LAGRANGIAN:

transformation : represents a kind of **recalibration** or transformation of one degree of freedom of the internal system that does not alter any physical property . It is like a kind of theory of relativity where we take as a reference a coordinate axis (or degrees of freedom) randomly without to influence the " scalar " values that are they fight .

We can also talk about **hyperspace** : space in 3 or more dimensions .

When it comes to **bosons** and **fermions** : we meet first present in interactions between particles subatomic (disintegration) , while the according to they have to do with with matter exchanges .

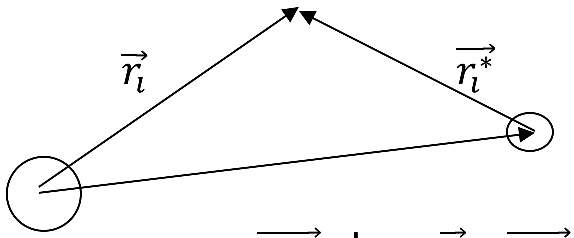
At every energy level constitutes a dimension?

About Planck

- Planck length: the basic and first λ (with respect to photons): $\lambda \propto 1/\nu$, where ν =frequency
- quantum : h: the elementary quantum of action.

Sometimes we can conceive others dimensions as " superpositions " of volumes or figures that converge with each other others from the 3rd era dimension .

and



$\overrightarrow{r_{CM}}$where $\overrightarrow{r_i}$= $\overrightarrow{r_{CM}} + \overrightarrow{r_i^*}$

with speeds and energies is similar

We can to study the **Lagrangian** :

$\frac{\partial L}{\partial q_i} = \frac{d}{dt}\left(\frac{\partial L}{\partial \dot{q_i}}\right)$ where L= f(x,v , t)= f(x, $\dot{x}$,t)

gives , therefore , a scalar.

$\frac{d}{dt}(\frac{\partial L(p_i(t),\dot{p_i(t)},t)}{\partial \dot{p_i}})$ - $\frac{\partial L(p_i(t),\dot{p_i(t)},t)}{\partial p_i}$=0

p_i position, $\dot{p}_i$speed

We deduce that $\dot{p_i} = \frac{dp_i}{dt}$ and $\ddot{p_i} = \frac{d\dot{p_i}}{dt}$

F. δr= m.$\ddot{r}$. δr

We know that the Lagrangian = L= TV= Ekinetic -Epotential

Then we understand that: Work =$\sum_i^n[\frac{\partial}{\partial t}(\frac{\partial(T-V)}{\partial \dot{p_i}}) -$ $(\frac{\partial(T-V)}{\partial p_i})]\delta p_i$

which can be non-conservative forces : work $\neq$0

Let's check it out :

$$\frac{\partial}{\partial t}\left(\frac{\partial T}{\partial \dot{p_\iota}}\right)=\frac{\partial}{\partial t}\left(\frac{\frac{1}{2}.m.\partial(\dot{p_\iota}^2)}{\partial \dot{p_\iota}}\right)=\frac{\partial}{\partial t}\left(\frac{1}{2}.m.\frac{2\dot{p_\iota}.\partial\dot{p_\iota}}{\partial \dot{p_\iota}}\right)=\frac{\partial}{\partial t}(\mathrm{m}.\dot{p_\iota})=\mathrm{m}.\ddot{p_\iota}$$

$$\frac{\partial}{\partial t}\left(\frac{\partial V}{\partial \dot{p_\iota}}\right)=\frac{\partial}{\partial t}\left(\frac{F.\partial p_i}{\partial \dot{p_\iota}}\right)=\mathrm{F}.\left(\frac{\dot{p_\iota}.\partial\dot{p_\iota}-\partial\dot{p_\iota}.\dot{p_\iota}}{\partial\dot{p_\iota}^2}\right)=0$$

$$\frac{\partial(T)}{\partial p_i}=\frac{\frac{1}{2}.m.\partial(\dot{p_\iota}^2)}{\dot{p_\iota}.dt}=\frac{1}{2}.m.\frac{2.\dot{p_\iota}.\partial\dot{p_\iota}}{\dot{p_\iota}.dt}=\mathrm{m}.\frac{\partial\dot{p_\iota}}{dt}=\mathrm{m}.\ddot{p_\iota}$$

$$\frac{\partial(V)}{\partial p_i}=\mathrm{F}.\frac{\partial p_i}{\partial p_i}=\mathrm{F}=\mathrm{m}.\ddot{p_\iota}$$

All this has another reading: the angular momentum is $\vec{L}=\vec{r}\times\vec{p}$

where $\vec{L}(p_i,\dot{p}_i)$.

If we derive it with respect to time $\frac{\partial\vec{L}}{\partial t}=\vec{r}\times\frac{\partial\vec{p}}{\partial t}+\frac{\partial\vec{r}}{\partial t}\times\vec{p}=$ $\vec{r}\times\vec{F}$since$\frac{\partial\vec{r}}{\partial t}$ i $\vec{p}$ they are parallel , then its vector product is =0.

If $\vec{L}$it is constant with respect to time,$\frac{\partial\vec{L}}{\partial t}=0$

The **Lagrangian** is defined as the remainder between Ec and Ep : L=TV

U(r)= Vq =- Fr V=U/q=- Fr F(r)=$\sum_{i,j}K.\frac{q_iq_j}{r_i^2}$

∂U(r)=$\sum_{i,j}\mathrm{K}.\frac{\mathrm{qj.q_i}}{dr_i}=-F.dr$

V =$\sum_{i,j}\mathrm{K}.\frac{\mathrm{q_j}}{\mathrm{r_i}}$