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Poster Session     Abstract  U71. 00237

## Introduction to a Unified Heuristic Quaternal Physics
### (Non Relativistic, Post Quantum, Inductive, Deterministic)
### (Toward a New, Absolute, Leaner, Lighter, more Inclusive Physics)
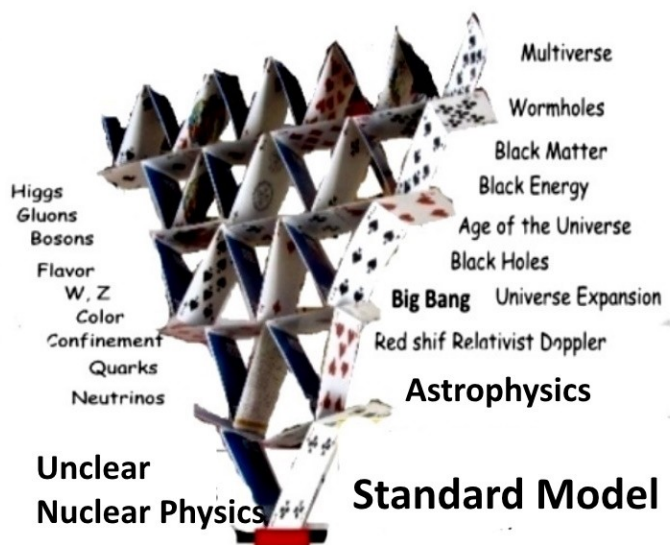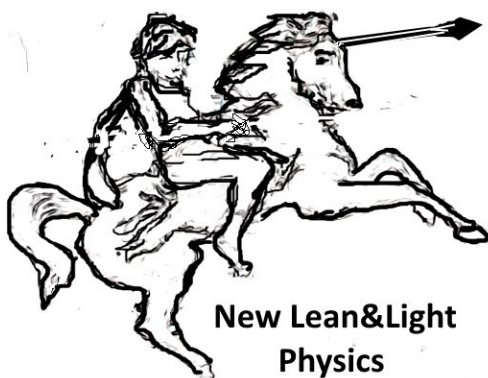
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*(My physical change over the years do illustrate perfectly the misleading relativistic error of linking space and time.  Matter is aging vs Time)*

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## Abstract
## Introduction to a Unified Heuristic Quaternal Physics

*Relativity and Quantum theories remain quite incompatible and forces are not unified. Anti and Dark Matter or Magnetic monopoles are not understood, Quantum computing and supraconductivity require near 0°K.*

*Fermi, in just 4 years did prove nuclear fission, but, so far, all controlled nuclear fusion experimental reactors have failed at producing a first kwh.*

*Physics, despite all its triumphs, is suffering, from its isolation from healthy competition by its total confinement in a hypertrophied Standard Model and its weakening by an opaque, stifling peer review system.*

*Far from these major concerns, my own starting venture toward a New Physics, stemmed from a serendipitous analogy between diphasic and dual wave/particle motions which struck me, in my early scientific career and led to challenge the relativistic base of  Physics, with*

*a New Hypothesis of the Complex Nature of Matter.*

*André Lichnérowicz did present it at the French Academy of  Sciences in 1994.*

*I have extended it into a quaternion based, new Physics, unifying relativistic with quantum results as well as electromagnetism with strong force and gravitation, defined as a residual purely electric force, modeling photons, electrons and protons with an updated Rutherford/Bohr Model and the neutron as a sub-hydrogen atom.*

"Tu crois, Albert, que la réalité existe?...."

**REALITY OF SPACE BUT,  NO PHYSICAL REALITY FOR SPACE/TIME**

# State of the Present Theoretical PHYSICS: based on  the Standard Model

Apparently barely noticed by its very busy community, Physics is nowadays threatened by deep clouds. After a century of quite amazing successes, Theoretical Physics, in front of the ominous threat of climatic changes faces exciting opportunities, stemming from dramatic challenges.

The utmost urgency, being clean and carbon free energy, somewhat surprisingly, seems to have, somewhat, caught it, off guard. So, old recipes are refreshed and rushed in,  like good old water electrolysis for hydrogen. Once threatened by Tchernobyl or Fukushima disasters, Fission Energy comes back on the front scene, with handy new smart, reasonably more safer, Small Modular Reactors...

But it is becoming clearer and clearer that, despite some recent energetic actions from freshly re-awakened plasma experts, Fusion Energy might be entirely missing the world green energy race.

<span style="color:red">Fermi took, only 4 years to master Nuclear fission.
But since 60 years <u>all controlled nuclear fusion attempts,</u> in the world <u>have failed</u> to produce a single kwh.  Giant ITER, in France will not be working until 2060, at best!  RISC in the US, will not be proven until 2035</span>

On theoretical grounds, Relativity and Quantum Theory remain totally incompatible. The Standard Model of Elementary Particles has over a century grown lavishly, without being neither audited, nor updated or challenged.  Still outside of the Standard Model, Obscure Strings and GUT Theories,  keep being developed, hoping to play a serious role in the near future, but they are still not validated

It is extremely important to point out, now, at this crucial point of evolution for Theoretical Physics, that the development of the Standard Model, has been, all along its history,  <span style="color:red">not based on direct experimental observations</span> of atomic and cosmic phenomena, of course, not yet possible, <span style="color:red">but are solely based on interpretations of these observations</span> with purely conceptual tools, interpretations, of course, stemming from brilliant physicists, often, later rewarded with Nobel prizes, so their interpretations seldom, and often, never challenged, became, practically untouchable!

I hope that my present challenge will show the urgency of launching a extensive Audit of the present Standard Model.

**Instead of formulating pure principles as basis of my Theoretical Physics, I state in this brief Summary, the properties and novelties stemming from challenging the principles and hypothesis or assumptions of the present relativistic Standard Model :**

**I list, some characteristics of my non relativistic dual/quaternal theory:**

**The laboratory is a good practical approximation of absolute rest!**
**The motion of earth, solar system, galaxy ...are almost always negligible**
**Lorentz formulae are ad-hoc formulae to comply with Maxwell's equations**
**Motion is an absolute objective phenomenon**
**Relativity is a subjective phenomenon**
**The velocity of light is a local optimum and constant.**
**Light is carried by the gravitational field of the earth**
**(This explains the null result of Michelson's experiment**
**Gravitation is a tiny residue of electric forces between proton and electron**
**Gravity is thus unified with electric forces**
**Gravity is a local constant**
**Inertial mass and gravitational mass can be different.**
**A particle at rest has an absolute inertial mass m°**
**Motion, Velocity, Energy are absolute phenomena**
**A moving particle is endowed with some extra i-material mass**
**Mass of elementary particles: complex/quaternions at low/high energy**
**Their mass at rest is real m° and the rest energy $E° = m°c^2$**
**The motion of the mass is due to an imaginary wavy mass m'**
**m' moves at the local speed of light which pulls the rest mass .**
**(Not to be confused with tachyons, supposedly, moving faster than c)**
**De Broglie's wave is not a pilot wave but a driving wave.**

**At low velocity the mass is complex $m* = m° + im'$ with $m^2 = m°^2 + m'^2$**
**The momentum balance at low energy, is $p = mv = m'c$ or $p° = m°v = m'c$**
**This gives two formulae $m = m°/sqrt(1 - v^2/c^2)$ or $m = m° sqrt(1 + v^2/c^2)$**
**( yields practically equivalent values up to 3c/4)**
**In the second model, the particle mass stay finite when v=c**
**At high energy the particle mass is a quaternion : $m* = m° + im' + jm'' + km'''$**
**with $m^2 = m°^2 + m'^2 + m''^2 + m'''^2$**
**m°, m', m'', m''' being respectively masses of rest, translation, spin, helicity**
**Inertial Mass can be real, imaginary or quaternal but is absolute**
**The neutron is an unstable sub atom of hydrogen**
**The neutron is a sub-gas**
**Neutrinos might not have any physical reality**
**The proton and neutron could be quarkless and gluonless**
**…...**

# DISRUPTING
# the Standard Model of Elementary Particles
# starts by challenging its relativistic roots
# and its Babel Tower kind of complexity.

## Awakening to a New Physical Reality



The theory of relativity last century did disrupt our concepts of matter and time, and was indeed, remarkably successful, but let's face it:

**The principle of relativity is false**

**Relativistic hypothesis and principles are quite unrealistic.**

**Conceived 20 years before de Broglie's wave/particle concept,**
**Relativity is incompatible with de Broglie's Dual Physics.**

Realistic moving Particles are not just, simple, spinless, pure point entities, straightly translating as simple inertial reference frames:

**REAL MOVING PHYSICAL PARTICLES ARE dual and wavy,**
**they have a complex mechanical structures, they spin and wobble**
The basic Lorentz equations are, actually, adhoc formulae!
Let's remember that they have been established primarily
**NOT as a real mechanism for the motion particles**
but to resolve the agonizing relativistic puzzle of Electromagnetism
(Maxwell's old equations, still remaining today unchallenged!)

**Despite its fruitful success the principle of relativity is false.**
**Dual Moving matter is different from Stationary Matter**
**Relativity  is only, a <u>subjective effect</u> .**
**Reality is objective . Motion is an absolute  mechanism**



(This was already, sensed and claimed, long time ago by Descartes who used to joke at relativity believers by saying:
**“*When my neighbor comes running to see me*
*He is all red and breathless, not me…*
(He, even, did speculate on the immaterial matter of our thoughts!)**

**The paradox for Relativity, historically very useful and fruitful theory,  is that, even though based on false principles, it still has yielded so important  results seeming to confirm it!**

**In this presentation,again,  I enter the fray, with my own kind of Rutherford's approach, (which Feynman  downgraded as simplistic ). On the contrary, I claim and intend to prove , that present Theoretical Physics is nowadays betrayed not by the observations, but, as in Ptolémée/Copernic dilemma, by their wrong mathematical interpretations.**
**My new concepts based on the interpretation of de Broglie wave/particle duality with complex algebra, allow me to build a new theoretical basis for the motion of the dual wave particle .**
**The motion of the two material elementary particles the proton and the electron, involves a complex mass, with a real inertial mass pulled by an imaginary wave mass moving at the speed of light.**
**Their structure can be defined by a re-actualized Rutherford approach excluding the need for quarks or gluons.**
**The photons appear as pure imaginary matter, moving at the speed of light, which is a local constant, linked to the gravitational field and move with it thus allowing Michelson's null result.**
**s**

# ROUGH SKETCH of my ABSOLUTE  Dual Physics
## (compatible with most well confirmed results )

My new theory evolved from my serendipitous observation of a surprising **experimental analogy**, between the  diphasic motion of a sample in gas phase chromatography and de Broglie's dual  wave/particle duality.

This led me to propose an **Hypothesis of the Complex Nature of Matter**   to the *French Académie des Sciences, thanks to André Lichnerowicz,  in 1994,*
**My Hypothesis rejects the principle of relativity.**

**I consider the motion of a dual wave/particle as an absolute mechanism independent of any reference frame. Absolute velocities can be measured with respect to the laboratory frame.**

**My Dual Mechanics for de Broglie's wave/particle motion, rejects the principle of relativity with a concept of dual mass.**

**It is necessary to differentiate the inertial mass of a moving particle  from the associated imaginary wave mass moving
at the speed of light like light waves.**

**I shall deal  later about the concept of the gravitational mass
and of its relationship with the inertial mass, as well as the physical meaning of the modulus of the complex mass.**

**I make the hypothesis that moving dual matter is complex, thus meaning that the motion of the dual particle inertial mass is ensured by an imaginary wavy mass pulling  the particle.**

**So, I express the duality of a moving particle,**  with complex algebra by postulating  two masses for the moving dual particle:
**an inertial real mass**  linked to a **wavy imaginary mas**s moving at the velocity of light and pulling the real mass, each aging according of their own time, thus leading also to the dual concept of complex time.

The velocity of the wavy mass **c** is the local velocity of light,

# COMPLEX THEORY of DUAL WAVE/PARTICLE MOTION

**I postulate that de Broglie's dual wave/particle has a complex mass**

$$m^* = m° + i\, m' \quad (\text{with } i^2 = -1)$$

**m° is** the real inertial mass of the particle equal to the mass at rest
**m' is** the imaginary mass of the wave
**m'** is an **i-material mass,** moving at the local **speed of light**, **c**.
The mass modulus of the wave/particle is then given

by $\quad m^2 = m°^2 + m'^2 \quad$ so $\quad m = \sqrt{(m°^2 + m'^2)}$

As a second postulate, the momentum **p** of the wave/particle is given by a straightforward momentum balance:

$$p = mv = m'c$$

**My two hypothesis surprisingly lead to the relativistic mass dilation!**

$$m = m° / \sqrt{(1 - v^2/c^2)}$$

**as well as to the other famous relativistic total energy :**

$$E = mc^2 = \sqrt{(m°^2 c^4 + p^2 c^2)}$$

**de Broglie wave-length and wave energy are now related by**

$$\lambda = h/mv = h/m'c = c/f$$
$$E' = m'c^2 = hf$$

**Thus my hypothesis unifies relativistic and quantum formulae**
**while ignoring any relativistic conditions!!!**
I, thus unify relativistic results with Planck's quantification et de Broglie's particle/wave duality without any relativistic conditions, without calling Lorentz Formulae, nor inertial reference frames...so rejecting relativity.

The revolutionary new conclusion is that:
**the basic laws of particle physics stem from the fact that**
**de Broglie's wave is an i-material mass driving the particle**
**without any relativistic hypothesis**

**Mass dilation**, instead of being a purely relativistic effect, stems actually, from the presence of a driving i-material mass pulling the inertial rest mass of the dual wave/particle.

**The masses of the wave/particle do not add up arithmetically but according to complex algebra, not to any relativity!**

# Space and Time are totally independent

## Space is Real

 it is a **Real** entity independent of **Mass** and **Time,**
**unable to undergo Curvature: SpaceTime is a false concept**
The real and imaginary masses being always linked together the same distance
**L** is traveled by the real and imaginary part of the mass.


 **TIME ;**
 **It is a complex entity.**
**The real and imaginary masses m° and m' age according to times t° and t'**
So, I introduce  **for a complex mass  a complex time t\***
$$\text{t*= } \text{t°+ it' } \text{ such that } \quad L = vt = ct'$$
with a **real time t°**  for the **inertial real mass**
      an **imaginary time t'**  for the imaginary wavy mass
and a time modulus
$$t = \sqrt{\left(t^{\circ\,2} + t^{\prime\,2}\right)}$$
 **T**he **time  balance** gives     **L = vt = ct'**

so     $$t = t^{\circ} / \sqrt{\left(1 - v^2/c^2\right)}$$

which yields the familiar relativist formula for time dilation
         **without relativistic assumptions!**

## Second  Dual COMPLEX model, (for low energy particle)

In my above model, as in  relativity , the mass becomes infinite when the
velocity v reaches the speed of light c.
At first sight, it might appear reassuring to retrieve all famous relativistic
results. But new studies, led me to a major change

 My first momentum balance for a dual wave/particle
$$\text{p= m'c = mv  with }\quad m = \sqrt{\left(m^{\circ\,2} + m^{\prime\,2}\right)}$$
did actually imply that the imaginary mass m'  is pulling, not only the inertial
rest mass m°, but also part of its own moving mass, since **p** the momentum of
the dual mass is equal to the momentum of the wavy mass. In other words in
my first model the wave is somewhat pulling itself, which is contradictory,
since it seems obvious that the wave mass move naturally, by itself and thus
does  not need to spend any  energy for its motion.

# SECOND MODEL OF COMPLEX DUAL WAVE/PARTICLE

My above model, introduces the concept of two types of mass, for the dual moving wave/particle: a real material mass which can be considered inertial and an i-material mass which can be said energetic.
In addition, the modulus of the complex dual mass can be the measurable complex moving mass combining the real and imaginary masses as

$$m = \sqrt{(m^2 + m'^2)} \; with \; p = mv = m'c$$

In a second model, conceived many years after the above one, dual motion is still ensured by an i-material moving mass pulling the inertial mass, but it takes into account the fact that actually, I still have

$$\mathbf{m* = m° + i \; m' \; ( \; with \; i^2 = -1)}$$
$$\mathbf{m^2 = m°^2 + m'^2}$$

**but the momentum balance, now, takes a new form**

$$\mathbf{\color{blue} p = m°v = m'c} \qquad \mathbf{(not \; \color{red} p = mv = m'c)}$$

**( this states the fact that the wavemass is naturally pulling itself)**
**(since it keeps moving naturally at the speed of light. At all times)**

This slight change has an enormous effect on Physics:
the total moving mass modulus is now, expressed as :

$$m = \sqrt{(m°^2 + m'^2)} = m° \sqrt{(1 + v^2/c^2)}$$

**The dual wave/particle can reach the speed of light with a finite mass!**
**At the speed of light the wave/particle mass remain finite:**

when v=c :

$$m = m° \sqrt{(2)}$$

**If further imaginary mass is added, the velocity stays constant, always equal to c, which is a local constant linked to the local value of the gravitational constant.**

**Above I discuss the difficult problem of differentiating the new potential differences between inertial mass and gravitational mass due to the new complex treatment**

## PHYSICS  AT HIGH ENERGY:

## QUATERNAL WAVES/PARTICLE

**In order to account for the  spin and the helicity** of an electron as a moving wave/particle, I extend  my model  with the use of    **quaternion algebra:**

**instead of a single de Broglie's wave,**
**I associate 4 waves to a moving  particle**
**thus opening a quaternal wave/particle physics**

**An inertial wave with**      **a     Compton wavelength**
**A translation wave with   a    de Broglie wavelength**
**A spin wave with            a          Spin wavelength**
**A helicity wave with       a     Helicity wave length**

**To these 4 waves I associate 4   quaternal masses**

**the inertial mass          $m°$**
**the translation mass    $m_T$  such that   $m_T v_T = m°c$**
**the spin mass            $m_S$   such that   $m_S v_S = m°c$**
**the helicity mass          $m_H$  such that   $m_H v_H = m°c$**
**with**

$$m^* = m° + i\,m_T + j\,m_S + km_H \text{  and  } i^2 = j^2 = k^2 = -1$$

**and**                 $$m^2 = m°^2 + m_T^2 + m_S^2 + m_H^2$$

 **which can be expressed as:**

$$m = m° \sqrt{\left(1 + v^2_T/c^2 + v^2_S/c^2 + v^2_H/c^2\right)}$$

**and  as:**
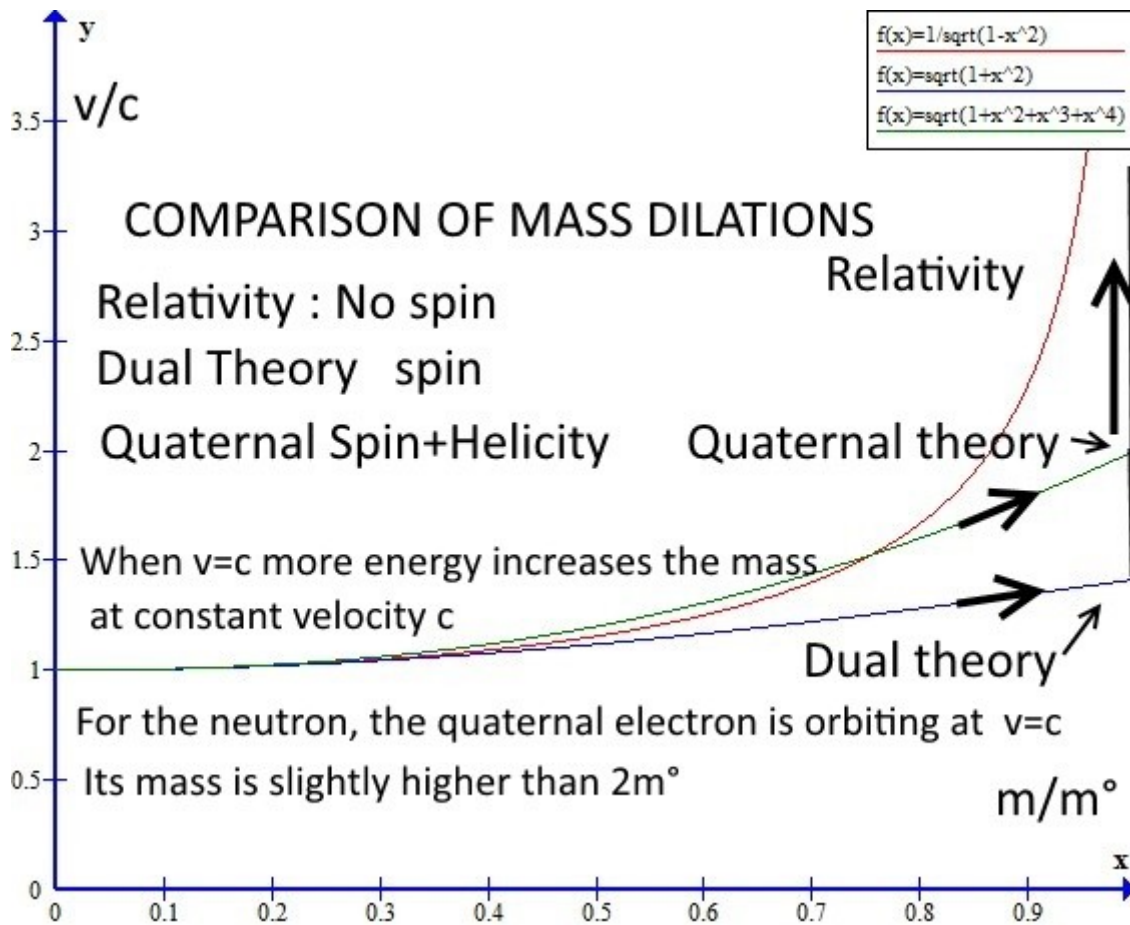
$$m = m° \sqrt{\left(1 + v^2_T/c^2 + v^3_T/c^3 + v^4_T/c^4\right)}$$

**When  vT = c  then m = 2m°**

**This is  a big change with respect to the first model.**
**When the  velocities of translation, spin and helicity equal c, wthe total mass is doubled. When the energy increases, the mass keeps growing at constant velocity  c.**

# COMPARISON OF MASS DILATION



The Dual Theory  concerns low energy wave particles
The Quaternal Theory brings spin and helicity for high energy
The particle velocity can reach the speed of light.
Its mass is doubled at the velocity of light.
For larger energy the velocity stays equal to the speed of light, but its mass keeps growing.
This is very important for the development of quantum computers, because the spin can be perturbed by helicity.

On the graph, we see that all the models give almost identical results for velocities less than c/2 , but they diverge for higher velocities. At the velocity of light, the relativistic mass becomes infinite, but never reaches c.

 The dual complex model is not valid for velocities greater than c/2. The quaternal model, allows to treat all velocities and to take into account, the spin and the helicity.

# Dual/Quaternal Unified Elementary Particles
# Minimal  Sketch

Unconvinced by the huge Standard Model of elementary particles,
(which has, sometimes been called a Zoo of elementary particles)
    and strongly focused on Ockam's principle of parsimony
 I need to open a new path with rough ultra simple models.


My goal is not to compete for precision with many more digits but to conceive
a simpler structure for a least number of particles in the spirit of Rutherford,
himself very critical of the playing with mathematical symbols instead of
enciphering the secrets of Nature


        I  define only 3 fundamental elementary particles:
                    electron, proton, photon
            with their real and/or imaginary masses.
        I extend to them Rutherford's model for the Hydrogen atom.
    I postulate their inner structure as an inertial massive entity spinning at the
speed of light, with a radius related to its kinetic moment

$$mcR = \hbar$$

With this simple model, the radius of  the spinning particle  can be  obtained
from the measured magnetic moment:

$$\mu = ecR/2$$

For the electron  and the proton the magnetic moments are, respectively

$$\text{electron } \mu_e = 927 \ 10^{-26} \text{ J/T}$$

$$\text{proton } \mu_p = 1{,}4 \ 10^{-26} \text{ J/T}$$

So their respective radius is

$$R_e = 386 \text{ fm}$$

$$R_p = 0{,}64 \text{ fm}$$


The space inside the particles is empty.
There are no quarks, no gluons, inside the particles.
**The center of the proton is empty and quarkless**
The photon is an imaginary mass m' ejected by the electron during a transition
to a external orbit, which can be easily computed

# UNIFICATION OF GRAVITATION with the ELECTRIC FORCE

I define gravity as a a very slight residue of electric force between opposite electric fields of the proton and electron.
The gravitational constant is an averaged between the forces of all the atoms of the two masses. So it can be a local constant.
I postulate that the photons are carried by the gravitational field so they are not sensitive to the motion of the earth, in Michelson's experiment.

## MODEL OF THE FREE NEUTRON
**My new theory yields a big change for the free neutron**
The neutron is not an elementary particle, but a subhydrogen atom
**I model the free neutron as an electron spinning around a proton at velocity c on an unstable orbit, with a mass of about 1.3 MeV, attracted by the strong force, 137 time stronger than Coulomb's electric force.**
**My model yields a good approximation of the mass of the neutron, and of its magnetic moment.**
**I thus update Rutherford Bohr's hydrogen model.**
**THE FREE NEUTRON IS NOT AN ELEMENTARY PARTICLE**

# The free neutron is a sub-atom of hydrogen
 **The radius of its orbit is about 1.4 fm**
Applying Feynman's life time t= h/E for a particle yields a rather good order of the free neutron life time .
**The electric dipole moment, is rigorously equal to zero,** since the proton and electron have the same center of mass.
A flux of free neutron can be considered a flow of unstable gas subatoms
Neutrinos might have no physical reality
## The neutron is quarkless since the proton and the electron are Quarkless

### Brief presentation of the model for the proton
I treat the proton as a positive charge of radius 0.2 fm spinning on an orbit of 0,2 fm at the speed of light. Th proton radius is of the order of 0.6 fm and the magnetic moment μ= 1.4 $10^{-26}$ J/T.

**Neutrinos :** The instability of the free subatomic neutron, seems to indicate that the bond can break down, at different orbital level, so its escaping energy can vary, without any need of introducing another particle, like the neutrino who might not exist. **So beta decay could be Neutrino-less!**

# Unification of Gravitation with the Electric Force

For unifying gravitation and electric forces in my new Physics, I reject entirely
the relativistic astrophysics of the Standard Model.
I interpret Michelson's experiment as showing that the photons emitted on earth
are carried along by the gravitational field of the earth ( as in the old Stokes
hypothesis, confirmed by  Fizeau's experiment of light transported by moving
water).
In my treatment I reject the reality of a curvature of space.
Space is completely independent of  matter.
Space/ Time has no physical reality. It cannot be curved by matter.
I consider gravitation as an attractive tiny residual electric force
 between the opposite electric fields of the protons and electrons in neutral
matter . The residual Coulomb's law, identified with the gravitational law
becomes:

$$F = \beta^2 e^2 / 4 \pi \epsilon^\circ R^2 \text{ with } \beta \text{ of the order of } 10^{-18}$$

For an aggregate of independent particles, a planet for example,  de Broglie's
law becomes independent of the mass of the aggregate and we can define a
astro/de Broglie's wave length as

$$\Lambda = H / V$$

H is an astro Planck constant  and V the orbital planet velocity
The quantification for a system of planet n can be written:

$$R_n V_n = n H$$

For  the solar system, this law gives as quantum numbers for Mercury n=3 ,
Venus n=4 , Earth n=5, and Mars n=6, with about 10% accuracy.

 (This quantification was also obtained, earlier, by Laurent Nottale, with a
totally different fractal theoretical approach)

 So gravitation appears confirmed as a residual electric force, a very complex
average,  between the electric fields of protons and electrons in matter.  It
becomes very likely that it should depend on the local structures and geometries
of atoms.
Gravitation seems likely to be local constant and should slightly vary between
materials So the equality between the gravitational and the inertial mass cannot
be ascertained. This  could be very important for the fusion of light elements

This uncertainty could perturb the values of mass spectrometry and might play a role in the evaluation of mass defects for the fusion projects.
Hence three potential discrepancies stem from my rough approach compared with the Standard Model approach. This is especially important for the controlled fusion projects of light elements :
1) the neutron is not a particle, so : what is the real structure of the nucleus?
2) are the mass defects really corresponding to fusion energy?
3) neutrinos might  not exist!

# Rough CONCLUSION

**The rough sketch of my New Absolute Physics is slowly improving**

**and progressively being updated**

**But it already shows that
Theoretical  Physics Needs a complete audit
of the
Standard Model hypothesis and conclusions
and its opening to competition.**

It is of vital importance for the future of controlled fusion.

**There is clearly a huge energy stored in the nuclei.
The problem is how to harvest it peacefully and efficiently
Present fusion theoretical models might be misleading and missing the goal
because of the hypercomplexity of the Standard Model of the nuclei.**

**New reactor designs
should be, urgently, independently tested.**

# Brief SUMMARY
## of the
# Some Impacts of
# my DUAL/QUATERNAL, Non Relativistic PHYSICS
# on the present Standard Model

My new approach complex algebra model of the wave/particle dual nature of matter at low energy,  quaternal at high energy (due to spin and helicity) allows to unify the strong and electric forces but leads me
## to rejects  many basic concepts of the Standard Model :

1) the principle of relativity
2) the absolute value
2) the physical reality of gravity as a curvature of space/time
3) gravitational and inertial mass equivalence
4) the Constancy of the velocity of light
5) universal value of the velocity of light
6) the physical reality of quarks/gluons
7) the physical existence of neutrinos,
8) the neutron as an elementary particle,
9) the role of the Higgs Boson in mass creation
10) the physical reality of the nuclear mass defect.
 ….