

SYNTHETIC BIOLOGY IN SINGAPORE AND LOOKING TO THE FUTURE

By

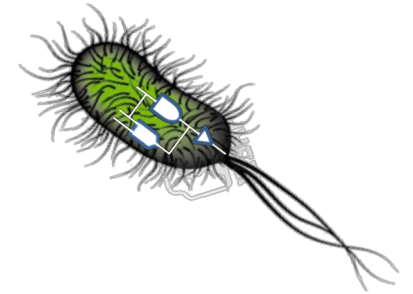
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**Global Forum On Scientific Advances Important To The
Biological And Toxin Weapons Convention
3rd Dec 2018**

SYNTHETIC BIOLOGY IN SINGAPORE

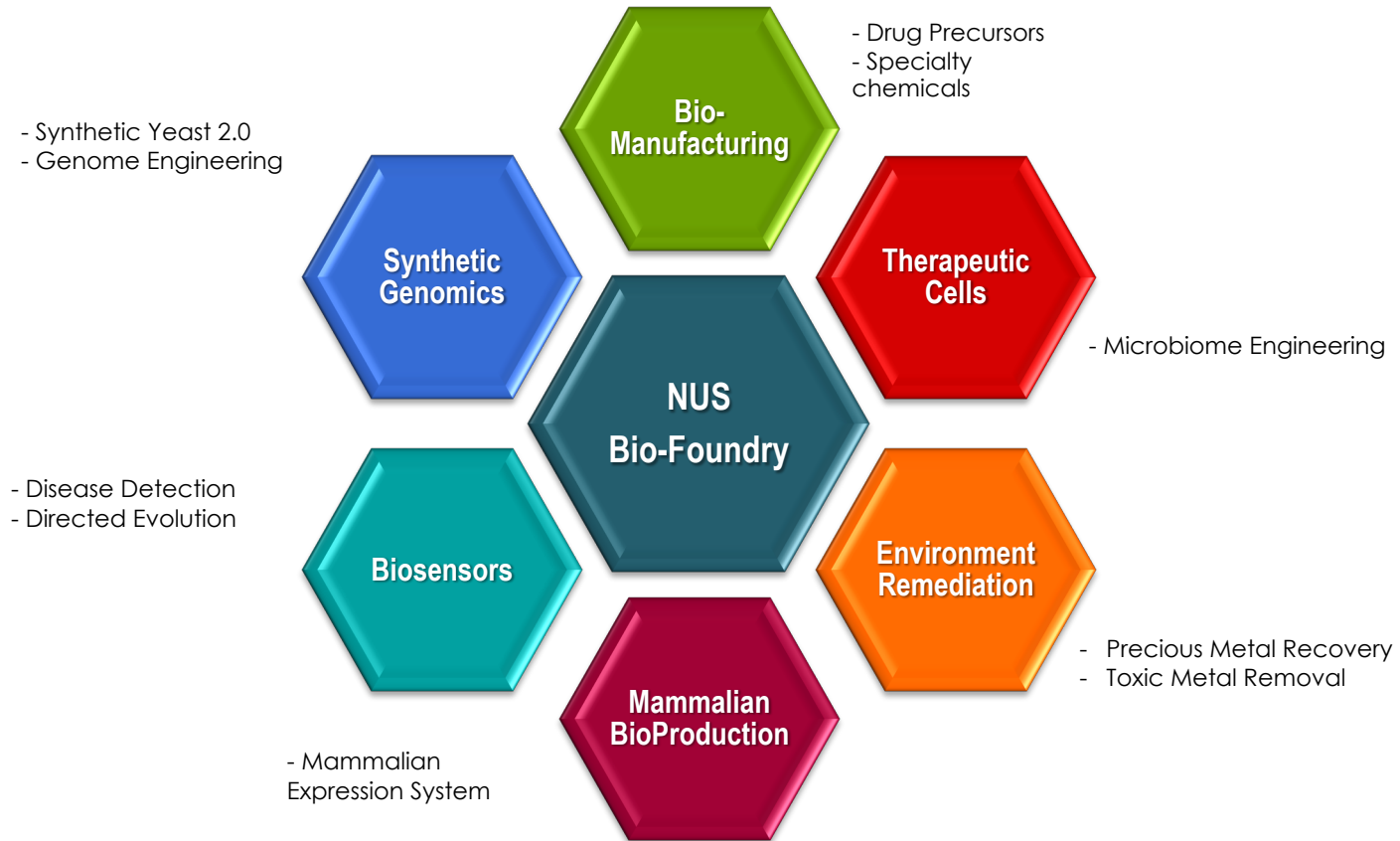
- Singapore Synthetic Biology Programme (SBP)
- Singapore consortium for Synthetic Biology
- Research center @ National University of Singapore, SynCTI
- Held SB7.0 in 2017



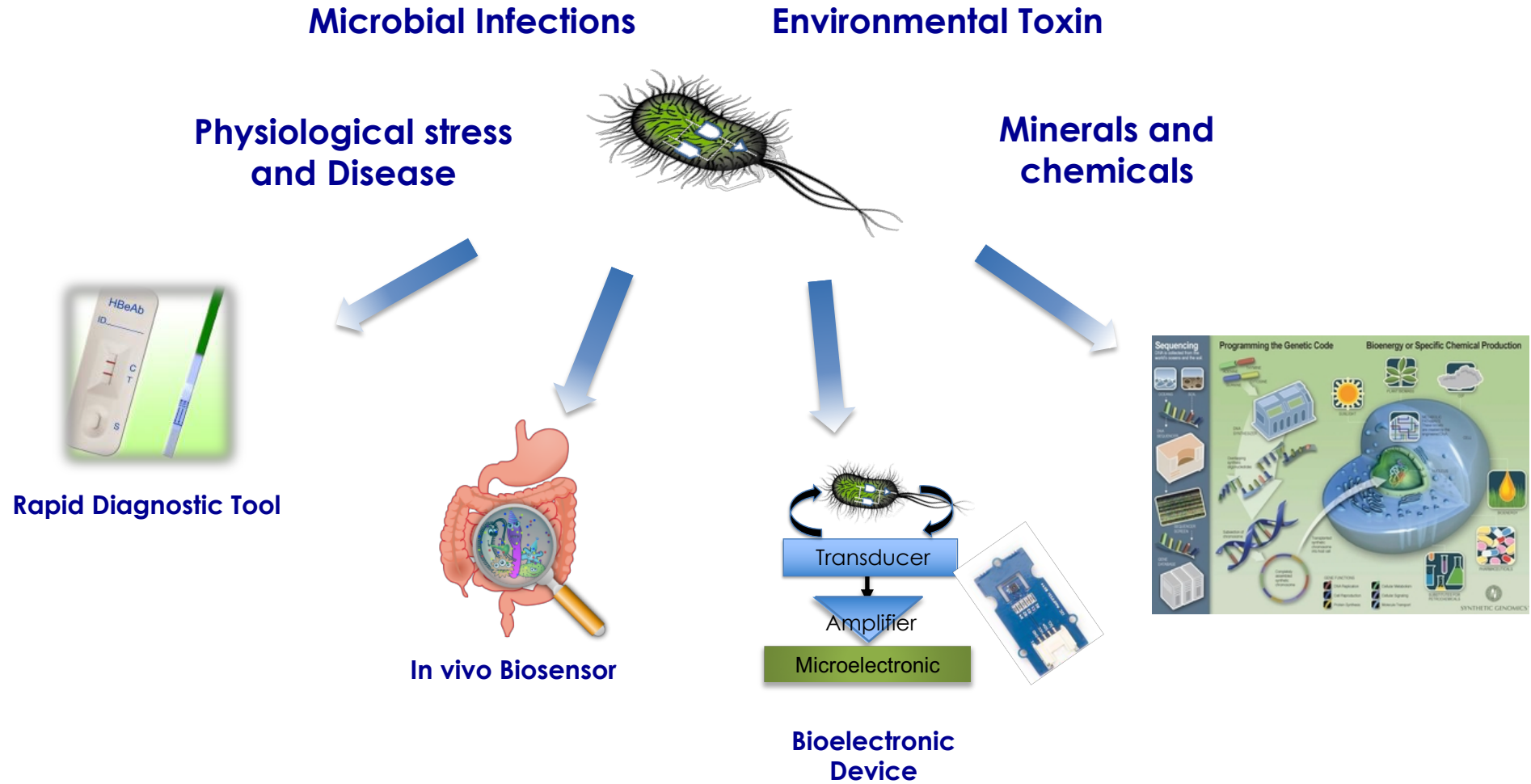
The image shows a screenshot of a news article from the journal Nature. The article is dated 25 April 2018 and includes a correction from 27 April 2018. The title is 'Singapore bets big on synthetic biology' and the sub-headline reads: 'The city-state wants to develop synthetic microorganisms that can be used to produce drugs and food.' The author is listed as Sandy Ong. The Nature logo and navigation icons (Search, E-alert, Submit, Login) are visible at the top.



Research Focus

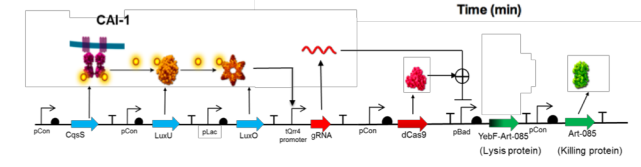
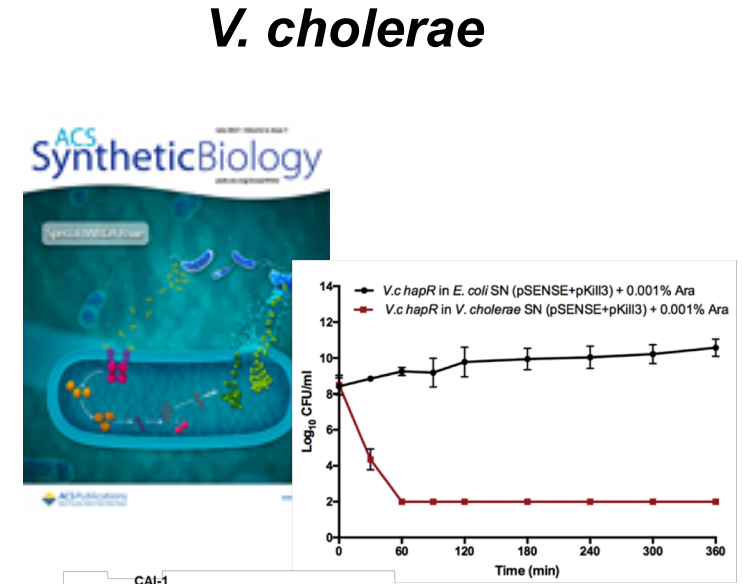
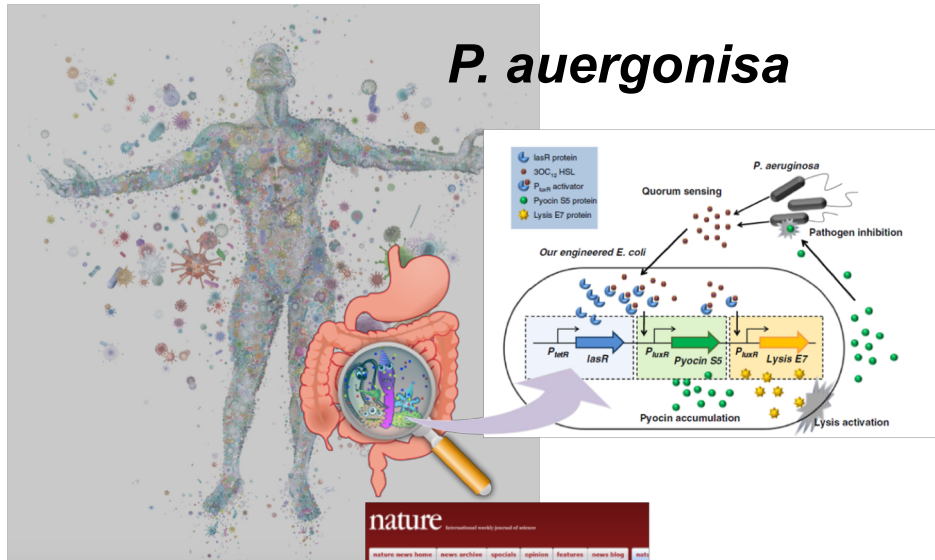


Biosensors



Sensing Systems for Diagnostics and Therapeutics

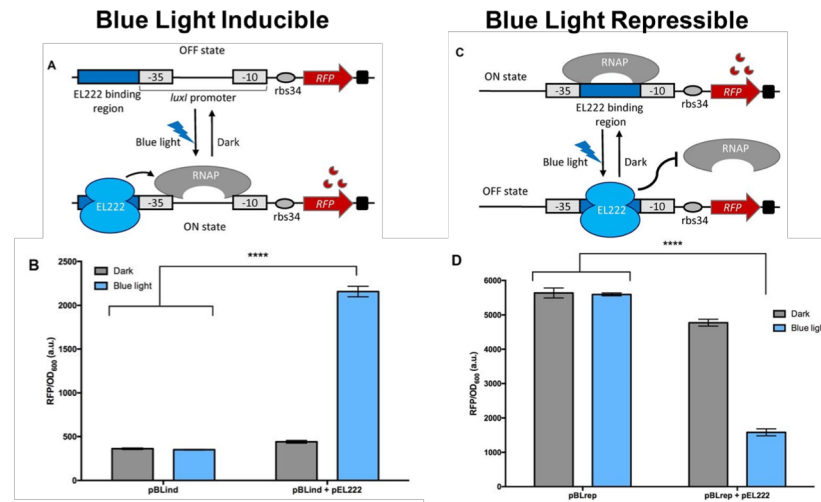
Engineering beneficial microbes to sense and kill pathogens



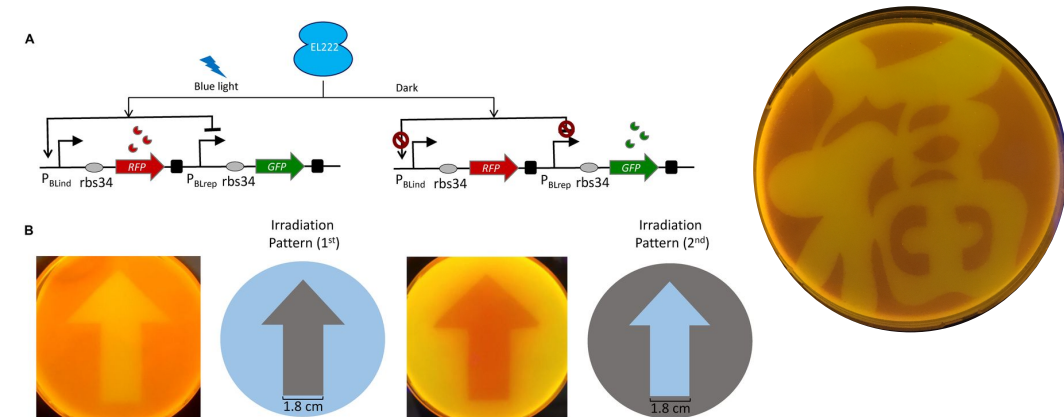
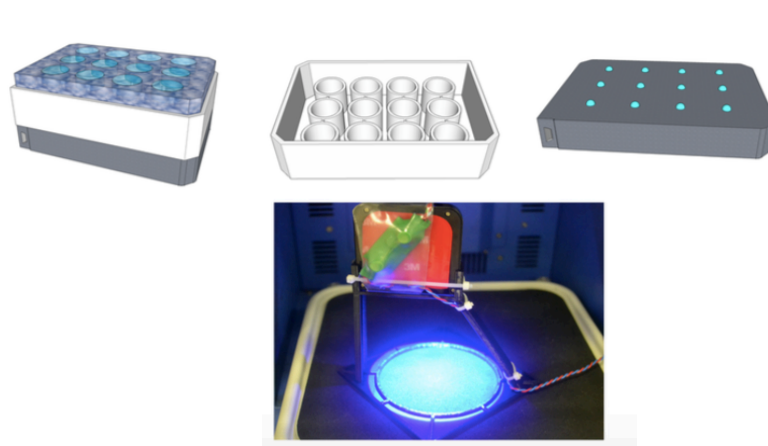
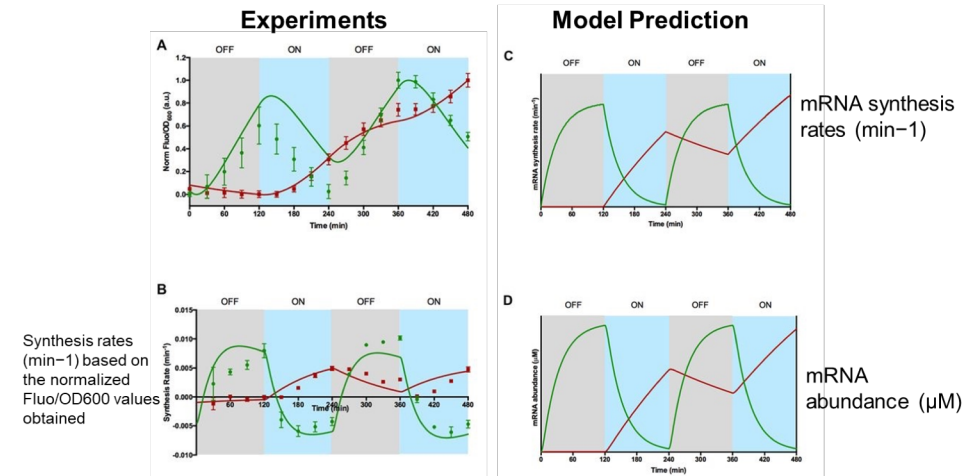
Prem et al. ACS Synthetic Biology. 2017
 Maciej et al. ACS Synthetic Biology. 2016
 CK Wong et al. Methods in Molecular Biology. 2014
 Hwang IY et al. ACS Synthetic Biology. 2014
 N Saeidi, et al. Molecular Systems Biology. 2011

Light Sensitive Promoter systems for fast and reversible gene expression

Nucleic acids research (2016) , 44, 6994-7005.

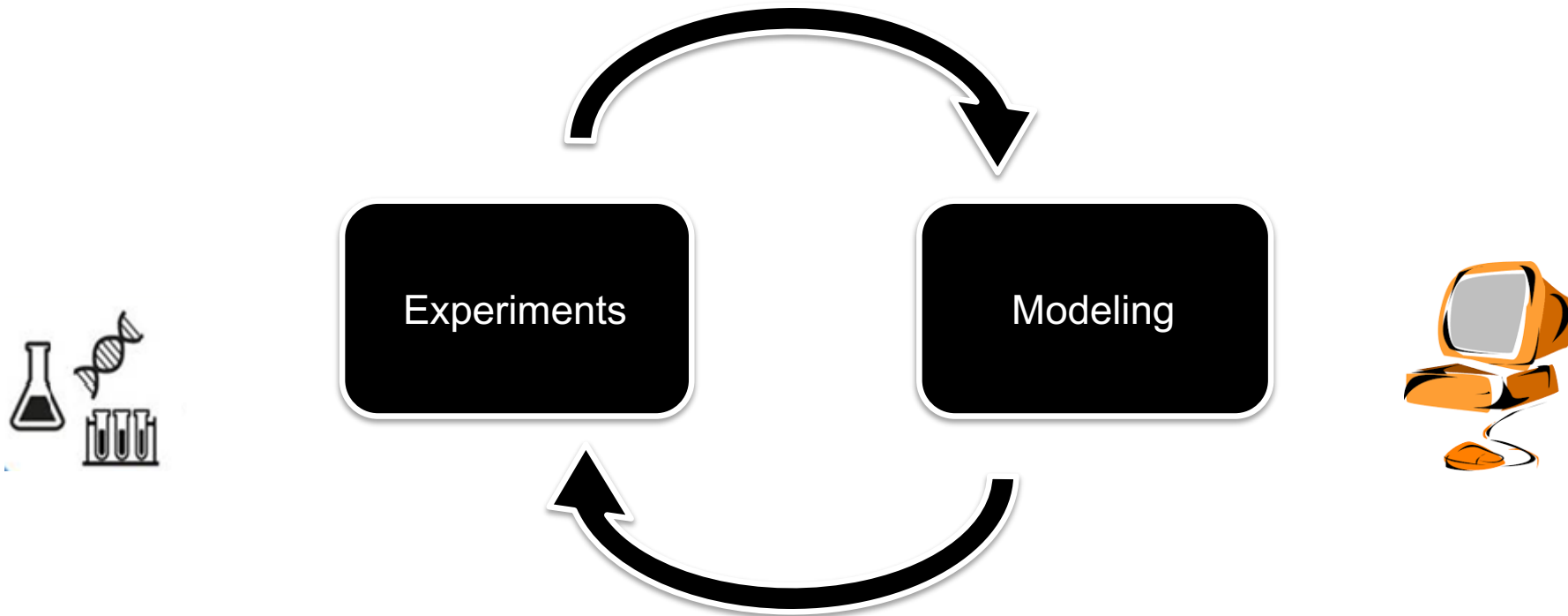


OFF-ON-OFF-ON cycle for every 2 h over a period of 8 h



Model Driven Engineering

Integrated Computational-Experimental platform



Growing number of Biofoundries

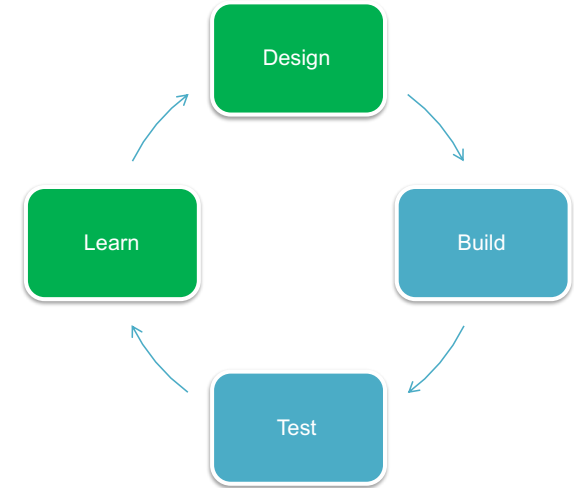


Rapid Prototyping
Building More Faster

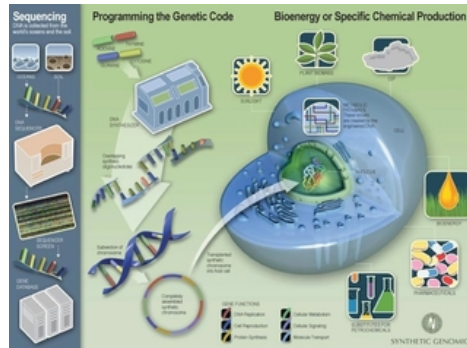


Advancing key enabling technologies

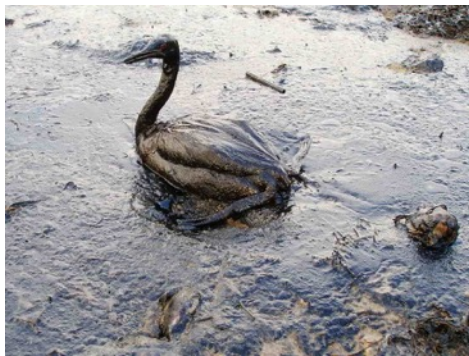
- Technologies that are accelerating the growth of synthetic biology
 - DNA synthesis and assembly
 - DNA sequencing
 - Genome Engineering
 - Computer Aided Design and Modelling, AI
 - Standard DNA toolkits and parts
 -



Dual Use of Synthetic Biology



Biorefinery



Bioremediation



Drug Discovery



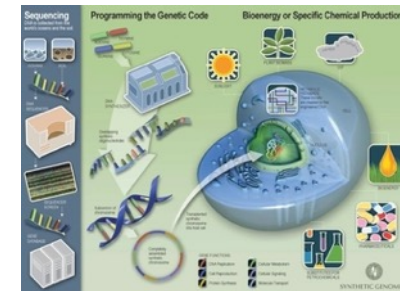
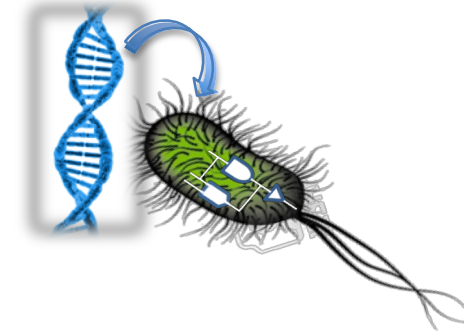
Microbiome Engineering



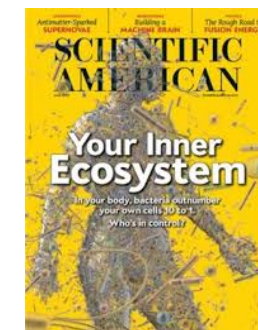
Gene Therapy

Potential areas of concerns

- Re-creating known **pathogenic** viruses/bacteria,
- Making existing viruses/bacteria **more dangerous** or even creating new pathogens!
- Using cells to manufacture **toxins** through natural or novel pathways
- **Modifying** our human microbiome
- **Damaging** our environment



Biorefinery

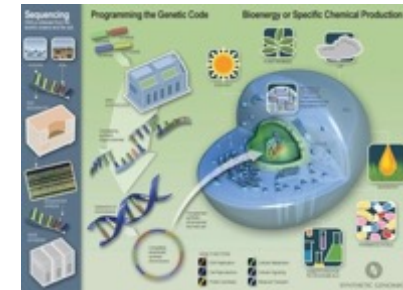
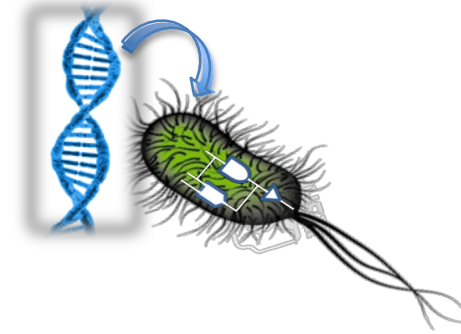


Microbiome Engineering

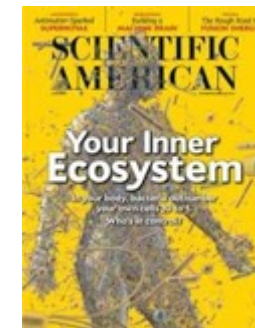
National Academies of Sciences, Engineering, and Medicine. 2018. *Biodefense in the Age of Synthetic Biology*. Washington, DC: The National Academies Press. <https://doi.org/10.17226/24890>.

Positive role of Synthetic Biology

- Engineering counter measure solutions that could address/mitigate the concerns
- ICT and Computational methods, e.g., screening of DNA synthesized
- Global collaborative effort
- Responsible research, recognizing biosafety and biosecurity early in the project



Biorefinery



Microbiome
Engineering

THANK YOU!

