the general science journal

The Alternative to The Standard Model
The Nuclear Framework

When a Theory has clearly defined what matter is and what material particles are, as distinct entities with their own characteristics as well-defined objects, and in an understandable way, this Theory faces a great amount of facts and experimental data that must match the conclusions of the Theory. Needless to say, the special nature of those coincidences and the difficulty faced by the Theory. We're talking about matter, material elementary particles, the atom, the atomic nucleus, the nuclear forces, the electromagnetic radiation... One can say without doubt that once the Theory has been enunciated a good number of contradictions would logically emerge and if that does not happen it is a good sign that the Theory goes in the right direction and it disserves to be analyzed in depth. And this is exactly the case.

In this series of Articles published in "The General Science Journal" I've been dealing with some of the key themes of the Theory presented in the Book "A New Physics for a New Millennium".

I will summarize some of the topics related to the coincidences I mentioned above: 1 - All material elementary particles have spin equal to $h/4\pi$; 2 – Dimensions of nucleons are of the order of 10^{-13} cm. and their times of the order 10^{-23} sec.; 3 - Mass increase with speed in accordance with Einstein formula, although the phenomenon has nothing to do with Relativity; 4 - The speed limit of matter is the speed of light; 5 - There are some forces of electromagnetic character between nucleons that are huge at very short distances and disappear at the distance of a fermi (10^{-13} cm.); 6 - Forces between proton and neutron in the nucleus of Heavy Hydrogen or Deuteron can be measured, with the conclusion that the binding energy of the particles of Deuteron is 2.21 MeV, result that coincides with the experimental measurements; 7 - The atomic elementary act of radiation that implies a sudden increase in size and reduction of rotational spin of an electric ring leads to the creation of a rotating pole intensity vector in a plane which in turn causes a rotating magnetic field vector. We know that a changing magnetic field originate for **induction** a changing electric field so that the two vectors are perpendicular to each other. This is how an electromagnetic radiation is created with exactly the same behaviour of the electromagnetic radiation we know through experiment.

I have already said that this Theory is based on the idea of the Japanese Physicist Yukawa whereby the elementary particles of matter might be rotating small blobs of

something some called "urmaterie" and others "goo". Working with experimental facts, such as the value of the gyromagnetic ratio of the electron which is e/m, twice what apparently should be e/2m, along with the immovable fact that all elementary particles have spin equal to h/4π, and a number of experimental facts rigorously analyzed, some conclusions determined by simple formulas are reached:
$E\ 2\ \pi\ R = h\ c$; $2\ \pi\ R\ \nu = c$ (at rest); from these two formulas we can deduce this third one: $E = m\ c^2 = h\ \nu$; the latter including Einstein's formula.
The meaning of the first law is that the size of material particles is inversely proportional to its energy. Also joining for the first time in the History of Science quantum constant h and the Einsteinian constant c. The second formula means that every point of the equator ring of a particle always travels at the speed of light. The third law shows the similarity between electromagnetic and material energy with the distinction of the different meaning of the frequencies in each case.

Regarding the size of particles inversely proportional to its energy I have mentioned in page 11 of the Article "The Alternative to the Standard Model – Starting Point of this Theory" some experiments the results of which go in the same direction as this Theory does. That is to say, more energy means smaller size.

Let us now go to the coincidences concerning the Nuclear Framework: The role of neutron as nuclear cement, the absolute stability of the α particle, the different energy levels of nuclei coincident with the experimental data. The reader may have a peep at the true reality of atomic nuclei from the time of birth and how its progress occurs with increasing atomic number. I do not think the reader will have other opportunity to peer into the atomic nucleus, since no one has said anything about it, except that it is composed of quarks that attract between them with a force that increases with distance.

But first let us remember some concepts concerning the union of charge-rings as seen in Article "The Nuclear Forces". The deuteron, a proton and a neutron turning in the same direction constitutes the "bottle neck" of the Universe. On the one hand, it is the only possible union of two nucleons and on the other hand, if that union were not stable, the Universe would consist of a huge amount of isolated particles.

The first problem this Theory faces is how to pass from the deuteron, the only possible union of two nucleons, to the compound nuclei, with three nucleons, which has two variants: $_1H^3$, called tritium and $_2He^3$. The first one is unstable and has a mean life of 12,2 years. Its decay consists in the emission of an electron, changing into $_2He^3$. That is to say, in an average time of 12,2 years, one of the neutrons forming the $_1H^3$ changes into a proton, by emitting an electron. The result is $_2He^3$ which is stable.

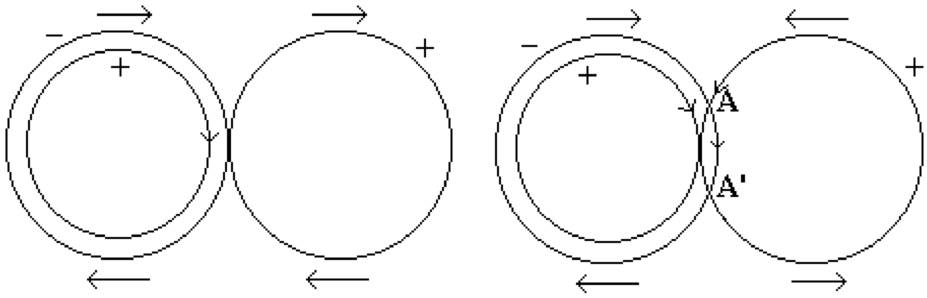
In short: there is only one possible stable union of two nucleons which is the deuteron. From this, two compound nuclei of three nucleons can be formed: $_1H^3$ by addition of a neutron and $_2He^3$ by addition of a proton. The first one changes into the second one in an average time of 12,2 years. Both nuclei $_1H^3$ and $_2He^3$ have a spin equal to h/4π, which implies that the newly incorporated nucleon, the neutron in the case of $_1H^3$ and the proton in the case of $_2He^3$, has a spin which is antiparallel to the spins of the nucleons forming the deuteron. In other words, the newly incorporated nucleon turns in opposite direction to the nucleons forming the deuteron.

This Theory is placed in a serious dilemma here. The newly incorporated nucleon is the same as one of the components of the deuteron and different from the other. This is true, whether the newly incorporated nucleon is a proton or a neutron. On the other hand the laws ruling the union of charge-rings, which have been deduced by this Theory, say that, if the contacting electric rings have the same sign, the particles must turn in opposite directions and, if the contacting electric rings have opposite signs, the particles must turn in the same direction. This makes the incorporated nucleon turn in one direction when obeying the neutron of the deuteron and in the opposite direction when obeying the proton of the deuteron.

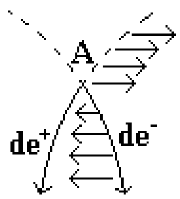
Let us imagine that the incorporated nucleon is a proton. This proton must necessarily turn in opposite direction to the proton of the deuteron. The laws ruling the union of electric rings do not allow the union of two protons turning in the same direction. On the other hand the incorporated proton and the existing neutron must turn in the same direction as the charge-ring of the incorporated proton and the exterior electric ring of the existing neutron have different signs. So the conclusion reached is that the newly incorporated proton must turn opposite to the existing proton and in the same direction as the existing neutron. As the existing nucleons in the deuteron turn in the same direction the result is contradictory.

The same kind of reasoning might be made when the incorporated nucleon is a neutron. It must turn in the same direction as the existing proton and in opposite direction to the existing neutron. And, as before, the existing nucleons of the deuteron turning in the same direction, we reach the contradictory conclusion that the new nucleon must turn on the one hand in one direction and on the other hand in the opposite one.

It is here where the especial characteristics of the neutron, which allow it to act as the "nuclear cement" of atomic nuclei, intervene to solve the dilemma. Let us see which are those especial characteristics of the neutron and afterwards all the theoretical consequences, which fully coincide with experimental facts, will be drawn. The neutron has two charge-rings: the exterior negative one, differential elements of charge of which travel at a speed higher than that of light, and the interior positive one, differential elements of charge of which travel at the speed of light. One might think that a proton and a neutron might join together, that is to say, have their charge-rings in contact so that the ring of the neutron which becomes tangential to the ring of the proton could be the interior one instead of the exterior one, as happens in the case of the deuteron.



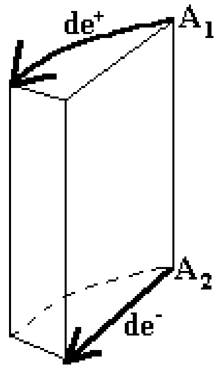
The deuteron has been represented on the left figure and the other kind of union on the right figure. The deuteron has been sufficiently discussed. Let us see what happens in the other type of union. Two electric rings of the same sign are in contact at the point of tangency T. Both rings are positive and they are turning in opposite directions. The product of multiplying the speeds of their differential elements of charge is higher than c^2 . So if the particles turn in opposite directions, a strong contact takes place at point T, although the rings have the same sign. What happens at points A and A' where the ring of the proton and the exterior ring of the neutron are in contact? What happens is that differential elements of charge with opposite signs come into contact. There is no problem from the electric point of view. Let us see what happens from the magnetic point of view. I have represented separately one of the points of contact on a larger scale, with the differential elements of charge of opposite signs, which travel in the directions shown, so that the product of their speeds is equal to 2,8527 c^2 .



As far as the two crossing differential elements of charge remain in contact the magnetic forces between them will be located on the equatorial plane of the particles, that is to say, on the horizontal plane. The electric signs of the rings being opposite the magnetic effect is repulsive, which means a force of attraction between the particles below point A and a force of repulsion between the particles above point A. Due to the curvature of the rings the first effect is higher than the second one. The conclusion is therefore that there is electric attraction between the differential elements of charge crossing at points A and A'. On the other hand, as far as the contact is maintained, the magnetic effect between the particles is attractive. The result is that, as far as contacts at points A and A' are maintained, the position will be stable. The point of tangency T as well as the crossing points A and A' tend to the union of the particles.

The first question arises. Why, if the above statement is right, does there not exist in Nature the union proton-neutron turning in opposite directions? Let us suppose that kind of union as depicted on the last page. It is evident that contact will be much more intimate at the point of tangency T, where the differential elements of charge are tangent, than at the crossing points A and A'. Therefore the union at point T is much stronger than that at points A and A'. This leads us to think that any lack of equilibrium which might take place will tend to break unions at A and A' and contact at point of tangency T will be maintained, point T acting as a hinge.

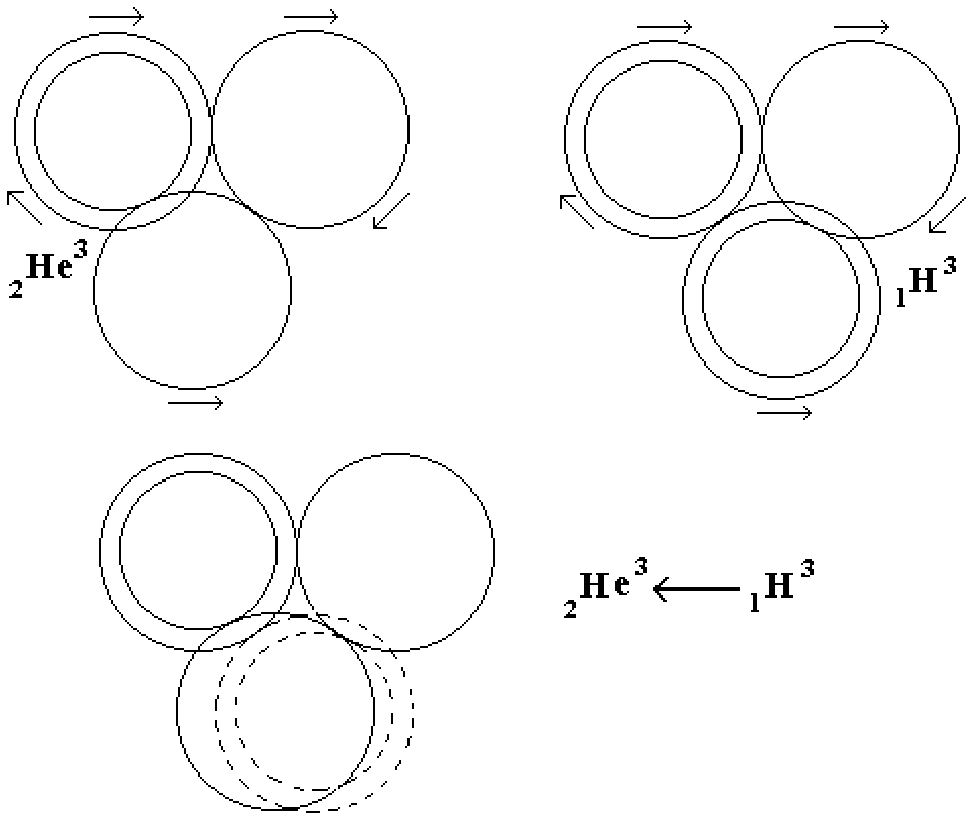
Let us now suppose that a lack of equilibrium occurs. As explained before this lack of equilibrium will momentarily break contacts at points A and A'. Let us see what happens at one of them, for example at point A. The two differential elements of charge that were in contact will now separate from each other.



The result is that point A will split into two points: A_1 ,belonging to one of the rings, and A_2 , belonging to the other ring, as shown in the figure. Electric forces of attraction will continue acting between the two separated differential elements of charge. But the magnetic forces, which were located before on the equatorial plane of the particles, now have the direction $A_1 A_2$ and they are repulsive, as they correspond to differential elements of charge with opposite signs. The result is that the repulsive magnetic force exceeds the attraction electric force, causing the breakage of the union. It can thus be explained why the union proton-neutron turning in the same direction can not exist.

The case is quite different when there is more than one point of tangency T, instead of only one, acting as a hinge when a lack of equilibrium occurs. When there are several points of tangency T, there is no hinge and the union becomes rigid. This is why the critical circumstance of stability disappears in the case of more than two particles

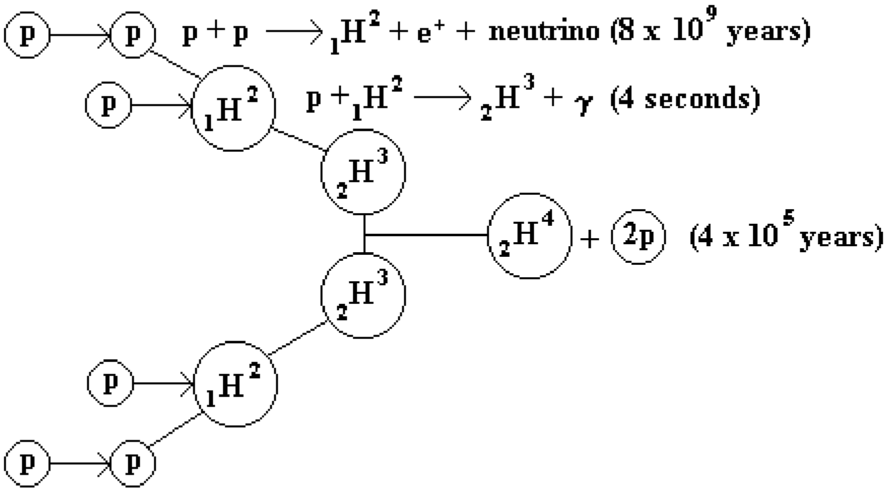
Let us first see the union ${}_1H^3$ as shown in the next figure. It is easy to check that all the rules referring to signs and turning directions of the rings are accomplished. In the same way these rules are accomplished for nucleus $_2He^3$. We see that the two nuclei of three particles $_1H^3$ and $_2He^3$ can exist. The fact that one of them is more stable, in other words, that it has a lower energy level than the other makes one transform itself into the other; $_1H^3$ changes into $_2He^3$. The neutron incorporated decays into a proton through a β emission and slides as depicted in the figure.



This is the right moment to make a comment about the formation of deuteron through the thermonuclear chain p-p, which takes place in the sun and the stars. In the next figure the process of combustion of hydrogen into helium has been presented schematically. The comment I was referring to is that deuteron is produced by the reaction of two protons. Does this mean that this reaction could not happen directly through the union of a proton and a neutron? It would seem much easier that the reaction were produced by the simple union of a proton and a neutron and not by the union of two protons, with the condition that one of the protons changes into a neutron, by emitting a positron and a neutrino, the very moment the union takes place. This phenomenon occurs within a particular proton in the sun every 8×10^9 years.

The above mentioned question has great importance, at least from two points of view. First from the point of view of formation of the deuteron, as a "bottle neck" in the combustion of hydrogen into helium, and second from the point of view of the formation of all compound atomic nuclei, especially the formation of the nucleus of helium $_2He^4$ or α particle.

Before entering into the analysis of the importance of this fact, from the two above mentioned points of view, it is necessary to give an answer to the above question: the reason why in the p-p thermonuclear chain the neutron does not intervene as the incorporated nucleon is simply because the neutron, being unstable when isolated, with an approximate mean life of 16 minutes, is a particle which exists in the sun and in the stars in a negligible proportion.



I will here quote in this respect Marcelo Alonso and Edward J. Finn of Georgetown University, Washington D.C.: "The simplest fusion reaction is the capture of a neutron by a proton to form a deuteron. The great advantage of this reaction is that there is no barrier of potential to overcome. It is supposed that this fusion reaction played an important role at the first early stages of the evolution of the Universe. Nevertheless at present, this fusion reaction has relatively no importance, due to the lack of sufficient amount of free neutrons. Nevertheless the reaction takes place when neutrons coming from a nuclear reactor spread through a hydrogenated substance, such as water or paraffin."

That is to say, neutrons are unstable and have a mean life of 16 minutes, which makes their presence in the Universe negligible. Only at the beginning of the formation of the Universe would nuclear reactions occur so fast that the first 16 minutes would have been long enough for neutrons to react before decaying. But, apart from that initial moment as well as experimental circumstances at laboratory, we must admit that the proportion of neutrons is negligible, due to their instability.

Let us come back to the fact that deuteron acts as "the bottle neck in the combustion of hydrogen into helium". If we imagined that neutron were stable, it would be obvious that its proportion in the Universe would be much higher than it is now. In that case the formation of deuteron through the simple union of a proton and a neutron would be quite probable; anyhow much more probable than now is the formation of deuteron through the reaction of two protons, which is the reaction really taking place, with a probability for a single proton in the Sun of occurring once every 8×10^9 years. It is clear that the stability of the neutron would enormously accelerate the formation of deuteron and consequently the rate of transformation of hydrogen into helium would be much faster than it is now. We can see in this way how important the fact is that neutron is unstable, even if it seems a casuistic circumstance.

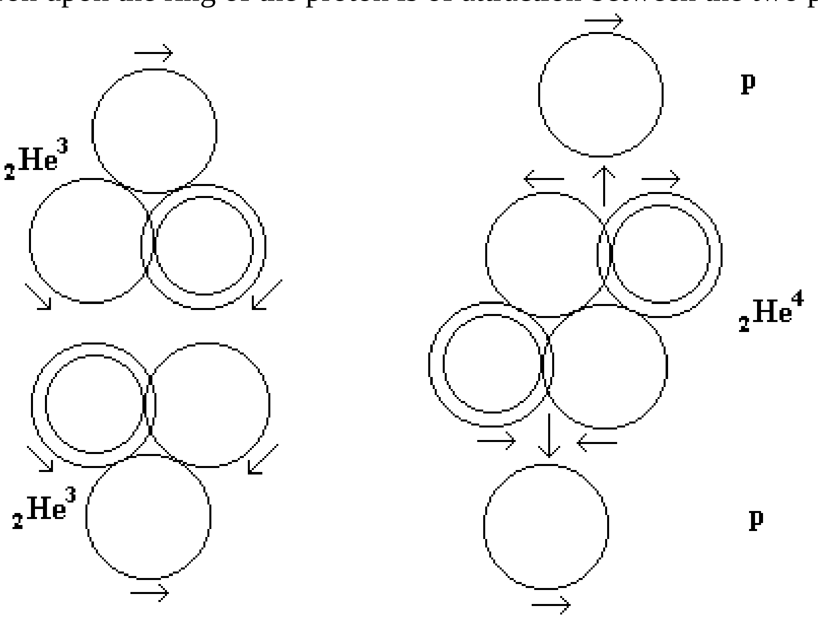
The second point of view referred to above, also influenced by the fact that neutron is unstable, is the formation of all compound atomic nuclei, especially the α particle. But first it is necessary to analyse how the α particle is formed and what is its structure. We have seen previously in the thermonuclear chain p-p that ${}_2He^4$ is produced through the reaction ${}_2He^3 + {}_2He^3 = {}_2He^4 + 2$ p; and that the probability that this reaction might take place in an isolated particle in the Sun is once every 4×10^5 years. Two nuclei of ${}_2He^3$ join together; two protons come off and the α particle remains. In the figure on the next page the reaction of the two nuclei of ${}_2He^3$ is represented with the corresponding turning directions. The joining of the two nuclei determines the separation of the two protons which were part of the two deuterons. Let us see how the protons coming off are those which initially were part of the deuterons, and not those incorporated during the process of formation of the nuclei ${}_2He^3$. I have represented the α particle so that there is contact between the protons, while the neutrons are separated. In the same way it could have been represented as shown in the second figure, the neutrons being now in contact and the protons separated. No doubt one of the two joining systems implies higher stability. The subject is not decisive for the reasoning. The important fact is that the α particle takes one of the two forms represented above. Nevertheless I am inclined to think that the first disposition is more stable, when protons are in contact. The reason is that from this disposition, when protons are in contact, energetic levels of nuclei with 6 and 7 nucleons can be deduced, as will be seen later on, with absolute exactness, which does not happen starting from the other disposition, when the neutrons are in contact.

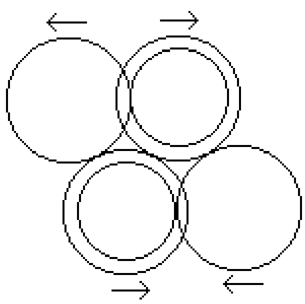
What would have happened if neutron existed in great proportions in Nature? Then the reaction ${}_2He^3 + n = {}_2He^4$ would be possible. And this reaction would take place at a much higher rate than the reaction ${}_2He^3 + {}_2He^3 = {}_2He^4 + 2$ p which takes place once every 4×10^5 years. This would mean a much higher rate of transformation of hydrogen into helium, in other words, the Sun and the stars would burn much faster. We can also see how here the fact that neutron is unstable contributes to the smooth flowing of the Universe. The stability of neutron is again a providential fact.

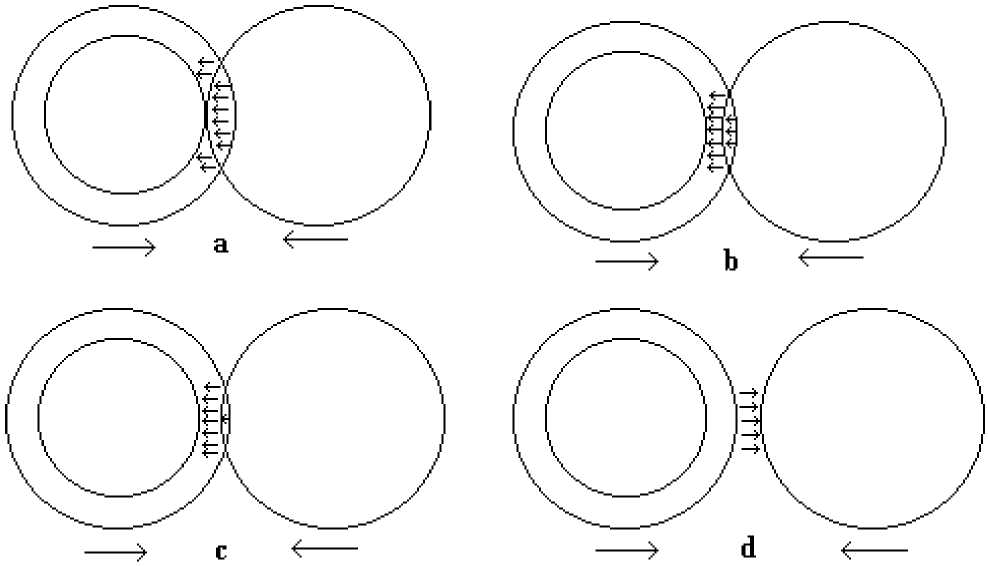
What I have said about the α particle may also be applied to all atomic nuclei of more than 4 nucleons. Their formation is conditioned by the lack of neutrons, as they disappear within 16 minutes after having been created.

An important point to make here is the reason why union p-n turning in opposite directions should imply higher binding energies than union p-n turning in the same directions, which justifies that binding energies per nucleon may increase so greatly starting from the deuteron, the value of which is 1,105 Mev; the value for $_2He^3$ is a little over 2,5 MeV and for $_2He^4$ is over 7 MeV per nucleon. For heavy nuclei that binding energy per nucleon varies between 7,5 and 8,5 MeV. The maximum value is that of $_{26}Fe^{56}$, equal to 8,79 MeV/nucleon. This is why iron is one of the most stable nuclei, which explains its great abundance in the Earth and in the Universe in general.

Let us see how the binding energy between a proton and a neutron turning in opposite directions, when this union is stable, is so high. In the bottom figure on the next page several positions of the particles have been represented. At position "a" the interior ring of the neutron and the ring of the proton are tangential. As the particles move away, the ring of the proton becomes farther from the interior ring of the neutron and becomes nearer the exterior ring of the neutron. In the zone where forces are higher, that is to say inside the common surface of the two big circumferences, the effect of both rings of the neutron upon the ring of the proton is of attraction between the two particles.





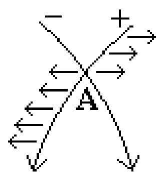


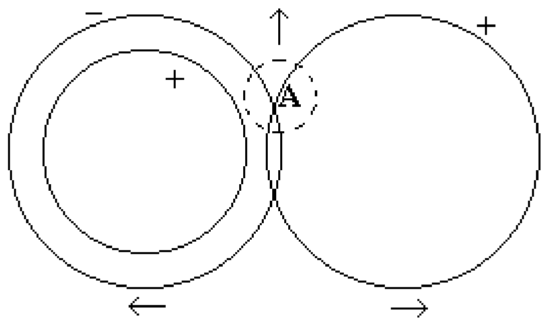
Another position "b" has been represented so that the portion of the ring of the proton causing the greatest effect is approximately midway between the two rings of the neutron. The strongest forces continue to act in the right direction so that the union is reinforced. In position "c", before the two exterior rings become tangential, forces are very strong due to the great proximity between the corresponding differential elements of charge. In position "d", once the point of tangency has been passed, the effect of the forces is repulsive between the two particles.

It can be seen that a great amount of energy must be necessary to disconnect the rings in the described way, as a result of the huge forces acting inside the common zone of the two big rings, as all these forces tend to keep the two particles together.

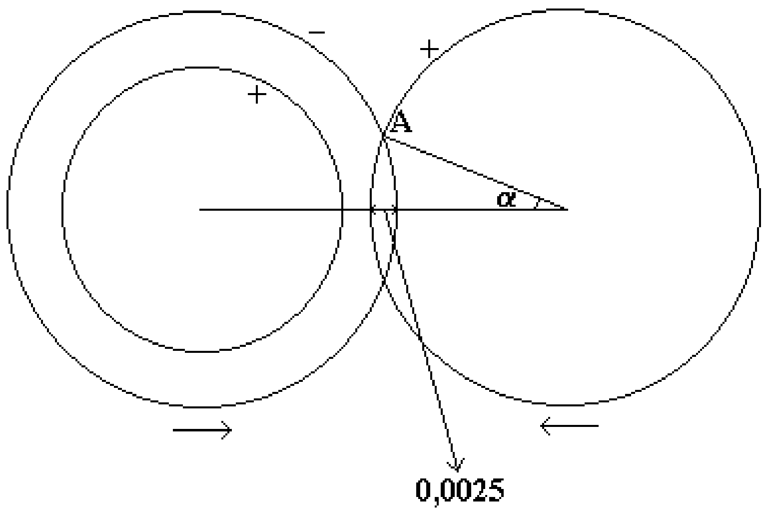
Using the same calculation system as the one used for calculating the binding energy of the deuteron, the binding energy between proton and neutron turning in opposite directions could be measured. Nevertheless, these calculations are not justified as it is not possible to reach exact results. The reason is the following: Let us imagine the two particles in a certain position, as depicted in the next figure. A is one of the crossing points of the big rings. This point A with its corresponding differential elements of charge has been depicted on a larger scale. The force between the nearest differential elements of charge is repulsive. It is easy to see that only above point A the repulsive effect of the forces means a repulsive effect between the two particles. But due to the curvature of the rings the attractive effect between the particles is stronger than the repulsive one.

There is an effect of attraction impossible to measure as it would require very small increments of the considered angles, which on the other hand would influence greatly the result of the binding energy when the rings cut each other. This effect, which cannot be measured, is much greater as the angle formed by the two crossing differential elements of charge becomes more acute. Anyway it would be possible to measure the binding energy approximately, without having to consider the differential elements of charge very close to the crossing points. The result obtained is a few MeV. This calculation has not been included in this Work as it would be too long. But it would show that the values obtained are in agreement with the binding energy of the α particle and in general with the binding energy per nucleon for heavy nuclei, from 7,5 MeV up to 8,5 MeV.

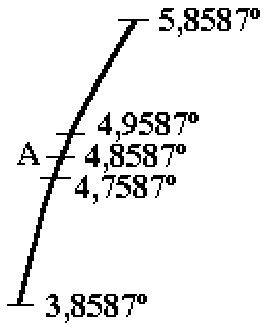




Although these calculations would make this Work too long, I want to cite as an example a case in which the above statement may be duly clear. Let us imagine the case in which the distance between the centers of proton and neutron is d = 0,7075 fermi, the distance between the ring of the proton and the exterior ring of the neutron then being equal to 0,0025 fermi.



In the figure this disposition has been represented. The crossing point of the rings corresponds to an angle α = 4,8587º. The figure has not been drawn on the right scale. If we take values of angle α equal to 3,8587º and 5,8587º, in other words, if we disregard the effect of the zone of the proton ring corresponding to 1º on each side of the crossing point A, the value of the force obtained is 2,35 e^2 c^2 10^{26} dyne.



If we take intermediate values α = 4,7587º and α = 4,9587º, so that the disregarded zone corresponds to 0,1º on each side of the crossing point A, instead of 1º, we obtain a new value of the force equal to 3,75 e^2 c^2 10^{26} dyne. That is to say, the fact of having considered the zone of the proton corresponding to 0,9º on each side of point A has changed the result approximately 60%. The part which has more influence, the one corresponding to the last 0,1º on each side of point A, still remains to be considered; the effect of this part cannot be measured but it no doubt has a great influence on the result.

What is quite clear is that the crossing rings oppose great resistance to slide in the direction which makes the angle formed by the crossing differential elements of charge more acute.

Somebody could ask: Why is it that charge-rings don't clash at the crossing points? The answer would be another question: Do photons clash when they coincide at a certain point in the same instant? They don't clash, they just interfere, which means that the corresponding vectorial values are added or subtracted. Therefore, we could think that charge-rings behave in the same way.

In view of what has been previously described, the role of the neutron as "nuclear cement" may be clearly appreciated. It is the neutron which allows the electric rings of nucleons to connect so that they may constitute the necessary framework to form stable nuclei. It is the neutron, with its especial features, which makes the great variety of union of nucleons possible. This role of the neutron as "nuclear cement", which permits the diversity of atomic nuclei, constitutes a new coincidence of behaviour between this Theory and Reality.

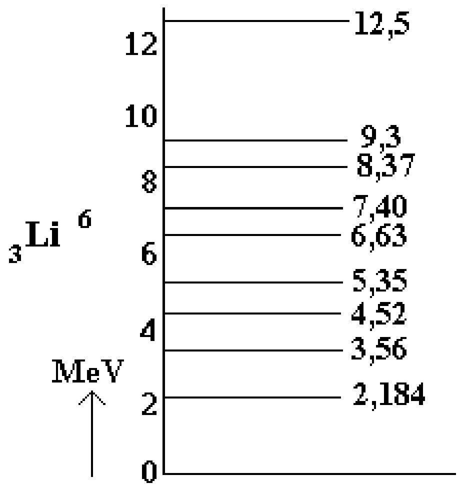
Once we have seen α particle, with its great stability, let us go to nuclei with a greater number of nucleons. We have $_2He^5$ and $_3Li^5$ with 5 nucleons. Both are unstable and decay as α + n and α + p respectively. α particle does not admit an isolated nucleon.

The only stable nucleus with 6 nucleons is $_3Li^6$. It seems natural that $_3Li^6$ would be originated by the union of an α particle and a deuteron, which is supported by the fact that the spin of $_3Li^6$ is h/2π, that is to say, the sum of the spins of α particle, which is zero, and that of deuteron, which is h/2π.

I consider it of great interest to speak about a new subject, which constitutes a new coincidence of this Theory with experimental Reality. We know that atomic nuclei present well determined energy levels, as well as orbital electrons of atoms. What can be the reason why different energy levels of atomic nuclei do exist? The reason is the different positions that the nucleons forming the nucleus may adopt.

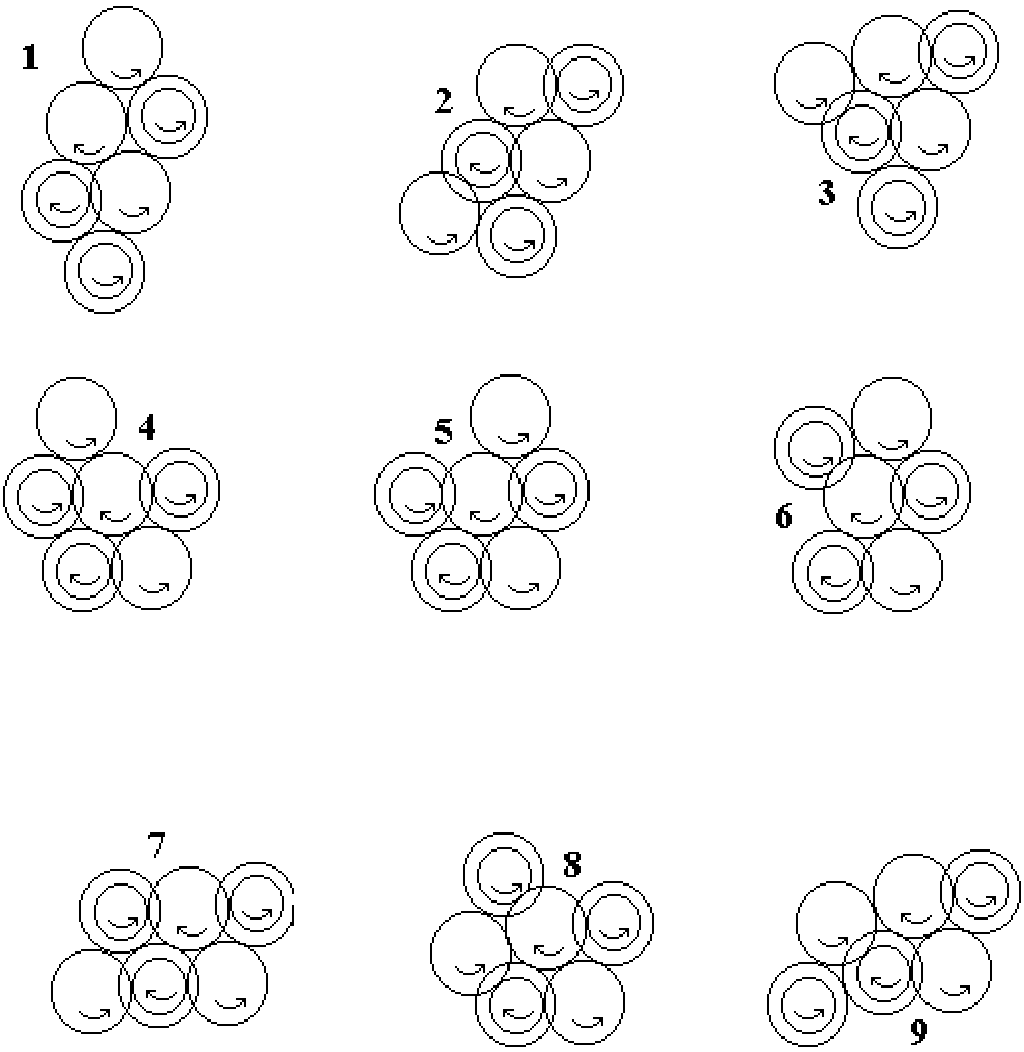
I have mentioned the stable nucleus of 6 nucleons, $_3Li^6$. Let us see what experimentation says about energy levels of this nucleus. I will mention again E. Segré in his book "Nuclei and particles" and the figure giving the energy levels of $_3Li^6$ is this:

We can see 9 energy levels. As I have said before, I think that this nucleus, having a spin h/2π, is formed by the addition of a deuteron and an α particle. $_3Li^6$ will be the result of incorporating a proton and a neutron turning in the same direction into the α particle.



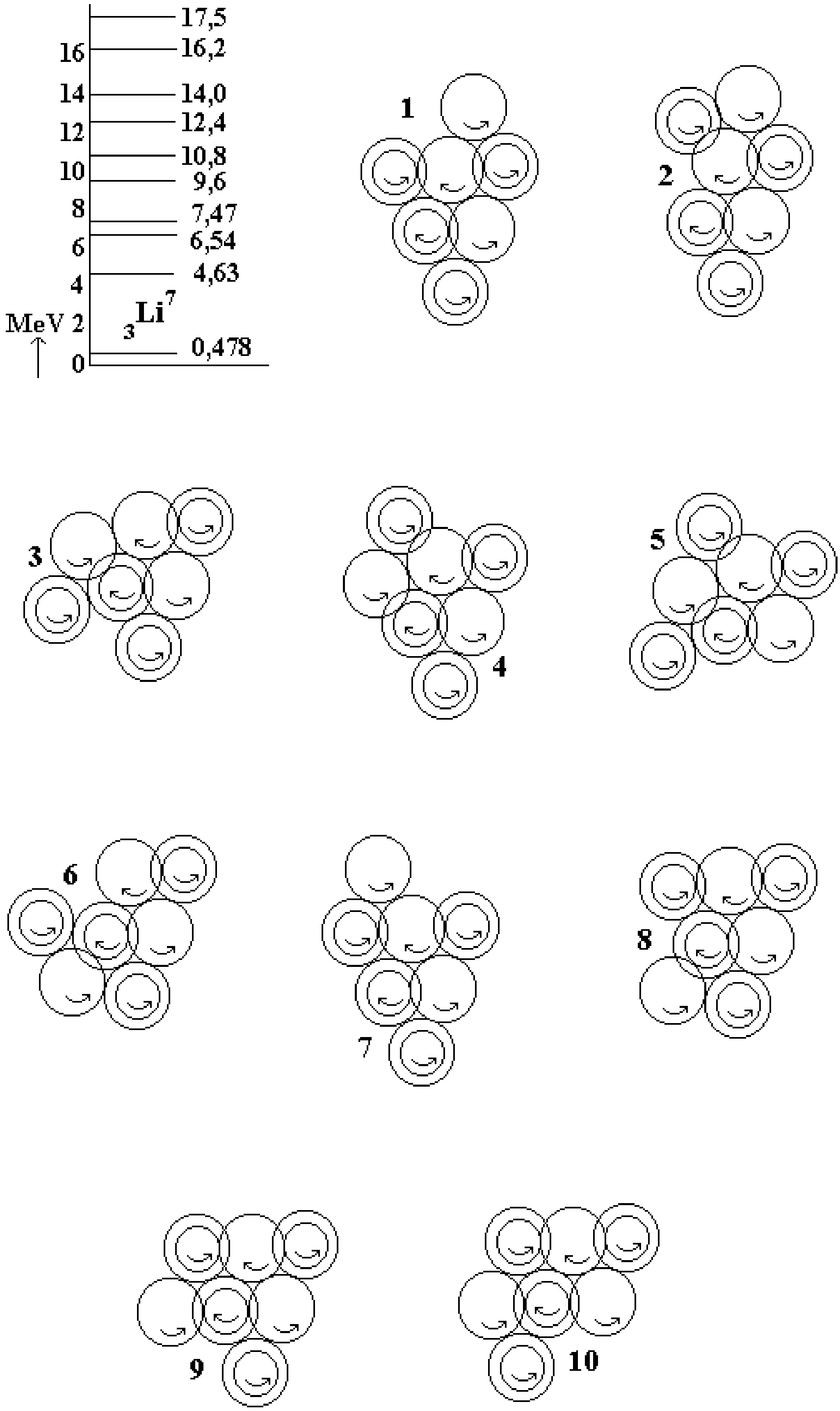
Taking into account the laws about union of nucleons deduced by this Theory, there are **only 9 ways** to incorporate a proton and a neutron turning in the same direction into an α particle. These ways are shown here. There is complete coincidence between the number of energy levels given by experimentation and those deduced by this Theory for

$_3Li^6$.



Let us see what happens to the sole nucleus with 7 nucleons, $_3Li^7$. This nucleus has a special interest, which I will try to explain: Its special feature is that it has a spin equal to 3h/4π, which means that there are three more nucleons turning in one direction than in the opposite direction. As the total number of nucleons is 7, there will be 2 nucleons turning in one direction and 5 nucleons turning in the other direction. This implies great disproportion.

Energy levels for $_3Li^7$ are represented in the next figure, according to the above mentioned book written by E. Segré. There are 10 energy levels. If we analyse all the possibilities of incorporating a proton and two neutrons turning in the same direction into an α particle, we will be able to see that there are **only 10 ways** to form the nucleus of $_3Li^7$, as shown here:


17,5
16,2
14,0
12,4
10,8
9,6
7,47
6,54
4,63
0,478
16
14
12
10
8
6
4
MeV 2
0
$_3$Li^7
1
2
3
4
5
6
7
8
9
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There is again coincidence between the experimental result and the result reached by this Theory. Nevertheless, the fact I want to point out here referring to the nucleus $_3Li^7$ is its special characteristic concerning what has been called "Barrier penetration effect".

In 1932, the same year in which neutron was discovered, the English physicists Cockcroft and Walton, both Rutherford's disciples, were successful in obtaining experimentally the reaction $_1H^1 + {}_3Li^7 = {}_4Be^8 = {}_2He^4 + {}_2He^4$. But maybe the most important characteristic of this experiment is that the accelerator they used, "the Cockcroft-Walton voltage multiplier", was only able to accelerate protons up to an energy of 0,6 MeV, lower than the Coulomb potential barrier of $_3Li^7$, which is 1,6 MeV. This effect, called "nuclear potential barrier", has been explained by means of the Wave Theory of matter. If a particle, without sufficient energy to overcome the Coulomb electrostatic repulsion, manages to reach an atomic nucleus, it is said that such a particle passes through a tunnel thanks to wave properties of matter.

The explanation given by this Theory is completely different. If we observe how atomic nuclei are formed, it is easy to see that there is no symmetry at all, especially when there is a great disproportion between the number of nucleons turning in one direction and the number of nucleons turning in the opposite direction; in other words, when the spin reaches a high number of units $h/4\pi$. In the case of $_3Li^7$, as the spin is $3h/4\pi$, there are 5 nucleons turning in one direction and 2 in the opposite direction. It is clear that there is a great lack of symmetry. But how does this lack of symmetry affect the process of the "nuclear potential barrier"? This will be seen in a new Article. The idea is: "Nuclear Potential Barrier" **only occurs** when there is a great lack of symmetry of the nucleons, which means high figure for the spin of the nucleus: $3h/4\pi$ for $_3Li^7$, 5 nucleons turning in one direction and 2 in the opposite direction.

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