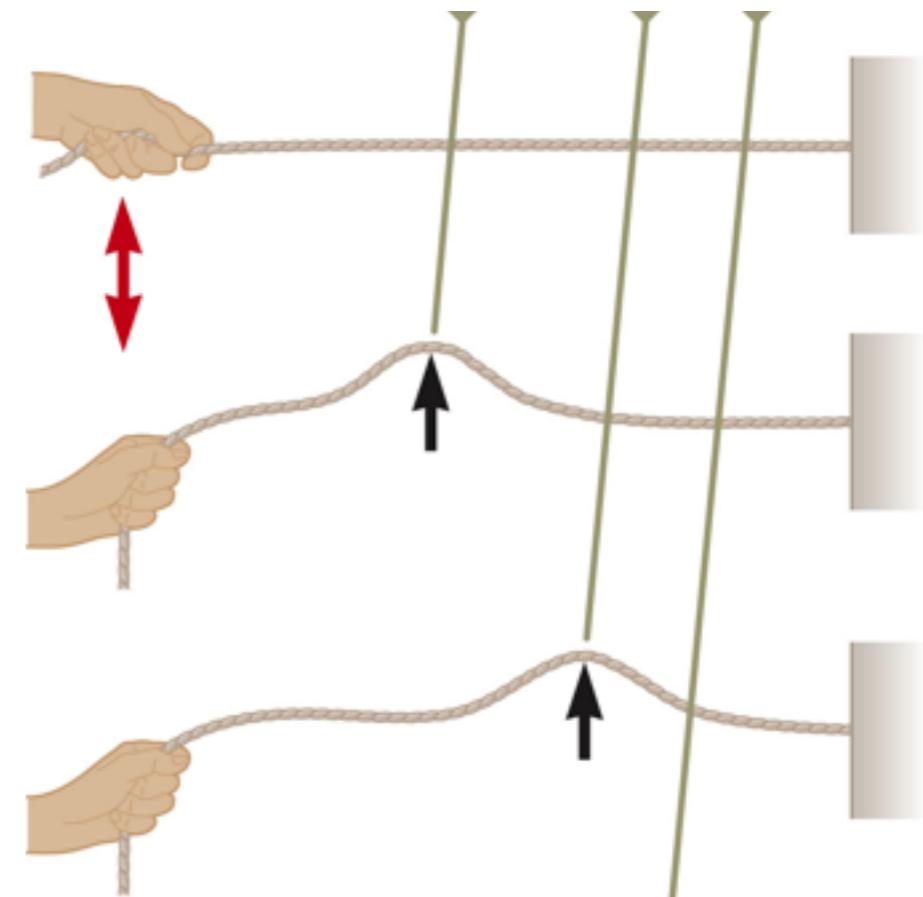


Ondes

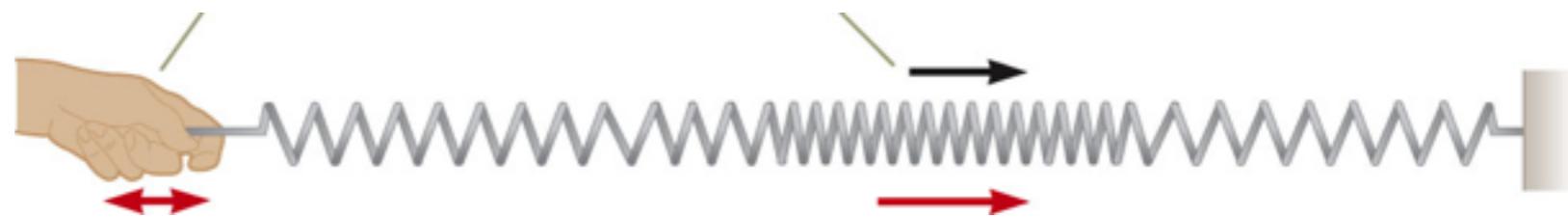
- ondes mécaniques : transfert de l'énergie et de la quantité de mouvement
- définition des termes : longueur d'onde, vitesse de propagation, vecteur d'onde
- interférence
- ondes stationnaires
- la lumière

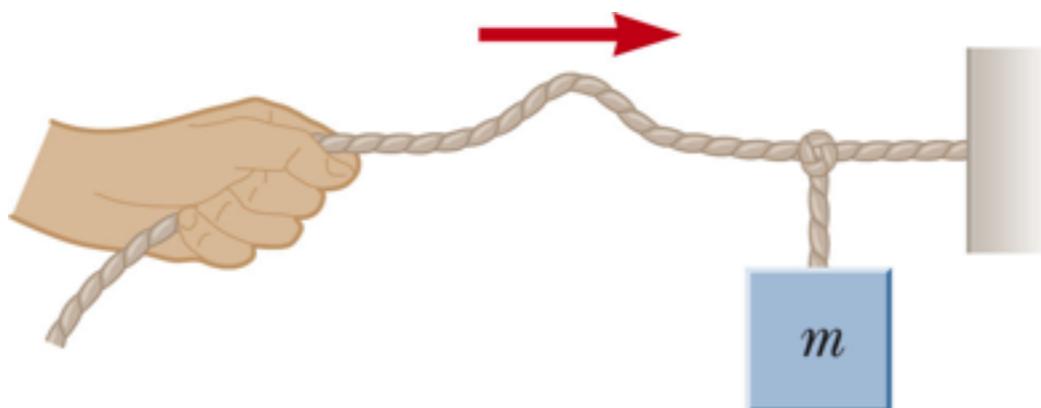
Taxonomie

- transversale



- longitudinale





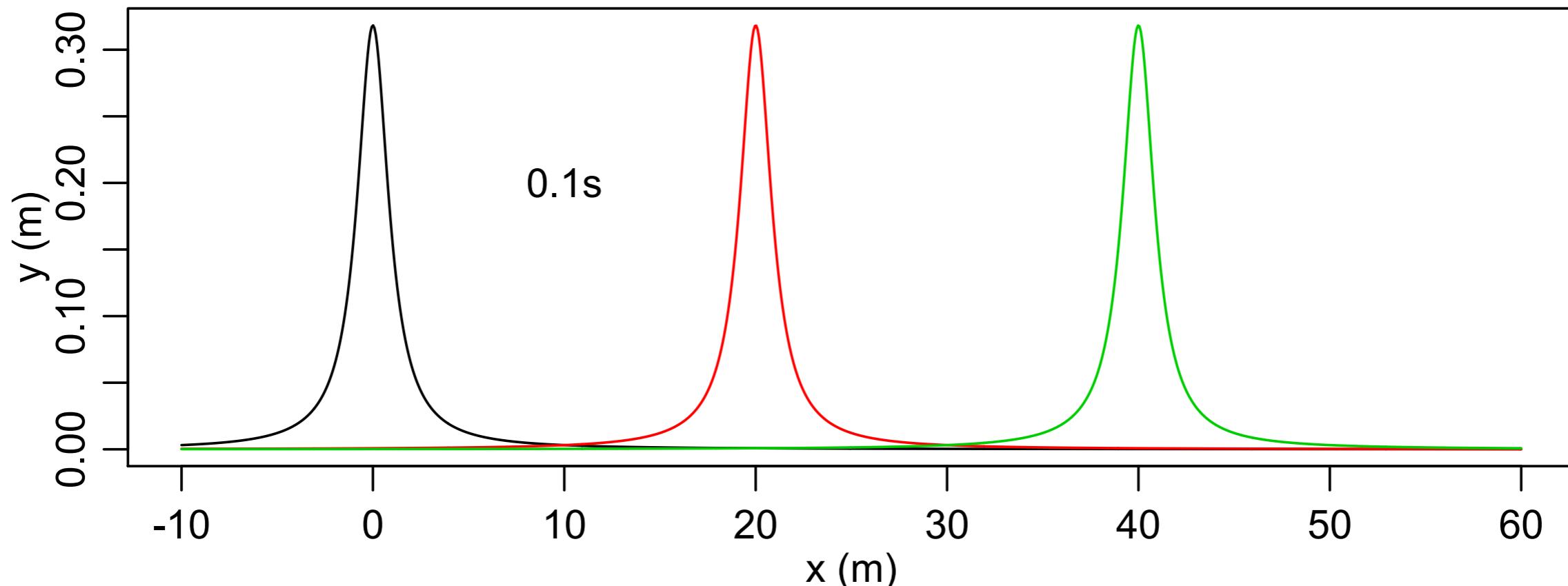
— a —

The pulse lifts the block,
increasing the gravitational
potential energy of the
block-Earth system.



— b —

Propagation d'un impulsion



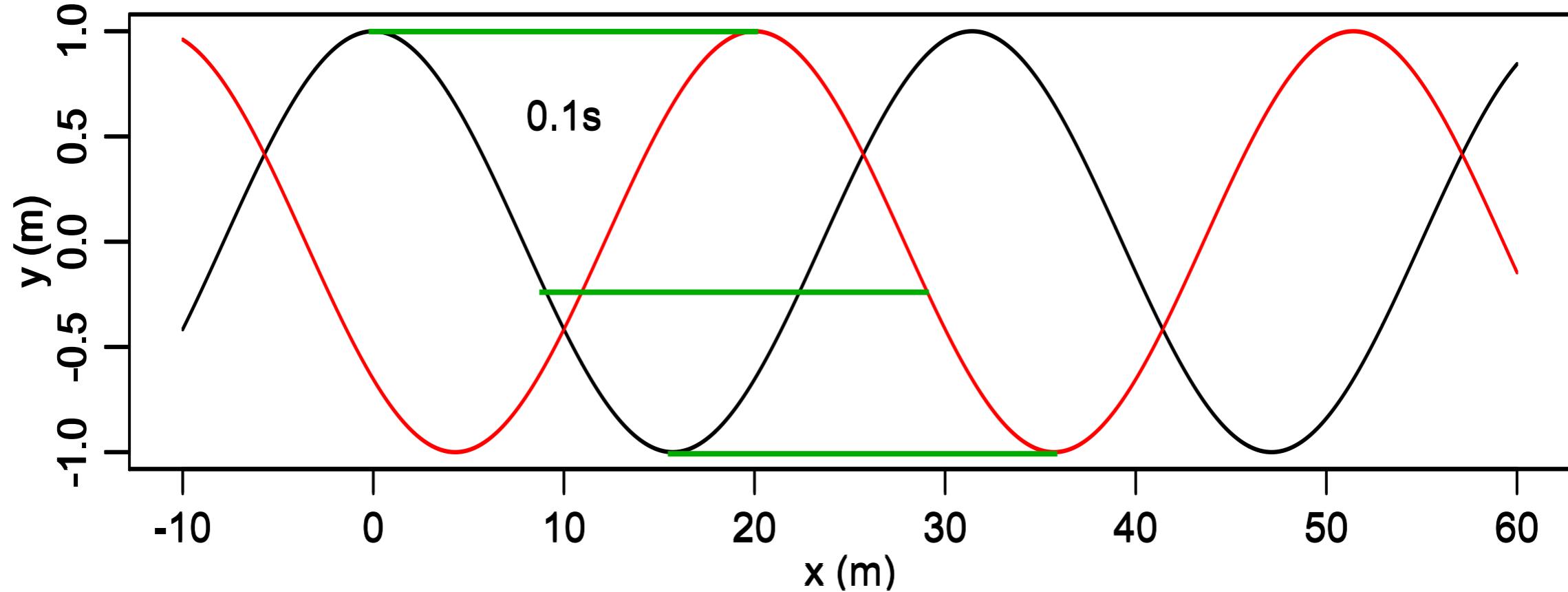
Calculer la vitesse de propagation !

$$f(x,t) = f(x - ct)$$

Propriétés des ondes

- Une fonction de x et de t
- de forme $f(x,t) = f(x \mp ct)$
- le milieu détermine uniquement la vitesse de propagation c

Onde harmonique

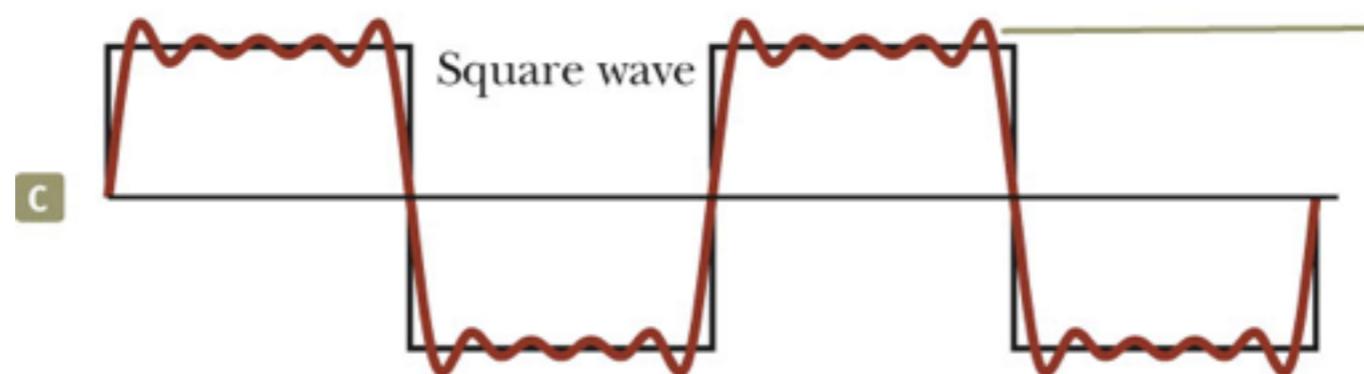
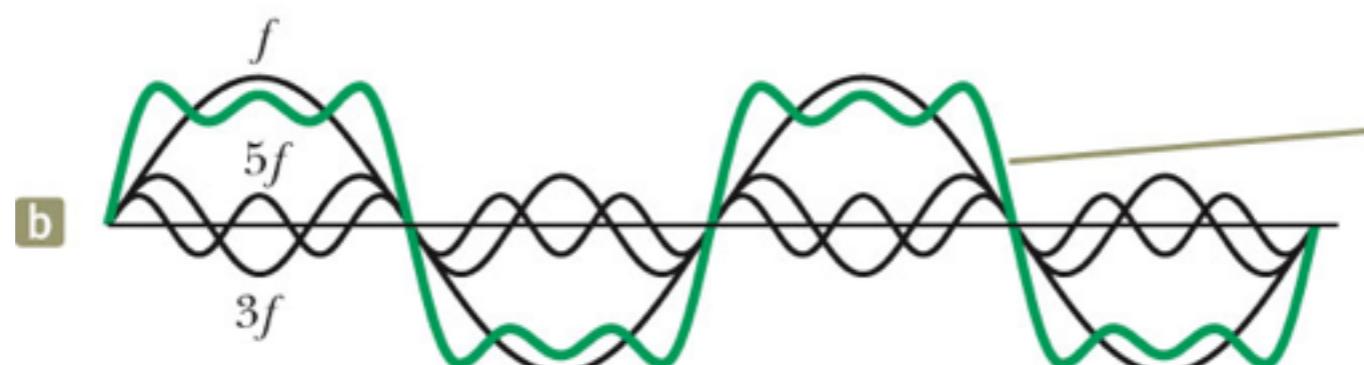
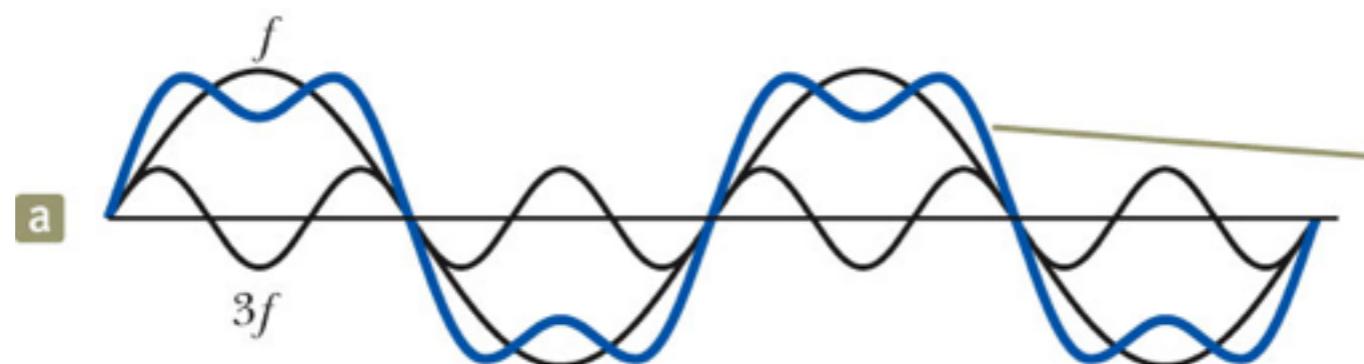


$$y(x,t) = A \sin(kx - \omega t)$$

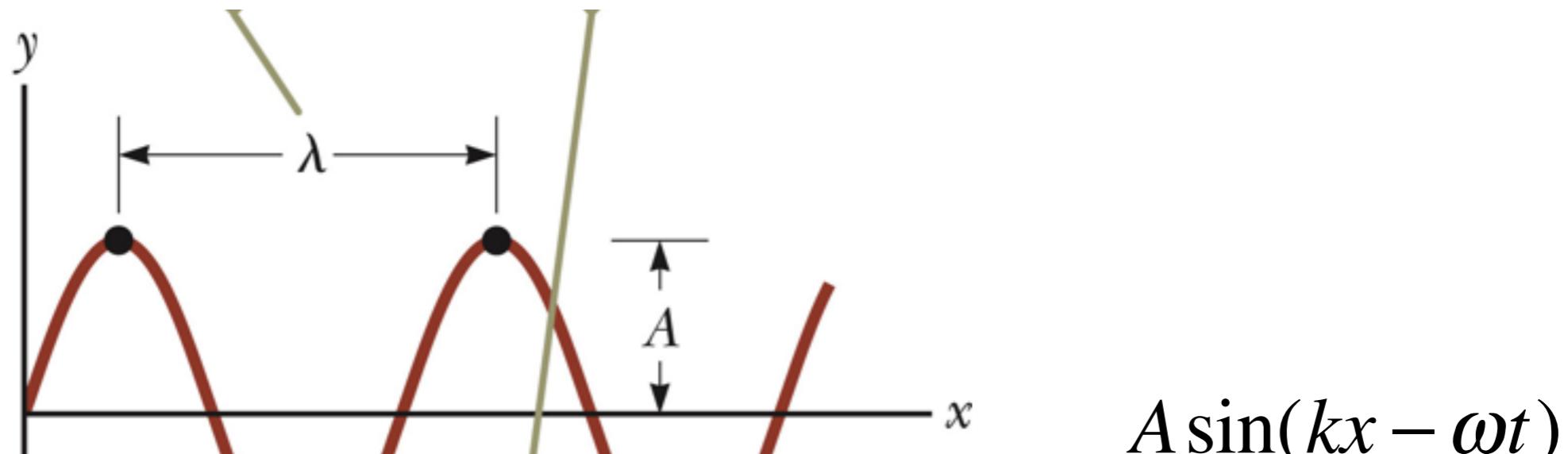
$$y(x,t) = A \sin(kx - \omega t)$$

- y peut être le déplacement longitudinal, le déplacement transversal, la pression etc
- ω est la vitesse angulaire de l'oscillation (comme pour l'oscillateur harmonique)
- k est le vecteur d'onde

Théorème de Fourier



Relation entre période temporelle et période spatiale



$$cT = \lambda$$

$$k\lambda = 2\pi \Rightarrow k\lambda = \frac{2\pi}{\lambda}$$

Vitesse de propagation

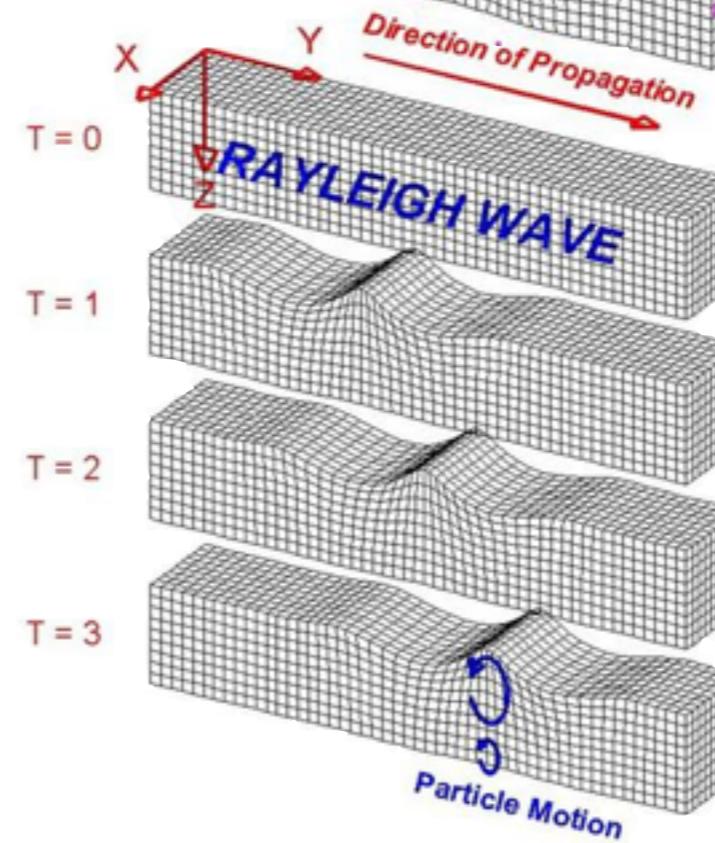
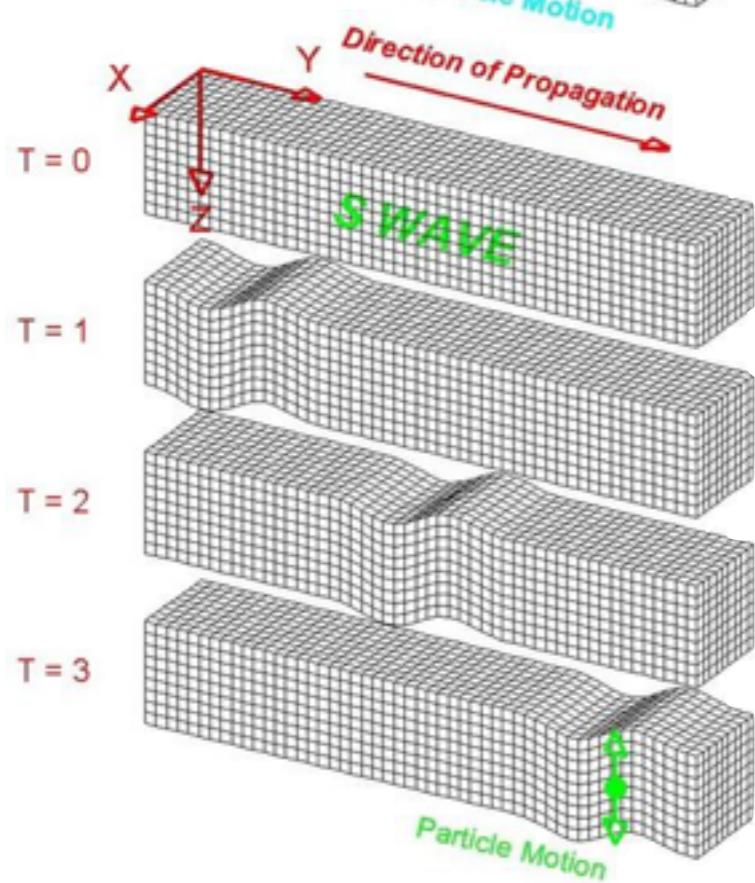
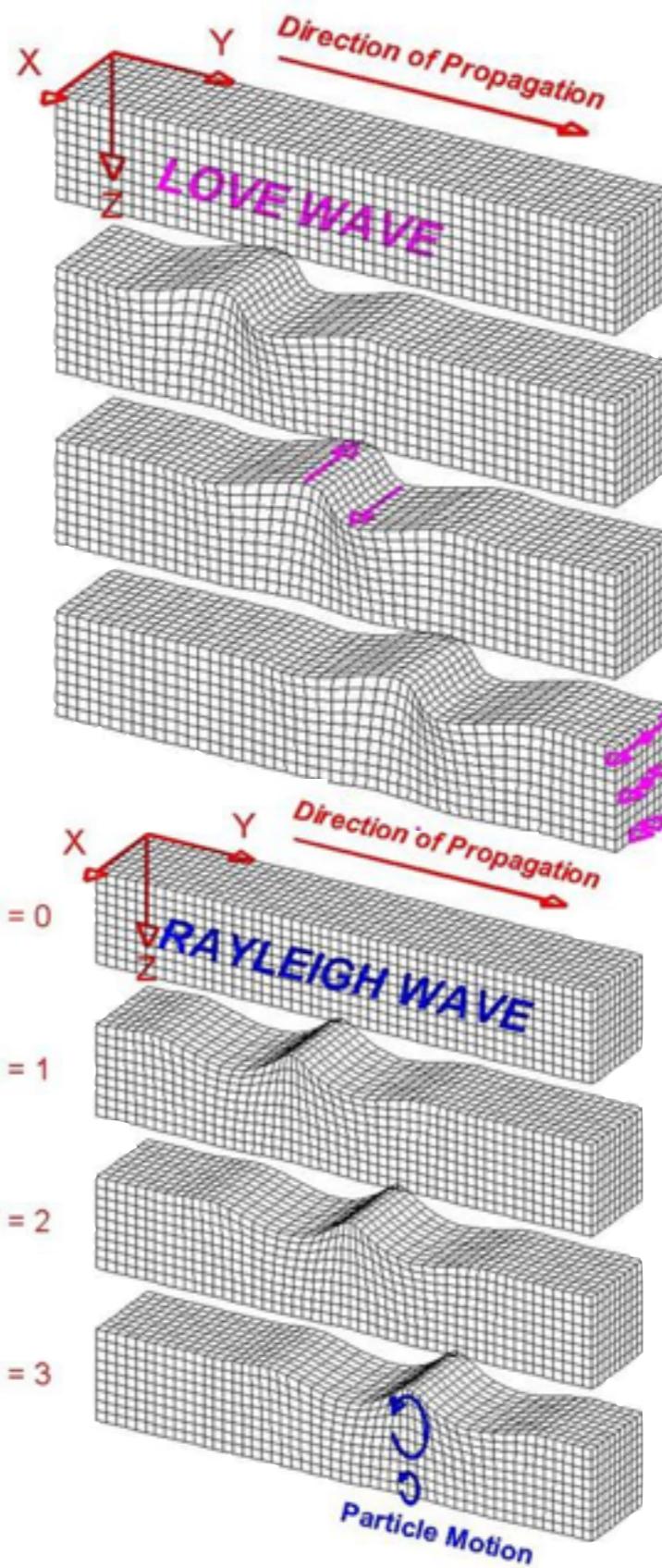
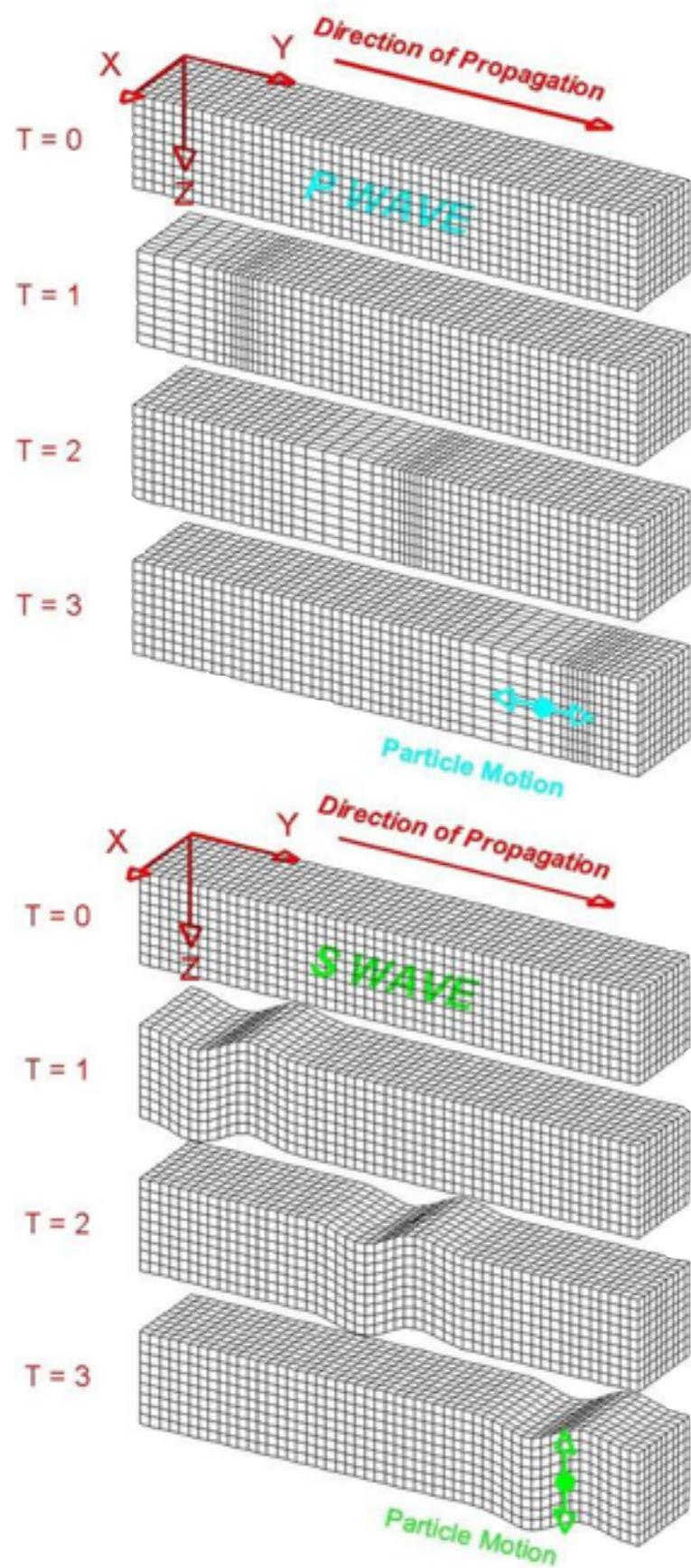
- toujours de forme racine(force/inertie)
- pour les ondes transversales

$$c = \sqrt{\frac{F}{m_l}}$$

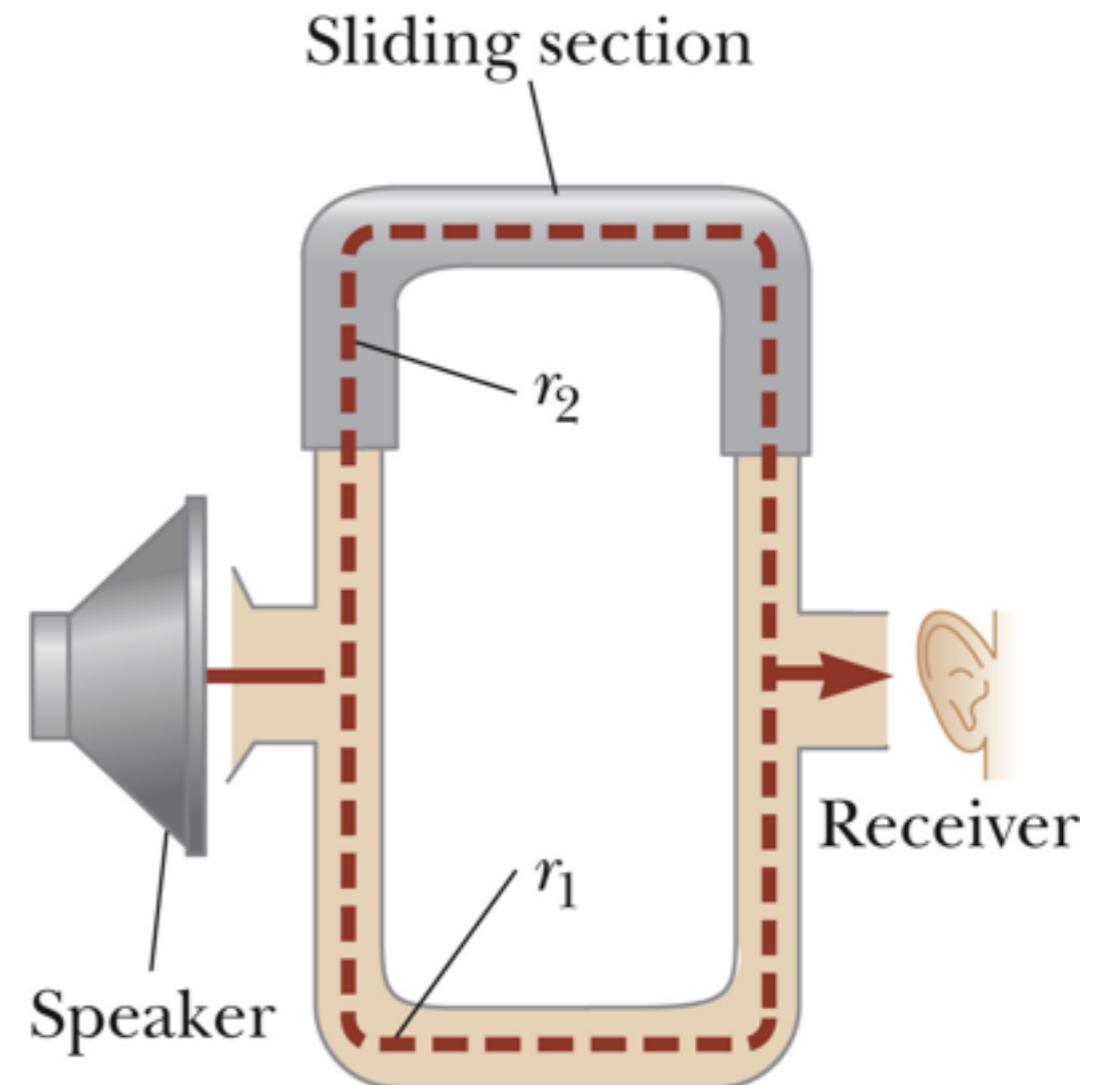
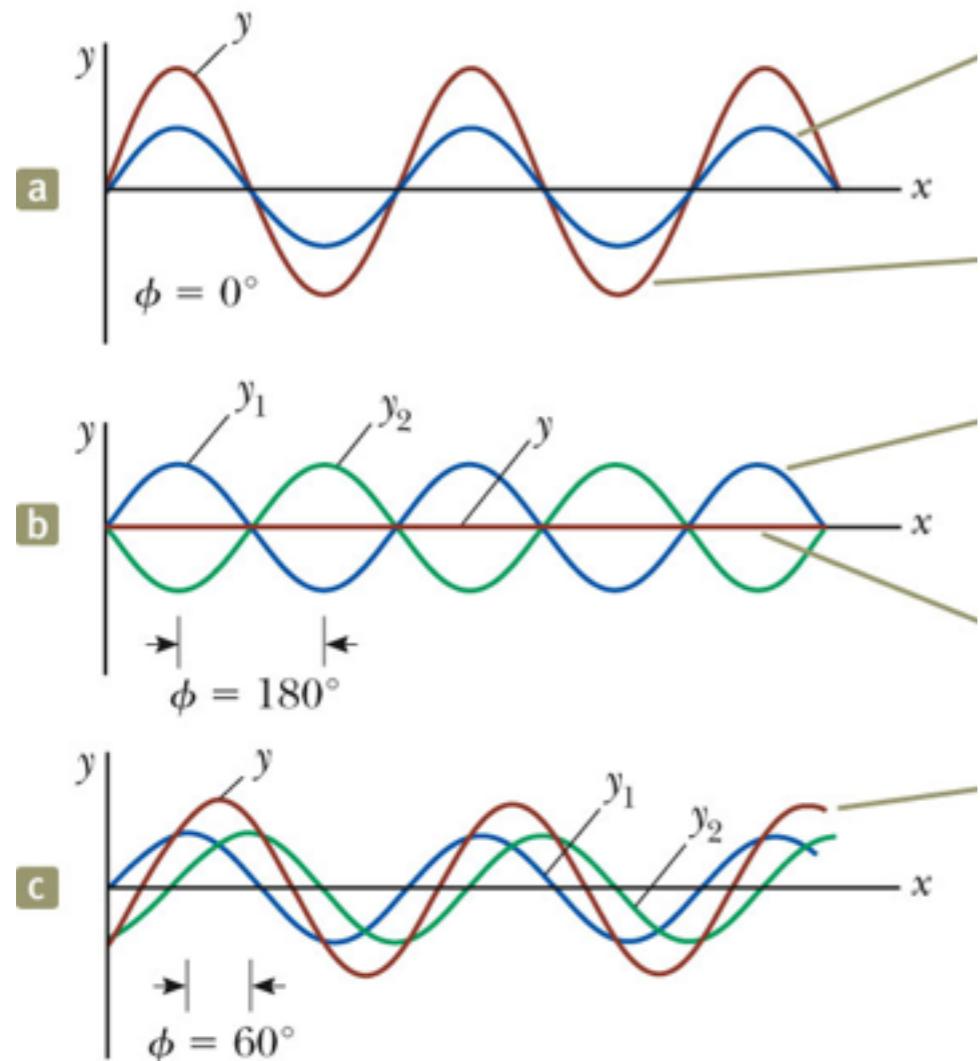
- pour les ondes de compression

$$c = \sqrt{\frac{E}{\rho}}$$

Seismology

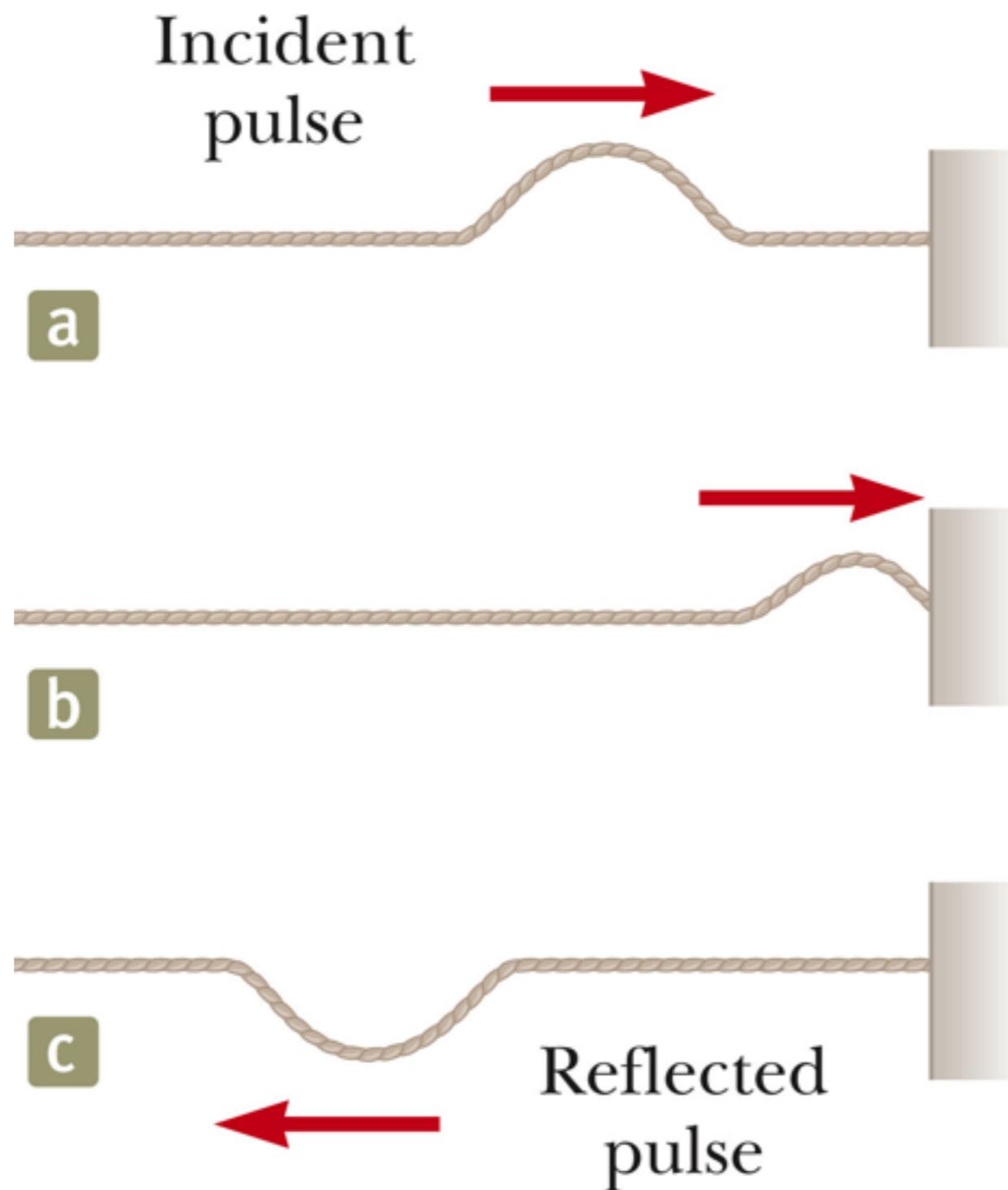


Superposition

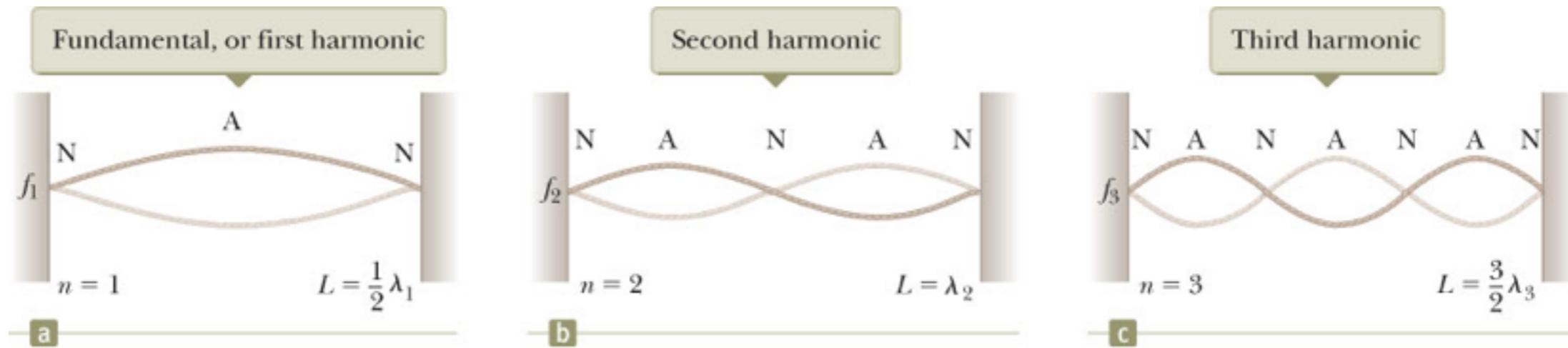


trombone de König

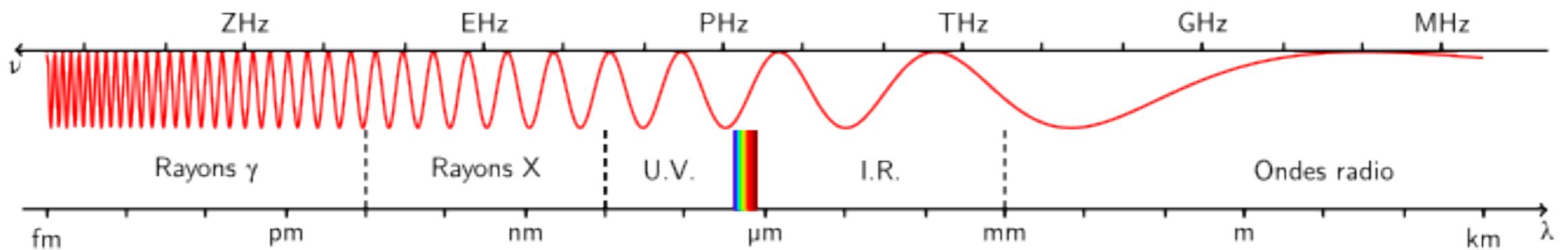
Réflexion



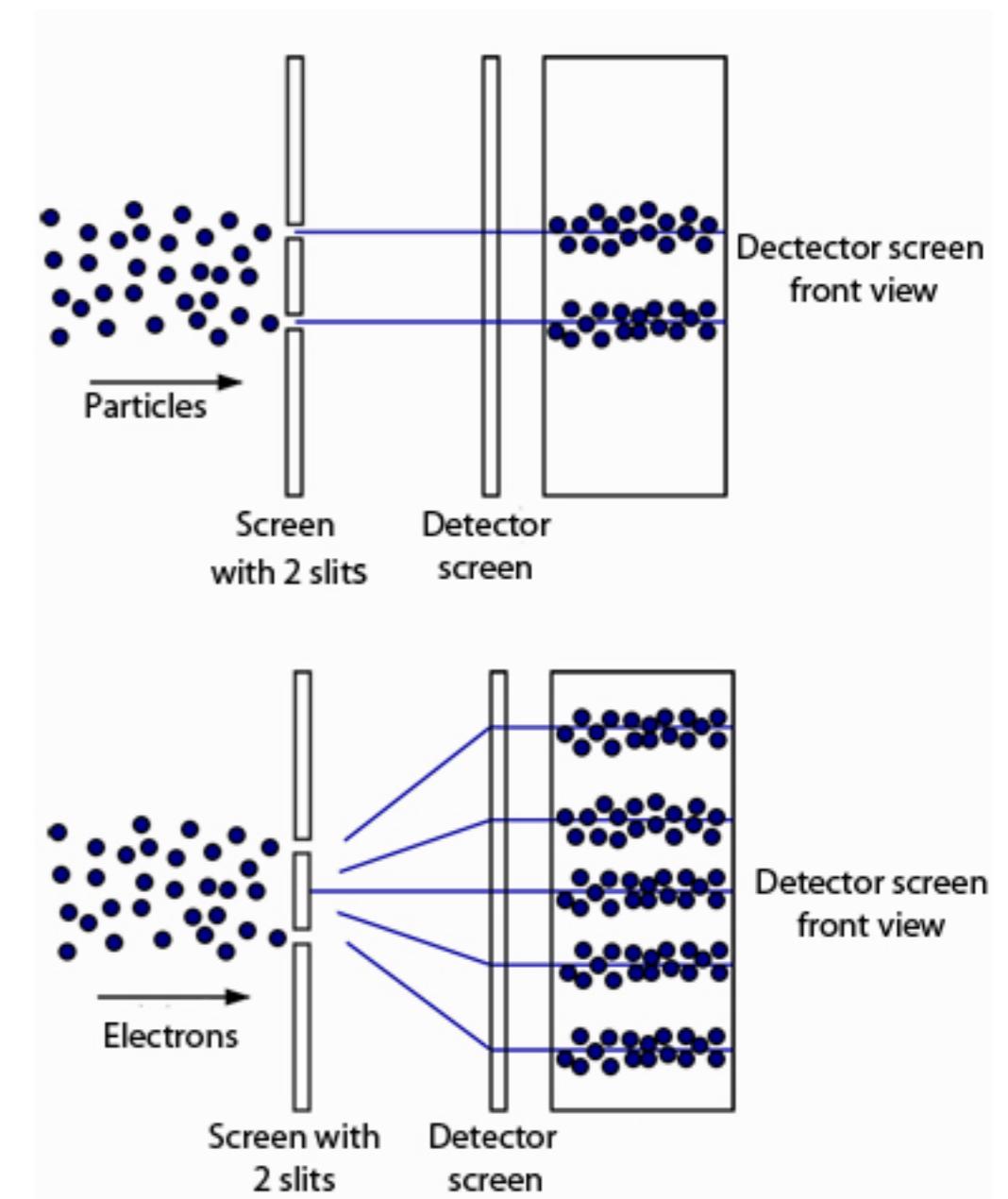
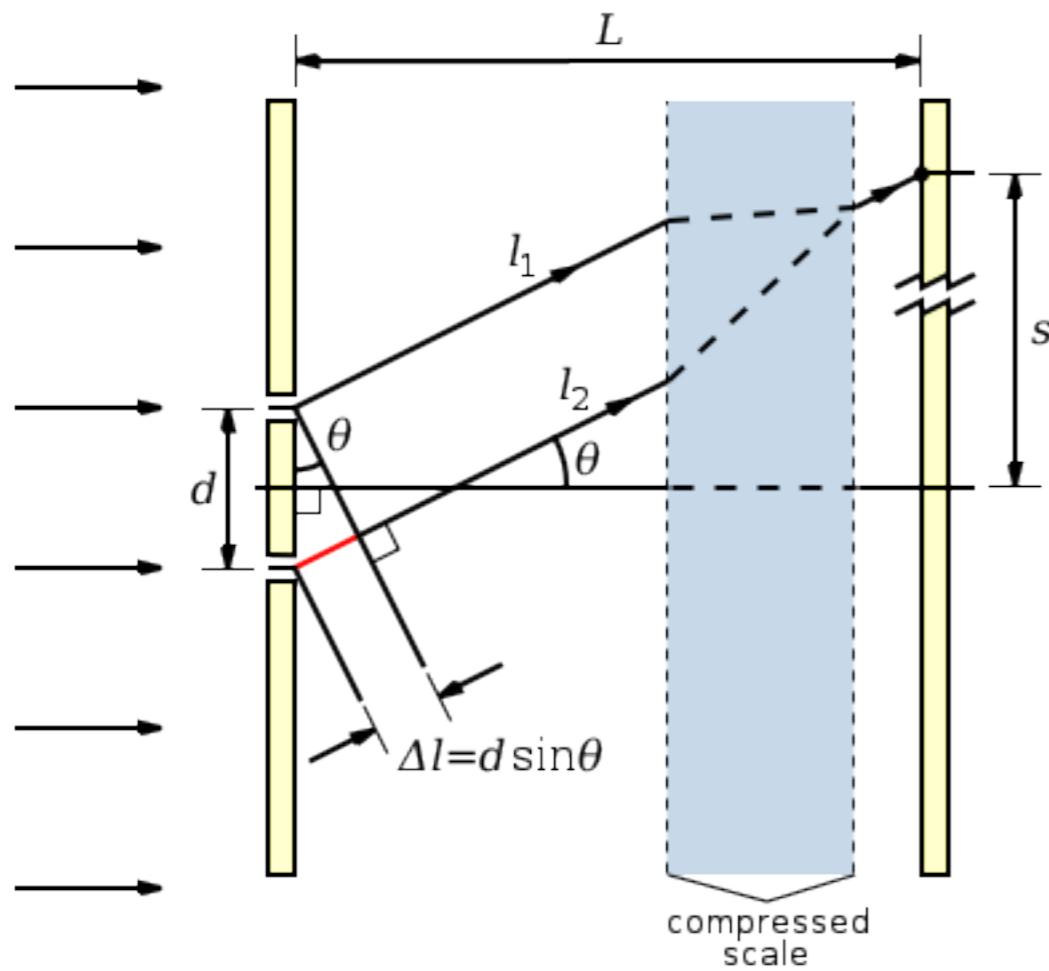
Ondes stationnaires



Ondes électromagnétiques



Double fente

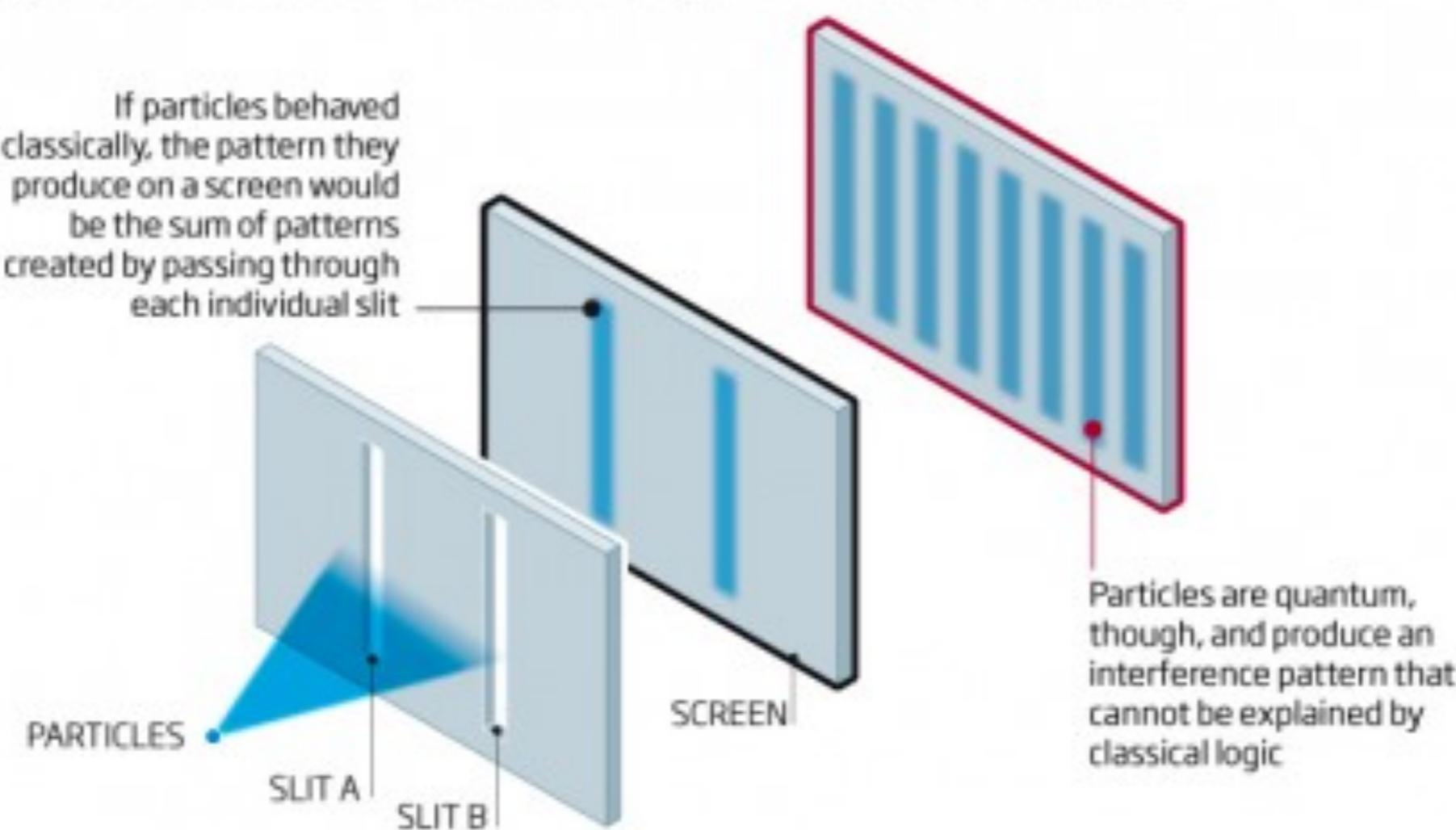


Interférence

The famous double slit experiment

©NewScientist

This experiment illustrates the difference between quantum and classical mathematics



Dualité particule-onde

- dans certaines situations, les particules se comportent comme des ondes (microscope électronique à transmission)
- dans certaines situations, la lumière se comporte comme une particule (effet photoélectrique, effet Compton)