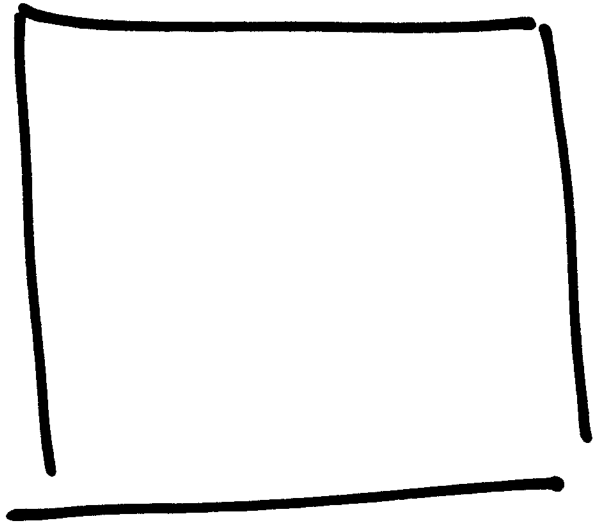


T, P

N_A, N_B

$\frac{N_B}{N}, \frac{N_A}{N}$

dn_A

$dG' \propto dn_A$

μ_A — Chemical potential

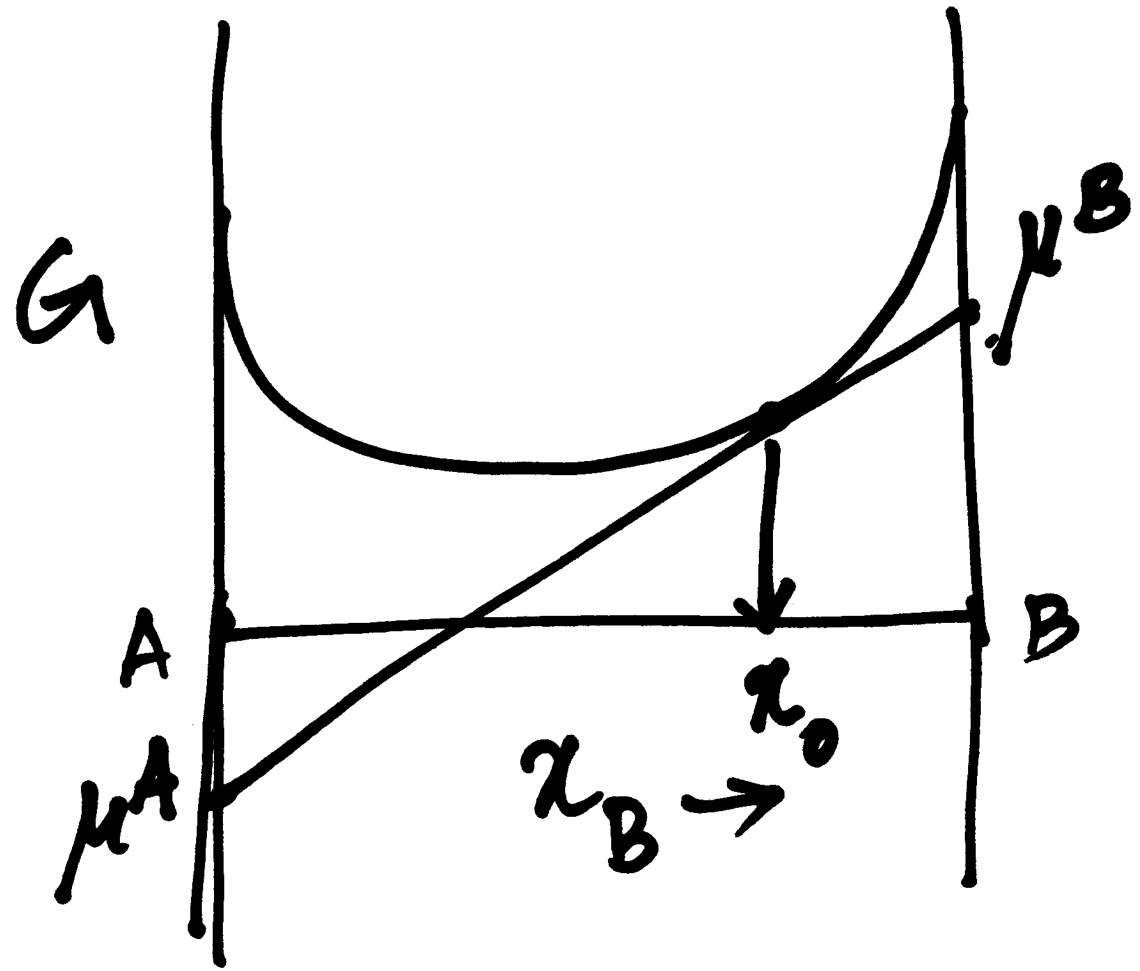
$dG' = \mu_A \, dn_A$

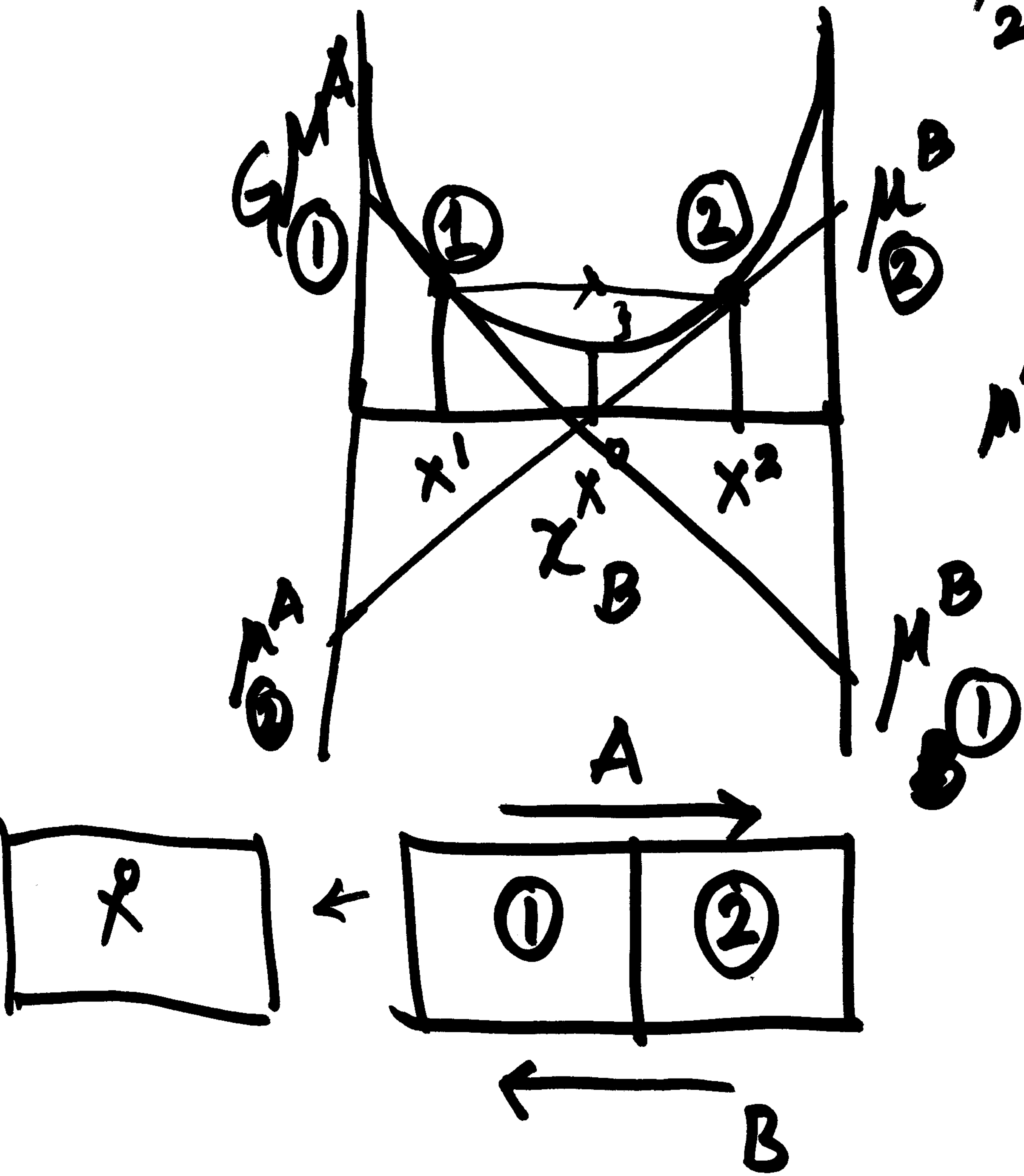
— Partial molar free energy of A in the system

$$\mu_A = \left(\frac{\partial G'}{\partial n_A}\right)_{T,\,P,\,n_B}$$

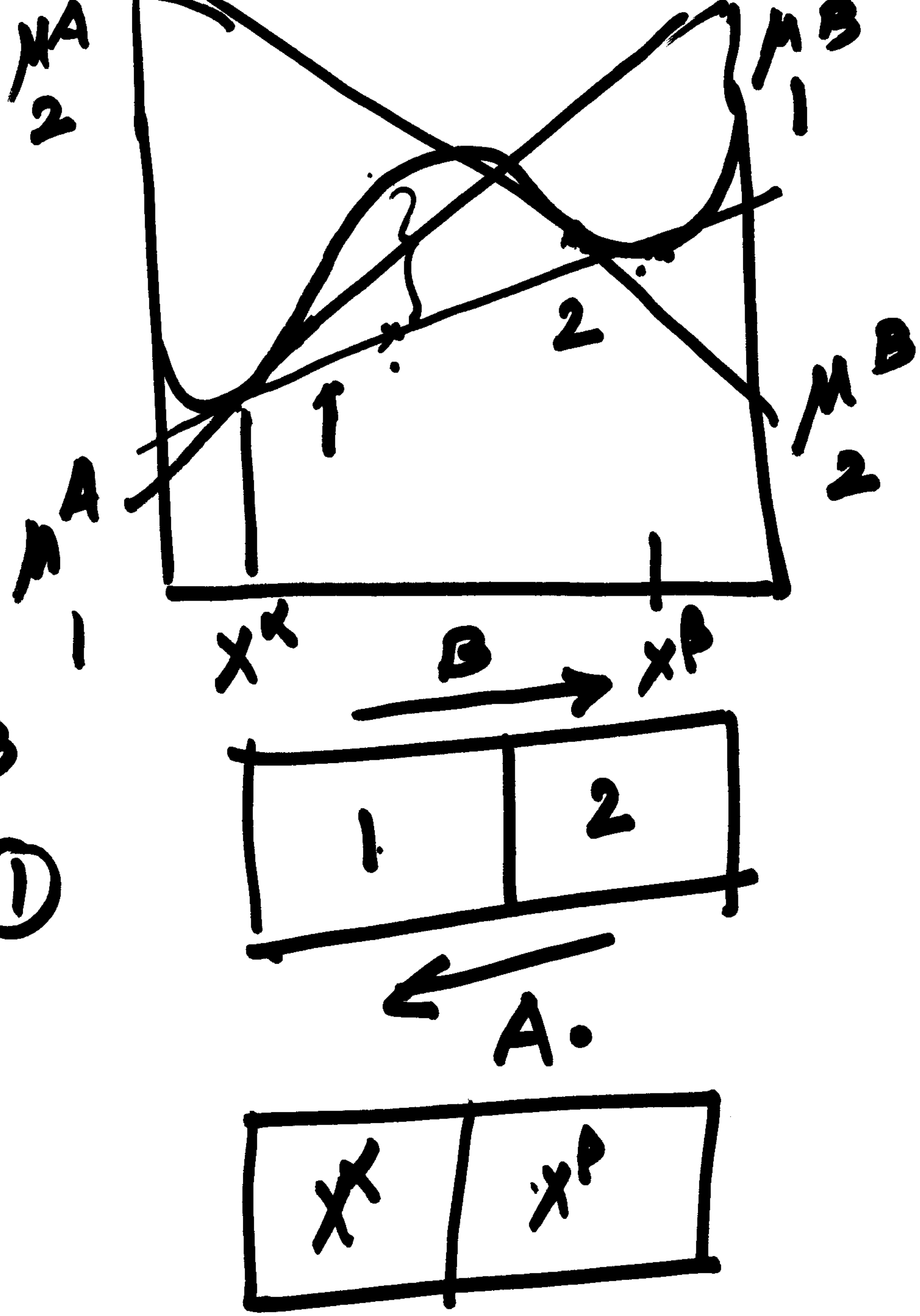
$$\mu_A = \left(\frac{\partial G'}{\partial d n_A}\right)_{T,\,P,\,\underbrace{n_B / x_B}_{\text{Composition}}}$$

$$\boxed{G = \mu_A x_A + \mu_B x_B}$$


G
μB
A
B
x0
μA
xB →



G
μ^A
①
1
2
μ^B
②
3
x^1
x
x^2
x_B
μ^A
②
μ^B
①
A
x
①
②
B



μ_2^A
μ_1^B
2
1
μ_1^A
μ_2^B
x^α
x^β
B
1
2
A.
x^α
x^β

$$\underbrace{\vec{J}}_{\text{Atomic flux}} = -\underbrace{D}_{\text{Diffusivity}}\ \underbrace{\nabla C}_{\text{Concentration gradient}}$$

Fick's First Law.

$$\frac{\partial C}{\partial t} = -\nabla \cdot \vec{J}$$

Law of conservation of mass.

$$\frac{\partial C}{\partial t} = \nabla \cdot D \nabla C$$

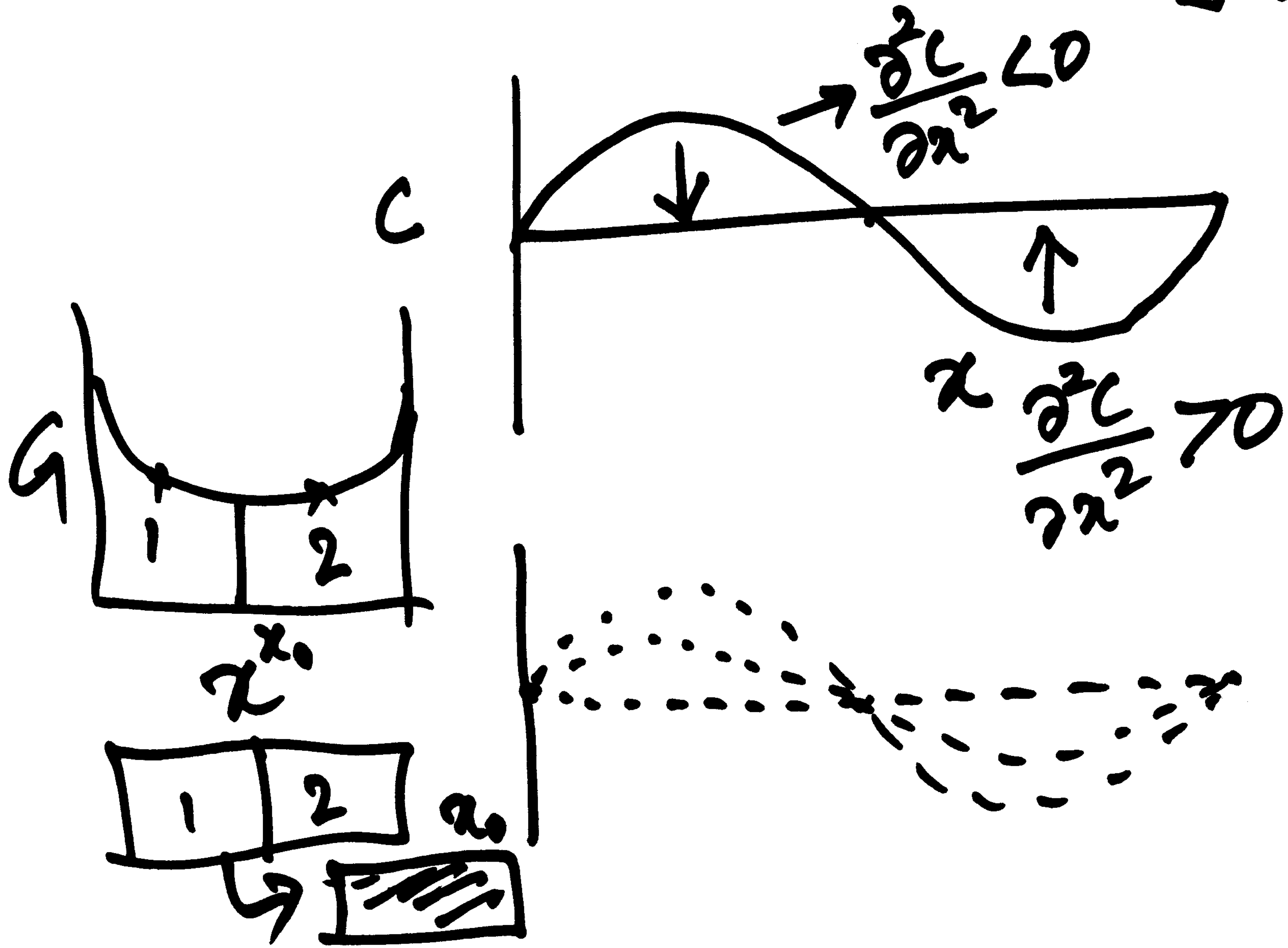
$$= D \nabla^2 C$$

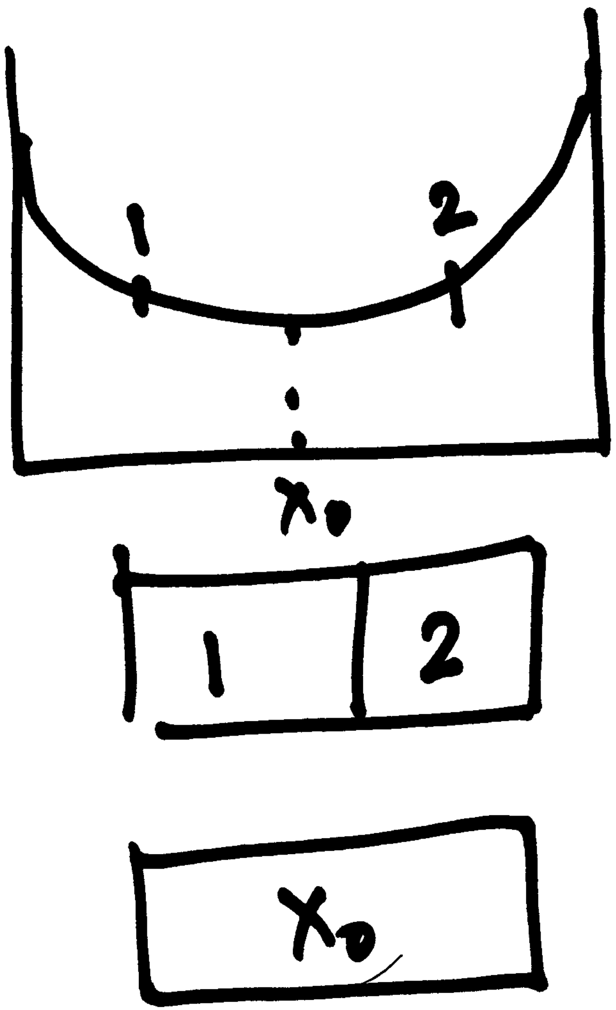
$$\boxed{\frac{\partial C}{\partial t} = D \nabla^2 C}$$

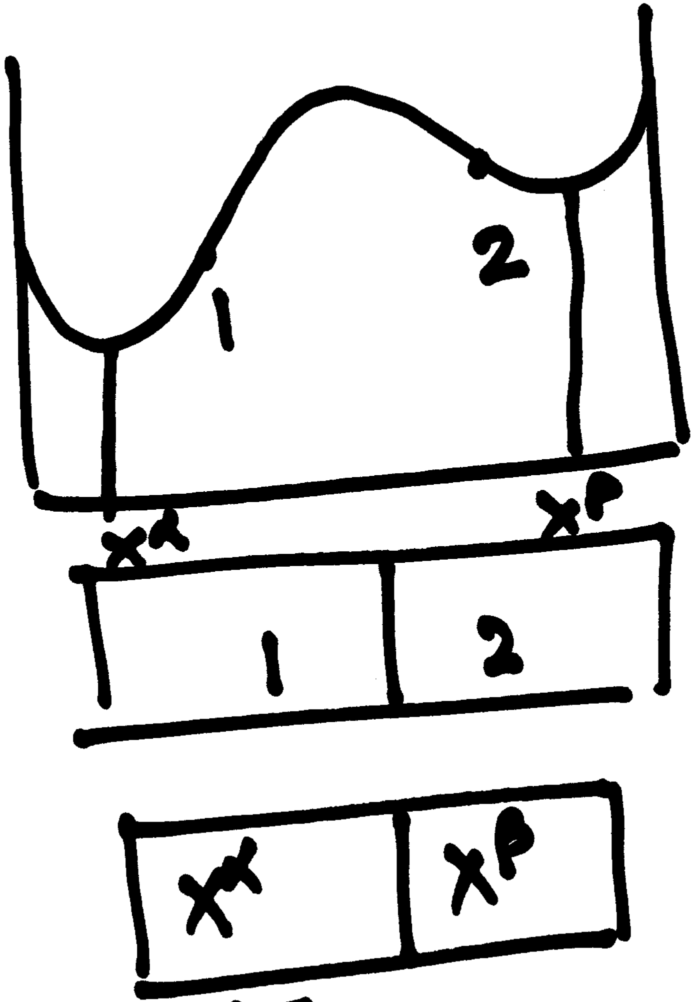
Fick's Second law.

$$\frac{\partial c}{\partial t} = D\frac{\partial^2 c}{\partial x^2}.$$

$$\vec{J} = -D\nabla c$$







$$\bar{J} = -D\nabla C$$

$$\frac{\partial c}{\partial t} = D\nabla^2 C$$

Downhill

$$\bar{J} = -D\nabla C$$

Uphill diffusion

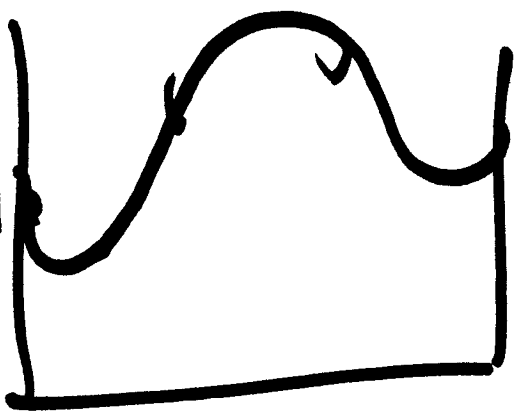
$$\vec{J} = -D\nabla C \quad \text{Fick's I law}$$

$$\vec{J} = -\underbrace{M}_{\text{Mobility.}}\nabla\mu \qquad \mu = \frac{\partial G}{\partial n_B}$$

G

x

$\frac{\partial^2 C}{\partial x^2}$ G



x