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The Alternative to The Standard Model
Neutrino and Antineutrino
Matter and Antimatter

In this article I will try to show how this Theory sees the Neutrino. This Theory whose Principles are the product of reasoning based on experimental facts. As I have said, none of these Principles comes from the invention or chance. They are simple and all have a clear physical meaning. The consequences of the Theory, or if you will, the results of applying it, fully match the experimental reality.

But before we get into arguments about the subject I must say that neutrino, like the rest of simple elementary particles is rotating "goo", with two particularities: no electric ring and it only exists in motion, never at rest. And following the laws of this Theory, more energy means smaller size. This is the reason why modern physicists believe that solar neutrinos are missing.

Decay of fundamental particles - The search for the missing solar neutrinos

There are two kinds of decay. One is related to the strong interaction and the other is related to the electroweak interaction. The first kind of decay is extremely fast. The mean life of unstable particles subject to the strong interaction is in the range of h/E, according to Heisenberg's Principle. How does this Theory look at this known experimental fact? One of the fundamental Principles of this Theory is $E = h \nu$, thus $t = 1/\nu = h/E$ is a day on the time-scale of the particle. This Theory maintains that a particle joins another particle or a group of particles through the charge-rings. If this union is unstable, the separation or decay will take place within a time which must be in the range of the time it takes the particle to complete a rotation around its own axis, that is to say h/E. There is total coincidence with Heisenberg and the decay process through the strong interaction is explained on a simple physical basis.

The second kind of decay, the one related to the electroweak interaction, is much slower. How does this Theory explain this decay process, called weak? Simply by the emission of pairs of whirls, certain amounts of "goo", with spins always equal to $h/4\pi$ and opposite directions, so that the angular momentum law is not violated. What happens in β decay, when a neutron decays into a proton, an electron and a neutrino? What happens is that two amounts of "goo", each of them submitted to the laws of Matter Mechanics presented in this Theory, come off the initial whirl that is the neutron, formed by part of "goo" also submitted to the same laws. The initial whirl remains with less energy, which means lower frequency, and two new whirls are liberated. Note that there is no intermediary particle for the force called electroweak. This force doesn't exist. The decay is a consequence of instability between the two electric rings of the neutron both located on a plane. This instability disappears when the neutron electric rings are supported by the electric rings of other nucleons.

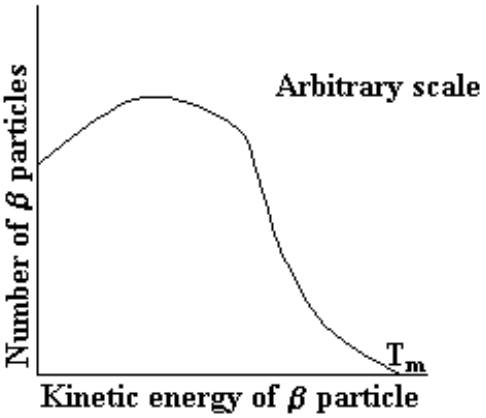
As the above decay cannot break spin constancy law, all decays of this kind must imply the formation of at least a couple of new whirls with opposite spins.

As electric charge constancy law must also be respected, the whirls share the existing charges in the form of electric rings or new couples of electric rings are created, as new shares in the allotment.

In the case of β decay, one of the whirls that come off carries away the negative electric ring of the neutron, becoming an electron and leaving the initial whirl converted into a proton. The other whirl, the neutrino, has no electric ring.

Let us remember that when a nucleus undergoes β decay, in contrast to α-particle energies, whose spectra are discrete mono-energetic "lines", the energy of the β particles from radioactive nuclei form a continuous distribution. A typical β spectrum is shown in the next figure. The energy spectrum shows that electrons are emitted anywhere from zero to some maximum energy T_m . The distribution is devoid of any indication of the mono energetic lines so characteristic of α decay spectra.

The maximum energy T_m of the known β particles varies from about 0,025 MeV to more than 15 MeV.



On the other hand we know that the energy of the neutrino is the part of that maximum energy T_m which has not been used by the β particle. In other words, the energy of the neutrino varies from less than 0,025 MeV to a few MeV, no more than 15 MeV. No doubt there is a great difference among electron neutrinos. Dr. John N. Bahcall, a specialist in solar neutrinos at the Institute for Advanced Study at Princeton N. J. recognizes that the most puzzling and controversial finding about neutrinos raises the possibility that some of them may have a mass at rest as great as 17 MeV. "The difference between this and other estimates of neutrino mass at rest, Dr. Bahcall says, is like the difference between a huge truck and a tiny pea".

According to the main law stated by this Theory, $2 \pi R E = h c$, the size of the neutrino is known for any given value of its energy. As the energy of the electron at rest is 0,511 MeV, the size of neutrinos varies from about 20 to 1/30 times the size of the electron.

If we look at the typical β spectrum shown above we see that most of the electrons emitted have energies from zero to 2/3 of the maximum energy T_m . This means that most of the neutrinos emitted have energies from T_m to 1/3 T_m .

As an example I shall show the maximum energy T_m of β particles emitted by different nuclei and the sizes of most of the corresponding neutrinos in comparison with the electron size:

Nucleus	T_m in Mev	β in Mev	neutrino in Mev	neutrino size electron size = 1
$_{82}Pb^{214}$	0,72	from 0 to 0,48	from 0,72 to 0,24	from 0,71 to 2,13
$_{83}Bi^{210}$	1,17	from 0 to 0,78	from 1,17 to 0,39	from 0,43 to 1,31
$_{87}Fr^{223}$	1,20	from 0 to 0,80	from 1,20 to 0,40	from 0,42 to 1,28
$_{89}Ac^{228}$	1,55	from 0 to 1,03	from 1,55 to 0,52	from 0,33 to 0,98

We see clearly that the order of magnitude of the neutrino is that of the electron. Some neutrinos are smaller than the electron and others are a bit larger, up to several times the size of the electron.

What will happen when neutrinos of different sizes travel a long distance as from the Sun to the Earth? It is obvious that large neutrinos coming from the Sun will have not much chance to reach the Soviet-American Gallium Experiment, called SAGE, in which 30 tons of the liquid metal gallium deep in a mine in the Caucasus Mountains serves as the detector. The large neutrinos simply collide with other particles on their way out of the Sun before they reach the SAGE. Only the smallest neutrinos are capable of reaching the Earth, but they are so small that they pass through it unhindered and undetected, except for a rare collision with matter. This is why the number of neutrino impacts in the experiment are much less than expected. Neutrinos differ in size and only the very small ones reach the place of the experiment.

This is what experimenters say about the subject in December 1991: "After years of trying to count neutrinos coming from the Sun, Russian and American scientists are becoming convinced that something strange is happening to these elusive subatomic particles on their way out of the Sun. Nearly all of them vanish, perhaps escaping detection by changing character. Virtually no solar neutrinos can be detected reaching Earth, even though the nuclear-fusion processes occurring at the Sun's core are presumably producing a profusion of these particles. Highly sensitive detectors on Earth should have identified the traces of at least 17 neutrino impacts over a six-month period; only three were found. These results strengthen the view among scientists that "**a "new physics" will have to be developed to account for the missing solar neutrinos**, one of the most puzzling and provocative mysteries in the physical sciences".

Dr. Thomas Bowles, a nuclear physicist at the Los Alamos National Laboratory who is working on the experiment suggests two possible explanations for the findings. Either scientists do not understand the Sun's internal operation as well as they think they do, or neutrinos change character after being generated by solar fusion, a conclusion that

would require major revisions of the Standard Model for the behaviour of particles.

Dr. John N. Bahcall, already mentioned in the previous page, said that he found the new evidence "very convincing" and that the most likely explanation involved **"some new physics, not new solar astronomy"**. He said this was the "overwhelming consensus" of physicists at a recent workshop on neutrinos. Bahcall has also said that "2001 to 2003 have been the golden years of solar neutrino research and that future measurements of the low-energy total fluxes, time dependences, energy spectra, flavour composition, and sterile component (if any) will contribute in an important way to understanding the physics of neutrinos".

Different detectors have been constructed in order to catch and count the elusive neutrinos coming from the sun. There is always a deficit of solar electron neutrinos in all the experiments carried out.

The production of neutrinos in the sun comes from 3 reactions:
- PP1 – p+p -----> D + positron + neutrino (less than 1 MeV; 0,26 MeV average energy); 91 % of the total flux
- PP2 – Be(7) + electron -----> Li(7) + neutrino (0,8 MeV average energy)
- PP3: B(8) --> Be(8) + positron + neutrino. The resultant neutrinos from this reaction have 7,2 MeV as average energy and maximum over 14 MeV; These neutrinos represent 0,01 % of the total flux of neutrinos coming from the sun.

The detector at Baksan (Russia) was designed to reach exclusively for solar electron neutrinos. In 4 months the Detector saw not a single neutrino.

The reaction in Chlorine detectors affects only electron neutrinos and produces Argon atoms. These detectors do not measure the energy of neutrino events. Can only detect higher energy neutrinos from side chains in the solar system: PP2 (0,8 MeV) and PP3 (7,2 MeV). Figures are average energy. Neutrinos interact with protons and produce positrons.

The reaction in Gallium detectors (GALLEX in Germany and SAGE in Russia) affects only electron neutrinos and produces Cerenkov radiation by electrons at high speeds. These detectors do not measure the energy of neutrino events. Sensitive to lower energies. Has observed PP1. Has read 80 units where 120 were expected.

Kamiokande (in Japan) Detector of **pure water** measured the rate at which electrons in the water scattered the highest-energy neutrinos coming from the sun. Water detectors provide specific information about the energies of the solar neutrinos. Only sensitive to higher energy neutrinos (> 5 MeV). Sensitive to all flavours of neutrinos. Neutrinos **collide with electrons**. **Higher flux of neutrinos PP3 (7,2 MeV)** coming from the decay of B(8) and less efficiency in counting them. The discrepancy was less severe than observed in the Chlorine detector.

Super-Kamiokande experiment reported the results of more than 18.000 neutrino-electron scattering events, increasing the number of previously reported solar neutrinos events by more than an order of magnitude. The results provide precise information about the total scattering rate as well as the recoil electron energy spectrum. **Observed about half as many events as were expected.**

SNO (Sudbury Neutrino Observatory) of **heavy water** in Canada. The reaction in Heavy Water detectors affects neutrinos of any flavour. First reaction: It affects only electron neutrinos and produces high-energy electrons that emit Cerenkov radiation. **Observed approximately one-third as many electron neutrinos as predicted**. Second reaction: Neutrinos of any flavour produce neutrons. Neutrinos **collide with nuclei** of heavy water. Comparing the two fluxes will show whether there are any muon or tau neutrinos coming from the sun. **Lower flux of neutrinos PP3 (7,2 MeV9).** SNO researchers say: "**we measure the total number of neutrinos**. **Neutrinos have changed from electron neutrinos into muon and tau neutrinos that are more difficult to detect".**

It is a fact that, from the point of view of detection, some electron neutrinos behave like muon and tau neutrinos. In other words, they are more difficult to detect.

First of all it should be made clear that most solar neutrinos have energies that are below the detection threshold for the water detectors. Water detectors are sensitive to only about 0,01 % of the neutrinos the sun emits. Researchers recognize that the remaining 99,9 % must be observed in the future with new detectors that are sensitive to relatively low energies.

Neutrinos detected by the SNO experiment come from PP3 reaction, the decay of B(8). And we have seen that these neutrinos represent only 0,01 % of the total flux of neutrinos coming from the sun. Then, the experiment that has led researchers to such a drastic solution of "the missing neutrinos" as to dynamite the Standard Model is dealing with a minimum part of solar neutrinos. Just 0,01 % of the total flux. More than 98 % of the solar neutrino flux lies below 1 MeV. It is the PP1 reaction, producing neutrinos with energy less than 1 MeV and 0,26 % MeV as average and covering 91 % of the total flux of electron neutrinos, the one that must be thoroughly investigated. I dare say that the results will be quite different and that the fact that the size of a single particle decreases proportionally with its energy must be considered.

Another problem for the proposed solution, apart from why and how this particular change, called "oscillation", takes place, is that it would require neutrinos to have mass (which they don't in current theories). This would imply New Physics. Most Physicists agree with that. Theorists have assumed that neutrinos have zero mass. But if they are to switch flavours, they must have some mass, what is against the Standard Model. This is what Sidney Drell wrote in a personal letter of explanation to John N. Bahcall in January 2003: "The success of the Standard Model was too dear to give up".

But where is this New Physics that will allow material particles to change flavours? Nobody has said a word about that. Physicists think now that some of the most basic assumptions of Physics may have to be re-evaluated. Kenneth Cande of the University of Pennsylvania says: "Neutrinos that transform flavours are behaving in ways never observed in particle accelerators, which simulate nuclear reactions at work in stars".

There is a New Physics that eludes this obstacle. One of the conclusions of the Theory proposing this New Physics is that the size of a single particle decreases proportionally with its energy. Neutrinos are moving mass and their sizes depend on their energy. High energy neutrinos are very small and atomic nuclei are very small targets. For the same

reason, all the energy of the Universe could have been concentrated in a single and incredibly small point.

What would happen if researchers come to consider this possibility? We all know that electron neutrinos coming from the sun have a very wide spectrum of energies. The already mentioned Dr. Bahcall, who is one of the researches who has announced the solution of the mystery of missing neutrinos, recognizes: "the most puzzling and controversial finding about neutrinos raises the possibility that some of them may have a mass at rest as great as 17 MeV. The difference between this and other estimates of neutrino mass at rest is like the difference between a huge truck and a tiny pea". He has also said: "We believe we can calculate the expected number of low energy neutrinos more accurately than we can calculate the number of high energy neutrinos".

The important fact is that some neutrinos are about 34 times smaller than an orbital electron, while others are several times larger than the same electron. Researchers could imagine that the large neutrinos, always present in great numbers in the 3 type of reactions, but mainly in the low energy PP1, will find much more difficult to cover the distance from the sun to the Earth detector without interfering with other particles of matter. Many of them will simply disappear on their journey. On the other hand, some other neutrinos are so energetic (so small) that they are very difficult to be detected by a system of collisions. Let us remember that the **average** energy of neutrinos produced in the sun is: pp, 91% with 0,26 MeV; Be(7) with 0,8 MeV; B(8), 0,01% with 7,2 MeV. And let us also remember that some of the projectiles are as large as a huge truck and others as small as a tiny pea, in the words of Dr. Bahcall. What he didn't know was that this fact is decisive when it comes to count the collisions between neutrinos and the matter in the detectors.

Another fact to be considered in the various experiments is not only the size of the projectile (the neutrino), but the size of the target. When the detector uses pure water the target neutrinos are looking for is an electron, while in detectors of heavy water the target depends on the type of reaction. It can be an electron or the nucleus of heavy water, that is to say, the deuteron, which is about 1.800 times smaller. Researchers working in the Super- Kamiokande experiment have reported the results of more than 18.000 neutrino-electron scattering events, increasing the number of previously reported solar neutrinos events by more than an order of magnitude. The target in this case was the large electron, not the small nucleus.

When an electron neutrino collides with its target, the reaction depends on the energy. If the detector device is sensitive to lower and higher energy neutrinos, the collision will produce one or the other effect, depending on the energy. But high energy events will take place very seldom as the sizes of the colliding projectiles are very small.

What is clear is that a New Physics is necessary. A New Physics capable of explainig the behaviour of neutrinos. The explanation lies in the fact that the size of a single particle decreases with its energy. This is not speculative. This is one more conclusion of a Theory that has predicted among other things the value of $h/4\pi$ as the spin of all single particles and the value of 2,21 MeV as the binding energy of deuteron.

As far as the subject whether neutrinos have some mass, we see that they are moving "goo", consequently they have mass and their energy is $m_v c^2$, where m_v is the neutrino

mass in movement. But we cannot think of their mass at rest because **they do not exist at rest**. We know that a moving mass m_v corresponds to a mass at rest m_0 so that

$$m_0 = m_v \sqrt{1 - \frac{v^2}{c^2}}$$

We can never figure m_0 out as v will always be unknown. It is not only that neutrinos do not exist at rest. We cannot even calculate what their corresponding rest masses would be. So, forget about the mass of neutrinos. It makes no sense to think of it.

Coming now to the question whether neutrinos could account for much of the unseen mass, or dark matter, that cosmologists presume must exist in the Universe, the explanation has been given in chapter 6 of Book "A New Physics for a New Millennium": the existence of infinitely small single particles with huge gravity. Neutrinos cannot account for the enormous amount of missing matter in the Universe. On the other hand we know that most of that missing matter must be right in the center of galaxies so that gravity can keep in orbit the whole mass of the galaxy. The only reason why we and our Solar System continue to turn on the verge of our Galaxy is the existence of a black hole in the centre and this black hole is simply a single particle with a huge mass and very small size turning at a tremendous frequency, following exactly the same law as any of the elusive neutrinos we have been talking about: $2 \pi R E = h c$.

Another point to be discussed is why the electron neutrino is the only one detectable with current instruments and tau and muon neutrinos are not detectable. The answer is that tau and muon neutrinos have much more energy than electron neutrinos. Tau and muon neutrinos are very small projectiles. If the smallest electron neutrinos, the only ones surviving on their way from the Sun to the Earth, are difficult to be observed in the experiments, it is evident that the tau and muon neutrinos, much smaller than the smallest electron neutrino, will always escape detection. The reason is just their size as they are moving "goo" following the main law of this Theory: $2 \pi R E = h c$.

Coming back to the weak interaction, it must be noticed that the time for decays based on weak interaction to take place is about 10^{-10} sec. That means, from the point of view of this Theory, that the necessary time for the formation of new couples of whirls, from an existing whirl, is about 10^{-10} sec. If we take into account that the frequency of nucleons is about 10^{23} , it is easy to see that in 10^{-10} sec, in other words, the decay time, the particle completes about 10^{13} turnings. That is to say, the formation time for new whirls through decay of an existing whirl is very long from the point of view of the particles. If we suppose, for the sake of comparison, that a turning corresponds to a day on the particle scale, the decay time is about 10.000 million years. We are, therefore, dealing with a very slow process from the point of view of the particle, accustomed to other types of quick processes, those connected with the strong interaction, which take place in about a day of the particle. In that slow process, part of the "goo" of the initial particle is emitted and segregated in the form of new whirls, each of them having a spin equal to $h/4\pi$.

In the case of the neutron, we find an anomaly. The decay time is much longer than that of other particles. But this does not mean that the decay process will last that time. On the contrary, it means that the neutron, due to its special characteristics of coexistence of two electric rings with opposite signs, remains stable for a mean time of only 16

minutes. But once its decay has started, the formation time of the two new whirls is about 10^{-10} sec.

The conclusion of this Theory is, then, that all decay phenomena connected with weak interaction are produced through emission of couples of whirls and that the formation time of those whirls is about 10^{-10} sec, which is extraordinarily long from the point of view of elementary particles.

It is convenient to distinguish the above described type of decay, connected with weak interaction, from the decay connected with strong interaction, that is to say, with the unions of particles through their electric rings. The time it takes electric rings to disconnect from each other must necessarily be about the same time as the time it takes them to complete a turning. Thus the time it takes an atomic nucleus to emit a nucleon should be about 10^{-23} sec. The process is about 10^{13} times quicker than decay connected with weak interaction.

When discussing Heisenberg's Uncertainty Principle under its form energy-time, we have seen how there are certain particles whose decay takes place through strong interaction and whose stable life-time is so short that their trail cannot be followed by particle detectors. In order to know their life-times Heisenberg's Uncertainty Principle must be applied. If we analyse all the above reasoning, we will see that applying Heisenberg's Uncertainty Principle can be equated with assuming that the stable life-time of the particle is equal to the time it takes its electric ring to complete a turning. I think that this gives physical sense to Heisenberg's Uncertainty Principle.

The life-times of some baryons, such as Δ and Δ' , have been deduced in this way, with the result that these life-times are less than 10^{-23} sec. This means that their turning frequencies are higher than 10^{23} , which corresponds to particles with more energy than nucleons have.

Heisenberg's Uncertainty Principle, as described above, is not applicable to particles that decay through weak interaction, that is to say, through the emission of couples of whirls. The reason is that this form of decay is not at all conditioned by the turning frequency of the decaying particle. However, in the case of decay through disconnection between electric rings, union-time should necessarily be about the same as the time it takes elementary particles to complete a turning.

So far we have seen interaction between particles through their electric rings, with or without contact between these rings, which implies that the interacting particles are more or less of the same size. We have also seen the decay connected with the so called weak interaction, through the emission of couples of whirls with opposite spins.

But there is another form of interaction between two particles. And it consists of collisions between two whirls, so that one of them submerges into the other, giving rise to some kind of explosion, which determines the emission of new whirls.

Let us imagine a high energy particle, submitted to great speed, which collides with a Hydrogen nucleus. To take a specific example, let us suppose that the incident particle is a proton submitted to energy of 20 GeV. Let us recall that, according to this Theory, a particle of 20 GeV has a size about 20 times smaller than a proton at rest. Then we have

a Hydrogen nucleus, a proton at rest with its normal size: whirl radius equal to 0,21 fermi. And the incident proton is about 20 times smaller. Let us imagine that the incident proton, point-like from the point of view of the Hydrogen nucleus, finds the latter in its way. Let us take into account the great difference between the densities of the two whirls. The density of the incident proton is much higher than that of the proton at rest, especially if the incident proton "manages" to go into the proton at rest along its turning axis, where density is minimum. We may think that the incident proton, with much higher density, much smaller size and speed very close to the speed of light, would submerge into the giant whirl found in its way, melting in it to become one single whirl.

I am not going to describe the mechanics of the process, that should necessarily be speculative, but we may draw the conclusion that, as one whirl goes into the other, a disequilibrium situation is produced, which will be solved by emission of couples of whirls. Each of the emitted whirls will have a spin equal to $h/4\pi$ and it will respond to the laws of Matter Mechanics:
- $2 \pi R E = h c$
- Equatorial speed equal to the speed of light

The process is of the same nature as the one described above when talking about β decay through weak interaction.

What will happen if the incident particle were an electron of 20 GeV, instead of a proton of 20 GeV? What should happen is that the process will take place exactly in the same way as when the incident particle was a proton of 20 GeV. In both cases we are dealing with whirls with similar characteristics. The only difference lies in the electric ring and the frequency accompanying the incident particle. But, as there is no difference between the size of the whirls, there will be no reason why the results of the collision would be fundamentally different. We can so understand the enigma arisen from experimental observation of incident high energy electrons and protons behaving exactly the same. I shall recall the already mentioned paragraph of the book "Unruly Matter": "It has been noted, in fact, that the energy distribution of the hadrons emerging from electron-positron collisions at high energies resembles nothing so much as the energy distribution of the particles emerging from very high energy proton-proton collisions. This observation has in turn suggested to some that the electron may be sensitive to the strong nuclear interaction within a radius of 10^{-16} centimetre. If this is true, it would appear that the electron, the best known of the lepton particles, that supposedly do not feel the strong force, spends part of its life as a hadron."

What has been said before concerning the behaviour of whirls, as constituents of all manifestations of matter, is applicable to all unstable compound particles, from baryons Δ, with mass more than double the mass of protons, spin $7h/4\pi$ and possibilities of electric charge -1, 0, +1, +2; up to mesons π, with mass about one seventh the mass of the proton, zero spin and possibilities of electric charge -1, 0, +1. I want to point out the important and transcendental fact that all particles have a spin multiple of $h/4\pi$.

That is logical, if we consider that all particles are formed by whirls, either isolated or in groups, the individual spin of each whirl being equal to $h/4\pi$. When the whirls are grouped forming a particle, they have their turning axes parallel or antiparallel. The spin of the particle will then have the value $(n_1 - n_2)\ h/4\pi$, where n_i is the number of whirls

turning in one direction and n_2 is the number of whirls turning in the opposite direction. If the difference between n_1 and n_2 is very high, the resultant spin will also be very high, as in the case of baryon Δ , the value of which is $7h/4\pi$. In other words, there are seven more whirls turning in one direction than in the opposite one. When $n_1 = n_2$, the number of whirls turning in each direction is the same and therefore the total spin is zero. That is the case of particles called mesons η, K and π.

As far as electric charge is concerned, the particle charge will be $(n'_1 - n'_2)$ e, where n'_1 is the number of whirls with positive charge, n'_2 the number of whirls with negative charge and "e" the value of the fundamental electric charge. It is clear that the values of the above electric charges are given as units of the fundamental electric charge "e". Obviously whirls with electric charge equal to zero do not affect the result.

Referring to the binding forces, which are necessary to keep the whirls together, they are of the same kind as nuclear forces.

We can therefore envisage all particles as formed by whirls, isolated or in groups. But all whirls are identical. The only difference between them, apart from electric charge, is the turning frequency. Those turning faster are smaller and have more mass. The enormous variety of particles that have been found through high-energy experiments and transformations of some particles into others can then be understood. These transformations are nothing but changes in the energy of the whirls, which implies changes in their masses, in their turning frequencies and in their sizes, as well as connections and disconnections of groups of whirls and energy emissions in the form of radiation, when the whirls modify their turning frequency.

Concerning the relationship between the existence of whirls and electric rings, there no doubt exists an intimate relationship which leads to the creation of new charge-rings, as new whirls are created, under certain conditions.

I am not going to discuss whether whirls engender charge-rings or vice versa and which is first. But the real fact is that both are there, intimately joined, except in the case of neutrino, which seems to be a stratagem of Nature regarding the spin invariability. Let us remember that we are talking about the two ultimate elements of matter, the material fluid or "goo" and the electric rings. This is something that has not any equivalence in the physical world as we know it now. We are at the very limit between the physical and the metaphysical worlds. Any question about what these two unique elements of matter are finally makes no sense. And to speak about lack of stability between these two elements makes no sense either. Does the material fluid engender the charge-rings under certain determined physical laws, although unknown? or on the other hand, do the charge-rings engender the turning of the material fluid for the constitution of particles of matter? I do not think this point is now important. The fact is that, by admitting their existence and their correlation, we can explain very anarchic aspects of matter behaviour.

The true fact is that, when matter is submitted to forced situations in the form of collisions, new particles with their corresponding electric charges are created. This really happens, whatever the correct theory about the innermost essence of matter may be. The creation of new electric charges is a reality which the successful theory in the end must face. This fact will not demolish the theory which will be able at last to

contain **Reality.**

Neutrino and Antineutrino - Matter and Antimatter

The fact that Matter can be annihilated constitutes one of the great mysteries of the Universe, when observed from our macrophysical positions. How is it possible that what we touch may disappear? Before trying to give an answer to this question, we must admit that the fact that this annihilation takes place shows clearly that Matter must necessarily have some characteristic that must be very far from the schemes of the macrophysical world.

No doubt, the day we get to know the true Reality of Matter, we will find some surprising facts about its innermost essence which will appear strange to us, since that rare characteristic of Matter has been so far unknown to us. It is obvious that, whatever the Reality of Matter may be, we will find strange situations as they will be new to us.

I think that a Theory, based on the existence of whirls made out of "something" turning as a sole manifestation of Matter should be able to give an explanation of the game played by Matter and Antimatter. This is an important point: there exists Matter; there exists Antimatter and both easily annihilate each other. If a Theory, with the above mentioned basis of turning whirls, did not give some explanation concerning the difference between Matter and Antimatter and some justification of the inconceivable fact of annihilation, that Theory would present a major flaw.

But I think that this Theory is, in principle, in condition to give an answer to those questions. Let us take into account what can be deduced from the simple principles enunciated by this Theory:

1. **Energy of all manifestation of Matter depends exclusively on movement**. More movement, more energy. When a particle is at rest, its energy depends exclusively on its turning frequency. When frequency tends to zero, energy also drops to zero.

2. When frequency tends to zero, size tends to infinity.

In the light of the above statement it is easy to imagine the annihilation of Matter as a "sudden braking" of the movement of particles, that makes the turning "goo" dilute itself with the Universe, without leaving any material trail.

But let us first distinguish between the concepts of Matter and Antimatter. A particle of Matter and its Antimatter, both at rest, cannot be distinguished, except through the signs of their charge-rings. Thus a positron is exactly the same thing as an electron, but the electric ring of the former is positive and that of the latter is negative. An antiproton is the same as a proton, but their electric rings are of different signs. Likewise an antineutron is the same as a neutron, but the signs of their electric rings are inverted, so that the exterior electric ring of antineutron will be positive and the interior one will be negative.

What happens to neutrino, the only alleged particle without charge-rings? According to what has been expressed so far, neutrino and antineutrino would be the same thing. But

something must be pointed out here: a neutrino cannot be imagined at rest; a neutrino is moving "goo" at a speed close to the speed of light.

According to this Theory a neutrino is simply another whirl, with the special characteristic that it only exists at a speed close to the speed of light. Neutrinos do not exist at rest.

One of the arguments presented against this Theory has been that neutrino, as it has no electric charge, would only differ from antineutrino in its turning direction. It goes without saying that, when the position of a particle is inverted in space, its turning direction is also inverted; but if the particle is moving and the direction of the turning axis coincides with the direction of the movement, the turning of the particle will be either dextrogyre or laevogyre, that is to say, it will turn like a screw or in the opposite direction. If we now consider the neutrino, a particle with spin $h/4\pi$, it may be dextrogyre or laevogyre. This conclusion is what has led some of my detractors to argue against this Theory by saying: "If the only difference between neutrino and antineutrino were their turning directions, both particles would be the same thing". And so they draw the conclusion that the way in which this Theory contemplates antimatter is too simple.

I shall again quote here E. Segré in his book "Nuclei and Particles": "It might seem, at first sight, that neutrino and antineutrino are strictly indistinguishable. The question whether neutrino and antineutrino are or are not the same particle can only be solved resorting to experimentation. Experiments that will be described later on will answer this question in a surprising way. The spin of neutrino is always antiparallel to its impulse. This property gives neutrino some characteristics analogous to those of a screw, thus introducing an asymmetry which is fundamental in its behaviour. It is obvious therefore that neutrino and antineutrino are different. The best way to describe this characteristic of neutrino is to resort to the helixity concept....Consequently, we may define neutrino as a dextrogyre particle and antineutrino as a laevogyre particle."

It should be noted that Emilio Segré, Nobel Prize in Physics "of the old times" (1959), speaks of the helixity concept in moving particles. Does not this indicate an internal rotation? How is it possible that modern physicists have accepted the idea of an electron as a point charge?

I shall also quote David B. Cline, Alfred K. Mann and Carlo Rubbia in their already mentioned article published in Scientific American: "In nature, neutrinos always spin in a characteristic direction: let us say left-handed for neutrinos and right-handed for antineutrinos."

A particle is defined as dextrogyre when it turns against the normal direction of a screw. It is said that its helixity is equal to -1. On the other hand, a particle is laevogyre when it turns in the same direction as an ordinary screw does. Then its helixity is equal to +1.

The above statement is not a conventionality of this Theory. It is a rule established by Physicists when they try to interpret the turning of elementary particles.

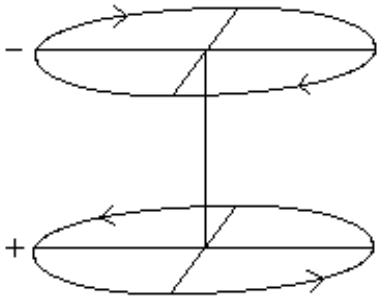
When I have mentioned here the concept of helixity, it has been assumed that the moving direction of the particle is coincident with its turning axis. What will happen when this is not the case; for example, when an orbital electron turns around an atomic

nucleus or when the deflection of an electron beam in an electric field takes place, as we have seen before? In order that no differential element of mass may exceed the speed of light, a certain deviation from the particle symmetry should take place, which does not prevent its spin from remaining unchanged. This symmetry deviation consists in a displacement of the internal turning axis of the particle. But this will be shown in a new post.

The above argument concerning the different helixity of neutrino and antineutrino removes the doubt of those who have considered the conclusions of this Theory about Matter and Antimatter to be simple. And now I shall try to explain how this Theory contemplates the Matter and Antimatter annihilation process.

It is well known that the annihilation of Matter is always accompanied by the emission of gamma rays, which are the result of the mass energy that disappears. But the emission of two or three gamma rays may take place. When particles face each other with opposite turning directions two gamma rays are emitted, each one corresponding to each of the annihilated particles. On the other hand, when the turning directions of the particles are the same, three gamma rays are emitted, the additional gamma ray corresponding to the inversion of the turning direction of one of the particles, so that they are in the right position, that is to say, turning in opposite directions.

It is clear that, for annihilation to take place, the two particles, apart from having the same energy, must turn in opposite directions. We must imagine the beginning of the process as two electric rings, with the same size but different signs, with coincident axes, as has been depicted in the figure.



It is easy to check that, under these circumstances, the strongest forces involved, electric as well as magnetic, are attractive and that these forces lead inexorably to the complete overlap of the two electric rings.

But what will happen to the whirl, the piece of "goo"? Before the overlap occurs, an interaction between the whirls will take place, precisely through the zones of less density, so that the turning "goos" submerge one into the other, as they are turning in opposite directions. One can imagine that this makes the two whirls lose speed, that is to say, the frequencies become lower and the sizes of the particles and the electric rings become greater. The increase in size causes a decrease in the density of the whirls. On the other hand, as the electric rings get nearer, forces become much greater and the immersion of one whirl into the other progresses; frequency decreases gradually and the size of the whirls increases.... up to the limit where frequency drops to zero and the

whirls, as well as the electric rings, are diluted into the Universe.

The sudden and brusque alteration of the electric rings is the origin of the emission of two gamma rays, with energy ν h, ν being now the frequency of the radiation.

No doubt the above process must be rather complex and subjected to a series of unknown laws which rule the behaviour of "goo" immersion into "antigoo"; but schematically the process must occur in this way. Any attempt to know the process in detail, at different stages, must be purely speculative.

What can be affirmed, if this Theory is correct, is that this is the mechanism Nature uses for converting turning frequency into radiation frequency, physical concepts which are completely different, but very similar in the way they take part in the value of energy E = h ν, valid for both radiation and Matter at rest.

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References:

E. Segré in his book "Nuclei and Particles"
David B. Cline, Alfred K. Mann and Carlo Rubbia in Scientific American