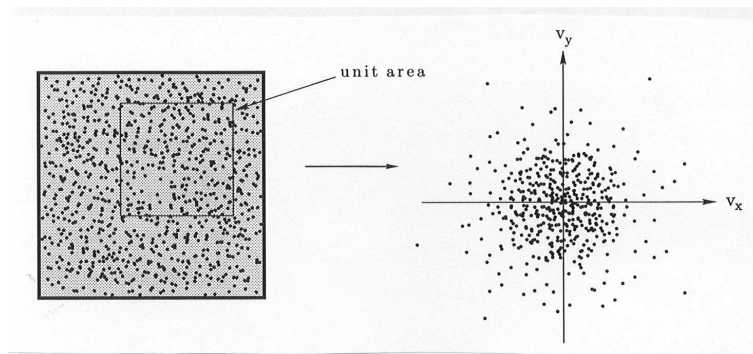


# Kinetics of Classical Ideal Gas [tsl28]

- Gas consists of a large number of atoms.
- Motion of each atom is rectilinear with constant speed.
- Interactions are limited to collisions with walls or between atoms.
- Motion is randomized by collisions.
- Thermal equilibrium is characterized by uniform spatial distribution of atoms and by a velocity distribution  $f(\mathbf{v})$  to be determined.

Position and velocity distribution in two dimensions.



Properties of velocity distribution  $f(\mathbf{v})$ :

- $\int d^3v f(\mathbf{v}) = 1$  (normalization),
- $\int d^3v f(\mathbf{v}) \mathbf{v} = 0$  (symmetry),
- $\int d^3v f(\mathbf{v}) \left( \frac{1}{2} m v^2 \right) = \frac{1}{2} m \langle v^2 \rangle = \frac{U}{N} = \frac{3}{2} k_B T$ .

Pressure [tex49]:  $p = \frac{1}{3} \frac{N}{V} m \langle v^2 \rangle = \frac{1}{3} \frac{N}{V} 3k_B T \Rightarrow pV = Nk_B T$ .