

## Genome-scale model of *E. coli*: M to ME

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Regulation of gene expression evolves to maximize fitness subject to physical and environmental constraints. Here, we show a genome-scale model of *E. coli* embodying metabolic and gene expression pathways and physicochemical constraints allows the prediction of condition-specific molecular phenotypes. Comparing and parameterizing the model with experimental data enables novel applications and leads to improved predictions and discovery.