(A) QUANTITATIVE PREDICTIONS AND COMPARISON WITH SYSTEMS LEVEL COMPILATION OF EXPERIMENTAL DATA

λ, growth rate [hr^{-1}]

DNA replication, <#ori>

cell size [μm^3] and total protein abundance per cell

predictions

experimental data

nutrient dependent cell size and cell composition
(Si et al. 2016, 2019; Basan et al. 2015; BioNumbers)

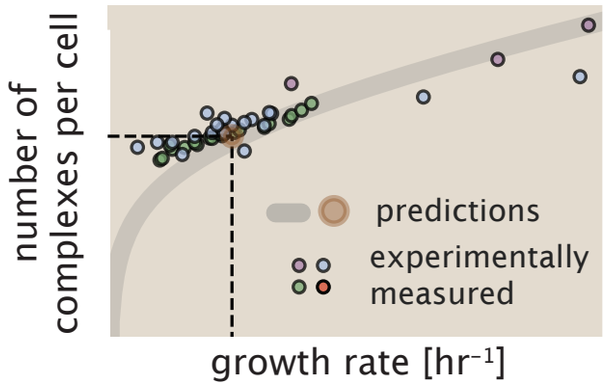
biochemical rates
(BioNumbers)

proteomics data (Valgepea et al. 2013, Peebo et al. 2015, Li et al. 2014, Schmidt et al. 2016)

calculate number of complexes required to double cell

data compatibility and curation
(EcoCyc, RegulonDB)

calculate average complex copy number per cell

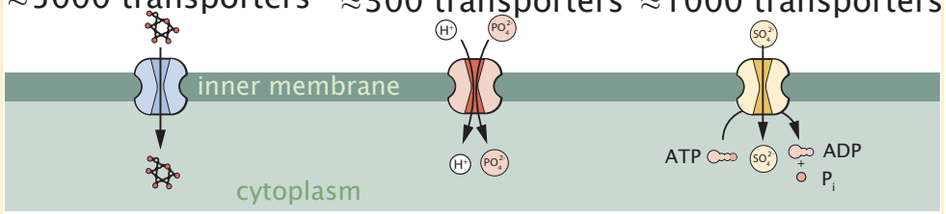


(B) WHAT SETS THE ABSOLUTE PROTEIN QUANTITIES AND TIMESCALE OF CELL DIVISION?

≈5000 sec

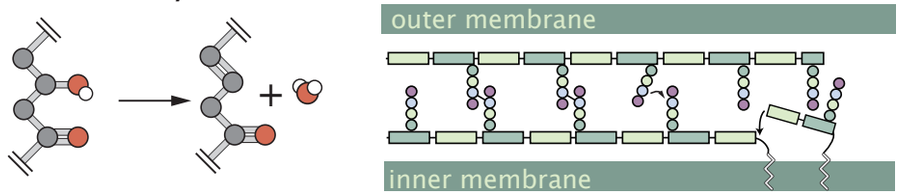
nutrient transport

carbon	phosphate	sulfate
≈5000 transporters	≈300 transporters	≈1000 transporters



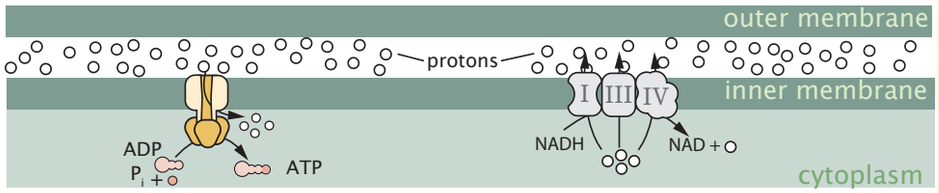
cell envelope biogenesis

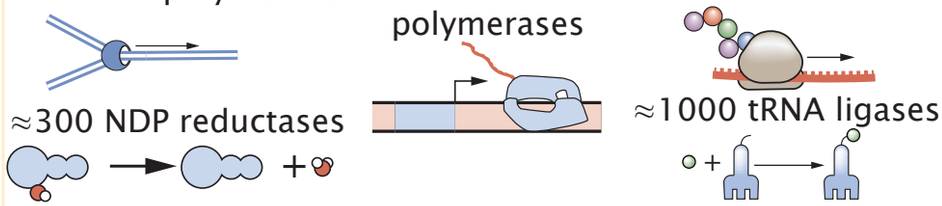
lipid synthesis	peptidoglycan crosslinking
≈4000 dehydratases	≈100 transpeptidases



energy production

ATP synthesis	proton gradient generation
≈3000 ATP synthases	≈2500 electron transport chains



central dogma

replication	transcription	translation
≈50 DNA polymerases	≈5000 RNA polymerases	≈10,000 ribosomes
≈300 NDP reductases		≈1000 tRNA ligases