Technology Strategy Board
Driving Innovation

Results of competition: Tools and services for synthetic biology – Collaborative R&D

Total available funding for this competition was £3.8m from the Biotechnology and Biological Sciences Research Council, Engineering and Physical Sciences Research Council and the Technology Strategy Board.

Note: These proposals have succeeded in the assessment stage of this competition. All are subject to grant offer and conditions being met.

Participant organisation names	Project title	Proposed project costs	Proposed project grant
Ingenza Ltd (lead) Lucite International Ltd University of Nottingham	P2P: Pentoses to products: a new tool for synthetic biology	£349,750	£248,307
Project description (provided by applicants)			
Ingenza and the University of Nottingham will engineer microorganisms for the utilisation of xylose and its conversion to products of interest by fermentation. We will exemplify the approach by converting xylose to a key intermediate required by Lucite International for the manufacture of monomers using sustainable bioprocessing. Use of xylose, derived from waste ligoncellulosic biomass, allows the production of chemicals by fermentation using sustainable raw materials which in no way compete with sugars produced for food use.			

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
Isogenica Ltd (lead) Imperial College London	Automated Gene Assembly from Codons to Complete Genes and Pathways	£347,006	£249,323
Project description (provided by applicants)			
The ability to assemble genes from smaller DNA fragments or generate combinatorial libraries of genetic mutations is fundamental to the field of synthetic biology. Different methodologies exist for their fabrication but enzymatic assembly produces a consistently high quality product, compared to other methods, which is essential for downstream processes for improved characteristics such as improved strains or improved protein function/yield. The project aims to achieve combinatorial gene assembly in a high throughput, automatable fashion, delivering a powerful and valuable tool for commercialisation in the synthetic biology arena and providing potential benefits for drug discovery and industrial applications.			

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
LabGenius Ltd (lead) Imperial College London	BaseHunter: A software tool making synthetic gene procurement faster, more efficient and traceable	£338,455	£243,647

Project description (provided by applicants)

Synthetic biology is an emerging discipline that seeks to build new biological systems for useful purposes. This task is achieved by inserting new arrangements of genes (sequences of DNA that encode proteins) into living organisms. The genes used in these engineered systems are frequently synthesized from scratch by commercial vendors.

Currently, synthetic gene procurement is time consuming and expensive. These problems stem from inefficient pricing and poor market transparency. In this 12 month project, we will address these issues through the development and validation of BaseHunter - an online synthetic gene procurement tool that will ensure researchers are free to spend their time and resources solving scientific problems, not logistical ones.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
Sphere Fluidics Ltd (lead) Imperial College London	A High Throughput Miniaturised Mass Spectrometry Tool for Profiling Synthetic Design Libraries	£325,482	£232,448

Project description (provided by applicants)

Synthetic biology has advanced genetic manipulation by applying engineering principles (design-build-test) to enable new discoveries by modifying safe microbes with custom DNA. The ability to write DNA has accelerated, but synthetic biology is now limited by a lack of high-throughput measurement methods to assess performance of custom-built strains.

The proposed project links foundational synthetic biology expertise at Imperial College London with microfluidics and mass spectrometry (MS) expertise at Sphere Fluidics Ltd. This synergistic team will build, test and demonstrate a new microfluidics-MS platform that enables in-depth analysis of the performance of hundreds of thousands of engineered microbes per day (conventional techniques use high sample volumes and can only test around 10,000 samples a day). To date, most synthetic biologists have only been able to analyse one gene at a time.

Uniquely, our MS approach will enable analysis of multiple genes and components of artificial pathways. This will accelerate the discovery, and improve production of new, valuable medicines and fuel sources, and generate valuable, nascent tools and services for commercialisation.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
Synpromics Ltd (lead) Touchlight Genetics Ltd	Engineering Promoters for Specific Antigen Expression in a Synthetic DNA Vaccine Construct	£346,386	£207,831
Project description (provided by applicants)			
The collaboration between Synpromics Ltd and Touchlight Genetics Ltd will combine two highly innovative and complementary technology platforms to develop an improved approach to developing DNA vaccines. The project will leverage Synpromics's proprietary technology to rationally design synthetic promoters that drive cell-specific antigen expression and that enhance the effectiveness of Touchlight Genetics's unique synthetic DNA vaccine cassette platform. The resulting new technology will subsequently be applied by Touchlight Genetics in the company's internal DNA vaccine development programmes, as well as be available for licensing by other developers. The project is expected to establish a unique UK-based synthetic biology capability for the production of safer and more effective DNA-based medicines.			

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
Synthace Ltd (lead) Synpromics Ltd University College London	A toolchest for rapid bootstrapping of novel chassis organisms	£347,854	£248,973

Project description (provided by applicants)

The bioscience industry currently relies on a small number of organisms to produce the majority of the recombinant products on the market.

A collaboration between two UK synthetic biology companies, Synthace and Synpromics, and University College London, this project combines cutting edge computational techniques with multifactorial experimental design to develop a novel toolset that will allow the rapid bootstrapping of novel chassis organisms for synthetic biology. This will enable future processes to use chassis that are far better suited to the industrial conditions they are used under, and accelerate the use of synthetic biology in healthcare, food production, chemicals and energy.

Outputs of the tools will be fully characterised to ensure they are fully robust under a range of conditions, making sure that they will be of maximum use to the synthetic biology industry.