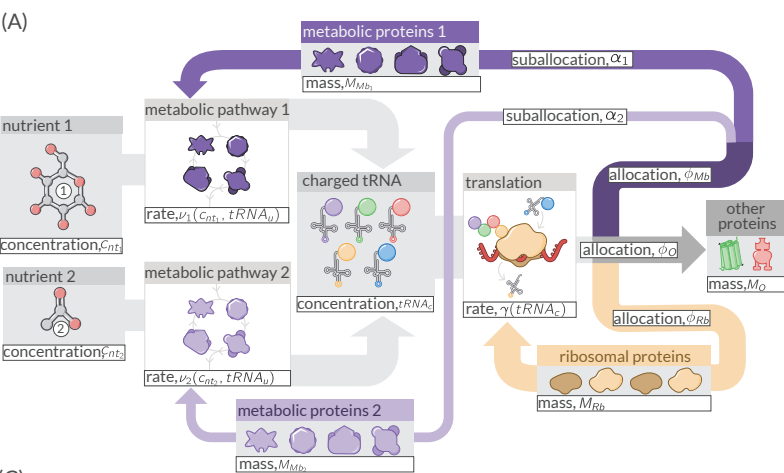
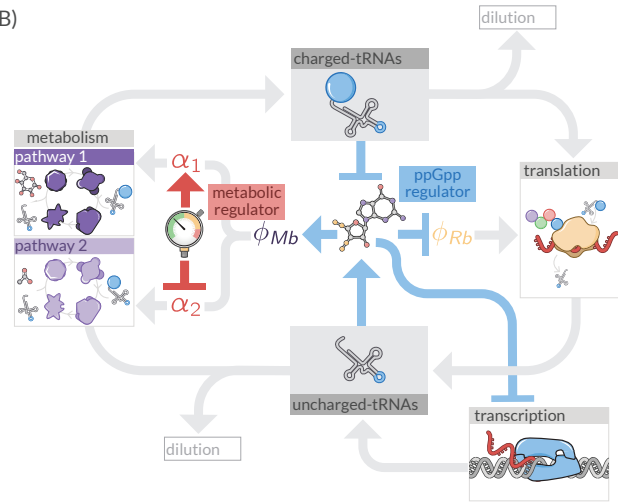


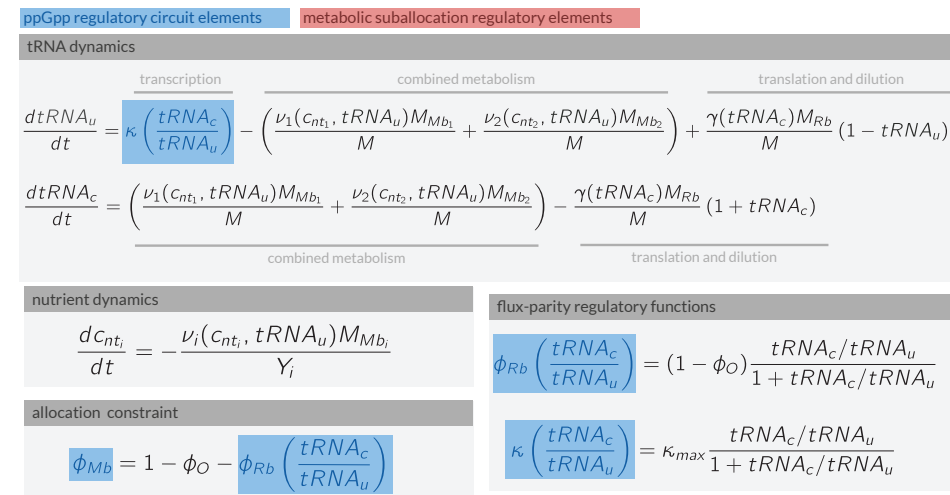
(A)



(B)



(C)

**biomass dynamics**

$$\begin{aligned} \frac{dM_{Rb}}{dt} &= \phi_{Rb} \left(\frac{tRNA_c}{tRNA_u} \right) \gamma(tRNA_c) M_{Rb} \\ \frac{dM_{Mb1}}{dt} &= \alpha_1 \left[1 - \phi_O - \phi_{Rb} \left(\frac{tRNA_c}{tRNA_u} \right) \right] \gamma(tRNA_c) M_{Rb} \\ \frac{dM_{Mb2}}{dt} &= \alpha_2 \left[1 - \phi_O - \phi_{Rb} \left(\frac{tRNA_c}{tRNA_u} \right) \right] \gamma(tRNA_c) M_{Rb} \\ \frac{dM_O}{dt} &= \phi_O \gamma(tRNA_c) M_{Rb} \end{aligned}$$

biochemical rate regulatory functions

$$\begin{aligned} \nu_i &= \nu_{max_i} \left(\frac{tRNA_u}{tRNA_u + K_D} \right) \left(\frac{C_{nt,i}}{C_{nt,i} + K_{M_i}} \right) \\ \gamma(tRNA_c) &= \gamma_{max} \left(\frac{tRNA_c}{tRNA_c + K_D} \right) \end{aligned}$$

flux-parity regulatory functions

$$\begin{aligned} \phi_{Rb} \left(\frac{tRNA_c}{tRNA_u} \right) &= (1 - \phi_O) \frac{tRNA_c/tRNA_u}{1 + tRNA_c/tRNA_u} \\ \kappa \left(\frac{tRNA_c}{tRNA_u} \right) &= \kappa_{max} \frac{tRNA_c/tRNA_u}{1 + tRNA_c/tRNA_u} \end{aligned}$$