N_i and R_α are the concentrations of each strain and resource, and vary both in time and space

energy per strain/resource, unit conversion factors, generally set to 1

uptake rates for each strain+resource combination per unit strain and resource concentraion - in [R]/(T[N][R])

cell upkeep energy consumption - in E/T/cell

$$\frac{\partial N_i}{\partial t} = g_i N_i \left(\sum_\alpha (1 - l_{i\alpha}) w_\alpha c_{i\alpha} R_\alpha - m_i \right) + D_{N_i} \nabla^2 N_i$$

leakage - the fraction of energy going towards byproducts, specific to each strain+resource combination

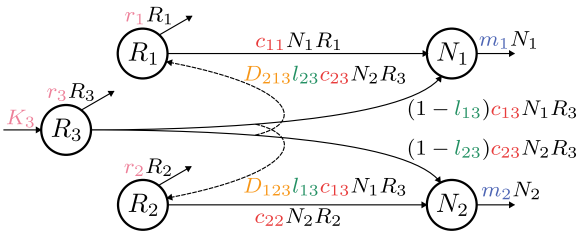
diffusion constants

$$\frac{\partial R_\alpha}{\partial t} = K_\alpha - r_\alpha R_\alpha - \sum_i N_i c_{i\alpha} R_\alpha + \sum_{i,\beta} D_{i\alpha\beta} \frac{w_\beta}{w_\alpha} l_{i\beta} N_i c_{i\beta} R_\beta + D_{R_\alpha} \nabla^2 R_\alpha$$

external supply and dilution rates, typically all r_α are the same

determines the byproduct of each reaction, specifically if strain i consumes resource beta then $D_{i\alpha\beta}$ is the fraction of the leaked energy of that reaction that produces resource alpha

Simple example showing crossfeeding (cosmo)



General diagram