- Random walks
- Diffusion equation

- The atomic hypothesis: matter is composed of small individual particles in perpetual motion that interact with one another, attracting one another when distant, repelling one another when close (R. Feynman)
- The state of perpetual motion at the atomic scale is perceived at a macroscopic scale as temperature, and the average kinetic energy per atomic degree of freedom is $kT/2$, $k = 1.38 \times 10^{-23}$ J/K. An atom with mass m and average velocity $\bar{v}$ has kinetic enery at temperature T

$$\frac{m\,\bar{v}^2}{2} = 3\,\frac{kT}{2}$$

- The average microscopic velocities of various atoms, molecules can be found as

$$\bar{v}^2 = \frac{3kT}{m}$$

- Consider a particle that can take position $x \in \mathbb{Z}$
- Let $p(m,n)$ denote that particle starting from $x=0$ is at position m after n steps
- Denote by r, l number of steps to the right $(+)$ and left $(-)$

$$m = r - l, n = r + l \Rightarrow r = \frac{1}{2}(m+n), l = \frac{1}{2}(n-m)$$

- Toss a coin n times, there are 2^n possible results of which

$$C(n,r) = \frac{n!}{r!\,(n-r)!}$$

- Probability of being at position m is $p(m,n) = C(n,r)/2^n$