



SYNBIOCHEM

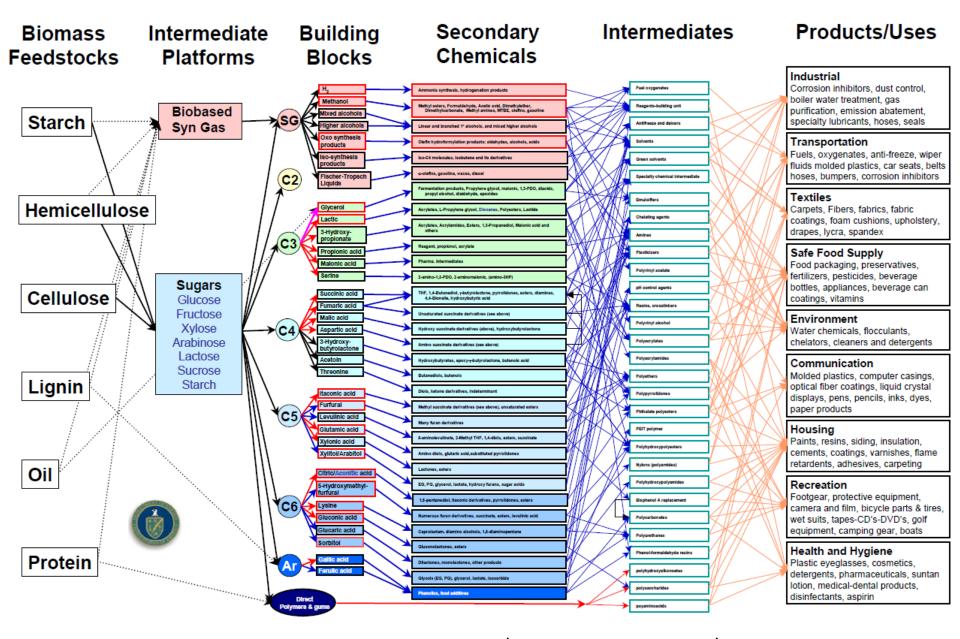
Manchester Synthetic Biology Research Centre for Fine and Speciality Chemicals

Synthetic Biology at the University of Manchester

Rainer Breitling



The University of Manchester Manchester Institute of Biotechnology

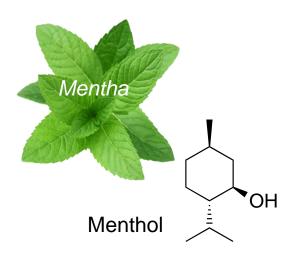


Predicted market value of Biotech by 2016: \$10.8 billion (from \$1.6 billion in 2011)



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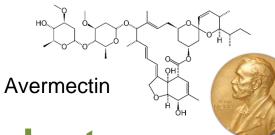




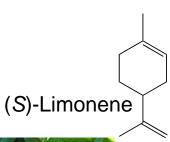


Geraniol

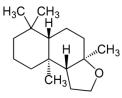




High-value Natural Products

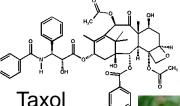






Ambroxan







Manchester Institute of Biotechnology

Discovery through innovation





Manchester Synthetic Biology Research Centre for Fine and Speciality Chemicals











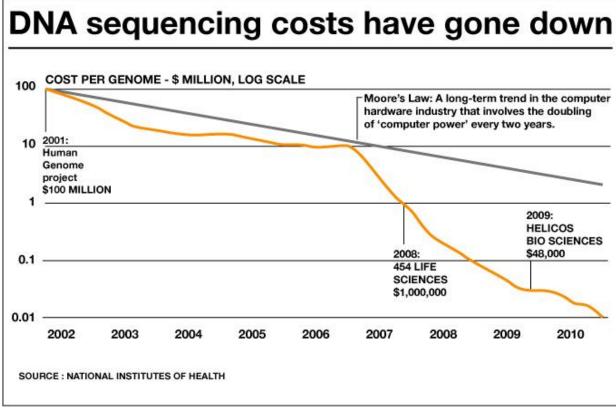
Major demand for sustainable, resource-efficient, bio-based alternatives to chemical production

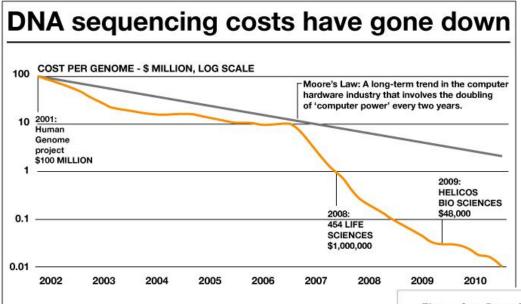
Synthetic Biology

Dreams of a new Industrial Revolution





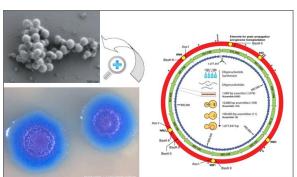


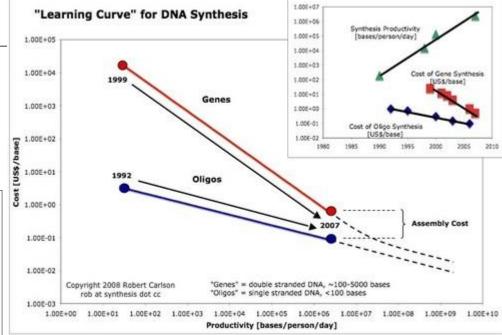


Reading

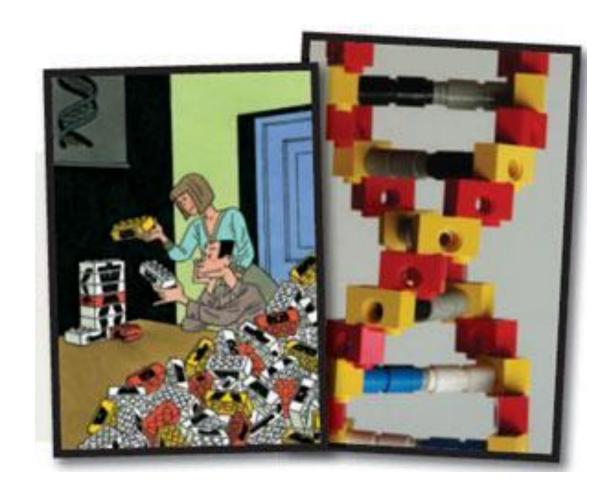
Writing

SOURCE: NATIONAL INSTITUTES OF HEALTH





Metaphor 1: Cells are like lego kits



Key words: Modularity, Composability, Standardization ("biobricks")

Metaphor 2: Cells are like electronic circuits



Key words: Design, Predictability, Programmability, Refactoring



Engineering Biology...

...the Manchester way

Genome-editing

Predictive modelling tools

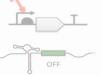
Regula

Compilation and assembly tools



Regulatory devices

light activation riboswitches circuit design



Biocatalyst/Pathway Selection

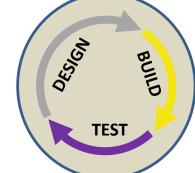
CAD tools

design modify homologues

Scale-up

Fermentation optimisation

State-of-the-art analytics facility



metabolism

kinetic/flux

catalysis

machine learning

Pathway design

Vector promoter RBS Gene cluster order

Pathway assembly

synthesis automated assembly

Chassis engineering

design modify homologues Eg. Carbon source, minimal genome

Testing

targeted analysis untargeted metabolomics microfluidics

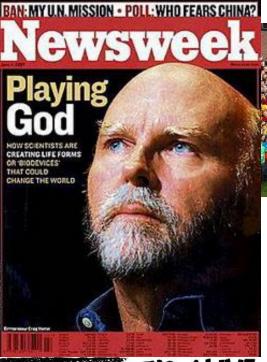
High-throughput tools

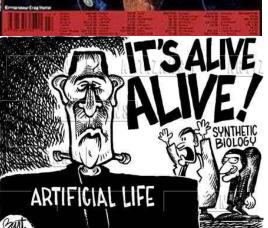
(Robotics, microscale growth/expression, analysis/assays)





Responsible Research & Innovation











An Introduction to Synthetic Biology

