[A]

biomass dynamics

total protein biomass; ribosomal protein mass; translational capacity

$$\frac{dM}{dt} = \gamma(c_{AA}) M_R$$

charged tRNA dynamics

charged tRNA concentration; metabolic protein mass; nutritional capacity

$$\frac{dc_{AA}}{dt} = \frac{\nu(c_N) M_P}{M} - \frac{(1 + c_{AA})}{M} \frac{dM}{dt}$$

nutrient dynamics

nutrient concentration; yield coefficient

$$\frac{dc_N}{dt} = -\frac{\nu(c_N) M_P}{\Omega}$$

nutrient-dependent capacities

maximal translational capacity; effective dissociation constant

$$\gamma(c_{AA}) = \gamma_{max} \frac{c_{AA}}{c_{AA} + K_D}$$

$$\nu(c_N) = \nu_{max} \frac{c_N}{c_N + K_M}$$

maximal nutritional capacity; Monod constant

resource allocation dynamics

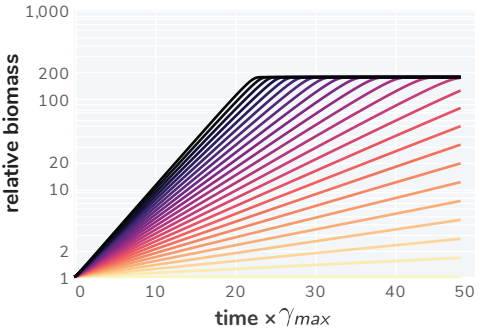
ribosomal mass fraction of proteome; metabolic mass fraction of proteome

$$\frac{dM_R}{dt} = \phi_R \frac{dM}{dt} \quad ; \quad \frac{dM_P}{dt} = \phi_P \frac{dM}{dt}$$

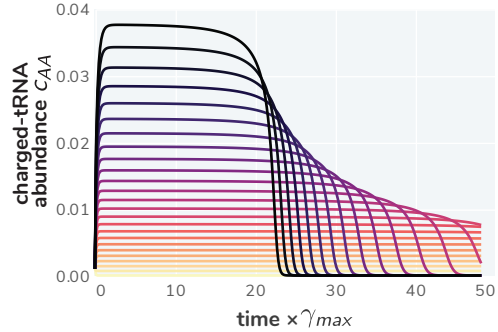
[B]

parameter	value	units
γ_{max}	≈ 9.65	ribosomal mass units per hr.
ν_{max}	0 – 10	metabolic mass units per hr.
K_D	≈ 3	mM
K_M	≈ 0.6	mM
Ω	≈ 0.4	unitless
ϕ_R	≈ 0.2	unitless
ϕ_P	≈ 0.45	unitless

[C]



[D]



[E]