

SYNTHACE

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- UCL | London Bioscience Innovation Centre

INTRODUCTION

- Synthace is an applied synthetic biology spin-out from UCL, and the only dedicated synthetic biology company in UK
- Focused on bio-manufacturing of high value proteins, fine and specialty chemicals
- Have assembled from active University collaboration and in house development, a complete stack of technologies for rapid organism engineering and optimization



MY BACKGROUND

- Founded first US based company in 1999, Relatable
- By 2001, had licensed technology to over 80 million users
- Transitioned to Bioinformatics in 2005, where I worked on protein structure prediction

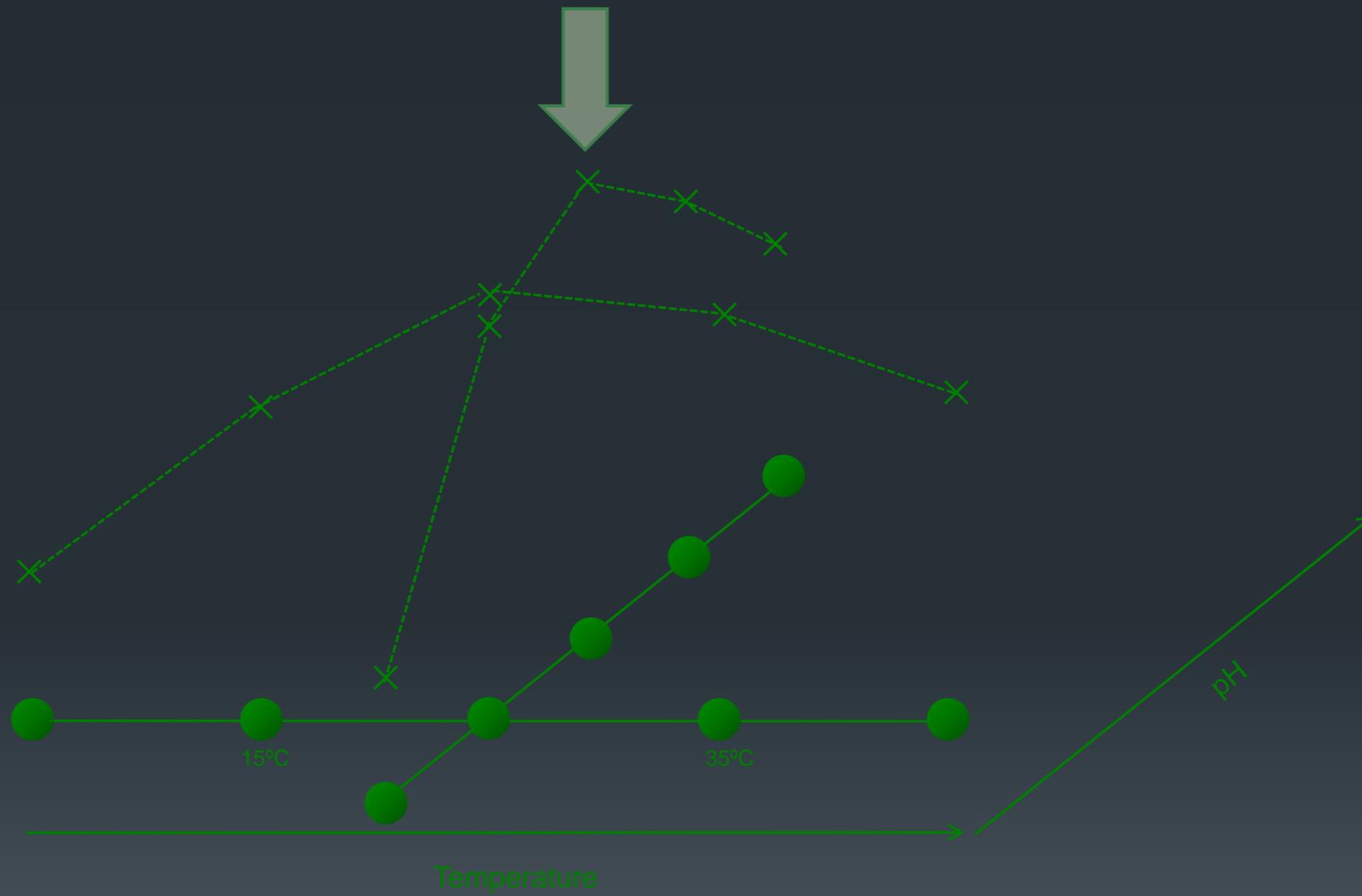
- Founded and spun out of UCL in January 2011
- Funded in April 2012, with investors from London Business School E100, London Business Angels, OION, Angels 5K, and UCL Business PLC
- First products now in the market (industrial biocatalysts)



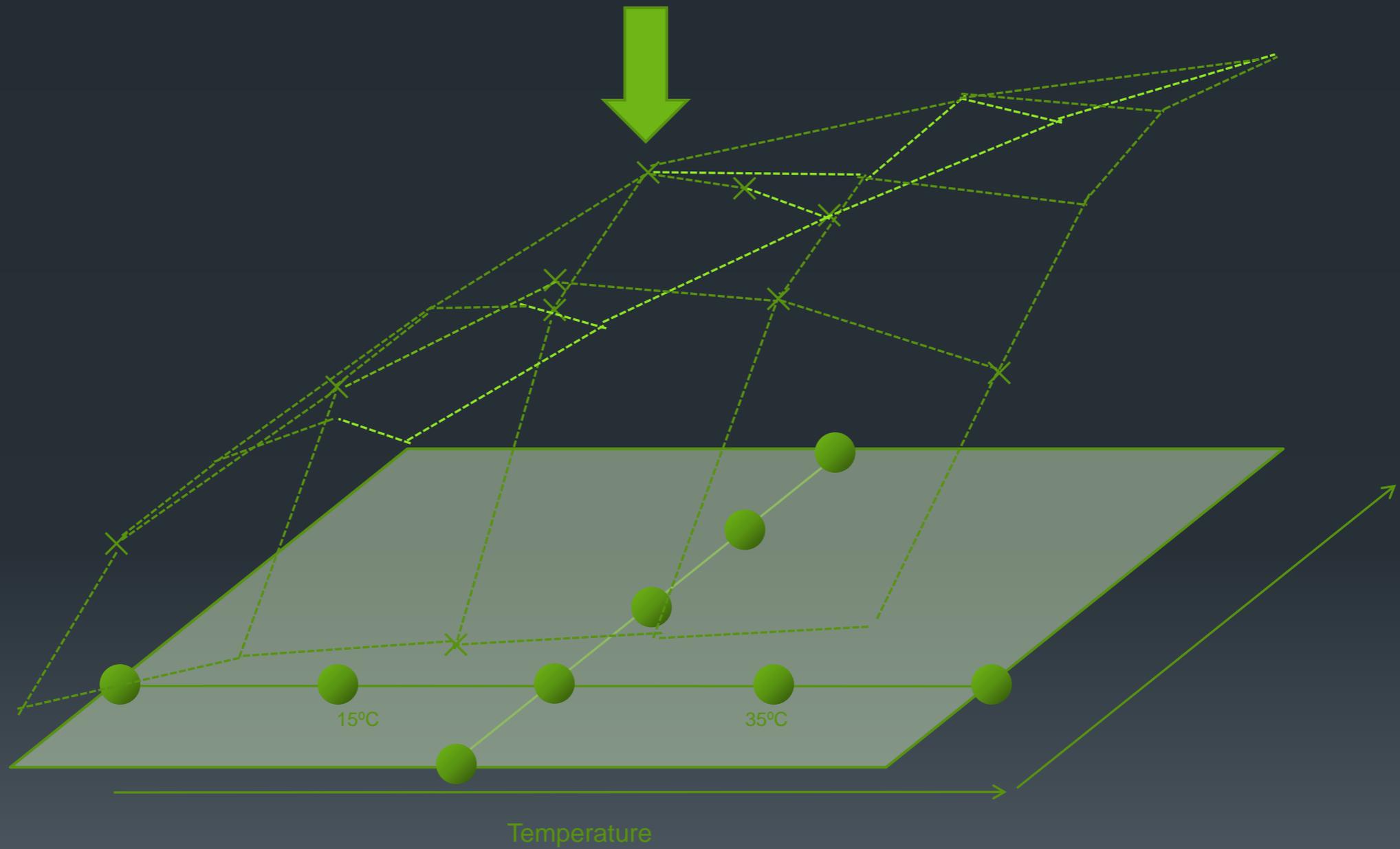
SYNTHETIC BIOLOGY

- "Synthetic biologists seek to design and engineer new biological systems, or redesign existing ones" - [Royal Society](#)

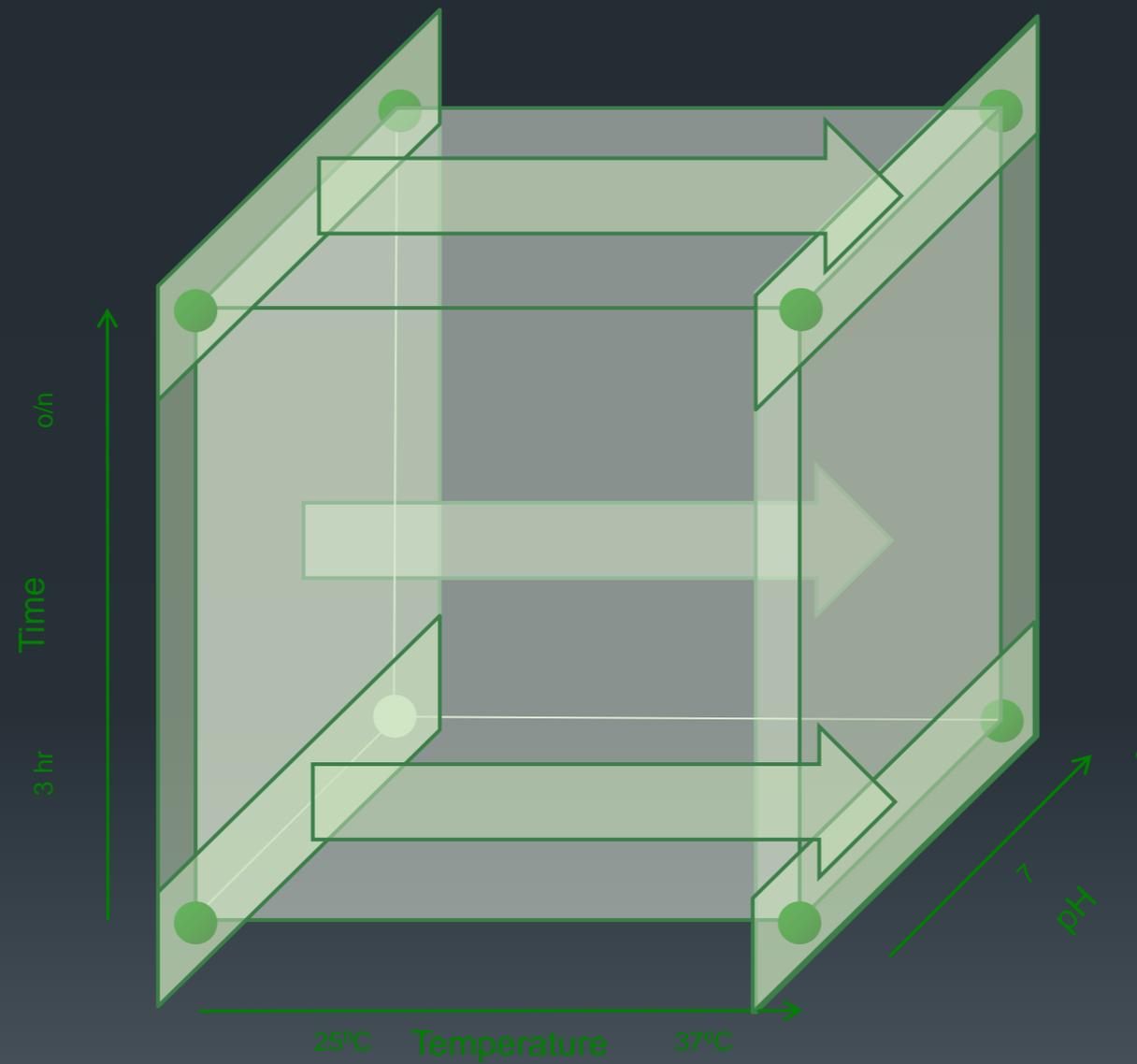
CLASSICAL SCIENCE



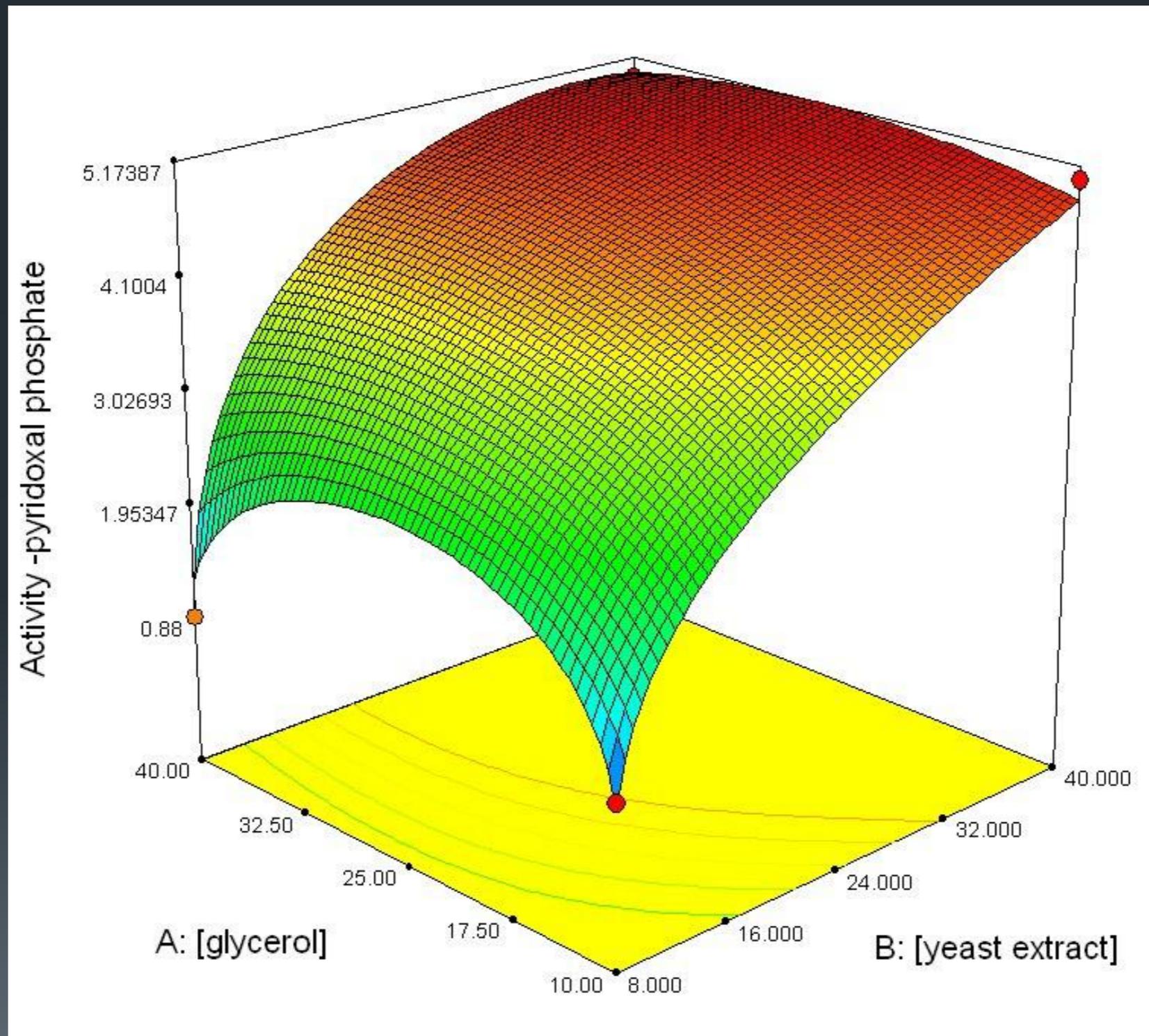
ONE FACTOR AT A TIME



MULTIFACTORIAL DESIGN



RESPONSE SURFACES



PROPRIETARY PLATFORM TECHNOLOGY



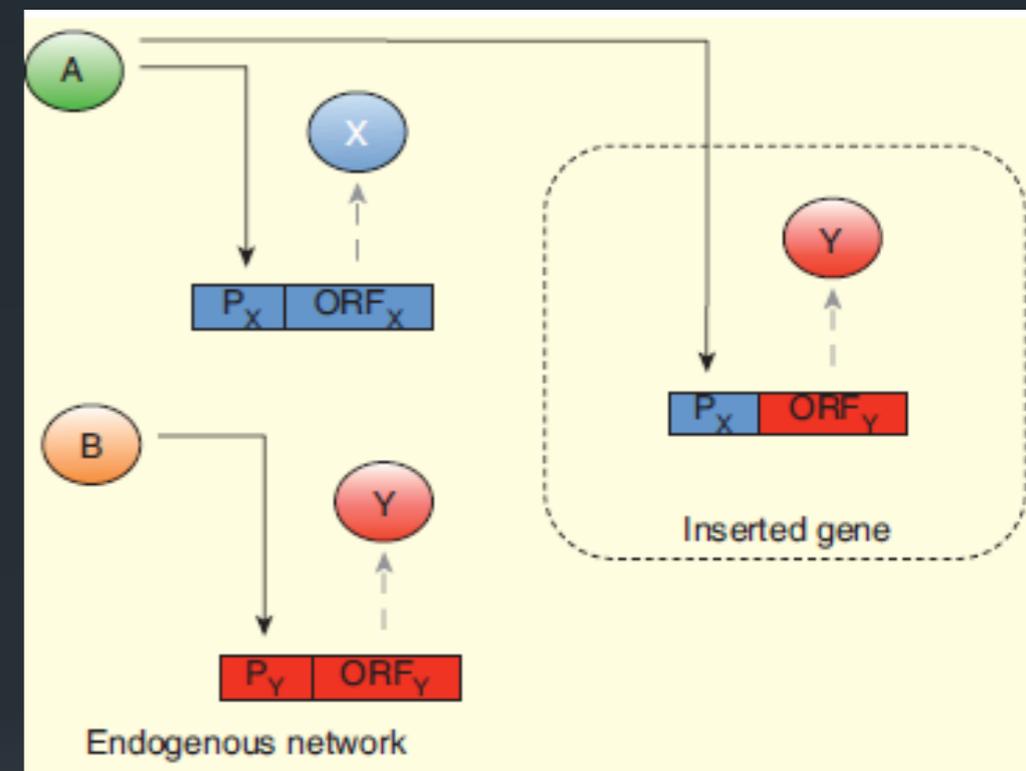
- An organism engineering pipeline and toolkit which allows the rapid creation of optimized bugs for the biosynthesis of high value proteins, fine and specialty chemicals
- Fast organism development (8 weeks for heterologous protein production) compared with the current standard of six months to years.
- Optimized organisms yield 1.3x to 40x more product compared with current industry practices

AUTOMATION



CELLULAR REWIRING

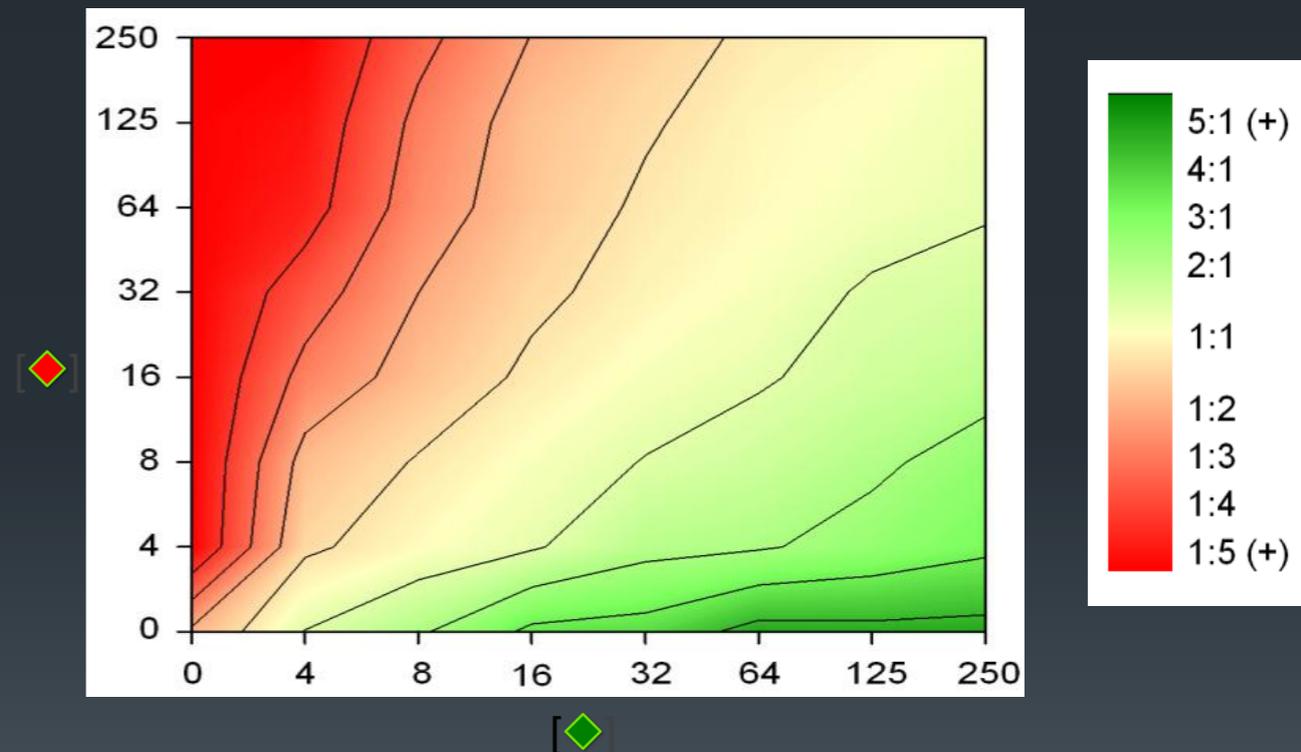
- Synthetic promoter/Open Reading Frame pairs introduce new cellular regulatory connections
- These can be screened in a high throughput fashion, allowing the sampling of a tremendous amount of phenotypic space to strain engineering
- Courtesy Dr Travis Bayer at Imperial College





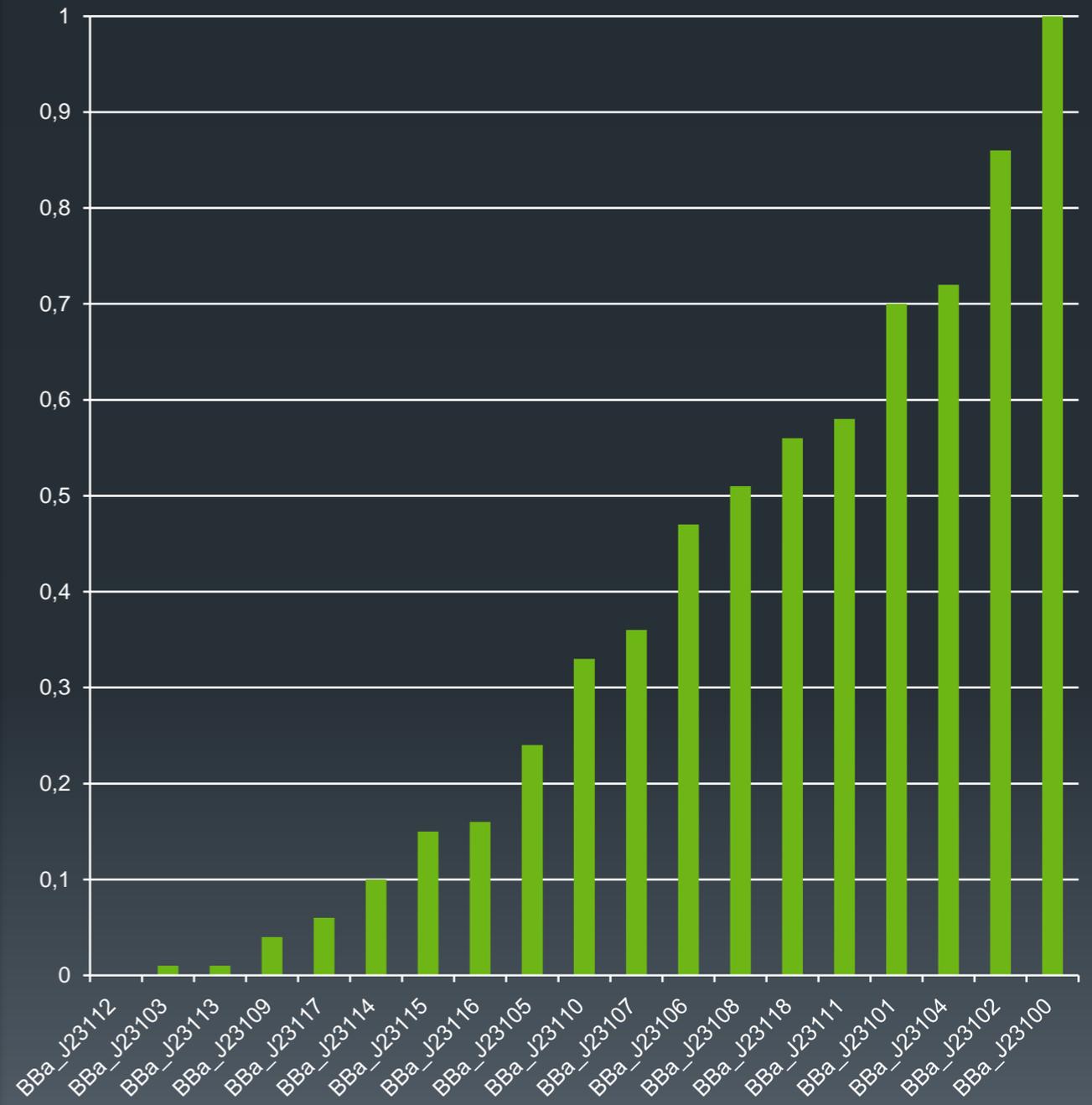
- Simultaneous and differential control of multiple genes in vivo
- Based on synthetic riboswitch activation by small molecules. No endogenous cross reactivity from activation.
- Courtesy Dr Neil Dixon at Manchester University

Stoichiometric control:



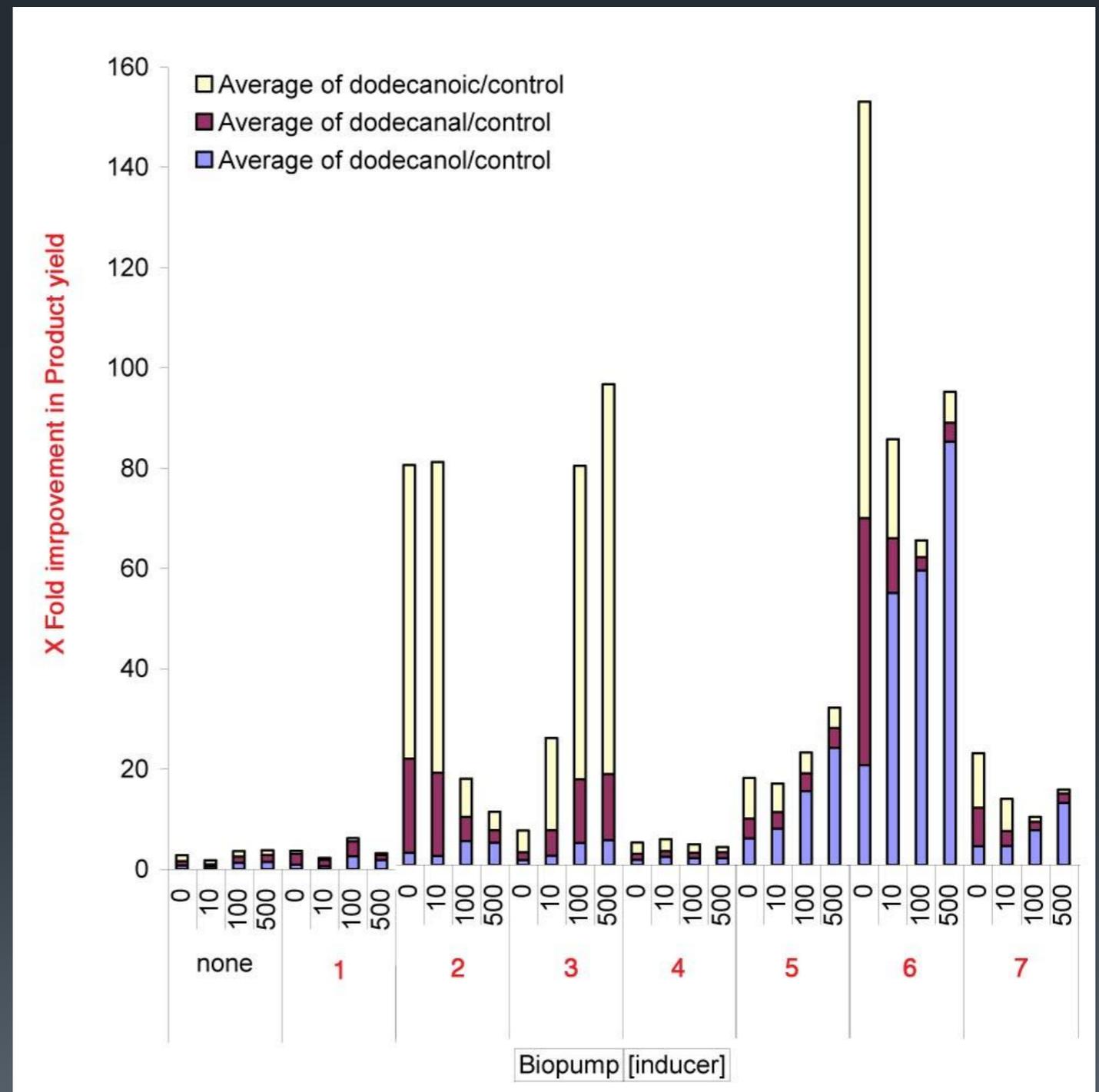
PARTS CHARACTERIZATION

Promoter number	Sequence	Strength
BBa_J23112	ctgatagctagctcagtcctagggattatgctagc	0
BBa_J23103	ctgatagctagctcagtcctagggattatgctagc	0.01
BBa_J23113	ctgatggctagctcagtcctagggattatgctagc	0.01
BBa_J23109	tttacagctagctcagtcctagggactgtgctagc	0.04
BBa_J23117	ttgacagctagctcagtcctagggattgtgctagc	0.06
BBa_J23114	tttatggctagctcagtcctaggtacaatgctagc	0.1
BBa_J23115	tttatagctagctcagcccttggtacaatgctagc	0.15
BBa_J23116	ttgacagctagctcagtcctagggactatgctagc	0.16
BBa_J23105	tttacggctagctcagtcctaggtactatgctagc	0.24
BBa_J23110	tttacggctagctcagtcctaggtacaatgctagc	0.33
BBa_J23107	tttacggctagctcagccctaggtattatgctagc	0.36
BBa_J23106	tttacggctagctcagtcctaggtatagtgctagc	0.47
BBa_J23108	ctgacagctagctcagtcctaggtataatgctagc	0.51
BBa_J23118	ttgacggctagctcagtcctaggtattgtgctagc	0.56
BBa_J23111	ttgacggctagctcagtcctaggtatagtgctagc	0.58
BBa_J23101	tttacagctagctcagtcctaggtattatgctagc	0.7
BBa_J23104	ttgacagctagctcagtcctaggtattgtgctagc	0.72
BBa_J23102	ttgacagctagctcagtcctaggtactgtgctagc	0.86
BBa_J23100	ttgacggctagctcagtcctaggtacagtgctagc	1





- A library of novel hydrophobic transport proteins
- Up to a 158x improvement in whole cell biocatalysis product yields
- Selective and controllable substrate feeding
- Courtesy Prof Frank Baganz and Dr Chris Grant at UCL



CELLULAR FACTORIES

- Biopumps allow the import of selective chemical compounds into cells, which can be catalyzed into higher value products via short synthetic pathways
- This substantially reduces the technical risk, compared with pathway engineering directly from basic feed stocks such as sugars
- Lastly, due to the novel tools synthetic biology provides for rapid optimization, they can be developed in relatively short timescales (3-9 months)

QUESTIONS

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