninja Therapeutics, USA



Kell Mortensen, Professor, The Niels Bohr Institute and Center for Synthetic Biology, University of Copenhagen, Denmark



Michael Skinner, Reader in Virology, Imperial College London, Chair of Health and Safety Executive – Scientific Advisory Committee on Genetic Modification (Contained Use)



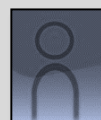
Rocky Cranenburgh, Chief Scientific Officer, Prokarium, UK



James Carothers, Assistant Professor, Departments of Chemical Engineering and Bioengineering, Molecular Engineering & Sciences Institute and Center for Synthetic Biology, University of Washington, USA



Sergey Zotchev, Professor, Department of Pharmacognosy, University of Vienna, Austria



Belen Carrillo-Rivas, Head of R&D Innovation Projects, BioTherapeutics Research & Development, Pfizer



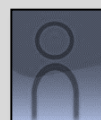
Heinz Neumann, Junior Professor of Biochemistry, Georg August University Göttingen, Germany



Brian Baynes, Partner, Flagship Ventures, USA



Winfried Römer, Junior Professor for Synthetic Biology of Signalling Processes, University of Freiburg, Germany



Keira Havens, CEO, Revolution Bioengineering, USA



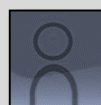
Yvonne Chen, Assistant Professor, Chemical and Biomolecular Engineering, UCLA, USA



Matthew Chang, Associate Professor, Department of Biochemistry, Yong Loo Lin School of Medicine; Program Leader, NUS Synthetic Biology for Clinical and Technological Innovation (SynCTI); National University of Singapore, Singapore



Alfonso Jaramillo, Professor of Synthetic Biology, School of Life Sciences, University of Warwick, UK



Xavier Duportet, CEO, PhageX, France



Sven Panke, Professor, Department of Biosystems Science and Engineering, ETH Zürich, Switzerland

Dean Falb, Chief Technology Officer, Synlogic, USA

The 2nd Synthetic Biology Congress – 20-21 October 2015, London

Confirmed Speakers & Track Chairs

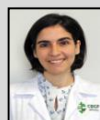
Plant Track



Daniel Voytas, Professor, Director of the Center for Genome Engineering, University of Minnesota, USA



Poul Erik Jensen, Professor, Department of Plant and Environmental Sciences, Vice-Head of Copenhagen Plant Science Center, University of Copenhagen, Denmark



Elena Caro Bernat, Assistant Professor, Ramón y Cajal Program, Technical University of Madrid, Spain



John Christie, Professor of Photobiology, Institute of Molecular Cell and Systems Biology, University of Glasgow



Rob Edwards, Professor, School of Agriculture, Food and Rural Development, Newcastle University



John Love, Professor of Synthetic Biology, University of Exeter



Janet Knowles, Partner, IP and Life Sciences Lawyer at HGF Law LLP, UK



George Lomonossoff, Project Leader, Department of Biological Chemistry, John Innes Centre



Greta Noelke, Research Group Leader, Metabolic Engineering, Fraunhofer Institute for Molecular Biology and Applied Ecology, Germany



Alison Smith, Professor of Plant Biochemistry, Department of Plant Sciences, University of Cambridge, UK



Phil Poole, Professor of Plant Microbiology, Department of Plant Sciences, University of Oxford



Rene Wijffels, Professor, Department of Bioprocess Engineering, Wageningen University, Netherlands



Jurgen Denecke, Professor of Plant Cell Biology & Biotechnology, University of Leeds



Sibylle Gaisser, Professor of Biotechnology and Bioethics, University of Ansbach, Germany



Anne Meyer, Professor, Department of Chemical and Biochemical Engineering, Technical University of Denmark, Denmark



Sarah O'Connor, Professor and Project Leader, Biological Chemistry, John Innes Centre



Sylvestre Marillonnet, Group Leader, Leibniz Institute of Plant Biochemistry, Department of Cell and Metabolic Biology, Germany



John Ward, Professor of Synthetic Biology for Bioprocessing, University College London, UK



Peter Eastmond, Principal Investigator, Rothamsted Research



John Cushman, Foundation Professor, Department of Biochemistry & Molecular Biology, University of Nevada, Reno, USA



Nigel Ten Fleming, CEO, ADVentura Capital, Spain

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Agenda: Day One – Tuesday 20th October 2015

08.00-08.50	Registration & Coffee		
08.50-09.00	Global Engage Welcome Address Stream Chair's Opening Remarks: Alfonso Jaramillo, Professor of Synthetic Biology, School of Life Sciences, University of Warwick, UK		
09.00-09.35	Keynote Address: Synthetic biology tools for high throughput discovery - Directed evolution for parts discovery - Melding and optimizing parts within pathways and genomes - Analytical opportunities via high-throughput sequencing Confirmed: Andrew Ellington, Research Professor of Biochemistry, Department of Chemistry, The University of Texas at Austin, USA		
09.35-10.05	Solution Provider Presentation Agilent Technologies  Agilent Technologies		
10.05-10.10	Track 1 – Synthetic Biology in Healthcare	Track 2 – Plant Synthetic Biology	Track 3 – Investment, Strategy, Start-Ups and Bioethics
10.10-10.35	Self-organizing, designer tissues: linking synthetic biology to tissue engineering Most applications of synthetic biology to date have been concerned with biosynthesis or with cellular computation. Coming from backgrounds in developmental biology and tissue engineering, we wish to apply synthetic biological techniques to control self-organizing arrangements of mammalian cells - "synthetic morphology". To this end, we have constructed a library of morphogenetic modules, to drive human cell adhesion, locomotion, proliferation etc, and have also constructed systems that cause human cells to make patterns de novo. This talk will review these efforts, and will look towards near-future extensions of the idea to useful applications. Confirmed: Jamie Davies, Professor of Experimental Anatomy, University of Edinburgh, UK	Redirecting photosynthetic energy and reducing power towards synthesis of bioactive molecules In photosynthesis solar energy is initially converted into chemical energy in the form of ATP and NADPH and subsequently into reduced carbon compounds. The talk will focus on how photosynthesis can be used to channel energy and reducing power into light-driven production of high-value bioactive compounds. Key enzymes catalyzing their biosynthesis are the diterpene synthases and cytochrome P450s. Through a synthetic biology approach, specific diterpene synthases and cytochrome P450s involved in biosynthesis of diterpenoids, with potential use as pharmaceuticals, has been coupled directly to the photosynthetic energy output by relocating them to the chloroplasts of tobacco or into the thylakoids of cyanobacteria. Approaches to optimize electron transfer towards the P450s and organization of the new biosynthetic enzymes will be presented. Confirmed: Poul Erik Jensen, Professor, Department of Plant and Environmental Sciences, Vice-Head of Copenhagen Plant Science Center, University of Copenhagen, Denmark	Responsible Research and Innovation (RRI) – challenges for synthetic biology Researchers and innovators are increasingly being expected to demonstrate that their work is being conducted 'responsibly'. This presentation will explain the background to the RRI concept, how it is currently being developed in the EU, and the potential challenges of the EU approach for innovative companies. A more adaptive approach to responsible innovation will be proposed that is better able to meet the challenges of developing products, processes and services that are safe, effective and meet global societal needs. Confirmed: Joyce Tait, Director, Innogen Institute, University of Edinburgh, UK
10.35-11.45	Morning Refreshments Poster Presentation Sessions		

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Agenda: Day One – Tuesday 20th October 2015

11.45-12.10	Synthetic Biologic approaches to Cell and Gene Therapy in Cancer • The ability to control cell and gene therapy in vivo enables many new treatment approaches • Cell and gene engineering are transforming immuno-oncology • Synthetic biologic technologies will help solve many of the challenges that lie ahead Confirmed: Jonathan Lewis, CEO and Chairman, Molecular Ninja Therapeutics, USA	Function and application of plant photoreceptors • Plants have evolved a range of photoreceptor systems to perceive and respond to their surrounding light environment. • Our research on UV/blue light photoreception has made major advances in understanding how these wavelengths are detected at the molecular level. • Here, we describe how these components have been engineered to create new tools to non-invasively track viral and bacterial infections and optically control biological processes including membrane excitability. Confirmed: John Christie, Professor of Photobiology, Institute of Molecular Cell and Systems Biology, University of Glasgow, UK	Emerging challenges for risk assessment from developments in synthetic biology • GM or not GM? • Future developments in Synthetic Biology • Challenges for risk assessment Confirmed: Michael Skinner, Reader in Virology, Imperial College London, Chair of Health and Safety Executive – Scientific Advisory Committee on Genetic Modification (Contained Use)
12.10-12.35	Engineering Smarter and Stronger T Cells for Cancer Immunotherapy T cells expressing chimeric antigen receptors (CARs) specific for the B-cell marker CD19 have shown impressive results in the treatment of B-cell malignancies. However, CD19 CAR-T cell therapy remains the only robustly effective T-cell immunotherapy to date. My laboratory is pursuing several strategies to engineer T cells with stronger anti-tumor functions and greater robustness against evasive mechanisms employed by cancer cells. I will discuss the development of multi-input CARs to prevent mutational escape by tumor cells, the design of synthetic circuits to counter immunosuppression in the tumor microenvironment, and the engineering of cytotoxic protein to interrogate intracellular tumor markers. These strategies combine to address critical limitations facing adoptive T-cell therapy, providing potential treatment options for diseases that are otherwise incurable with current technology. Confirmed: Yvonne Chen, Assistant Professor, Chemical and Biomolecular Engineering, UCLA, USA	When less is more: Regulating levels of transient expression in plants using a non-replicating system A transient expression system based on a deleted version of Cowpea mosaic virus (CPMV) RNA-2, termed CPMV-HT, has been successfully used for the plant-based expression of a wide range of proteins. In this system the sequence to be expressed is flanked by the 5' and 3' UTRs of RNA-2 prior to the delivery of the constructs by agroinfiltration. Mutations in the 5' UTR can vary the expression level 15-fold, due to differences in RNA translatability. This feature has been exploited to express heteromultimeric protein complexes in which the component polypeptides are present in different stoichiometries and to analyse and recreate biosynthetic pathways. Confirmed: George Lomonosoff, Project Leader, Department of Biological Chemistry, John Innes Centre	Making a difference: accelerating research outputs towards application Governments around the world recognise the benefits to society and the economy of investing in research. However, it is important to provide routes to driving the outputs of this investment towards commercial and wider application. As part of the holistic approach that the UK has taken to driving research and innovation in synthetic biology, we have a clear strategy to enable the acceleration of findings, understanding and other outputs towards use. Aspects of this will be discussed. Confirmed: Celia Caulcott, Executive Director, Innovation and Skills, BBSRC

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Agenda: Day One – Tuesday 20th October 2015

12.35-13.05	Solution Provider Presentation Twist Bioscience 		Solution Provider Presentation For sponsorship opportunities please contact Steve Hambrook at steve@globalengage.co.uk
13.05-14.05	Lunch		
14.05-14.30	Engineered riboswitches: Convenient building blocks for the construction of synthetic genetic circuits One of the most interesting areas of Synthetic Biology is the control of cellular behaviour using engineered circuits. Genes with selected features are combined in a building block manner to achieve desired biological functions. However, the expression level of the corresponding genes must be fine-tuned to avoid unbalanced gene expression and the accumulation of toxic intermediates. In order to achieve this, a versatile set of RNA-based control devices, so called engineered riboswitches, have been developed by using in vitro selected, small molecule binding aptamers. I will present such regulators developed for all three domains of life and give a mechanistic insight into their regulation. Confirmed: Beatrix Suess, Professor for Genetics and Synthetic Biology, Department of Biology, University of Darmstadt, Germany	Crassulacean Acid Metabolism (CAM) Biodesign for Sustainable Agriculture and Agroforestry in a Hotter, Drier World Crassulacean Acid Metabolism (CAM) is a photosynthetic CO₂ fixation pathway that maximizes water-use efficiency (WUE), reduces photorespiration, and improves the efficiency of RUBISCO by using a temporal “CO₂ pump”. In order to understand the enzymatic and regulatory pathways required to engineer CAM photosynthetic machinery into model C₃ species, comparative transcriptome (and genome) analysis across several model CAM species is being performed. Metabolic pathway components are also being tested for functional importance by RNAi knock-down experiments. Gene modules or circuits are being expressed in the readily transformable model Arabidopsis and the important bioenergy crop Populus. Resulting plants will be tested for biochemical and physiological signatures of CAM, CO₂ assimilation, stomatal conductance and transpiration rates, leaf carbon balance, biomass productivity and quality, and integrated WUE. Confirmed: John Cushman, Foundation Professor, Department of Biochemistry & Molecular Biology, University of Nevada, Reno, USA	Ethics of knowledge sharing and its implication for communication in synthetic biology Confirmed: Sibylle Gaisser, Professor of Biotechnology and Bioethics, University of Ansbach, Germany
14.30-14.55	Make connections for life: tools from flesh-eating bacteria to create unbreakable protein assemblies To build assemblies in synthetic biology, one often depends on protein:protein interactions reversible in minutes. We have created irreversible interaction based upon the human pathogen Streptococcus pyogenes. By rational engineering, we generated a peptide (SpyTag) that spontaneously reacts to form an isopeptide bond to the protein partner (SpyCatcher). The reaction is high-yielding, genetically-encodable and specific in E. coli and human cells. This protein padlock generated non-linear biomaterials for cancer cell capture from blood and cyclized enzymes conferring resilience to boiling. We now have a family of different peptide/protein tags forming unbreakable linkages. I will describe their use for programmable synthesis of multi-functional teams, to modulate precisely human cell signalling. The simple modular nature of these assemblies should allow exploration of new kinds of biological architectures. Confirmed: Mark Howarth, Associate Professor of Bionanotechnology, University of Oxford, UK	Understanding and engineering natural product pathways from plants Plants encode many high value chemicals, but these chemicals can be difficult to obtain from natural plant sources. Therefore, reconstitution of plant pathways in microbes is an attractive and general solution for inexpensive production of these valuable molecules. Elucidating plant pathway genes, however, is challenging. Here we discuss our efforts to discover the genes involved in synthesis of the monoterpene indole alkaloid vinblastine and related natural products. We also describe the development of a yeast host in which a key biosynthetic intermediate involved in vinblastine biosynthesis has been reconstituted. Confirmed: Sarah O'Connor, Professor and Project Leader, Biological Chemistry, John Innes Centre, UK	IP and Synthetic Biology Confirmed: Janet Knowles, Partner, IP and Life Sciences Lawyer at HGF Law LLP, UK

Agenda: Day One – Tuesday 20th October 2015

14.55-15.20	Synthetic Biology of Antibiotic-Producing Bacteria for Drug Discovery and Development Actinomycete bacteria produce a variety of biologically active compounds, some of which are currently used as anti-microbial and anti-cancer drugs, immunosuppressants etc. Recent genome sequencing of several hundred actinomycetes revealed astounding genetic potential for production of novel compounds that were never discovered by a conventional bioactivity screening. Hence, actinomycetes are attractive targets for Synthetic Biology-based approaches that may help to harness their biotechnological potential and lead to the discovery of novel drug leads. The latter can be achieved, for example, via activation of silent biosynthetic gene clusters, engineering of designer production hosts, and construction of novel regulatory circuits. Some advances in these research directions will be presented. Confirmed: Sergey Zotchev, Professor, Department of Pharmacognosy, University of Vienna, Austria	Engineering plant microbe interactions -Nitrogen fixation by plant associated bacteria is limited by the supply of carbon from the plant. We are investigating the engineering of carbon supply by plants -Bacteria have evolved to retain fixed nitrogen so we are engineering synthetic switches to promote its realisation to the plant. -All components of how plants and bacteria interact need to be considered when engineering new associations. Confirmed: Phil Poole, Professor of Plant Microbiology, Department of Plant Sciences, University of Oxford	Small Company Showcase Confirmed: Keira Havens, CEO, Revolution Bioengineering, USA
15.20-15.45	Engineering synthetic development: how many ways can you make a stripe? Synthetic biology is a promising tool to study the function and properties of gene regulatory networks. Gene circuits with predefined behaviors have been successfully built and modeled, but largely on a case-by-case basis. In this talk, I will present work where we go beyond individual networks and explore both computationally and synthetically the design space of possible dynamical mechanisms for 3-node stripe-forming networks. First, we computationally test every possible 3-node network for stripe formation in a morphogen gradient. We discover four different dynamical mechanisms to form a stripe and identify the minimal network of each group. Next, with the help of newly established engineering criteria we build these four networks synthetically and show that they indeed operate with four fundamental distinct mechanisms. Finally, this close match between theory and experiments allows us to infer and subsequently build a 2-node network that represents the archetype of the explored design space. Confirmed: Mark Isalan, Reader in Gene Network Engineering, Imperial College London, UK	Exploring the Synthetic Promoter Space and the "Never-Weres" of Evolution. Confirmed: John Love, Professor of Synthetic Biology, University of Exeter, UK	Xeno nucleic acids as therapeutics Confirmed: Evan Thompson, Cofounder, CEO of Theraxen
15.45-16.15	Solution Provider Presentation For sponsorship opportunities please contact Steve Hambrook at steve@globalengagage.co.uk		Solution Provider Presentation For sponsorship opportunities please contact Steve Hambrook at steve@globalengagage.co.uk
16.15-17.05	Afternoon Refreshments Poster Presentation Sessions		
17.05-17.30	Engineered antibiotics Confirmed: Chris Willis, Professor of Organic Chemistry, School of Chemistry, University of Bristol	Engineering biofuels Confirmed: Rene Wijffels, Professor, Department of Bioprocess Engineering, Wageningen University, Netherlands	Isomerase Therapeutics – Drug discovery through synthetic biology Isomerase was founded in December 2012 and moved into laboratory space near Cambridge in June 2013. Since then we have collaborated with companies in the Pharma, Biotech, Agritech and Fine Chemicals fields, using bioengineering and our collective experience to discover and develop microbial natural products. The talk will cover how the business was set up, then discuss some example projects. Confirmed: Matthew Gregory, CEO, Isomerase Therapeutics, UK

Agenda: Day One – Tuesday 20th October 2015

17.30-17.55	Developing programmable biological functionalities for autonomous microbial therapeutics Synthetic biology aims to engineer genetically modified biological systems that perform novel functions that do not exist in nature, with reusable, standard interchangeable biological parts. The use of these standard biological parts enables the exploitation of common engineering principles such as standardization, decoupling, and abstraction for synthetic biology. With this engineering framework in place, synthetic biology has the potential to make the construction of novel biological systems a predictable, reliable, systematic process. In this talk, our recent efforts to develop synthetic microbes with programmable behaviors will be presented. In particular, an emphasis will be placed on our recent development of auto-regulatory genetic circuits for microbial chemical production and therapeutic applications. Confirmed: Matthew Chang, Associate Professor, Department of Biochemistry, Yong Loo Lin School of Medicine; Program Leader, NUS Synthetic Biology for Clinical and Technological Innovation (SynCTI); National University of Singapore, Singapore	Engineering microalgae for biotechnology There is enormous potential to use microalgae as feedstocks for everything from recombinant proteins and high value chemicals to biofuels, but to implement this technology in a sustainable and economic manner, it will be necessary to optimize many parameters, and metabolic engineering strategies will be essential. However, in comparison with the well-developed molecular biology approaches available for manipulation of bacteria, yeast, and even land plants, those for algae are limited, even for the well-studied <i>Chlamydomonas reinhardtii</i>. We have established a synthetic biology workflow to enable rapid assembly of different genetic elements (eg coding region, regulatory elements, targeting and epitope tags), allowing high throughput testing of different components, and ultimately orthogonality – where standard parts can be used in any system to generate predictable outcomes. Confirmed: Alison Smith, Professor of Plant Biochemistry, Department of Plant Sciences, University of Cambridge, UK	Synthetic Biology Applications in Human Diseases Confirmed: Dean Falb, Chief Technology Officer, Synlogic, USA
17.55-18.20	Rebuilding cellular processes on synthetic membrane systems • Host-pathogen interactions • Endocytosis and signaling • Optogenetics Confirmed: Winfried Römer, Junior Professor for Synthetic Biology of Signalling Processes, University of Freiburg, Germany	Integration of Chlamydomonas CO2 concentration mechanism components into tobacco chloroplasts Increasing agricultural productivity is one of the most important aims of modern biotechnology. One way to increase productivity of crops is to enhance the efficiency of photosynthesis and thus the amount of fixed carbon. We have investigated the ability of <i>Chlamydomonas</i> CCM components - CAH1, CAH3, LCIA and LCIB - to increase the rate of carbon assimilation and biomass accumulation in higher plants. The recombinant proteins were active in planta and increased the CO2 concentration in the vicinity of RuBisCO, enhancing photosynthesis and biomass. This approach has the potential to increase biomass and yield of diverse crops. Confirmed: Greta Noelke, Research Group Leader, Metabolic Engineering, Department Plant Biotechnology, Fraunhofer Institute for Molecular Biology and Applied Ecology	Small company showcase Invitation to:
18.20-18.45	Design of novel bioprocesses for pharma Confirmed: Sven Panke, Professor, Department of Biosystems Science and Engineering, ETH Zürich, Switzerland		
18.45	Chair's Closing Remarks and End of Day 1		
18.45-19.45	Networking Drinks Reception		

Agenda: Day Two – Wednesday 21st October 2015

08.00-08.35	Morning Coffee		
08.35-08.40	Global Engage Welcome Address Stream Chair's Opening Remarks: TBC		
08.40-09.10	Keynote Address: Synthetic Biology: where we are, where we are going Confirmed: Adam Arkin, Professor of Bioengineering, UC Berkeley, USA		
09.10-09.40	Solution Provider Presentation For sponsorship opportunities please contact Steve Hambrook at steve@globalengage.co.uk		
09.40-09.45	Track 1 – Synthetic Biology in Healthcare	Track 2 – Plant Synthetic Biology	Track 3 – Investment, Strategy, Start-Ups and Bioethics
09.45-10.10	Massively Parallel Combinatorial Genetics in Human and Bacterial Cells 1. High-order combinatorial genetic interactions are important in determining complex biological functions. 2. Existing strategies for mapping combinatorial genetic networks to biological phenotypes are low throughput and challenging to scale. 3. We have established a high-throughput and scalable strategy for systematically perturbing biological networks with high-order combinatorial genetic perturbations and tracking these perturbations with next-generation sequencing, thus revealing new insights into biological networks that underlie human and bacterial cell function. Confirmed: Timothy Lu, Associate Professor of Biological Engineering and Electrical Engineering and Computer Science, MIT, USA	Genetic engineering - methods to achieve targeted modifications in plants Confirmed: Daniel Voytas, Professor, Director of the Center for Genome Engineering, University of Minnesota, USA	Responsible Research in Synthetic Biology Confirmed: Janet Bainbridge, Head of Agricultural Technology at UK Trade and Investment, UK
10.10-11.00	Morning Refreshments Poster Presentation Sessions		
11.00-11.30	Solution Provider Presentation For sponsorship opportunities please contact Steve Hambrook at steve@globalengage.co.uk		Solution Provider Presentation For sponsorship opportunities please contact Steve Hambrook at steve@globalengage.co.uk
11.30-11.55	X-ray and Neutron Scattering Methods applied in the field of Synthetic Biology X-ray and neutron scattering techniques have become essential methods in biophysics studies, and is expected to play key role in the development of synthetic biology. These techniques reveal structural characteristics of bimolecular complexes and are crucial for the understanding of molecular functionality. We have in particular aimed for structural understanding of membrane proteins and their complexation, and their response to external stimuli. Combination of X-ray and neutron scattering methods are particular powerful, since the contrast conditions for the two techniques are very different and the high-resolution of X-ray is complementary to pure neutron scattering experiments. We have used the concept of nano-disc to study membrane protein and protein-lipid complexes, using both small-angle scattering methods on bulk solution-samples as well as reflectometry studies on the near-surface structures. Confirmed: Kell Mortensen, Professor, The Niels Bohr Institute and Center for Synthetic Biology, University of Copenhagen, Denmark	Engineering nitrogen-fixing plants: multigene transfer, targeting of expression to organelles and tissues, and other challenges. Biological N ₂ fixation, catalyzed by the prokaryotic enzyme nitrogenase, is an alternative to the use of synthetic N fertilizers to increase cereal production yields. The strategy we are pursuing in an effort to increase cereal crops productivity is the direct transfer of nif prokaryotic genes into cereals. Because Nitrogenase is an O ₂ -labile metalloenzyme which biosynthesis requires a complex pathway where numerous nif gene products are involved, the main challenges we face are the control of gene expression and protein accumulation in an O ₂ depleted environment and the stable and high expression of multiple transgenes. Our efforts are now focused on controlling expression targeting to different tissues and organelles and on studying the signals in transgenes that license gene silencing. Confirmed: Elena Caro Bernat, Assistant Professor, Ramón y Cajal Program, Technical University of Madrid, Spain	Vaxonella: a synbio platform for oral recombinant vaccine delivery Prokarium has used synthetic biology to create Vaxonella®: an oral vaccine delivery platform with Salmonella as the chassis organisms. These contain mutations that make them very safe, yet retain a high degree of viability and immunogenicity. They deliver recombinant protein or DNA vaccines on plasmids which contain no antibiotic resistance genes, as the Salmonella excise these genes following transformation using X-mark™ technology. A genetic feedback loop called ORT-VAC™ then stably maintains the plasmid. Vaxonella uses Salmonella Typhimurium for evaluation in mice which has the same route of antigen presentation as the human vaccine vector Salmonella Typhi, both possessing the same genetic mutations and technologies. The pre-clinical development and Phase 1 clinical trial a novel Vaxonella-based vaccine against typhoid and travellers' diarrhoea will be presented. Confirmed: Rocky Cranenburgh, Chief Scientific Officer, Prokarium, UK

Agenda: Day Two – Wednesday 21st October 2015

11.55-12.20	Building nano-assemblies that can be used in detection systems Confirmed: Tim Dafforn, Professor of Biotechnology, School of Biosciences, University of Birmingham	Engineering plants to accumulate oil in their leaves Confirmed: Peter Eastmond, Principal Investigator, Rothamsted Research UK	Panel Discussion – Venture Capitalism, Biotechnology Start-ups and Partnering Opportunities • Where are the business opportunities in Synthetic Biology research? • How does a VC justify his value to the entrepreneur? • VCs vs. high net worth individuals vs. crowd funding vs. other creative funding options • Appetite for partnering and contractual expectations • Sources of IP and technology Confirmed: Nigel Ten Fleming, CEO, ADVentura Capital, Spain Oliver Sexton, Investment Manager, Midven, UK Brian Baynes, Partner, Flagship Ventures, USA
12.20-12.45	Design-driven RNA system engineering for multiplexed biosensing <i>in vitro</i> and <i>in vivo</i> We are developing RNA aptamer-based biosensor systems to process molecular information into programmable nucleic acid circuit outputs. We are engineering synthetic RNA circuits to create robust platforms for multiplexed biomarker sensing <i>in vitro</i> using common laboratory equipment such as a qPCR machine. By extending these efforts to a broad panel of biomarker targets and integrating them with nucleic acid circuits <i>in vivo</i>, we are generating complete molecular biosensor devices for use in mammalian cells, with potential applications in imaging, diagnostics and programmable therapeutic delivery. Confirmed: James Carothers, Assistant Professor, Departments of Chemical Engineering and Bioengineering, Molecular Engineering & Sciences Institute and Center for Synthetic Biology, University of Washington, USA	Synthetic biology in potatoes to create biofuel Confirmed: Jurgen Denecke, Professor of Plant Cell Biology & Biotechnology, University of Leeds, UK	Application of Oxitec technology in the biological control of agricultural and public health pests Oxitec has developed pioneering genetic technology to control insect pests that reduce crop and livestock yields and vector serious human diseases using designed genes that cause offspring that carry them to die. The benefits of this technology include biological species specific control that does not affect beneficial insects or pest predators which may be used in conjunction with either chemical or other biotechnology pest control programs. The technology will be explained along with the application to human health and agriculture markets. One recent product which will be highlighted is the OX513A mosquito to control <i>Aedes aegypti</i> which is the principal mosquito vector of dengue fever. Confirmed: Simon Warner, Chief Scientific Officer, Oxitec, UK
12.45-13.45	Lunch		
13.45-14.10	Synthetic Genetics We are interested in the chemical etiology of the genetic apparatus shared by all life on earth. Specifically, we ask why information storage and propagation in biology is based on just two types of nucleic acids, DNA and RNA. Is the chemistry of life's genetic system based on chance or necessity? I'll be presenting progress on the development of strategies to enable the replication and evolution of synthetic genetic polymers, which we term XNAs and show that different XNAs can mediate information storage and propagation. Beyond heredity, we demonstrate a capacity for Darwinian evolution by the discovery of specific XNA ligands (aptamers) and catalysts (XNAzymes). Thus, both heredity and evolution are likely to be general emergent properties of polymers capable of information storage and replication. Confirmed: Philipp Holliger, Program Leader, MRC Laboratory of Molecular Biology, Cambridge, UK	Biological catalysts to synthesise new compounds Confirmed: Anne Meyer, Professor, Department of Chemical and Biochemical Engineering, Technical University of Denmark, Denmark	Small Company Showcase Confirmed: Xavier Duportet, CEO, PhageX, France

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14.10-14.35	Synthetic Biochemistry Confirmed: Murray Brown, Global Coordinator, Innovation in Synthetic Biochemistry, GSK	Using synthetic biology to construct metabolic pathways Confirmed: John Ward, Professor of Synthetic Biology for Bioprocessing, University College London, UK	Small Company Showcase For sponsorship opportunities please contact Steve Hambrook at steve@globalengage.co.uk
14.35-15.00	Studies on chromatin dynamics with an expanded amino acid repertoire With few minor variations, the genetic code is universal to all forms of life on earth. Synthetic biology, however, endeavours to undo this frozen accident of evolution and create organisms with an expanded genetic code by the heterologous expression of evolved aminoacyl-tRNA synthetase/tRNACUA pairs. These mediate the incorporation of unnatural amino acids in response to blank codons, grafting exciting new properties on proteins; for use as spectroscopic probes, UV-inducible crosslinkers, functional groups for bioorthogonal conjugations or posttranslational modifications. My lab is using these amazing tools to study biological processes, especially the dynamic properties of eukaryotic chromatin. I will report on recent work using genetically encoded UV-crosslinkers, by which we have identified a cascade of events that drives the condensation of chromosomes in mitosis. Confirmed: Heinz Neumann, Junior Professor of Biochemistry, Georg August University Göttingen, Germany	Roles for Synthetic Biology in Sustainable Agriculture While the current focus for synthetic biology in translational science has been directed at applications in biomedicine, it could be argued that the greatest impact of this technology will be realized when applied to mankind's greatest global endeavour, food production. Faced with unprecedented needs to increase agricultural productivity, while reducing environmental and energy footprints and enhancing biodiversity, it seems improbable that existing technologies alone can provide all the answers given the short timescales we have to work to. In this presentation some of the bottle necks in sustainable intensification in agriculture will be identified, which in turn help identify where paradigm shifts in our approach to developing solutions will need to be applied. Technically, these include developing the genetic tools which will allow us to rapidly design crops that deliver the output traits needed for current nutritional needs while reducing chemical inputs as well as providing new technologies for crop protection agents that help overcome our over-dependence on a declining arsenal of agrochemicals. Confirmed: Rob Edwards, Professor, School of Agriculture, Food and Rural Development, Newcastle University, UK	Small Company Showcase For sponsorship opportunities please contact Steve Hambrook at steve@globalengage.co.uk
15.00-15.25	Detecting protein biomarkers using engineered biosensors based on synthetic biology principles Diagnostic biosensors provide low-cost solutions for the detection of a number of diseases. Whole-cell biosensors offer a convenient platform as they are self-renewing and easy to transport. However, for protein biomarkers, designers of whole cell biosensors are faced with an issue of how to transmit information across the cell membrane. We have approached this problem in two ways. First, by developing a class of biosensors based on the bacterial surface display of antibody fragments. The biomarker induces cell aggregation, which can be transmitted as a downstream signal through optical assays or more sophisticated genetic circuitry. The second, is to remove the cell wall and use its internal contents for target recognition and signal production. I will discuss our latest results on both of these approaches. Confirmed: Karen Polizzi, Lecturer, Department of Life Sciences, Imperial College London, UK	Developing tools for synthetic biology: Golden Gate Cloning and the MoClo System We have developed a modular cloning system for standardized assembly of multigene constructs. Basic genetic elements such as promoters, coding sequences and terminators are cloned as level 0 entry modules. Multigene constructs are then assembled from level 0 modules using a series of one-pot assembly reactions. As an example, a construct containing 27 transcription units was assembled from 81 basic modules in three cloning steps. The system can be used to make constructs for any host organism of choice. It can also be used to assemble constructs that contain multiple repeats such as transcription activator-like effectors, and to generate libraries of variant constructs variant that differ in either regulatory or coding sequences, depending on the need of the user. Confirmed: Sylvestre Marillonnet, Group Leader, Leibniz Institute of Plant Biochemistry, Department of Cell and Metabolic Biology, Germany	Small Company Showcase For sponsorship opportunities please contact Steve Hambrook at steve@globalengage.co.uk
15.25-15.55	Afternoon Refreshments Poster Presentation Sessions		

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	Track 1 – Synthetic Biology in Healthcare	Track 2 – Plant Synthetic Biology
15.55-16.20	Synthetic biology tools for biologics Confirmed: Belen Carrillo-Rivas, Head of R&D Innovation Projects, BioTherapeutics Research & Development, Pfizer	Plant metabolic engineering Reserved: Stevens Brumbly, Associate Professor of Biology, University of North Texas, USA
16.20-16.45	Biomedical Engineering Confirmed: Alistair Elfick, Professor and Director of Centre for Biomedical Engineering School of Engineering, University of Edinburgh, UK	Invitation to:
16.45	Chairman's Closing Remarks and Conference Close	

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