CHAPTER 8

NUCLEAR LINK.

Duplexing wave-corpuscle, De Broglie ...

Just to see **De Broglie's** formula I figured that someone should discover it sooner or later; Of the many relationships between variables, we can understand them as directly or inversely proportional, exponential, parabolic, linear or consecutive, arithmetic or geometric progressions ...
And, as you can see in classical physics, all or almost all formulas have the meaning that we have indicated:

W = F.r
F= -k.x
F = m.a
P. V = n.R. T (kinetic theory of matter).
Pressure = F / Area
F = G. q.q '/ r^2
I = q / t

It is also common for differential equations to be the starting point of many formulas already settled, for example:

E = mg h from: W = $\int_i^f F.dr$ F=-m.g h= $h_f - h_i$

E = (1/2).mv^2 from: dx = v_x . dt, a_x = v_x /dt
Etc...

De Broglie took equations previously used by **Einstein** and Planck and reordered them to calculate the λ (*wavelengths*) of the particles in motion;
E = mv^2= h.ν= c /λ .
λ= h / p = h / mv = [(E /ν) / (mv)]

When you increase the mass or speed, the λ is made smaller .
Such a wavelength, for most objects such as a "baseball" ball or a dust particle can not be measured because the physical system for calculating them is small.
Another addition: with De Broglie we deduce that by increasing the time at the time of making the *journey* (that is, transforming to a visible level the displacement of e^- since weigh more and therefore go more slowly) the length low wave; however if we go faster (ie, decreases the time) λ increases.

You may e^- have their moments when λ have the same dimension *space interatomic* crystals.

Principle of uncertainty of Heisenberg:
Simultaneous measure between *position and speed* ; You can not determine the time of the e^- at the same time as your position is determined. When determining its position its moment changes in an unknown *magnitude* . [A photon wavelength λ' take a *moment* $p = h / \lambda'$ and the ***collision*** "- **e - photon"** is transferred to the e^- a fraction of the momentum of the photon unknown].

To locate and $^-$ at a distance $\Delta x \cdot$ "+/- λ produced an" uncertainty "at the time $\Delta p = h / \lambda'$. The product of the two "uncertainties" is: $\Delta x. \Delta x \approx h$ (because they are *inversely proportional).*

Nuclear link theory and nuclear energy:

My brother helped me to absolute extremes. Every Sunday of every week of every month of almost all the course I was going to walk in the woods (Torroella, L'Estartit, Vall de St. Daniel, Escala ...) until the painful moment of the farewell of a custom that we were well rooted. I remember that during those walks we sometimes even called the lungs open and caught in mother nature to decongest tension (it was like a merger with her and knowing that the nuclei are very energy-intensive).

To see a little more about the **nuclear reaction** and the Equation of Einstein will say and I will repeat respectively three optical, at least:

- : In the released Energy when fusing the nucleons, the nucleus gains stability as it has been seen in the equation $\Delta E = \Delta mc^2$ (where *the mass and energy are tied*).

Ex:

$a\,{}^{1}_{0}p + b\,{}^{1}_{0}n \longrightarrow {}^{A}_{Z}X + \Delta E$ where A= a+ b

Δ E / A represents the E of attraction of a nucleon with respect to the other nucleons, knowing that A = mass number = neutron number + nº protons, and Z = electron number = atomic number.

Δ E is the **Energy that keeps the nucleus together** since we have to:

$$\Delta E + \text{nucleus} \longrightarrow a\,{}^{1}_{0}p + b\,{}^{1}_{0}n$$

Such particles (protons and neutrons) of energy spenen, and the more particles more E decompressed.

At first, $\Delta E/\ A \approx 14'1$ MeV means the E of a nucleon that can be combined with the environment.

- It tells us the following:

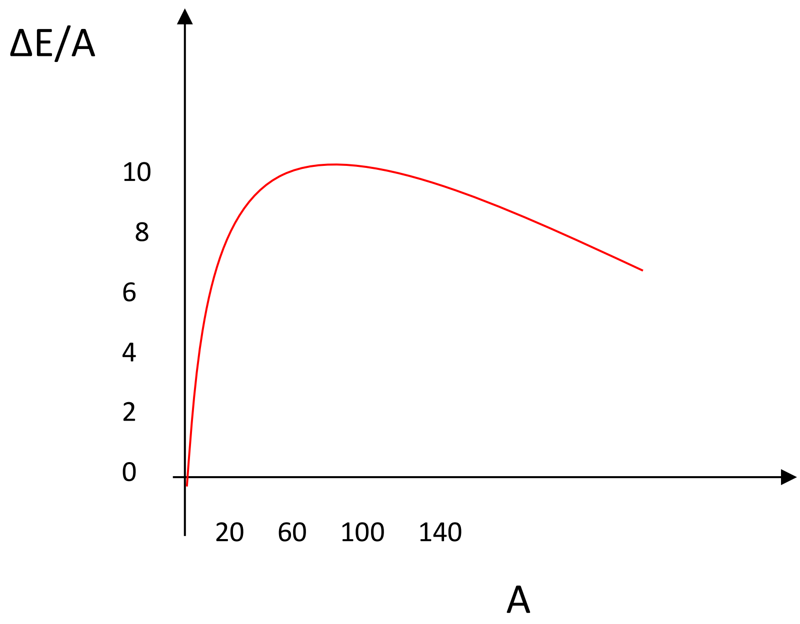
Sum of the atomic weights of the total nucleons. Atomic weight of the particular nucleon ≠ 0
For example, to calculate the *mass loss caused by the formation of an* oxygen *core* , do the following:

$$8{}_0^1n + 8{}_1^1p \longrightarrow {}_8^{16}O$$

where the mass of the neutron is 1'0087 uma and that of the proton 1'0078 uma.
The mass of an oxygen atom is 15995. Then the procedure is Δ m = 15'995- [8 (1'0087) + 8 (1'0078)] = -0'137 uma's.
Therefore: $\Delta E = \Delta mc^2 = (-0'137).\ (3.10^8\ )^2 = -1'223.10^{16}$ J knowing that the Joule is $Kgr.m^2 / sg^2$.

- Starting from the relation between mass and E, the existing mass difference existing at subtracting one that weighs an atom and its sum of nucleons is translated into the E that dissipates.

I will say at least that I have discovered that for a value of A less than or equal to 20, the relationship is more*inaccurate, but* with A ≈ 60 (from 30 to 80 or 90 ...) this relationship improves when it is stable.



The graph Δ E / A vs. A, it has a vertiginous upward form up to A ≤ 30, whereas for A superiors (up to 120 or similar) the graph stays quite ctnt; When advancing more, the curve undergoes a slight descent.

In order to finish it, the **Δ E/ A ratio** drops from 14'1 MeV to that of 8 MeV due to the proton repulsion (therefore the only explanation is that the interactions p-p influence the stability, just as express in fig.25).

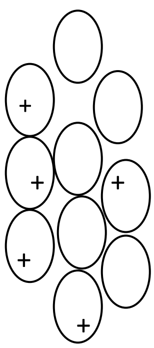
Such a symptom can be assimilated to the sample taking of a crop: If you take 3 samples in 1 day and you are one month without doing anything, the reliability is minimal, however if every day of the month in presses 3 the result is more credible. As I can see, variable t can be replaced by that of space.

I like to like and be in my place: I have the feeling that I can imagine what an "x" person can answer to a question or comment "y" and that can be answered using a "z" attitude. So there will always be somebody above us who watches over us.

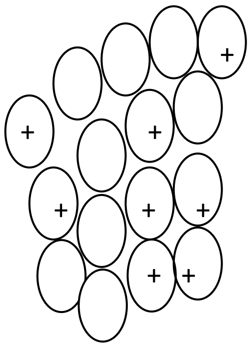
In the the amount of nuclear particles *(nucleons)* gives more events for at least ∃ mucleons connections all together, so it is more reliable *(if there are few* **particles interconnecting** *is more inaccurate*).

And we have to fit where we can, and there are jobs that are more pleasant than others, that they "go big." It seems a question of a nuclear connection or a "positive vibration link" or "interchange of sensations link" ... that seems to be related to my current reality and agree (at least minimally) in my radius of " Action without having to make efforts to keep the flag high (at this time it seems like a couple).

Fig. 25:



$$\left.\begin{array}{l} 10 = n + p \\ n/p = 1'5 \end{array}\right\} \begin{array}{l} p = 4 \\ n = 6 \end{array} \qquad \frac{9+8+7\ldots+2+1}{3+2+1} = 7'5$$



$$\left.\begin{array}{l}16= n+ p\\ n/ p= 1'5\end{array}\right\} \begin{array}{l}p= 6\\ n= 10\end{array} \quad \frac{15+ 14+\ldots+2+ 1}{5+ 4+\ldots+ 2+ 1} = 8'0$$

$$\left.\begin{array}{l}30= n+ p\\ n/ p= 1'5\end{array}\right\} \begin{array}{l}p= 12\\ n= 18\end{array} \quad \frac{29+ 28+\ldots+ 2+ 1}{11+ 10+\ldots+ 2+ 1} = 6'59$$

$$\left.\begin{array}{l}70= n+ p\\ n/ p= 1'5\end{array}\right\} \begin{array}{l}p= 28\\ n= 42\end{array} \quad \frac{69+ 68+\ldots+ 2+ 1}{27+ 26+\ldots+ 2+ 1} = 6'39$$

$$\left.\begin{array}{l}80= n+ p\\ n/ p= 1'5\end{array}\right\} \begin{array}{l}p= 32\\ n= 48\end{array} \quad \frac{79+ 78+\ldots+ 2+ 1}{31+ 30+\ldots+ 2+1} = 6'37$$

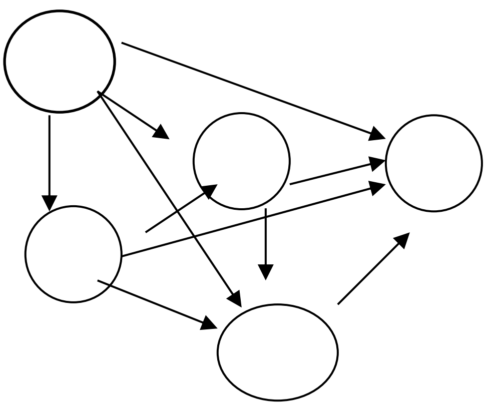
$$\left.\begin{array}{l}150= n+ p\\ n/ p= 1'5\end{array}\right\} \begin{array}{l}p= 60\\ n= 90\end{array} \quad \frac{149+ 148+\ldots+ 2+ 1}{59+ 58+\ldots+ 2+ 1} = 6'40$$

$$\left.\begin{array}{l}130= n+ p\\ n/ p= 1'5\end{array}\right\} \begin{array}{l}p= 52\\ n= 78\end{array} \quad \frac{129+ 128+\ldots+ 2+ 1}{51+ 50+\ldots+ 2+ 1} = 6'32$$

We use n / p = 1'5 since statistically it is the relation between protons and neutrons of all the elements, although it would be necessary to calculate it case by case (sometimes nip has the same value, while others do not).

We teach this small example of when we have 5 particles, where the combination of all with all gives 4+ 3+ 2+ 1 (taking into account that the expression in Figure 2 is:

$$[(n-n) + (n-p) + (p-p)] / (p-p)$$



As we can see in Figure 25, the neutron-proton relationship must be constant (since otherwise, the calculation of nº of interactions between nucleons / nº of interactions between protons would be pointless).

Thanks to the resolution of the equation systems we see that when increasing the particle number (nip) the relation or ratio between the interactions between them takes a uniformity (as we have seen in the figure: 7'5, 8, 6'5, 6 '3, 6'37, 6'39, 6'32 ...).

If the reader allows me, I have deepened in this "assembly" of Figure 25:
Instead of using the split of the number of interactions of all the nucleons with all / proton protons in order to visualize and understand, with the resulting results, the graph above mentioned (Δ I / A versus A), I present the inverse: sum of interactions between the protons / sum of 'interactions between all nucleons (both protons and neutrons);

n + p = 10 → 0'13
n + p = 16 → 0'17
n + p = 30 → 0'15
n + p = 70 → 0'16
n + p = 80 → 0'16
n + p = 150 → 0'16
n + p = 190 → 0'158

1- In probability we have to:

The number of interactions between nucleons (nn) + (pn) + (pp) / nº interactions between protons (pp) = "x" ix**fluctuates** strongly when the A $\leq$ 30.

2- As we have said, in amounts of A between 30 and 90 the previous relation is "y" and it does not fluctuate so much.

Note that the large number of elements found on the ground, the *heaviest* are in the interior and the *lightest* on the surface.

Where there is more amount of elements it is with A $\approx$ 60, which means that they feel **stable** (there is more number of nuclei with such A value). Then the *fission* and the *merger* arise *;* The first is to unite 2 nuclei to obtain a third party with A $\approx$ 60, while the second is to divide a heavier nucleus into two lighter ones that have a mass number of about 60, too.

Habitually when increasing the age the common sense increases and the capacity to follow the norms that prevail in each scene (university classroom, office, game of chess, party of tennis ...) and to shut up when it is necessary;although just because I was born in the Empordà, I'm a little touched by the tramuntana.