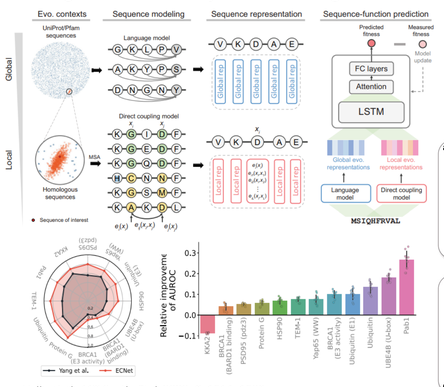
The Zhao Group

Harnessing the power of synthetic biology, machine learning, and laboratory automation for fundamental and applied biological research

Self-driving Biofoundry

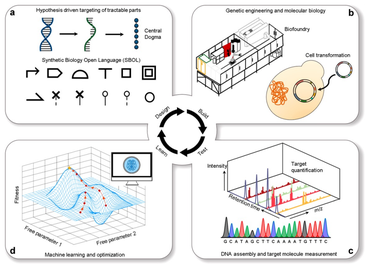
Apply state-of-the-art laboratory automation (iBioFAB) and machine learning to accelerate the design-build-test-learn cycle

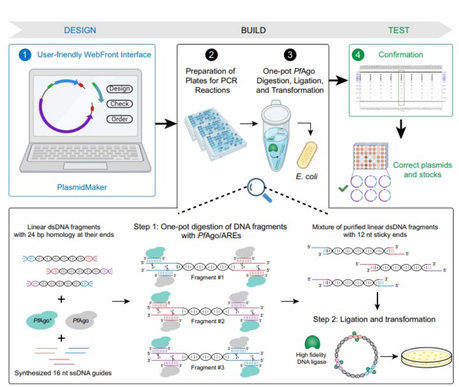
Leverage predictive power of machine learning to optimize organism and enzyme screening, selection, and engineering



Develop automated systems (iBioFAB) for optimizing and accelerating the engineering of biological systems

Illinois Biological Foundry for Advanced Biomanufacturing





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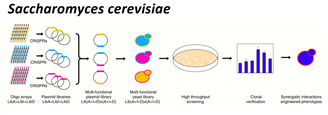
Microbial Cell Factories

Engineer microorganisms on the genome, metabolic, and protein level for producing improved and novel routes for advanced biofuel and industrial chemical synthesis

Engineer yeast strains capable of producing advanced biofuels and important industrial chemicals

Saccharomyces cerevisiae



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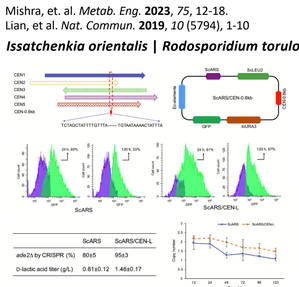
Issatchenkia orientalis* | *Rodosporidium toruloides



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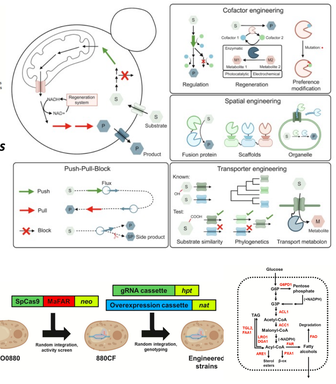

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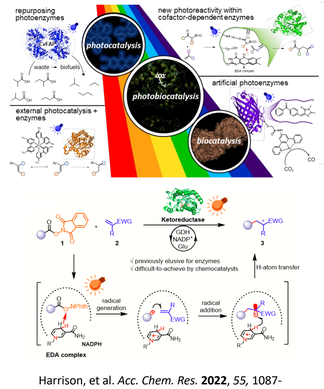
Synergize photocatalysis and enzymes to develop sustainable methodologies for the synthesis of specialty chemicals



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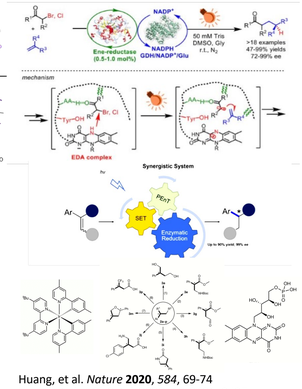

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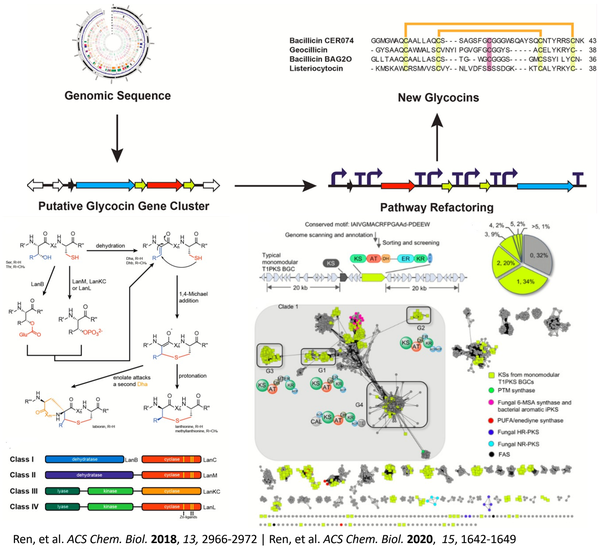
Natural Product Discovery

Discover novel natural products by activating cryptic pathways from sequenced genomes and metagenomes and investigate their biosynthetic mechanisms

Large-Scale Discovery of **Ri**bosomally synthesized and **P**ost-translationally modified **P**eptide**s** (RiPPs)



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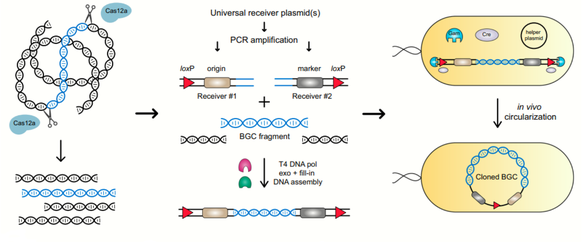
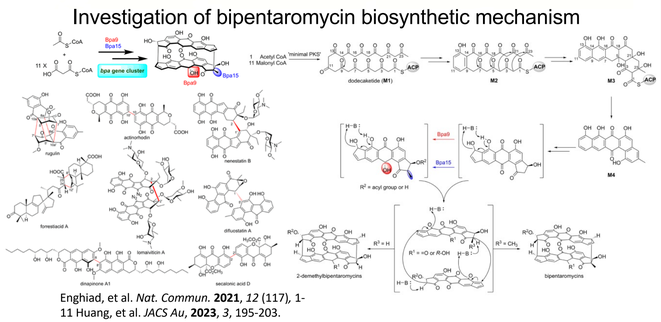
Cas12a assisted precise targeted cloning using in vivo Cre-lox recombination (CAPTURE)



Investigation of bipentaromycin biosynthetic mechanism



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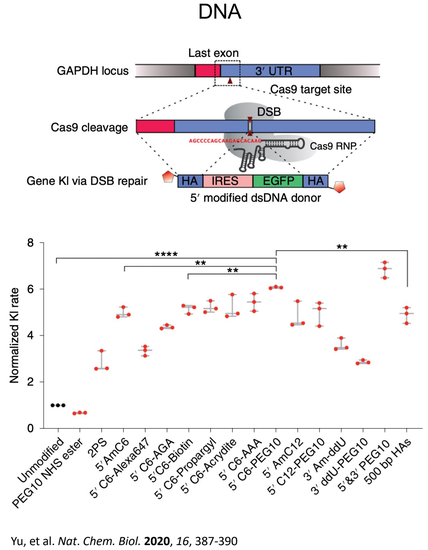
Huang, et al. *JACS Au*, **2023**, *3*, 195-203.

Mammalian Synthetic Biology

Develop new targeted genome engineering tools and gene regulation tools for applications in gene therapy and functional genomics.

Improving CRISPR/Cas9-mediated knock-in efficiency with chemically modified donor DNA



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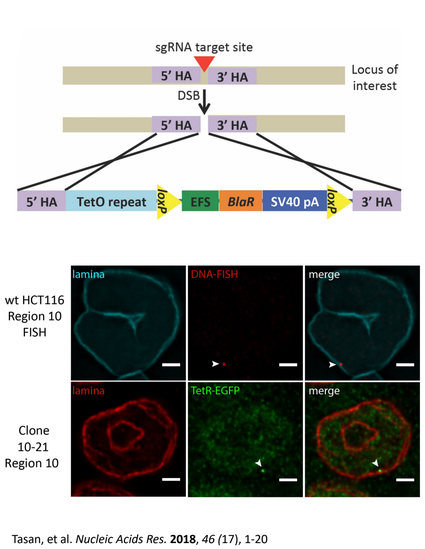
Imaging of endogenous loci in mammalian cells



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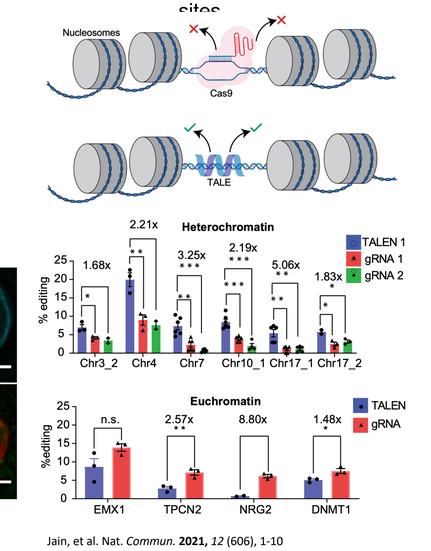
Target search mechanism of Cas9 vs TALENs: TALEN outperforms Cas9 in heterochromatin sites



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