Quantitative metabolic modeling at the Joint BioEnergy Institute

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Project Goals: The Quantitative Metabolic Modeling (QMM) group is devoted to developing predictive models of metabolism that can leverage high-throughput 'omics data and systematically direct metabolic engineering efforts.

Our inability to predict the behavior of biological systems severely hampers progress in bioengineering and biomedical applications. We cannot predict the effect of genotype changes on phenotype, nor extrapolate the large-scale behavior from small-scale experiments. Machine learning techniques recently reached a new level of maturity, and are capable of providing the needed predictive power without a detailed mechanistic understanding. However, they require large amounts of data to be trained. The amount and quality of data required can only be produced through a combination of synthetic biology and automation, so as to generate a large diversity of biological systems with high reproducibility.

Here we show the variety of methods created in the QMM group to leverage 'omics data and guide metabolic engineering. We have used **machine learning** approaches to predict pathway dynamics directly from time-series data [1], **microfluidics chips** for automated synthetic biology [2] and created **online tools for –omics data visualization.**

References

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