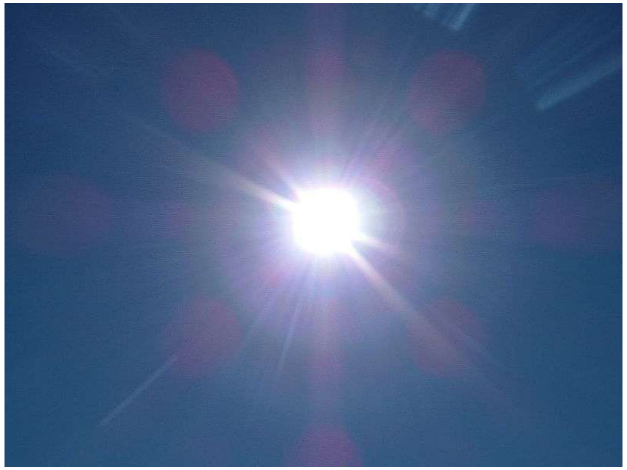
LP 8 : PHENOMÈNES DE TRANSPORT.

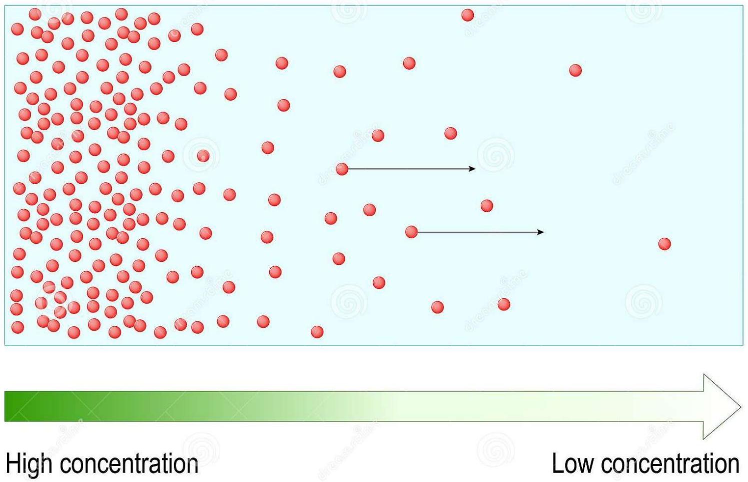
PRÉSENTÉ PAR : RAPHAEL AESCHLIMANN

TYPES DE TRANSPORT

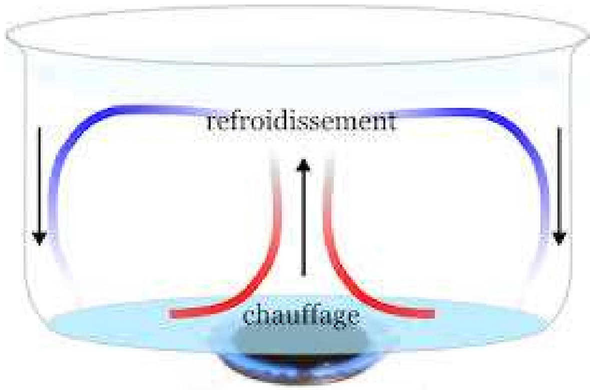
Rayonnement



Diffusion

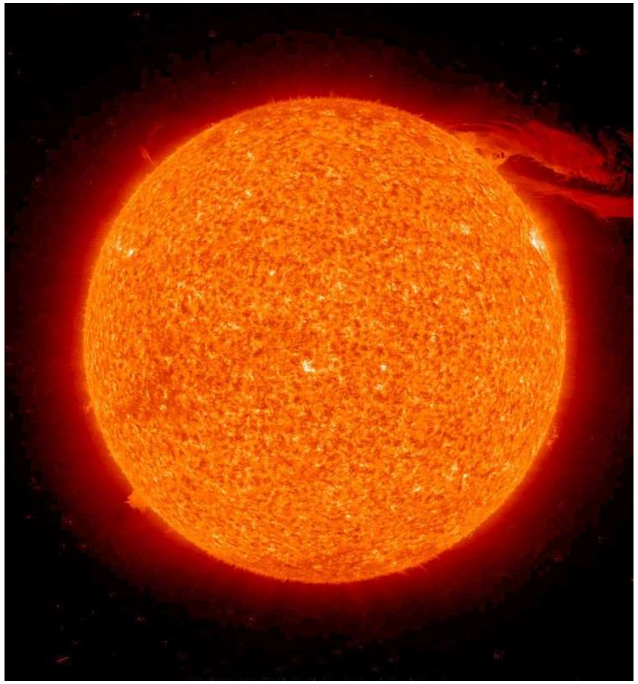


Convection



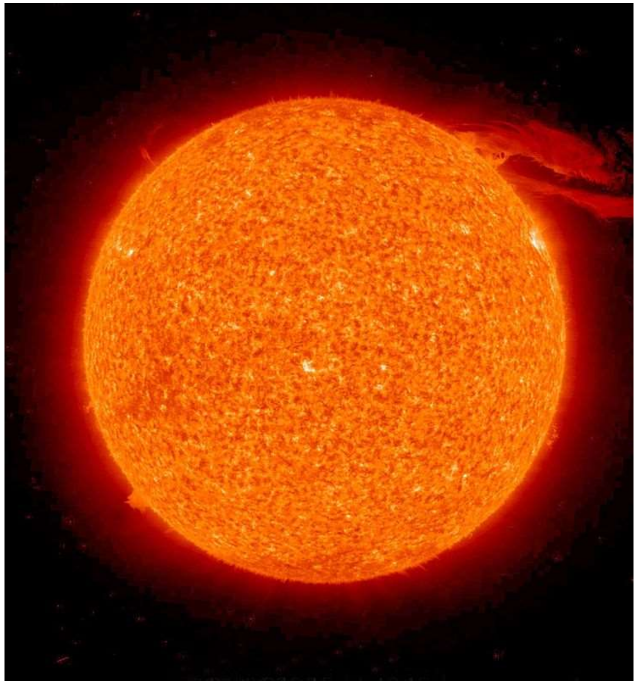
CAS D'ETUDE

Rayonnement thermique



CAS D'ETUDE

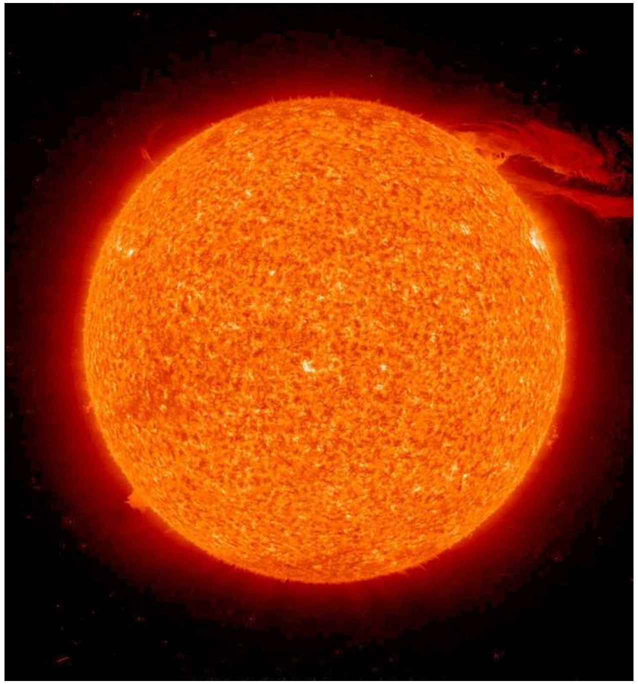
Rayonnement thermique



Diffusion de particules

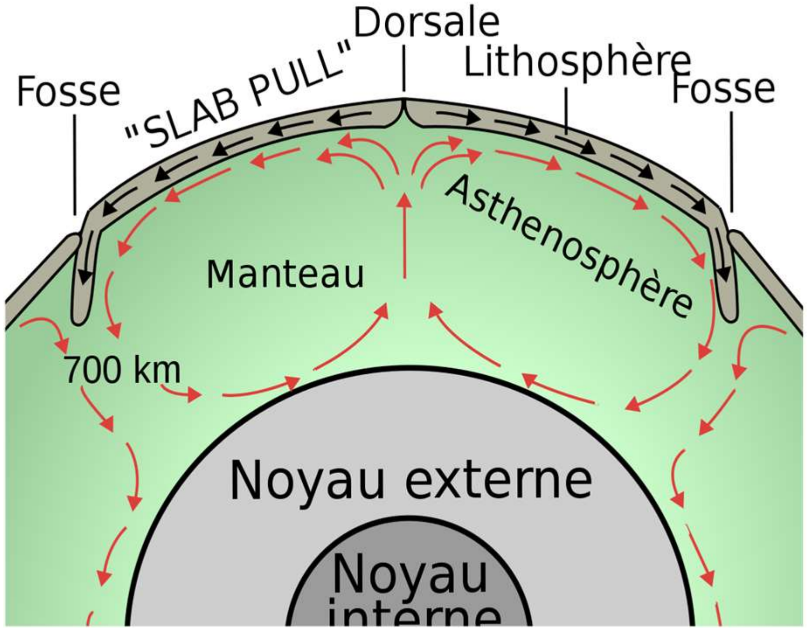
CAS D’ETUDE

Rayonnement thermique

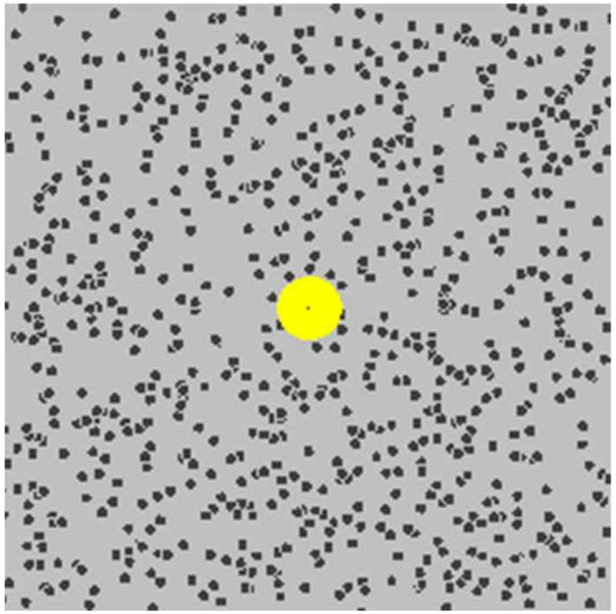


Diffusion de particules

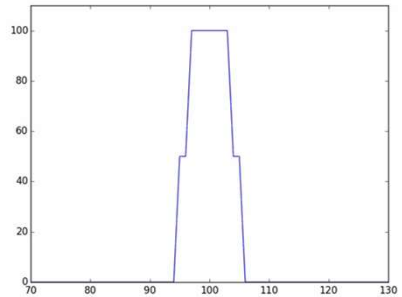
Convection thermique

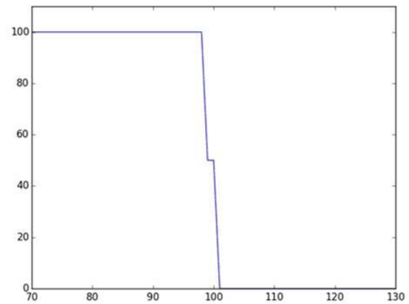


ORIGINE MICROSCOPIQUE



Mouvement brownien

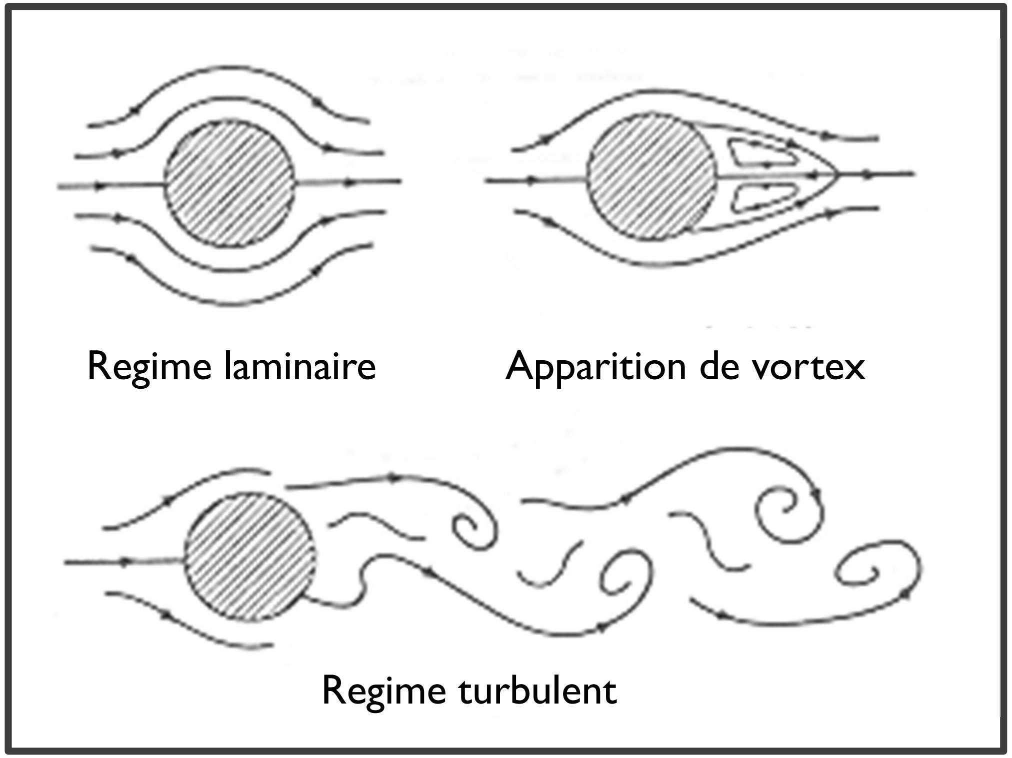


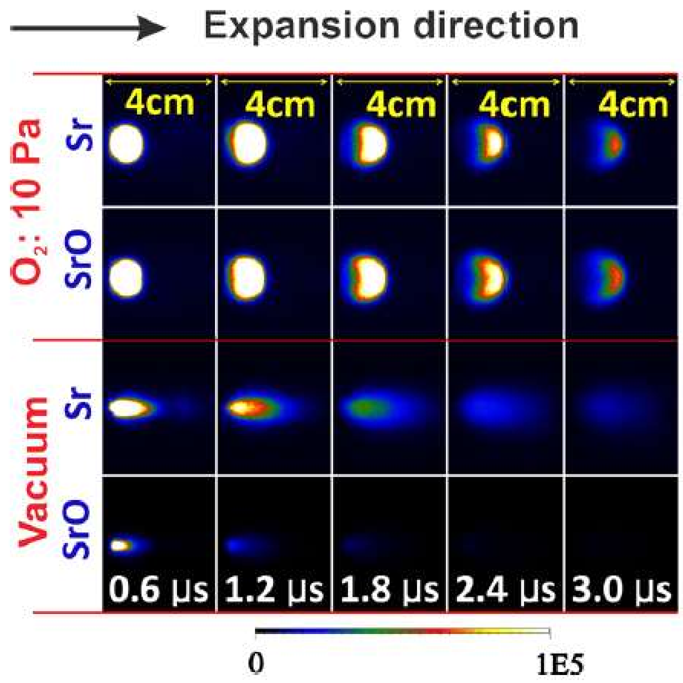


ANALOGIES

	Diffusion thermique	Diffusion de particules	Diffusion électrique
Grandeur intensive *f*	Température	Densité de particule	Potentiel électrique
Cause	$-\overrightarrow{grad}\,T \neq 0$	$-\overrightarrow{grad}\,n \neq 0$	$-\overrightarrow{grad}\,V \neq 0$
Grandeur extensive G	Énergie interne	Nombre de particules	Charge électrique
Effet	$\delta Q = \overrightarrow{j_Q}\,\overrightarrow{dS}\,dt$	$\delta N = \overrightarrow{j_N}\,\overrightarrow{dS}\,dt$	$\delta q = \vec{j}\,\overrightarrow{dS}\,dt$
Loi phenomenologique	$\overrightarrow{j_Q} = -\lambda \overrightarrow{grad}\,T$ loi de Fourier	$\overrightarrow{j_N} = -D\overrightarrow{grad}\,n$ loi de Fick	$\vec{j} = -\sigma \overrightarrow{grad}\,V$ loi d'Ohm
Equation de conservation	$div\,\overrightarrow{j_Q} + \mu c_V \frac{\partial T}{\partial t} = 0$	$div\,\overrightarrow{j_N} + \frac{\partial n}{\partial t} = 0$	$div\,\vec{j} + \frac{\partial \rho}{\partial t} = 0$

COMPARAISON DES DIFFERENT TYPES DE TRANSPORT

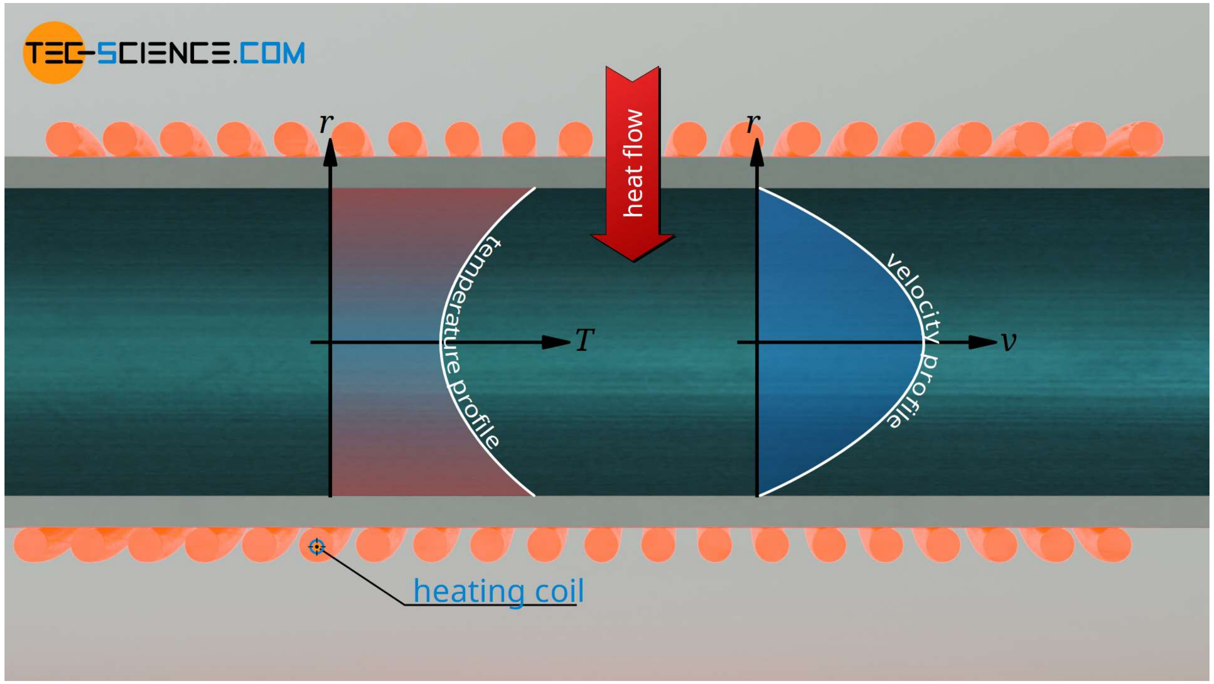




Adapté de Stender, D. *et al.* *Journal of Applied Physics* **118**, 165306 (2015).

CONVECTION VS DIFFUSION

Nombre de Prandtl



RETOUR SUR LE CAFÉ

- Rayonnement : $\overrightarrow{j_Q} = \sigma T^4 \approx 593\, W.m^2$
- Diffusion : $\overrightarrow{j_Q} = \lambda \overrightarrow{grad}\, T \approx 1000\, W.m^2$
- Convection : $\overrightarrow{j_Q} = h\, \Delta T \approx 1000 - 6000\, W.m^2$

OUVERTURE

Effet Seebeck

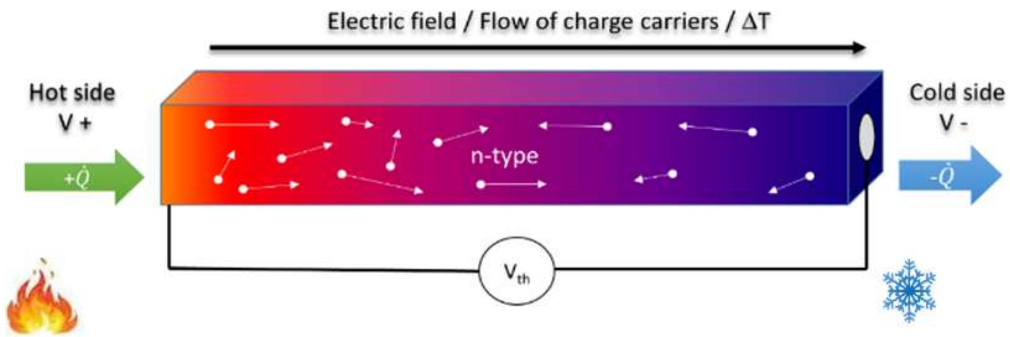
$$\overrightarrow{j_Q} \rightarrow \vec{j}$$

Effet Peltier

$$\vec{j} \rightarrow \overrightarrow{j_Q}$$

OUVERTURE

Effet Seebeck



Effet Peltier