B·DEBATE International Center for Scientific Debate BARCELONA

upf. Universitat Pompeu Fabra Barcelona

# PATRICK YIZHI CAI

CV

PARTICIPANT AT:

## SYNTHETIC BIOLOGY.
## FROM STANDARD BIOLOGICAL PARTS TO ARTIFICIAL LIFE

**September, 17th-18th, 2015, Barcelona**

**"Patrick" Yizhi Cai** , co-Director, Edinburgh Genome Foundry, University of Edinburgh, Edinburgh, UK

"Patrick" Yizhi Cai received a bachelor degree in Computer Science in China, a master degree in Bioinformatics from University of Edinburgh in the UK, and a PhD in Genetics, Bioinformatics and Computational Biology from Virginia Tech in the USA. Cai has his postdoctoral fellowship under Jef Boeke in the Johns Hopkins University School of Medicine. Cai serves as a senior scientific consultant to Beijing Genomics Institute, and is the first Autodesk Distinguished Scholar. Starting summer 2013, Cai starts his own research group at the University of Edinburgh with a prestigious Chancellor's Fellowship, and his lab focus on Computer Assisted Design for Synthetic Biology, NeoChromosome design and synthesis in the yeast, and DNA assembly automation. Dr. Cai found and directs Edinburgh Genome Foundry, a UK national facility for automated DNA synthesis and assembly.

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ABSTRACT

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### Synthetic Genomics: from Genetic Parts to Genomes

The Synthetic Yeast genome project, or Sc2.0 (www.syntheticyeast.org), aims to design, construct, and replace the native 12Mb genome of Saccharomyces cerevisiae with a fully synthetic version. Sc2.0 chromosomes encode a myriad of designer changes. First, to improve genomic stability, destabilizing elements such as transposons and tRNA genes are removed from the synthetic genome. Second, synonymously recoded sequences called PCRtags permit encryption and tracking of the synthetic DNA. Finally, to enable downstream genetic flexibility, Sc2.0 encodes an inducible evolution system called SCRaMbLE (Synthetic Chromosome Rearrangement and Modification by LoxP-mediated Evolution) that can generate combinatorial genetic diversity on command. To date, ~10% of the genome has been synthesized and we have powered a semi-synthetic yeast entirely dependent on multiple synthetic chromosome arms designed to our specifications. Software and experimental infrastructure developed to facilitate Sc2.0 genome design and construction are applicable to new projects ranging from single gene/pathway design to synthesizing artificial chromosomes. Sc2.0 international partners include Imperial College London, Edinburgh University (UK); Tsinghua University, Tianjin University, BGI (China) and New York University. Sc2.0 has the potential to revolutionize the future of genome structure-function analysis.

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