

University of Houston - Biomedical Engineering Seminar
Friday, April 21, 2023, 12 noon Room 105 SEC

Genome Engineering:
A New Engineering Discipline Emerging in the 2020s?



Bernhard Palsson, Ph.D.

Abstract

The sequencing of the first genomes in the 1990s fundamentally changed life sciences. The functional annotation of the ORFs led to the first genome-scale metabolic network reconstructions. Flux-balance analysis of these reconstructions could lead to computed phenotypic states. Thus, the first full genome-scale mechanistic genotype-phenotype relations were established. Genome-scale models (GEMs) became more comprehensive over the next 20 years. GEMs have led to whole cell models to study growth under a given condition in great mechanistic detail. One might characterize this undertaking as a Cartesian approach. Its applications should reveal the nature of the growth process and play a role in designing *de novo* genomes. A massive drop in the cost of DNA sequencing enabled a second line of inquiry. We now have a series of databases with data analytics for the major data types that constitute the basic ‘dogma of molecular biology’ in addition to metabolic features. These half a dozen or so databases are now being made interoperable with each other, as well as with GEMs. Looking at these developments in the context of other technology drivers leads one to the hypothesis that before this decade is up, leading universities will establish Departments of Genome Engineering.

Biosketch

Bernhard Palsson is a Professor in Bioengineering and the Principal Investigator of the Systems Biology Research Group at UCSD. He is a founding member and Director of the NNF Center for Biosustainability, now with an international membership of 300 FTEs. His research includes the development of computational biology methods, data analytic methods and the formulation of specific sysbio models of the red blood cell, *E. coli*, CHO cells, and many human pathogens. Dr. Palsson has co-authored more than 600 research articles and has authored four textbooks. He holds over 40 U.S. patents and is the co-founder of several biotechnology companies. Dr. Palsson is a member of the NAE, a Fellow of the AIChE, AIMBE, AAAS, and the AAM. Dr. Palsson has been a Clarivate Highly Cited Researcher since 2014.