



SYNTHETIC “MATERIALS” BIOLOGY?

Linda S. Sapochak
Division Director
Division of Materials Research (DMR)
Mathematical & Physical Sciences (MPS)

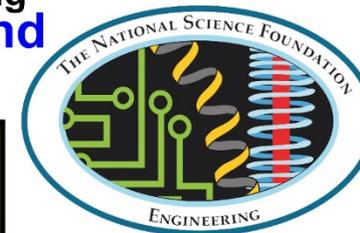
Rich B. Dickinson
Division Director
Division of Chemical, Bioengineering,
Environmental, and Transport Systems (CBET)
Engineering (ENG)

Note:

- BIOMAPs (no longer active)
- NSF-wide Synthetic Biology Working Group
- NSF Big Idea - Rules of Life
- OISE –Multiplier in Synthetic Biology (materials opportunities?)
- NSF-Air Force Partnership – Synthetic Biology for Materials



National Science Foundation | Directorate for Engineering Chemical, Bioengineering, Environmental, and Transport Systems Division (CBET)




Division Director
Richard Dickinson



Deputy Division Director (Acting)
Timothy Patten

Chemical Process Systems	Engineering Biology & Health	Environmental Engineering & Sustainability	Transport Phenomena
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1401 Catalysis
Robert McCabe



1417 Process Separations
Angela Lueking



1403 Process Systems, Reaction Engineering, & Molecular Thermodynamics
Triantafillos Mountziaris



7644 Energy for Sustainability
Carole Read



1491 Cellular & Biochemical Engineering
Steven Peretti



5345 Engineering of Biomedical Systems
Michele Grimm



7236 Biophotonics
Leon Esterowitz



7909 Nano-Biosensing
Chenzhong Li



5342 Disability & Rehabilitation Engineering
Michele Grimm



1440 Environmental Engineering
Karl Rockne



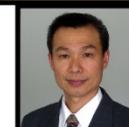
1179 Biological & Environmental Interactions of Nanoscale Materials
Nora Savage



7643 Environmental Sustainability
Bruce Hamilton



022Y INFEWS
James Jones



1407 Combustion & Fire Systems
Song-Chang Kong



1443 Fluid Dynamics
Ronald Joslin



1415 Particulate & Multiphase Processes
Susan Muller



1406 Thermal Transport Processes
José Lage

Associate Program Directors

Chemical Process Systems Cluster
VACANT



Engineering Biology & Health Cluster
Christina Payne



Environmental Engineering & Sustainability Cluster
Brandi Schottel

Transport Phenomena Cluster
VACANT

Division Experts and AAAS Science & Technology Policy Fellows



Multiple Programs Expert
Geoffrey Prentice



Engineering of Biomedical Systems Expert
Carol Lucas



AAAS S&T Policy Fellow
Gregory Meyer

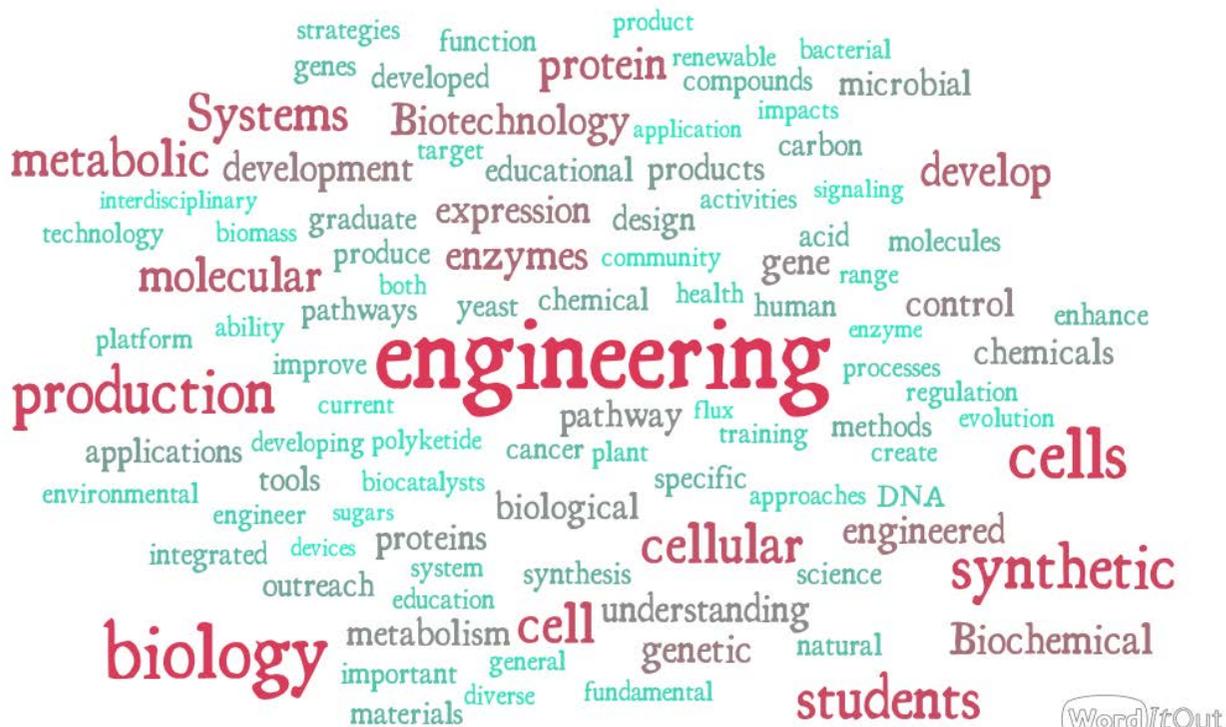
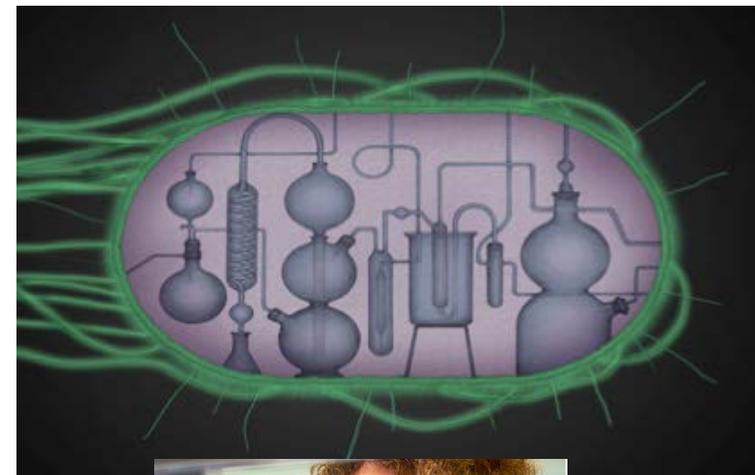


AAAS S&T Policy Fellow
Emily Aurand



SYNTHETIC BIOLOGY IN CBET

- Sustainable biomanufacturing – chemicals, pharmaceuticals, biofuels
- Applied environmental biotechnology
- Tissue engineering and regenerative medicine
- Biosensing and biophotonics

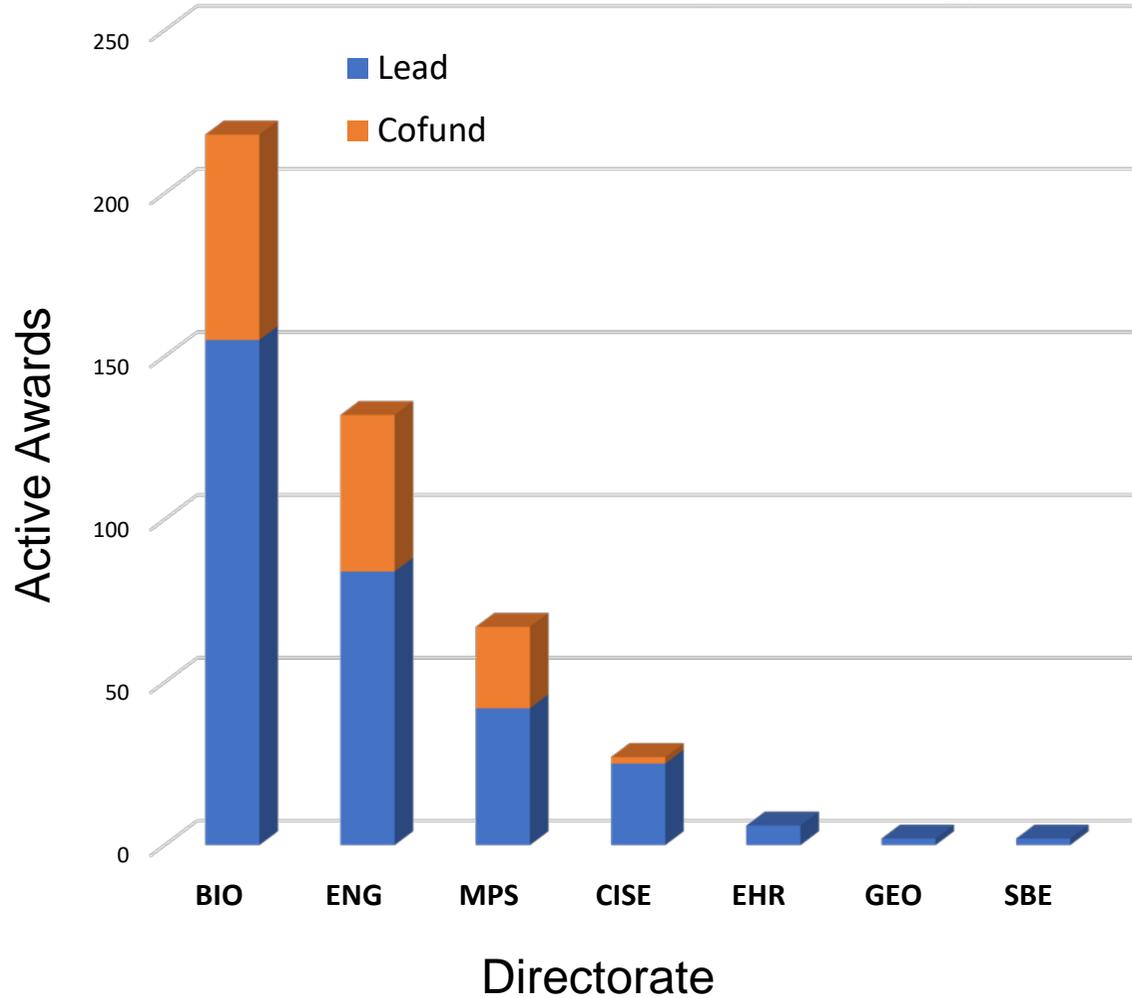




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SYNTHETIC BIOLOGY IN CBET

Current Award Search: "Synthetic Biology"

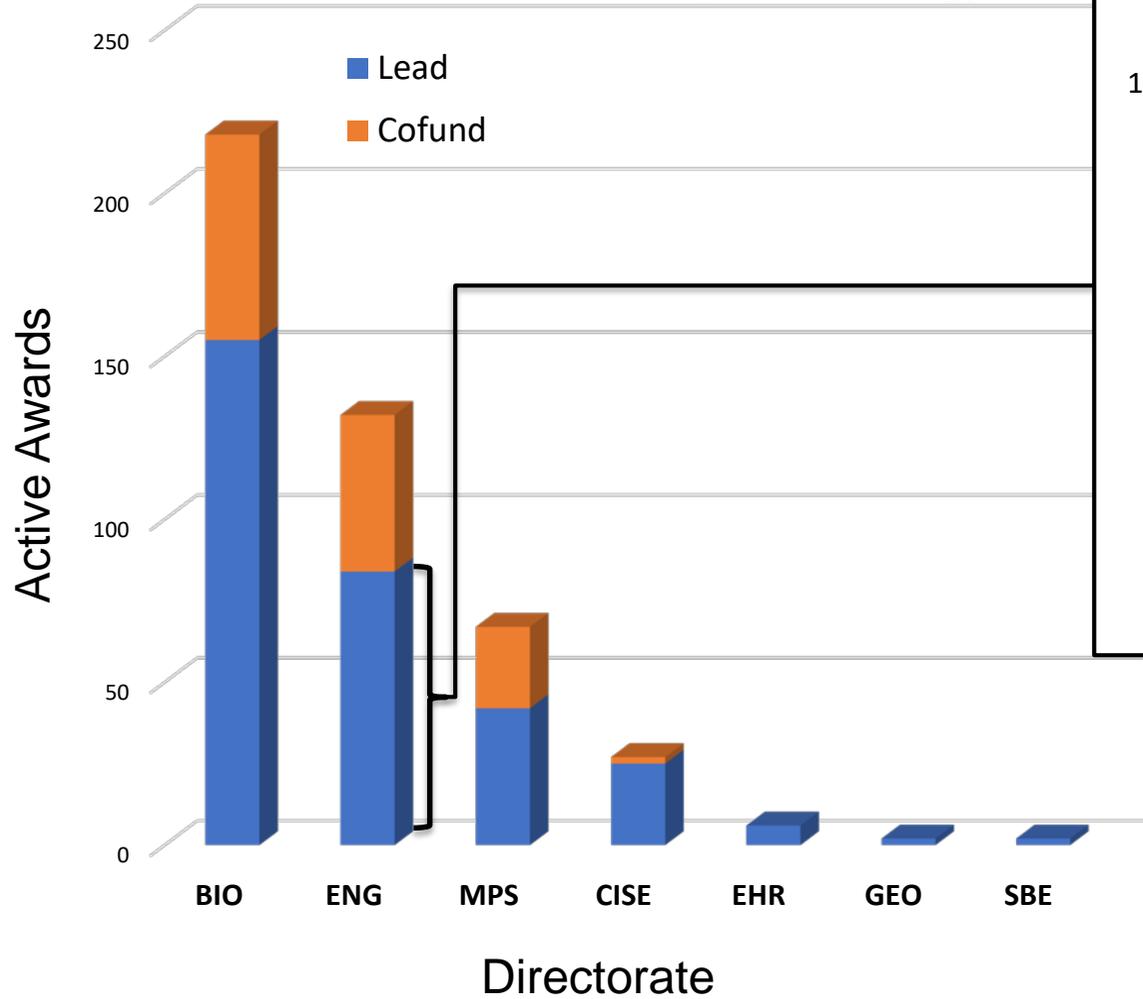




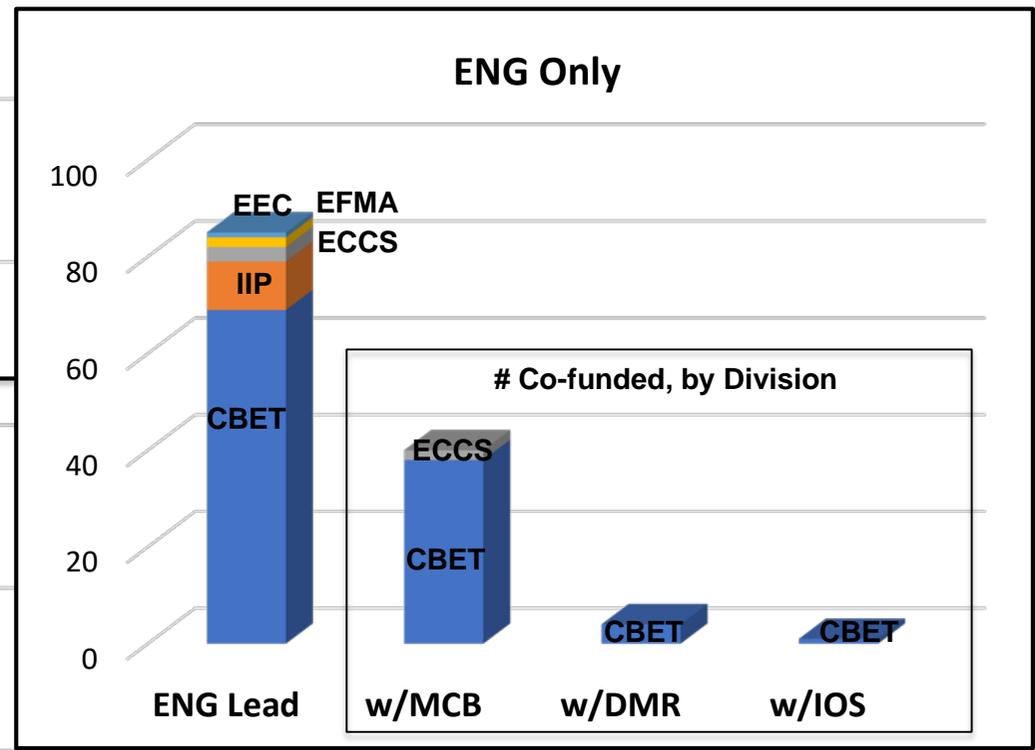
National Science Foundation

SYNTHETIC BIOLOGY IN CBET

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ENG Only

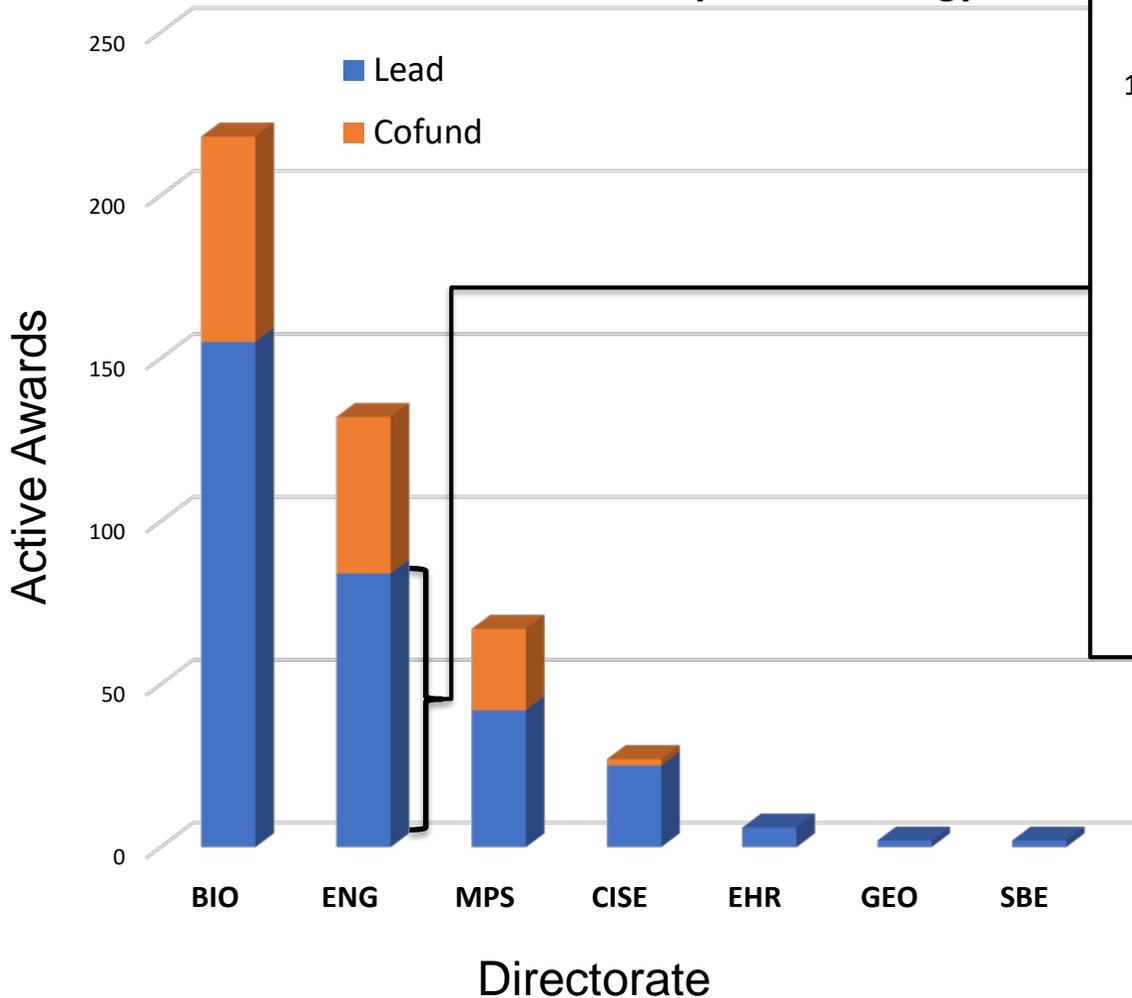




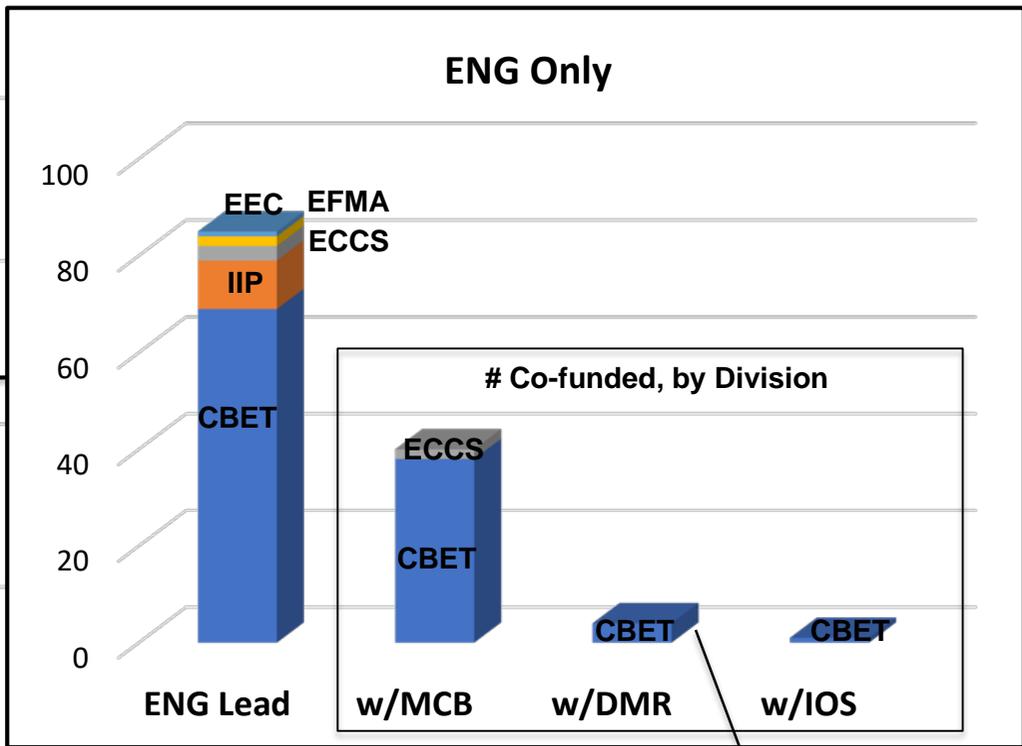
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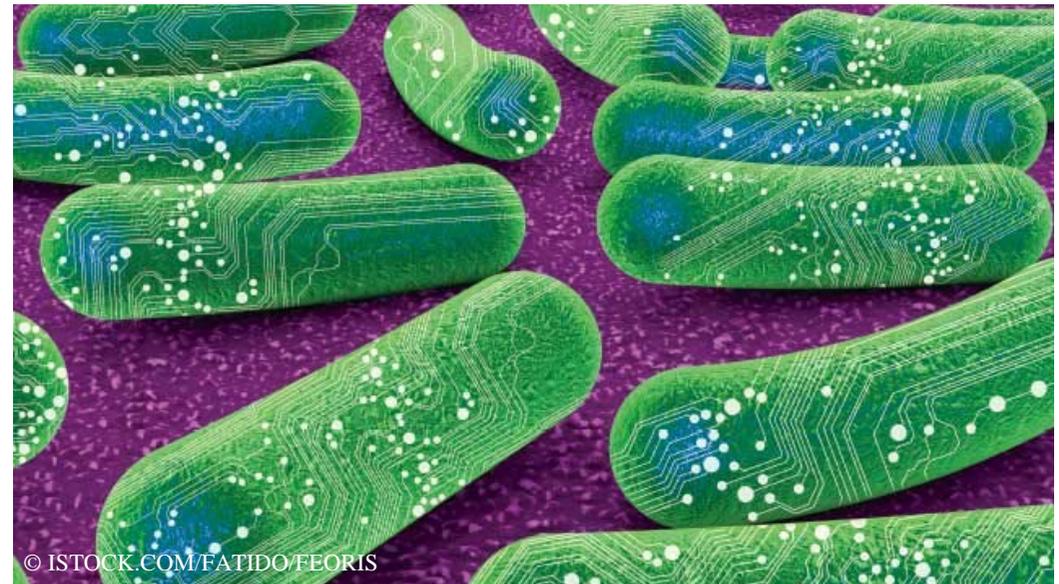
CBET#1344298- INSPIRE: Protocells as a Platform for Bottom-up Synthetic Biology. PI Yingxiao Wang, UCSD
Co-funded by CBET, MCB, DMR



NSF 18-071 DCL: RULES OF LIFE: DESIGN AND ENGINEERING OF SYNTHETIC CELLS AND CELL COMPONENTS (DESYN-C³)

**ENG (CBET & CMMI)
MPS (CHE & DMR)**

Convergent research towards *de novo* design and construction of synthetic cells or cell components (invited EAGERs and RAISEs)





UK & US DOD ADVOCATING FOR SYN BIO FOR MATERIALS

Synthetic and Systems Biotechnology 1 (2016) 258–264



Contents lists available at ScienceDirect

Synthetic and Systems Biotechnology

Contents lists available at ScienceDirect
Synthetic and Systems Biotechnology 3 (2018) 105–112



Synthetic and Systems Biotechnology
journal homepage: <http://www.keaipublishing.com/en/journals/synthetic-and-systems-biotechnology/>

A living foundry for Synthetic Biological Materials: A synthetic biology roadmap to new advanced materials

Rosalind A. Le Feuvre ^{a, b, **}, Nigel S. Scrutton ^{a, b, *}

^a BBSRC/EPSC Manchester Centre for Synthetic Biology of Fine and Speciality Chemicals (SYNBIOCHEM), Manchester Institute of Biotechnology, The University of Manchester, Manchester M1 7DN, United Kingdom
^b School of Chemistry, The University of Manchester, Manchester M1 7DN, United Kingdom



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Synthetic biology in the UK – An outline of plans and progress

L.J. Clarke ^{a, b, c, d, *}, R.I. Kitney ^{a, e, f, g}

^a UK Synthetic Biology Leadership Council, UK
^b Department of BioEngineering, Imperial College, UK
^c Faculty of Life Sciences, University of Manchester, UK
^d BionerG, UK
^e EPSRC National Centre for Synthetic Biology and Innovation, UK
^f Institute of Systems and Synthetic Biology, UK
^g BioMedical Systems Engineering, Imperial College, UK

Workshop Support: Naval Research Global, Defense Science & Technology Laboratory



Synthetic Biology and Materials from Biology

The rapid and predictable engineering of biological micro-organisms to provide access to new materials requiring:

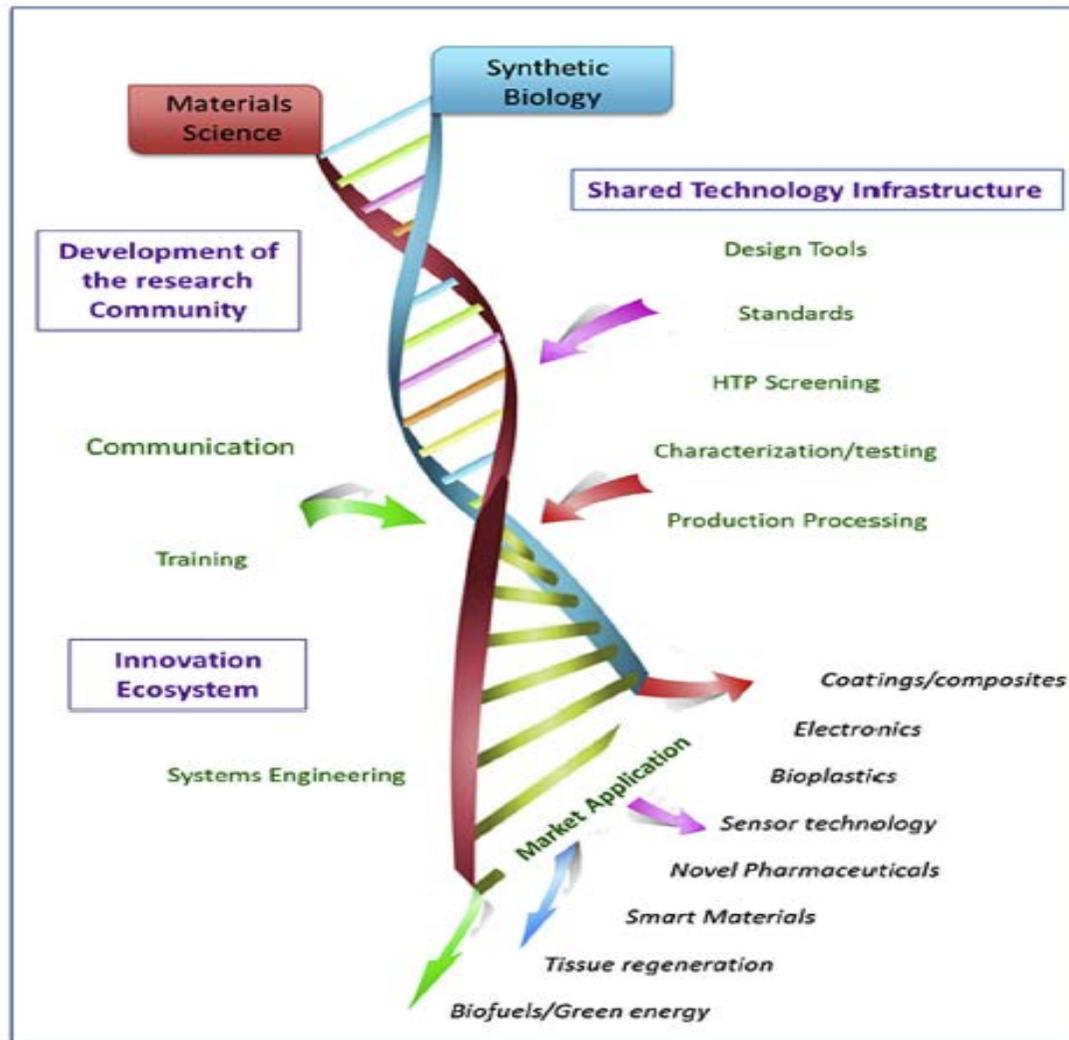
- Expanded metabolic space to derive new material components
- New routes to chemicals/materials diversity and new biopolymers
- Hierarchical assembly of new biological and hybrid chemical/biological materials (soft, hard, composites, and multi-component/functional materials)
- Sustainable, affordable and environmentally acceptable methods of production.

Synthetic Biological Materials

New Advanced Materials that are genetically encoded and generated from biology by harnessing synbio platforms to create new higher order materials and their component parts. Also, materials produced using synbio platforms in conjunction with other capability platforms (e.g. additive manufacturing) to fabricated multi-component, multi-functional and novel composite materials.



UK WORKSHOP RECOMMENDATIONS.....



“By harnessing the power of SynBio, existing materials discovery platforms and fabrication technologies can be augmented to widen the materials development space and define a new materials paradigm – Synthetic Biological Materials”

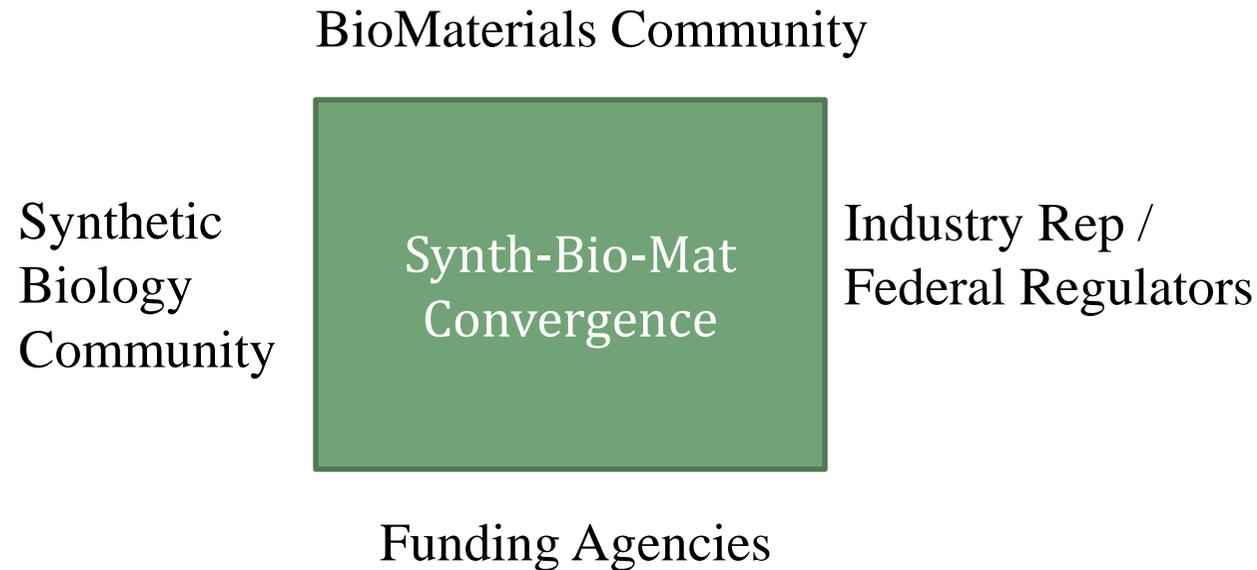
Synthetic and Systems BioTechnology **3** (2018) 105-112.

Fig. 1. Developing an ecosystem to deliver a living foundry for Synthetic Biological Materials.



SQUARE-TABLE: *LIVING INTERFACES* - EXPLORING SYNTHETIC BIOLOGY AND EVOLUTION FOR THE DEVELOPMENT OF NEXT-GENERATION BIOMATERIALS

- 2-4 December 2018 in Alexandria, VA
- Engage representatives from the biomaterials, synthetic biology, and molecular evolution communities, along with funding agencies, regulators and industry.
- “Living Interfaces” frames an exciting first challenge, the successful prosecution of which will open many other avenues of collaboration and research.



DMR invited: BIO/MCB, MPS/CHE & PHY, ENG/CBET, NIH and FDA representatives.



MPS SUB-COMMITTEE ON SYN-"MATERIALS"-BIO

- How can DMR leverage ongoing activities/programs supported by NSF to accelerate Syn- “Materials” Bio?
- How can Sustainable Materials Development, Materials Genome Initiative (MGI), and Synthetic “Materials” Biology efforts be complementary?
- What materials topics are already “touched” by SynBio and what new opportunities does Syn- “Materials” Bio hold for interdisciplinary teams (across DMR, MPS, NSF)?