What is a **wave**?

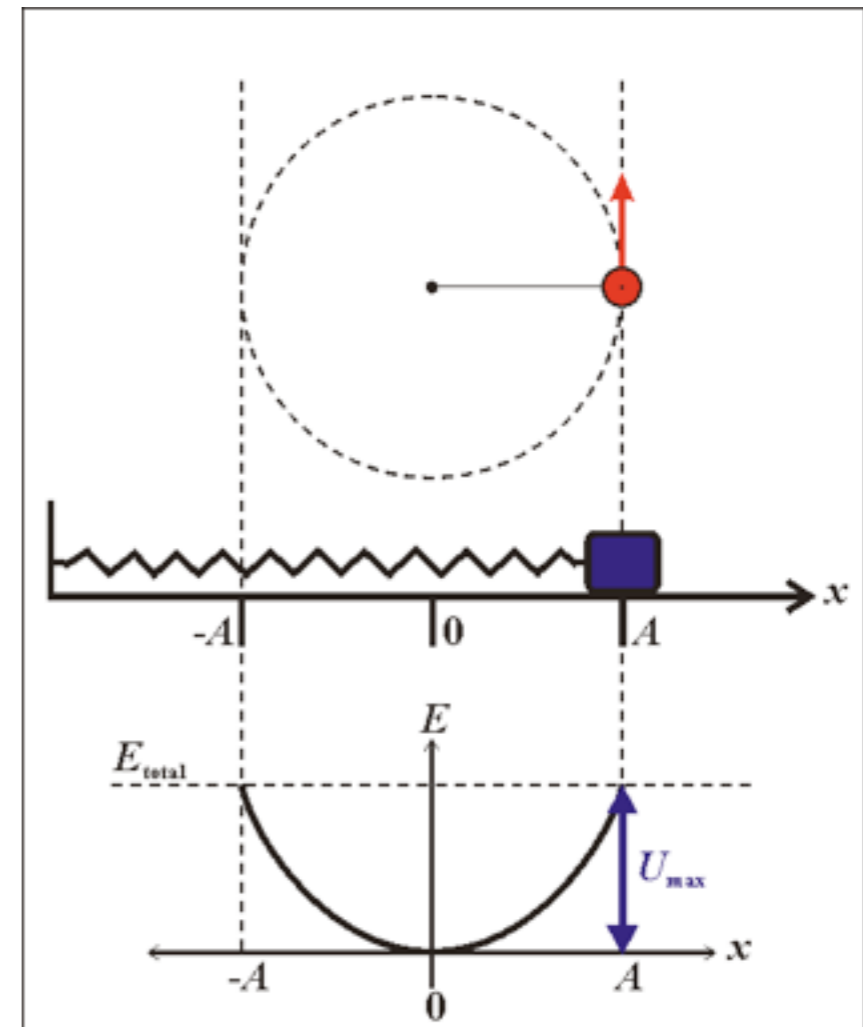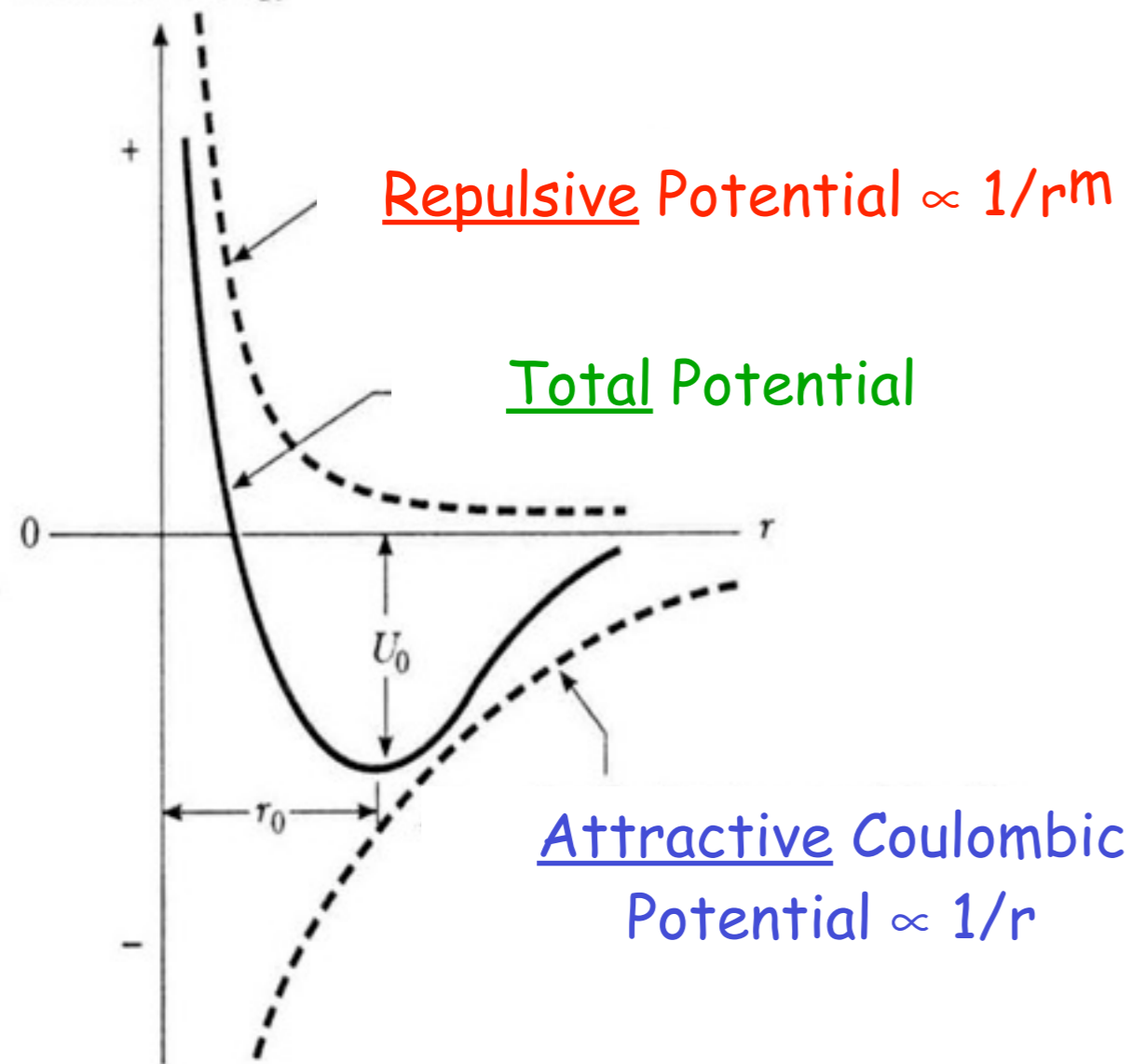**Small** perturbations of a **stable** equilibrium point → **Linear restoring force** → **Harmonic Oscillation**
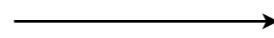
Potential energy
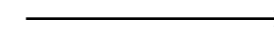
Repulsive Potential $\propto 1/r^m$

Total Potential

Attractive Coulombic Potential $\propto 1/r$

What is a **wave**? - 2

Small perturbations of a **stable** equilibrium point $\longrightarrow$ **Linear restoring force** $\longrightarrow$ **Harmonic Oscillation**

Coupling of harmonic oscillators $\longrightarrow$ the disturbances can **propagate**
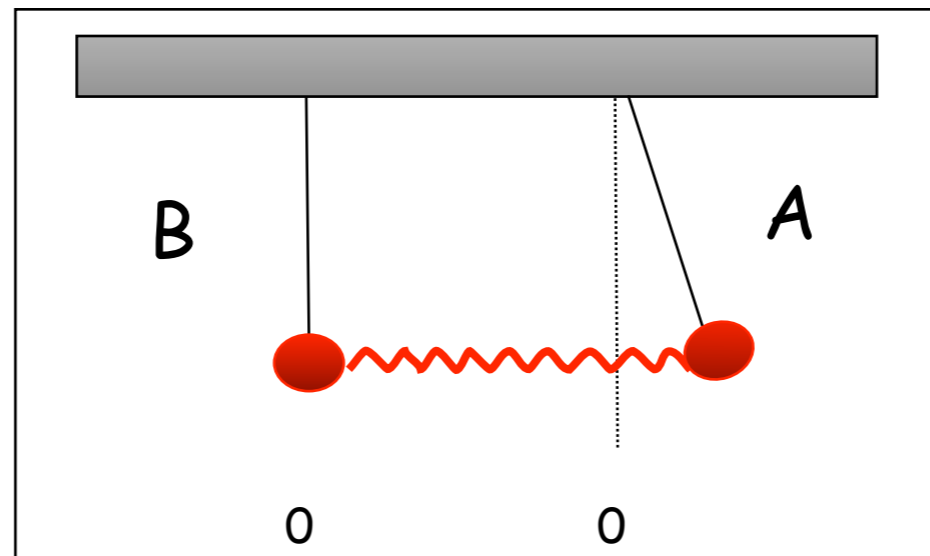
What is a **wave**? - 2

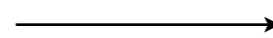**Small** perturbations of a **stable** equilibrium point → **Linear restoring force** → **Harmonic Oscillation**
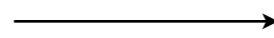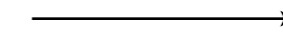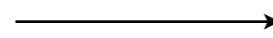
Coupling of harmonic oscillators → the disturbances can propagate, superpose and **stand**

Normal modes of the system

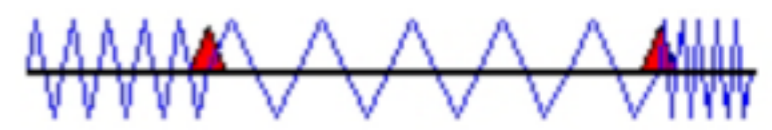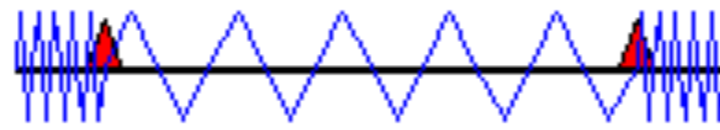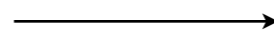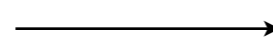**Small** perturbations of a **stable** equilibrium point $\longrightarrow$ **Linear restoring force** $\longrightarrow$ **Harmonic Oscillation**
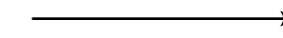
Coupling of harmonic oscillators $\longrightarrow$ the disturbances can **propagate**, superpose and stand
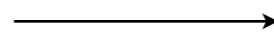
WAVE: organized **propagating imbalance**, satisfying differential equations of motion

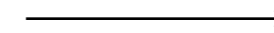$$\frac{\partial^2 y}{\partial x^2} = \frac{1}{v^2}\frac{\partial^2 y}{\partial t^2}$$

General form of LWE

What is a **wave**? - 4
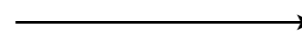
Small perturbations of a **stable** equilibrium point $\longrightarrow$ **Linear restoring force** $\longrightarrow$ **Harmonic Oscillation**

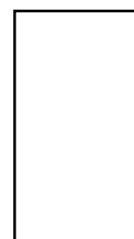**Coupling** of **harmonic oscillators** $\longrightarrow$ the disturbances can **propagate**, superpose, stand and be **dispersed**

WAVE: organized propagating imbalance, satisfying differential equations of motion

Organization can be destroyed, when interference is destructive

non linearity

strong scattering

Turbulence

Diffusion

Exceptions

Solitons

Phonons