Molecular and Cellular Bioscience Approaches for Exploring the Rules of Life

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DIVISION OF MOLECULAR & CELLULAR BIOSCIENCES

Biology Advisory Committee
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Predictive Biology through Interdisciplinary Research

Evolutionary-Life History
(What Has Happened?)

Experimental/Theoretical Framework
(How Things Happen.)

“That which I can’t build, I don’t understand”
R. Feynman

Synthetic Biology
Embracing the Rules of Life

Engineering Derived Traits
(What can Happen?)
Engineering Derived Traits
(What Can Happen?)

MCB 1553041 (SSB)
Jianto Guo, University of Nebraska-Lincoln –
CAREER: Quadruplet codon decoding mechanistic studies and Application - Cellular Genetic Code Expansion
Objective: Build a quadruplet codon system

MCB 1443228 (SSB)
Dawson Philip, Scripps Research Institute – ERASynBio: Establishment of a Fully Synthetic, Mirror-Image Biological System
Objective: Build a functional cell composed of mirror image components; e.g. enatiomeric L-nucleotides and D-amino acids

[Diagram of protein translation and aminoacylation processes with annotations for slippage, unnatural amino acid (unAA), aminoacyl-tRNA synthetase (aaRS), L-Ligase, and D-Ligase.]

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Predictive Biology through Interdisciplinary Research
Theoretical Framework
(How do things happen?)

MCB 1344203 (CDF)
Jennifer Ross, University of Massachusetts-Amherst INSPIRE Track 1: Condensed Phases and Transitions of Cellular Patterns
-Objective: Apply soft matter physics principles to understand biological self-organization
Evolutionary Life History
(What has Happened?)

MCB 1548533 (CDF)
John Pringle, Stanford University. EAGER-Cytokinesis mechanisms and cytoskeletal dynamics in Chlamydomonas
Objective: Discover ancestral cytokinetic states in extant cells.
Objective: Engineer phage-resistant bacteria using CRISPR technology

SynBio will benefit immensely from the CRISPR technology that was supported by MCB from the beginning