Diffusion: how will particles spread in time and space?

There are two key equations to know:

\[ J_{N_k} = -D_k \frac{\partial N_k}{\partial x} \quad \text{Fick's law} \]

and:

\[ D_k = \frac{k_B T}{\eta_k} \quad \text{Stokes-Einstein relation} \]

The first equation tells us that the change in particles across an area with respect to time \( J_{N_k} \) is proportional to the gradient of particles in space \( \frac{\partial N_k}{\partial x} \), i.e., the concentration gradient.

The second equation tells us that the proportionally constant \( D_k \) is inversely related to the coeff. of friction \( \eta_k \).