SYDNEY D'AGVILO

INTERVALIC THEORY

THE INTERVALIC STRUCTURES
OF SUBATOMIC PARTICLES AND
THE LAST FOUNDATIONS OF PHYSICS

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TABLE OF CONTENTS

IN MEMORIAM

ALBERT EINSTEIN
(1879-1955)

Chapter 0

Abstract

(by way of introduction):

INTERVALIC THEORY IN PHYSICS

The Intervalic Theory is the major paradigm shift that has occurred in the history of mankind, affecting all disciplines. It was originally postulated by Sydney d'Agvilo in 1987 in the field of Music, in 2005 in Physics, and in 2016 in the Economy, disciplines that respectively represent the bastions of the three major branches of knowledge: the arts, the hard sciences and social sciences.

From a historical standpoint the Intervalic Theory closes, in the most unexpected way, the long gap existing between relativity and quantum mechanics, two theories of Nature that are mutually incompatible: the first one, of *geometric* nature; the second one, *probabilistic*. Most physicists have been working for decades on trying to discover a theory of everything which includes relativity in the quantum paradigm. On the contrary, the Intervalic Theory has surprisingly formulated a theory of everything absorbing the correct parts of quantum mechanics within the relativistic paradigm, which from now on is also encompassed in a theory of everything more general: the Intervalic Theory, which converts all Physics in geometry. This means the failure of the probabilistic conception of knowledge and of the world, and the triumph of the geometric vision; or in other words, the failure of pseudo scientific *empirical-inductive* method, and the triumph of true scientific method *par excellence*, the *logical-deductive* one.

Intervalic Theory, in any medium, is based on a single axiom: the *intervalic axiom*, which simply states: "an interval exists". In physics, branch that enjoys precedence over all others for obvious reasons, because it is what explains the generation of the Universe, the intervalic axiom means that a one-dimensional space line —an interval—, is the only thing whose existence is postulated before the creation of the Universe, when there was absolutely nothing, that is, neither matter nor energy, time or three-dimensional space, much less the so-called "quantum vacuum". The existence of a linear space interval necessarily implies the existence of mathematics. Well, from the mathematical logic and a space interval of any length there will necessarily generate time, energy, matter and all the Universe we know. That interval is the *intervalic length*, $\hbar$, very similar to the Planck's length value, although it could have taken any other value and the Universe thus created would be identical and indistinguishable to the current one because all physics constants —including the elementary charge— are not fundamental indeed, but they are logically derived from the only two fundamental constants of Nature, which compose the *intervalic dimensional basis* of the intervalic system of physical quantities (and because you can not measure anything from "outside" the Universe).

The interval axiom determines an *intervalic dimensional basis*, which is different and *not equivalent* to the traditional ones (comprising length, mass, time, etc.), being composed exclusively of length, L, and the imaginary number $i = \sqrt{-1}$, both derived from the intervalic axiom. Alternatively, the intervalic dimensional basis can also be deduced logically and necessarily from the definition of *time* as *imaginary space* ($T = i$L), which is the definition of time that was originally postulated in the Intervalic Theory in Music.

The *intervalic dimensional basis* shows the astonishing fact that the equation of dimensions of the two fundamental constants of Nature, namely Planck's constant, and the speed of light, *c*, respectively coincide with the two elements comprising the intervalic dimensional basis (L, *i*), being L the dimension of $\hbar$, and *i* the dimension of *c* (or i^{-1}, which produces an identical dimensional system). The systematic combination of L and *i* generates logically the intervalic group of all existing physical quantities, which are exactly 40. As each and every one of the physical quantities thus generated is a certain combination of $\hbar$ —the *quantum* of length— and c —the *limit* of speed and of energy at subatomic scale—, we have got the remarkable result that all physical quantities are simple combinations of the two fundamental constants of Nature, $\hbar$ and c, and therefore all of them are geometrically delimited by a lower mark —*quantum*— or a higher mark —*limit*—. This means that *there can not be infinite values for any physical quantity*, and not only for speed or action, as believed by quantum mechanics. This means, for example, that there are no infinite masses or energies, which implies that singularities can not exist (black holes) as they are described by some science fantasy tales that make an improper use of relativity. In fact, the intervalic cosmology, closely linked to the particle physics theory, shows what is the intervalic structure of very massive stars, which are described using some equations common to subatomic particles, being this study a fascinating branch of the Intervalic Theory which explains a lot of astronomical phenomena in a completely unattainable way for quantum mechanics.

Traditional systems of physical quantities and units do lack of epistemological range, meaning that two *distinct* physical quantities can have the *same* equation of dimensions, that is to say, the equation of dimensions of a physical quantity is not significant except formally. By contrast, the

INTERVALIC UNITS, INTERVALIC QUANTA, INTERVALIC LIMITS

Inter. dim.	*Physical quantity*	*Definition*	*Rank **	*Value showing the equivalence between intervalic units and SI units*	*Inter. dim.*	*Physical quantity*	*Definition*	*Rank **	*Value showing the equivalence between intervalic units and SI units*
1	Permitivity	$\boldsymbol{\varepsilon}_\mathbf{I} = c^{\pm2}\mu_0^{-1}$	c.f.	$1/4\pi\ (1) = 8.85418781\cdot10^{-12}\ (\mathrm{F\ m^{-1}})$	$i\,\mathrm{L}^{-2}$	Area density	$\boldsymbol{\Delta}^\mathbf{2}_\mathbf{I} = c^{-1}\,\hbar^{-2}$	a.l.	$1\ (i\,\mathrm{L}^{-2}) = 2.993302893\cdot10^{59}\ (\mathrm{kg\ m^{-2}})$
	Molar gas constant	R	c.f.	$1\ (1) = 8.314510\ (\mathrm{J\ mol^{-1}\ K^{-1}})$		Inflexion	$\mathbf{i}_\mathbf{I} = c^{-1}\,\hbar^{-2}$	a.l.	$1\ (i\,\mathrm{L}^{-2}) = 2.993302893\cdot10^{59}\ (\mathrm{m\ s^{-3}})$
	Boltzmann constant	$k_B = R/N_A$	c.f.	$1\ (1) = 1.380658\cdot10^{-23}\ (\mathrm{J\ K^{-1}})$	$i^{-1}\mathrm{L}^{-2}$	Surface Tension	$\boldsymbol{\sigma}_\mathbf{I} = c\,\hbar^{-2}$	a.l.	$1\ (i^{-1}\mathrm{L}^{-2}) = 2.690246477\cdot10^{76}\ (\mathrm{N\ m^{-1}})$
	Momentum	$\mathbf{p_I} = \mathbf{m_I}\,\mathbf{v_I} = = c^{-1}c$	s.l.	$1\ (1) = 1\ (\mathrm{kg\ m\ s^{-1}})$	L^3	Volume	$\mathbf{V_I} = \hbar^3$	q.	$1\ (\mathrm{L}^3) = 1.17636731\cdot10^{-102}\ (\mathrm{m^3})$
-1	Permeability	$\boldsymbol{\mu}_\mathbf{I} = \mu_0$	c.f.	$4\pi\ (-1) = 4\pi\cdot10^{-7}\ (\mathrm{H\ m^{-1}})$	$-\mathrm{L}^3$	Antivolume	$-\mathbf{V_I} = c^{\pm2}\,\hbar^3$	c.f.	$1\ (-\mathrm{L}^3) = 1.057266212\cdot10^{-85}\ (-\mathrm{m^3})$
	Gravitational potential	$\boldsymbol{\Phi}_\mathbf{I} = c^{\pm2}$	s.l.	$1\ (-1) = 8.98755179\cdot10^{16}\ (\mathrm{m^2\ s^{-2}})$	$i\,\mathrm{L}^3$	Inertia volume momentum	$\mathbf{I}^\mathbf{3}_\mathbf{I} = c^{-1}\,\hbar^3$	q.	$1\ (i\mathrm{L}^3) = 3.923938974\cdot10^{-111}\ (\mathrm{kg\ m^3})$
	Antimomentum	$-\mathbf{p_I} = c^{\pm2}$	c.f.	$1(-1) = 8.98755179\cdot10^{16}\ (-\mathrm{kg\ m\ s^{-1}})$	$i^{-1}\mathrm{L}^3$	Fermi constant physical quantity	$c\,\hbar^3$	q.	$1\ (i^{-1}\mathrm{L}^3) = 3.526660474\cdot10^{-94}\ (\mathrm{kg\ m^3})$
i	**Mass**	$\mathbf{m_I} = c^{-1}$	s.l.	$1\ (i) = 3.335640952\cdot10^{-9}\ (\mathrm{kg})$	L^{-3}	Fluctuation	$\mathbf{f_I} = \hbar^{-3}$	a.l.	$1\ (\mathrm{L}^{-3}) = 8.50074625\cdot10^{101}\ (\mathrm{m\ s^{-4}})$
i^{-1}	**Velenergy:** Velocity Energy	$\mathbf{v_I} = c$	a.l.	$1\ (i^{-1}) = 2.99792458\cdot10^{8}\ (\mathrm{m\ s^{-1}})$	$-\mathrm{L}^{-3}$	Volume power	$\mathbf{W}^\mathbf{3}_\mathbf{I} = c^{\pm2}\,\hbar^{-3}$	a.l.	$1\ (-\mathrm{L}^{-3}) = 7.640089715\cdot10^{117}\ (-\mathrm{m^{-3}})$
		$\mathbf{E_I} = c$	s.l.	$1\ (i^{-1}) = 2.99792458\cdot10^{8}\ (\mathrm{J})$		Irradiance	$\mathbf{E_{eI}} = c^{\pm2}\,\hbar^{-3}$	a.l.	$1\ (-\mathrm{L}^{-3}) = 7.640089715\cdot10^{117}\ (\mathrm{W\ m^{-2}})$
	Temperature	$\boldsymbol{\Theta}_\mathbf{I} = c\,k_B^{-1}$	a.l.	$1\ \Theta_I\ (i^{-1}) = 2.17138589\cdot10^{31}\ (\mathrm{K})$	$i\,\mathrm{L}^{-3}$	Volume density	$\boldsymbol{\rho}_\mathbf{I} = c^{-1}\,\hbar^{-3}$	a.l.	$1\ (i\,\mathrm{L}^{-3}) = 2.835543731\cdot10^{93}\ (\mathrm{kg\ m^{-3}})$
L	**Length** (real space)	$\mathbf{l_I} = \hbar$	q.	$1\ (\mathrm{L}) = 1.0556363\cdot10^{-34}\ (\mathrm{m})$	$i^{-1}\mathrm{L}^{-3}$	Pressure	$\mathbf{P_I} = c\,\hbar^{-3}$	a.l.	$1\ (i^{-1}\mathrm{L}^{-3}) = 2.548459613\cdot10^{110}\ (\mathrm{Pa})$
	Action	$\mathbf{S_I} = \hbar$	q.	$1\ (\mathrm{L}) = 1.0556363\cdot10^{-34}\ (\mathrm{J\ s})$		Energy-tension density	$\mathbf{u_I} = c\,\hbar^{-3}$	a.l.	$1\ (i^{-1}\mathrm{L}^{-3}) = 2.548459613\cdot10^{110}\ (\mathrm{J\ m^{-3}})$
	Capacitance	$\mathbf{C_I} = \hbar$	q.	$1\ (\mathrm{L}) = 1.0556363\cdot10^{-34}\ (\mathrm{F})$	$i^{1/2}\mathrm{L}^{1/2}$	**Magnetic charge**	$\boldsymbol{\theta}_\mathbf{I} = \surd\text{-}(c\,\hbar)$	s.l.	$1\ (i^{1/2}\mathrm{L}^{1/2}) = 1.778965433\cdot10^{-13}\ (\mathrm{Wb})$
-L	Antilength	$\mathbf{L_I} = c^{\pm2}\,\hbar$	c.f.	$1\ (-\mathrm{L}) = 9.487585915\cdot10^{-18}\ (\mathrm{m})$		Magnetic flux	$\boldsymbol{\Phi}_\mathbf{I} = \surd\text{-}(c\,\hbar)$	s.l.	$1\ (i^{1/2}\mathrm{L}^{1/2}) = 1.778965433\cdot10^{-13}\ (\mathrm{Wb})$
$i\,\mathrm{L}$	**Time** (imagin. space)	$\mathbf{t_I} = c^{-1}\,\hbar$	q.	$1\ (i\mathrm{L}) = 3.521223673\cdot10^{-43}\ (\mathrm{s})$	$i^{-1/2}\mathrm{L}^{1/2}$	**Electric charge**	$\mathbf{q_I} = \surd\text{-}(c^{-1}\,\hbar)$	q.	$1\ (i^{-1/2}\mathrm{L}^{1/2}) = 5.93398995\cdot10^{-22}\ (\mathrm{C})$
$i^{-1}\,\mathrm{L}$	Antitime	$-\mathbf{t_I} = c\,\hbar$	c.f.	$1\ (i^{-1}\,\mathrm{L}) = 3.164718011\cdot10^{-26}\ (-\mathrm{s})$	$i^{1/2}\mathrm{L}^{-1/2}$	Current	$\mathbf{I_I} = \surd\text{-}(c\,\hbar^{-1})$	a.l.	$1\ (i^{1/2}\mathrm{L}^{-1/2}) = 1.685206764\cdot10^{21}\ (\mathrm{A})$
L^{-1}	Wavevector	$\mathbf{k_I} = \hbar^{-1}$	a.l.	$1\ (\mathrm{L}^{-1}) = 9.47295958\cdot10^{33}\ (\mathrm{m^{-1}})$		Electric potential	$\mathbf{V_I} = \surd\text{-}(c\,\hbar^{-1})$	a.l.	$1\ (i^{1/2}\mathrm{L}^{-1/2}) = 1.685206764\cdot10^{21}\ (\mathrm{V})$
$-\mathrm{L}^{-1}$	**Gravitational field- -Poweration:** Acceleration Power	$\mathbf{g_I} = c^{\pm2}\,\hbar^{-1}$	a.l.	$1\ (-\mathrm{L}^{-1}) = 8.51387148\cdot10^{50}\ (\mathrm{m\ s^{-2}})$		Magnetic vector potential	$\mathbf{A_I} = \surd\text{-}(c\,\hbar^{-1})$	a.l.	$1\ (i^{1/2}\mathrm{L}^{-1/2}) = 1.685206764\cdot10^{21}\ (\mathrm{Wb\ m^{-1}})$
		$\mathbf{a_I} = c^{\pm2}\,\hbar^{-1}$	a.l.	$1\ (-\mathrm{L}^{-1}) = 8.51387148\cdot10^{50}\ (\mathrm{m\ s^{-2}})$	$i^{-1/2}\mathrm{L}^{-1/2}$	Magnetic inverflux	$\boldsymbol{\Phi}^{\mathbf{-1}}_\mathbf{I} = \surd\text{-}(c^{-1}\hbar^{-1})$	s.l.	$1\ (i^{-1/2}\mathrm{L}^{-1/2}) = 5.621244694\cdot10^{12}\ (\mathrm{Wb^{-1}})$
		$\mathbf{W_I} = c^{\pm2}\,\hbar^{-1}$	a.l.	$1\ (-\mathrm{L}^{-1}) = 8.51387148\cdot10^{50}\ (\mathrm{W})$	$i^{1/2}\mathrm{L}^{3/2}$	Bohr magneton physical quantity	$\boldsymbol{\mu}_\mathbf{BI} = \surd\text{-}(c\,\hbar^3)$	q.	$1\ (i^{1/2}\mathrm{L}^{3/2}) = 1.877940487\cdot10^{-47}\ (\mathrm{J\ T^{-1}})$
$i\,\mathrm{L}^{-1}$	Linear density	$\boldsymbol{\Delta}^\mathbf{1}_\mathbf{I} = c^{-1}\,\hbar^{-1}$	a.l.	$1\ (i\,\mathrm{L}^{-1}) = 3.15983919\cdot10^{25}\ (\mathrm{kg\ m^{-1}})$	$i^{-1/2}\mathrm{L}^{3/2}$	?	$\surd\text{-}(c^{-1}\,\hbar^3)$	q.	$1\ (i^{-1/2}\mathrm{L}^{3/2}) = 6.264135195\cdot10^{-56}\ (\mathrm{T^{-1}})$
$i^{-1}\,\mathrm{L}^{-1}$	**Frequorce, φ:** Frequency Force	$\boldsymbol{\nu}_\mathbf{I} = c\,\hbar^{-1}$	a.l.	$1\ (i^{-1}\,\mathrm{L}^{-1}) = 2.839921837\cdot10^{42}\ (\mathrm{s^{-1}})$	$i^{1/2}\mathrm{L}^{-3/2}$	Electric field strength	**Є**$_\mathbf{I} = \surd\text{-}(c\,\hbar^{-3})$	a.l.	$1\ (i^{1/2}\mathrm{L}^{-3/2}) = 1.596389556\cdot10^{55}\ (\mathrm{V\ m^{-1}})$
		$\mathbf{F_I} = c\,\hbar^{-1}$	a.l.	$1\ (i^{-1}\,\mathrm{L}^{-1}) = 2.839921837\cdot10^{42}\ (\mathrm{N})$		Magnetic field strength	$\mathbf{H_I} = \surd\text{-}(c\,\hbar^{-3})$	a.l.	$1\ (i^{1/2}\mathrm{L}^{-3/2}) = 1.596389556\cdot10^{55}\ (\mathrm{A\ m^{-1}})$
	Conductivity	$\boldsymbol{\sigma}_\mathbf{I} = c\,\hbar^{-1}$	a.l.	$1\ (i^{-1}\,\mathrm{L}^{-1}) = 2.839921837\cdot10^{42}\ (\mathrm{S\ m^{-1}})$		Magnetic flux density	$\mathbf{B_I} = \surd\text{-}(c\,\hbar^{-3})$	a.l.	$1\ (i^{1/2}\mathrm{L}^{-3/2}) = 1.596389556\cdot10^{55}\ (\mathrm{T})$
L^2	Area	$\mathbf{S_I} = \hbar^2$	q.	$1\ (\mathrm{L}^2) = 1.114367998\cdot10^{-68}\ (\mathrm{m^2})$	$i^{-1/2}\mathrm{L}^{-3/2}$	Electric polarisation	$\mathbf{P_I} = \surd\text{-}(c^{-1}\,\hbar^{-3})$	a.l.	$1\ (i^{-1/2}\mathrm{L}^{-3/2}) = 5.324982377\cdot10^{46}\ (\mathrm{C\ m^{-2}})$
$-\mathrm{L}^2$	Antiarea	$-\mathbf{S_I} = c^{\pm2}\,\hbar^2$	c.f.	$1\ (-\mathrm{L}^2) = 1.001544009\cdot10^{-51}\ (-\mathrm{m^2})$	$i^{1/2}\mathrm{L}^{5/2}$	?	$\surd\text{-}(c\,\hbar^5)$	q.	$1\ (i^{1/2}\mathrm{L}^{5/2}) = 1.982422148\cdot10^{-81}\ (\quad)$
$i\,\mathrm{L}^2$	Inertia area momentum	$\mathbf{I}^\mathbf{2}_\mathbf{I} = c^{-1}\,\hbar^2$	q.	$1\ (i\,\mathrm{L}^2) = 3.717131529\cdot10^{-77}\ (\mathrm{kg\ m^2})$	$i^{-1/2}\mathrm{L}^{5/2}$	?	$\surd\text{-}(c^{-1}\,\hbar^5)$	q.	$1\ (i^{-1/2}\mathrm{L}^{5/2}) = 6.612648501\cdot10^{-90}\ (\mathrm{C^{-1}\ m^3})$
$i^{-1}\mathrm{L}^2$	?	$c\,\hbar^2$	q.	$1\ (i^{-1}\mathrm{L}^2) = 3.340791212\cdot10^{-60}\ (\mathrm{J\ m^2})$	$i^{1/2}\mathrm{L}^{-5/2}$	Charge density	$\boldsymbol{\rho}_\mathbf{I} = \surd\text{-}(c\,\hbar^{-5})$	a.l.	$1\ (i^{1/2}\mathrm{L}^{-5/2}) = 1.512253373\cdot10^{89}\ (\mathrm{C\ m^{-3}})$
L^{-2}	Viscosity (dynamic)	$\boldsymbol{\eta}_\mathbf{I} = \hbar^{-2}$	a.l.	$1\ (\mathrm{L}^{-2}) = 8.973696318\cdot10^{67}\ (\mathrm{Pa\ s})$		Current density	$\mathbf{J_I} = \surd\text{-}(c\,\hbar^{-5})$	a.l.	$1\ (i^{1/2}\mathrm{L}^{-5/2}) = 1.512253373\cdot10^{89}\ (\mathrm{A\ m^{-2}})$
$-\mathrm{L}^{-2}$	Area power	$\mathbf{W}^\mathbf{2}_\mathbf{I} = c^{\pm2}\hbar^{-2}$	a.l.	$1\ (-\mathrm{L}^{-2}) = 8.065156039\cdot10^{84}\ (-\mathrm{m^{-2}})$	$i^{-1/2}\mathrm{L}^{-5/2}$	?	$\surd\text{-}(c^{-1}\,\hbar^{-5})$	a.l.	$1\ (i^{-1/2}\mathrm{L}^{-5/2}) = 5.044334281\cdot10^{80}\ (\quad)$

Main differences between the INTERVALIC SYSTEM of PHYSICAL QUANTITIES and all other systems of units and dimensions

- It is the unique dimensional system whose **dimensional basis —(L, *i*)—** is just composed by the single intervalic dimensions of the **last fundamental constants of Nature, ħ and c**: dim ħ = (L), dim c (i^{-1}). Of course, the system has two formulations: dim c = (i^{-1}) or dim c = (*i*), which are absolutely equivalent.
- Existing physical quantities are *generated* by all algebraic combinations between the two dimensional basis —L and *i*— which makes a *finite* and *ordered* set of **40 physical quantities**. The *number of physical quantities* is given by the formula: 4 + 12*n*, being *n* the number of actual dimensions of space.
- There are no physical quantities whose equation of dimensions have more than the *actual dimensions* of space (3) and time (1), as in other systems, which is absolutely a nonsense or, at least, an inconsistency.
- There are neither different physical quantities with the same equation of dimensions (as in traditional units), nor different dimensions with the same physical quantity (as in the misleading called "geometrized" units, which is the poorest system of units ever made, not even being consistent).
- The intervalic dimensions of all physical quantities can *operate algebraically* with the signs of its corresponding magnitudes in any equation.
- The own definition of all existing physical quantities as an algebraic combination of c (i^{-1}) and ħ (L) yields unavoidably a *geometric height* for every physical quantity, making the full set of INTERVALIC QUANTA and INTERVALIC LIMITS, which form not only the Intervalic Units, but above all, the foundations of the **underlying fundamental geometry of Nature**, from which are derived the genuine **intervalic symmetries of Nature**, long time searched by Physics.
- Therefore, every physical quantity can not acquire any value, as each of them is *geometrically* closed by its corresponding height: an intervalic quanta or limit, which is another great difference between the intervalic system of units and the remaining systems, which like to play with infinites and singularities.
- Being the intervalic dimensions the truthful units of Nature, the intervalic physical quantities have got an *epistemological rank* by means

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.../...

of their equations of dimensions have got an *heuristic value*, which is lacked in other systems. The most important example is the merging of two traditional physical quantities into a new one because their intervalic dimensions are identical. That is the case of: velenergy (velocity-energy), frequorce (frequency-force) and poweration (power-acceleration)-gravitational field strength. The merged physical quantities means that they are really the same underlying physical quantity, although in phenomenology there may appear as different in incomplete or false dimensional systems. All this allow to unify intervalic dimensions, physical quantities and units in a unique concept, if desired.

- When applying basic geometry to the intervalic dimensions inside the Argand-like Intervalic Dimensional Space, a full set of invariant **Intervalic Transformations** of physical quantities is *geometrically* derived. The Intervalic Transformations comprise the former Lorentz-Einstein transformations of Special Relativity, which stays as a specific case inside a much wider geometry.
- Contrarily to supposed, the Intervalic System of Dimensions is the unique system which is **not equivalent** to all the remaining dimensional systems of units (which are, from now on, irrelevant in Physics research).
- All results yielded in the Intervalic Theory of Particle Physics are *geometric statements* logical and unavoidably deduced from the *intervalic quanta and limits* of the **Intervalic System of Units** *without using any mathematical formalism.*
- The Intervalic Theory is the unique Physics theory ever postulated which has *no one arbitrary constant*.
- Inasmuch as c and ħ are universal constants, the *intervalic quanta and limits* are reliable physical quantities of *universal validity*. The Intervalic System of Units is not an arbitrary one but the genuine **system of units of Nature**. It must be noted that the *intervalic symmetries of Nature* can not be deduced by means of any other dimensional system, but only from the intervalic one. Thus its knowledge might be viewed as a clue of the scientific degree of development of a civilization, and so it is also apparent that the Intervalic Units are the unique which could be shared with hypothetical advanced extraterrestrial intelligences.
- Any value expressed in *intervalic units* can be interpreted as a *dimensionless interval or ratio* and Physics really becomes truthful Geometry. Hence the name of the Intervalic Theory.

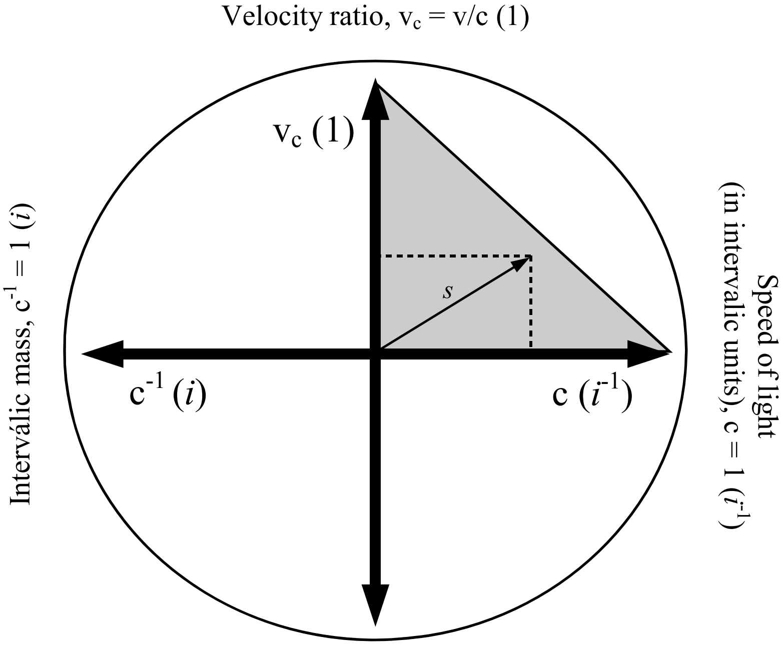
intervalic system of physical quantities has got an epistemological range, which means that if two physical quantities have the *same* equation of dimensions equation, that means that they are the *same* magnitude, although we have misinterpreted them as different in the past. This happens, for example, with speed and energy, which are actually a single physical quantity, or equally with acceleration and gravitational field, whose discovery was, in words of Albert Einstein, “the happiest thought in my life”, which led him to postulate the general relativity theory.

Algebraic operations between different physical quantities can’t be performed on a single axis as in traditional systems, but as a result of the introduction of the imaginary number *i* in the intervalic dimensional basis, two axes are needed: a real one (representing the real component, L) and an imaginary one (representing the imaginary component, *i*) —in mathematical terms, an Argand space—. Because of the peculiar properties of the *i* number, each successive integer powers of the speed of light, *c*, whose intervalic dimension is i^{-1}, represents a turn of ±90° on the dimensional axes of coordinates:

THE GROUP OF GEOMETRIC *TRANSFORMERS* IN THE INTERVALIC DIMENSIONAL SYSTEM		
Value	*Intervalic dimension*	*Rotation*
c^{-1}	i	+90º
c^{1}	i^{-1}	-90º
$c^{\pm 2}$	$i^{\pm 2} = -1$	±180º
c^{-3}	$i^{3} = i^{-1}$	+270º = -90º
c^{3}	$i^{-3} = i$	-270º = +90º
$c^{\pm 4}$	$i^{\pm 4} = 1$	±360º

The geometric representation of any physical quantity on these dimensional coordinates gives automatically an *invariant* geometric measurement, which is to say that the transformations of Lorentz-Einstein of special relativity are already included in the properties of the intervalic dimensional space, being inherent to the intervalic metric itself, so it affects to all physical quantities, standing out for its simplicity the intervalic transformations of space, time, energy, mass or time *regarding temperature*, as can be seen in the graph.

INTERVALIC TRANSFORMATIONS OF VELOCITY IN THE INTERVALIC SYSTEM OF PHYSICAL QUANTITIES



From the figure (which is a simple Argand space composed by two axes: a real one and an imaginary one), we have:

$s^2 = c^2 + v_c^2$, that is to say, $s = \sqrt{(c^2 + v_c^2)}$

To make a formulation which looks like the relativistic one, it can be introduced the *intervalic factor xi*, ξ, defined as the inverse of the invariant interval, s:

$\xi \equiv 1/s = 1/\sqrt{(c^2 + v_c^2)}$
$\xi^{-1} \equiv s = \sqrt{(c^2 + v_c^2)}$

The intervalic dimension of ξ is $1/\sqrt{(-1)} = (i^{-1})$. Taking the value of c in intervalic units ($v_c = v/c$ is already an intervalic dimensionless ratio):

$\xi \equiv 1/s = 1/\sqrt{[1(-1) + v_c^2]} = 1/\sqrt{[-1 + v_c^2]}$

And thus the Intervalic Transformations of time, space, mass and momentum *regarding* VELOCITY are:

$L \cdot \xi\ (i^{-1}) = T\ (i\ L)$, time $\qquad m \cdot \xi^{-1}\ (i) = p\ (1)$, momentum
$T \cdot \xi^{-1}\ (i) = L\ (L)$, space $\qquad p \cdot \xi\ (i^{-1}) = m\ (i)$, mass

For converting $\xi\ (i^{-1})$ into the dimensionless relativistic gamma factor, $\gamma = 1/\sqrt{(1 - v_c^2)}$, it only have to be multiplied dimensionally by *i*: $\xi\ (i^{-1}) \cdot (i) = \gamma\ (1)$.

Hence multiplying *dimensionally* by (i) or (i^{-1}) the above equations in the intervalic dimensional space are obtained the classic Lorentz-Einstein transformations.

The **Intervalic Transformations** of space, time, energy, mass and momentum *regarding* TEMPERATURE are, already written in the traditional relativistic mode:

$L = L_0\, \gamma^{-1}(\Theta) \qquad T = \gamma(\Theta)\, T_0 \qquad E = \gamma(\Theta)\, E_0 \qquad m = \gamma(\Theta)\, m_0 \qquad p = \gamma(\Theta)\, p_0$

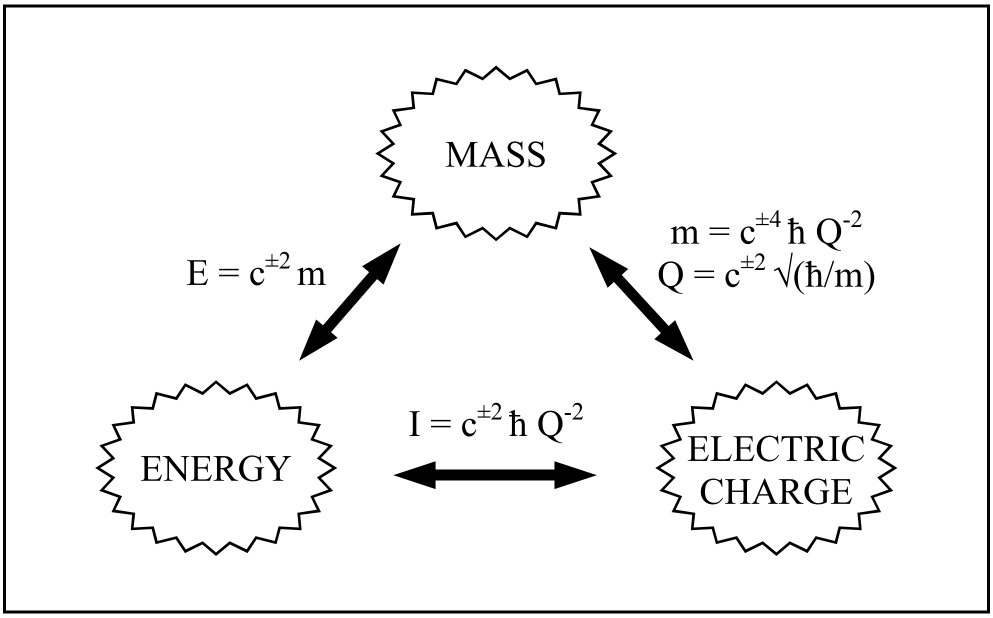
where $\gamma(\Theta)$ is the corresponding new gamma factor regarding temperature: $\gamma(\Theta) = 1/\sqrt{(1 - \Theta_c^2)}$, where it can be seen the dimensionless ratio $\Theta_c = \Theta/\mathbf{\Theta_I}$, being $\mathbf{\Theta_I}$ the intervalic limit of temperature: $\mathbf{\Theta_I} = c\ k_B^{-1} = 2.17138589 \cdot 10^{31}$ (K). This geometric limit of temperature plays an important role in the phenomenon of “bounce” of the Universe, between the Big Crunch and the next Big Bang.

Some of the most important equations of physics, such as all of special relativity, are derived in an independent way by the Intervalic Theory as mere *geometric statements* of its intervalic equation of dimensions, since in the Intervalic Theory *all equations are relativistic*, so there is no a non-relativistic mechanics as in quantum mechanics. Among these geometric statements it must be stand out what is possibly the most important formula of Physics, the equation of *intervalic energy*, I, which establishes the *equivalence* between *electric charge*, Q, and *energy*:

$$I = c^{\pm 2}\, \hbar\, Q^{-2}$$

This equation, painfully unknown by quantum mechanics, plays a role analogous to: $E = c^{\pm 2} m$, which establishes the *equivalence* between *mass* and *energy*, Einstein's famous equation now also deduced in an independent way to relativity, as a simple *geometric statement* by the Intervalic Theory (please note that the geometric constant *c* is always written ahead of the variables, and their power is ±2 instead of +2, as the -2 power produces an identical rotation (in single intervalic units where the value of *c* and $\hbar$ is set to the unit).

Similarly is deduced geometrically the equation of the photon momentum, which until now was only an empirical result: $E = c\, p$. It should be noted that these important physical equations are always *invariant* because they are mere *geometric statements* which describe the *dimensional equivalence between two physical quantities*, which does not depend on the frame of reference chosen.



	Mass	Electric charge
Equivalent energy	$E = c^{\pm 2} m$	$I = c^{\pm 2} \hbar Q^{-2}$
Field energy	$U = G m^2 / r$	$U = (1/4\pi\varepsilon) Q^2 / r$

Furthermore, when comparing the equivalent energy of mass and electric charge is further exposed the initial gross mistake on which the standard model is based, whose complex Lagrangian formalism can not hide its serious inconsistency of misapplying the formula of the electromagnetic potential energy to a particle which, according to the standard model itself, is a mysterious "energy density" lacking of structure. But if this particle is not composed by other sub particles, then, it can not possess electromagnetic energy, since, by definition, this energy only makes sense applied to a particle or to a body *with structure*, as it is well known by any high school student. Clumsy inconsistencies like that, among several others as the unwarranted use of about 20 arbitrary constants set *ad hoc*, were what led Albert Einstein to never accept the validity of the standard model, who always regarded it as merely provisional and baseless. It has been now confirmed with overwhelming logic by the Intervalic Theory.

The systems of physical quantities and units have no physical meaning (beyond the formal one), nor have any logical link with the equations of physics. On the contrary, the entire corpus of physics and all the results derived by the Intervalic Theory —which has not a single arbitrary constant—, are *geometric and logical statements* necessarily deduced from the intervalic *quanta* and *limits* of the *intervalic system of physical quantities and units,* without the mediation of any complex mathematical formalism. This is an outstanding feature of the strong logic economy with what has been deduced the theory. This implies that the intervalic structure of subatomic particles and the fundamental symmetries of Nature will never be able to be discovered by quantum mechanics or any other theory that does not use the *intervalic —or natural— system of physical quantities*, which differs essentially from the rest ones because it includes the imaginary number $i = \sqrt{-1}$ in its dimensional basis, which makes sense when you consider that the *i* number *i* appears in most physics equations. Therefore, any dimensional basis that does not contain the *i* number will not be able to have any logical bond with physical equations (except symbolically), nor to deduct any of them. Hence, quantum mechanics is by his reason in an impasse which impedes it to make further progress, as its last foundations are incomplete and inconsistent.

The theoretical definition and the exact geometry value of the elementary charge, e, and of the fine structure constant, α, are straightforwardly deduced starting from the intervalic system of physical quantities. Indeed, the definition and the geometric value of the *intervalic quantum of electric charge*, $\mathbf{q_I}$, which is automatically deduced by simple dimensional analysis, is:

$$\mathbf{q_I} = \surd\text{-}(c^{-1}\hbar) = 1\ (i^{-1/2}L^{1/2}) = 5.93398995 \cdot 10^{-22}\ (C)$$

As it is usually explained in textbooks, the fine structure constant, α, is a measure of the squared value of the elementary charge *in natural units*. This value implies that the value of e is 270 in natural units, which coincides exactly with the value of the elementary charge *in intervalic units*, so we can say that the intervalic units are the genuine natural units, hitherto unknown:

$$e = 270\ \mathbf{q_I} = 270\ \surd\text{-}(c^{-1}\hbar) = 1.60217733 \cdot 10^{-19}\ (C)$$
$$\alpha = 270^2 \cdot 10^{-7} = 1/137.1742112\ (1)\ \text{—valor exacto—}$$

This result, as final as obvious, had not been accepted by quantum mechanics as a result of its absurd prejudice that subatomic particles lack of structure, a quasi religious dogma, completely wrong, on which the standard model is based, that has prevented significant progress in theoretical physics for decades.

From here we can get the exact geometric values of fundamental constants, rather than the traditional empirical values, of which c was set by hand, e was empirically set, and $\hbar$ was derived indirectly from the previous one. Now we know that there is a deviation of about 5/10,000 somewhere in all these traditional empirical values gathered. Since the value of c is taken by definition and e is quite reliable, we conclude that this small deviation is on $\hbar$, which can now be corrected and thus to define the exact geometric values of the two fundamental constants of Nature (expressed in arbitrary traditional units) from the exact theoretical value of the fine structure constant:

$$c = 270^2\ \hbar\ e^{-2} = 2.9979246 \cdot 10^8\ (m/s)$$
$$\hbar = 270^{-2}\ c\ e^2 = 1.0556363 \cdot 10^{-34}\ (m)$$

The fact that the value of the elementary charge is 270 in intervalic or natural units *necessarily implies* that the elementary charge is not the *quantum of electric charge*, as previously thought, but that subatomic particles have got *structure*, i.e., they are composed by other sub particles even more fundamental. This result bankrupts the root paradigm of quantum mechanics, which conceives subatomic particles as "energy densities without structure", while according to the Intervalic Theory they are composite particles, which have an *intervalic structure* —of extraordinary logical economy and mathematical beauty—, of which all their physical properties and also all fundamental interactions of physics are deduced, whose origins were unknown to quantum mechanics.

In this way, subatomic particles are *states of minimum energy* that have become very deep wells of electromagnetic potential energy, which is the reason why they are all *identical*, and not because they obey certain quantum, mysterious and inexplicable numbers, as postulated by the standard model, or because there is an essential difference between the physical nature of the subatomic world and the other one of the macroscopic or cosmological world.

In fact, the results of the Intervalic Theory show that there is not such difference, even between the organic and the inorganic world, as it is shown, for example, by means of the ratio of the constituent energies —intervalic and electromagnetic— of nucleon, which are ruled by the *golden mean* or the Φ number, which also determines the pattern of so-called *harmonious growth* of living beings. Well, it has been found that the Φ number also rules the primordial intervalic synthesis of subatomic particles:

Structural energy ratios of nucleon
$\langle \mathrm{I}(N)/\mathrm{U}(N)\rangle = 1.618829402 \sim \Phi$
$\langle \mathrm{I}(N)/\mathrm{E}(N)_{\mathrm{mass}}\rangle = 0.618143766 \sim \Phi^{-1}$
$\langle \mathrm{U}(N)/\mathrm{E}(N)_{\mathrm{mass}}\rangle = 0.381855365 \sim 1 - \Phi^{-1}$

Deviation from the golden mean, Φ
$\Delta[\langle \mathrm{I}(N)/\mathrm{U}(N)\rangle] = +0.0491593\%$
$\Delta[\langle \mathrm{I}(N)/\mathrm{E}(N)_{\mathrm{mass}}\rangle] = +0.0177623\%$
$\Delta[\langle \mathrm{U}(N)/\mathrm{E}(N)_{\mathrm{mass}}\rangle] = -0.0289759\%$

Among the thousand first natural numbers, 270 is what most classes or symmetries possesses, each one of them indicates the existence of a well of electromagnetic potential energy under the *principle of minimum energy* and also under the *intervalic principle of minimum information*, being the former one a simple corollary. From the point of view of chaos theory, the number 270 would be the principal attractor at subatomic scale, and its divisors the secondary attractors. These 16 classes are natural dividers of 270, which determine the values of the electrical charges of subatomic particles allowed by the intervalic symmetries of the elementary charge, and are as follows (expressed in natural units: $e = 270$):

1, 2, 3, 5, 6, 9, 10, 15, 18, 27, 30, 45, 54, 90, 135, 270.

Of these, half are unstable below its threshold temperature of synthesis, being stable: 2, 3, 5, 6, 18, 30, 45 and 270. Although these intervalic symmetries has been uncovered by the logical-deductive way, which is the scientific method *par excellence*, the truth is that it could have also been discovered via empirical-inductive, as far as it is an empirical evidence that massive subatomic particles detected till today have got masses whose values are proportional to the inverse square of 270, 45, 30, 18, 6 and 5, as anyone can easily check. If this incontrovertible empirical data has not led to the discovery of the Intervalic Theory previously, this is due to the absurd prejudice of quantum mechanics to believe that subatomic particles are punctual entities *without structure*, childish dogma, comparable to medieval believing about the Earth as the centre of the Universe, which have prevented the advance of Physics for decades. Certainly, in the annals of Physics, after the missed belief in a flat Earth, the standard model of particles without structure will be history as the most ridiculous mistake in Physics.

The synthesis of subatomic particles is always made obeying one of the most fundamental principles of Nature: the *spin-statistics theorem*, of mathematical origin, which states that any identical particles have a degree of freedom, what means that the *constituent* particles of a subatomic particle can only be in a *symmetric or antisymmetric state under interchange*, being also generated both states in accordance with the general principle of *intervalicity*, which allows only logical and necessary relationships between the elements of the theory (or under the so-called *universality assumption* of quantum mechanics, which would be a corollary of the above).

The fundamental law that rules the intervalic structure and the physical properties of all subatomic particles is the *intervalic principle of energy balance*, which states that the total energy or *structural energy*, A, of all subatomic particles is composed by three factors: intervalic energy, I, electromagnetic energy, $U \approx I^{-1}$ —whose magnitude is in inverse proportion to the above—, and the spin energy, E_J —being the latter the only one not manifested as mass but as kinetic energy—, according to the following basic equation, also written in developed form below:

$$I - I^{-1} - E_J = 0$$

$$c^{\pm 2}\, ħ\, Q^{-2} - [\, ½(1/4\pi\varepsilon_0)Q^2 / r\,] - m\, r^2\omega_J^{\,2} = 0$$

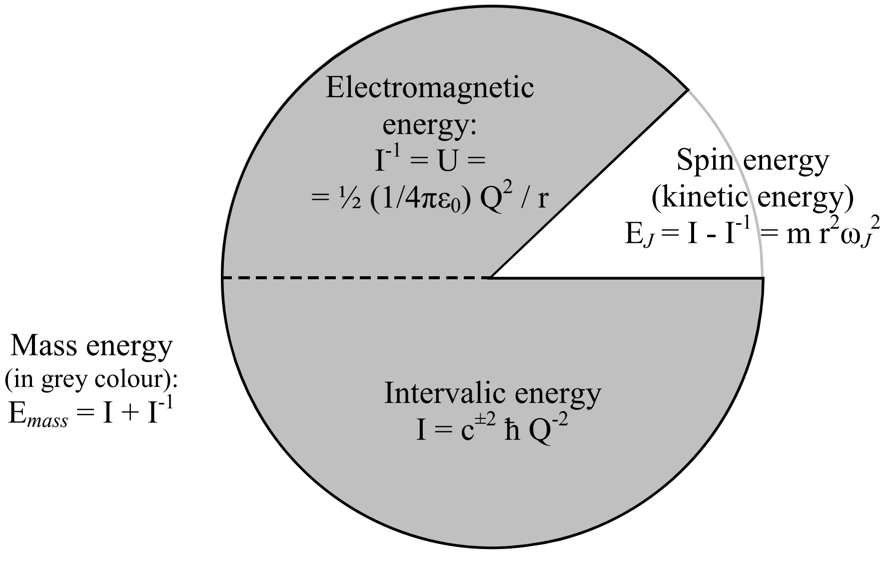
The intervalic energy, I, represents half of the structural energy, A, of the subatomic particle, which coincides precisely with the Schwarzschild's mass for the particle:

$$A = 2\, I$$
$$A = I + I^{-1} + E_J = c^{\pm 2}\, m_{\mathrm{Schw}}$$

If all the structural energy was manifested as mass, all particles would have got exactly the minimum mass to be black holes. This never happens because the spin energy does not contribute to the mass but it is manifested as kinetic energy, being able to define the spin energy according to these values:

$$E_J = c^{\pm 2}\, (m_{\mathrm{Schw}} - m)$$

ARCHITECTURE OF THE STRUCTURAL ENERGY
OF SUBATOMIC PARTICLES



Intervalic principle of energy balance for subatomic particles: $I - I^{-1} - E_J = 0$
Structural energy (or Schwarschild's mass): $A = c^{\pm 2}\, m_{\mathrm{Schw}} = I + I^{-1} + E_J$

This further gives us a new definition of the Schwarzschild's mass for subatomic particles, since its magnitude is simply twice the intervalic energy:

$$I = ½ c^{\pm 2} m_{Schw}$$

This is the energy balance that determines the fundamental underlying architecture that forms the intervalic structure of all subatomic particles with extraordinary beauty and logical simplicity.

Well, from here, it follows logically and inevitably the synthesis of all subatomic particles that make the energy and matter in the universe, both *visible* and *dark*, totalizing 108 *visible* particles (without including baryons and mesons, which are monteverdinos) and 39 *dark* particles, whose intervalic structures and physical properties have been described with full geometric precision by the Intervalic Theory. The way that Nature has made this, starting exclusively from the existence of an interval, is a way plenty of logical elegance and disarming economy. Although the description of the *primordial intervalic synthesis of subatomic particles* can not be condensed into a short essay, we will try to offer some tables that show graphically the intervalic structure of the most important subatomic particles.

The primordial intervalic synthesis of intervalic structures, which originated from nothing all subatomic particles and fundamental interactions of physics, has seven consecutive phases. In each phase it is synthesized an intervalic structure in both symmetric and antisymmetric state under interchange, being one of them *visible* matter or energy —particles which in turn are the constituent sub particles of the next phase, which is still synthesizing a new type of intervalic structure in symmetric and antisymmetric state under interchange—, and other one *dark* matter or energy —which does not continue with the process of synthesis, causing a symmetry breaking, so that at each stage only one of the two states continues the process of synthesis that leads to the next phase—.

Along with singularities (black holes), antimatter universes and parallel universes, another one of the misleading myths that the Intervalic Theory invalidates is that one of the Big Bang considered as a haphazard and random explanation of the origin of the Universe. On the contrary, the Intervalic Theory shows what the origin of the Big Bang, which was a huge release of energy that came in the 4th phase of the primordial intervalic synthesis: the dalino-synthesis —where dalinos were synthetized, which are the first particles with electromagnetic energy—, a phase that began between $1.521843955 \cdot 10^{-10}$ and $1.979589614 \cdot$ and 10^{-9} seconds *after the beginning*

INTERVALIC PRIMORDIAL ASSEMBLY OF INTERVALIC STRUCTURES

WHICH ORIGINATED ALL DEGREES OF FREEDOM AND INTERACTIONS

<table>
<tr><th>Tree level</th><th>1</th><th>2</th><th>3</th><th>4</th><th>5</th><th>6</th><th>7</th><th>8</th></tr>
<tr>
<td rowspan="10">Assemblies are made in symmetric and antisymmetric states under interchange, with identical shares. The appearance of each new *intervalic structure* assembled makes automatically the introduction of a new degree of freedom with its corresponding *fundamental interaction* in the Universe. When some intervalic structures do not make further assemblies, there is a *symmetry breaking* in the tree and that branch of the Intervalic Primordial Assembly ends.</td>
<td rowspan="8">INTERVALIC STRING
—quantum of space—
(Share = 1)
Intervalic string state
$S = \{\uparrow, \downarrow\}$
Intervalic string radius
$r_S = \tfrac{1}{2}\,\hbar$
Intervalic string spin
$J_S = \tfrac{1}{2}\,\hbar$
Intervalic string length
$l_S = \pi\, \mathbf{l_I} = \pi\, \hbar$
Number of intervalic strings
$n(S) = 4\, n(\gamma) =$
$= 4\, \tfrac{1}{4}\, c^8 = c^8$

Neutrino
Neutrino is defined as *an intervalic string came to light.* The majority of neutrinos have been made at the Intervalic Primordial Assembly of gaudinos and dalinos, which began between $1.521843955 \cdot 10^{-10}$ (s) and $1.979589614 \cdot 10^{-9}$ (s) after the intervalic structure level No. 2 (synthesis of photon and chi) which marked the *beginning of time.*</td>
<td rowspan="7">PHOTON
—quantum of light—
(Share = 1/2)
= Symmetric assembly of Intervalic Strings:
$\gamma = \{ |\uparrow\uparrow|, 2^{-½} (|\uparrow\downarrow| + |\downarrow\uparrow|), |\downarrow\downarrow| \}$
Photon radius
$r_\gamma = \hbar =$
$= 1.0556363 \cdot 10^{-34}$ (m)
Frequorce of primordial photon
$\varphi_\gamma = \boldsymbol{\varphi}_\mathbf{I} = c\, \hbar^{-1} =$
$= 2.839921837 \cdot 10^{42}$ (s^{-1})
Temperature of primordial photon
$\Theta_\gamma = \boldsymbol{\Theta}_\mathbf{I} = c\, k_B^{-1} =$
$= 2.17138589 \cdot 10^{31}$ (K)
Intervalic-relativistic transformations of time regarding temperature
$t = t_0 / \sqrt{}(1-[\Theta/\boldsymbol{\Theta}_\mathbf{I}]^2)$
Total energy of primordial photons
$\Sigma E(\gamma) = \tfrac{1}{4}\, c^7\, \hbar^2\, \boldsymbol{\varphi}_\mathbf{I}^2 = \tfrac{1}{4}\, c^9$
$= 4.890196776 \cdot 10^{75}$ (J)
Since the energy of primordial photons was exactly the intervalic velenergy, $c = 2.99792458 \cdot 10^8$ (J), we can surprisingly know with astonishing simplicity the *number of primordial photons* assembled from intervalic strings at the beginning of the Universe:
$n(\gamma) = \Sigma E(\gamma) / c = \tfrac{1}{4}\, c^8 =$
$= 1.631194063 \cdot 10^{67}$</td>
<td rowspan="6">INTERVALINO
—quantum of matter—
(Share = 1/4)
= Antisymmetric assembly of Photons
Intervalino state
$\mathbf{I} = 2^{-½} (|\gamma\underline{\gamma}| - |\underline{\gamma}\gamma|)$
Intervalino radius
$r(\mathbf{I}) = c / \omega(\mathbf{I}) = 2\, \hbar =$
$= 2.1112726 \cdot 10^{-34}$ (m)
Intervalino spin: $J(\mathbf{I}) = 0$
Intervalino charge
$\mathbf{q_I} = \sqrt{}-(c^{-1}\hbar) = 1\, (i^{-1/2}L^{1/2}) =$
$= 5.93398995 \cdot 10^{-22}$ (C)
Intervalino intervalic energy
$I(\mathbf{I}) = c^{\pm 2}\, \hbar\, \mathbf{q_I}^{-2} = c^{-1} =$
$= 20{,}819.42423$ (MeV/c^2)
Intervalino electromagnetic potential energy: $U(\mathbf{I}) = 0$
Intervalino mass: $m(\mathbf{I}) = I(\mathbf{I})$
Intervalino spin energy
$E_J(\mathbf{I}) = I(\mathbf{I}) - U(\mathbf{I}) = c^{-1} =$
$= 20{,}819.42423$ (MeV/c^2)
Intervalino linear velocity on surface:
$v(\mathbf{I}) = c$
Total energy of primordial intervalinos and gravitons
$\Sigma E(\mathbf{I}) \equiv \Sigma E(g) = \tfrac{1}{2}\, \Sigma E(\gamma) =$
$= (1/8)\, c^9 =$
$= 2.445098388 \cdot 10^{75}$ (J)
Number of primordial intervalinos assembled at the IPA
$n(\mathbf{I}) = \Sigma E(\mathbf{I}) / I(\mathbf{I}) =$
$= (1/8)\, c^{10} = 7.330220558 \cdot 10^{83}$
Threshold temperature of annihilation-materialization of intervalinos, $\gamma\gamma \leftrightarrow \mathbf{I}$
$\Theta_t(\mathbf{I}) \geq c^{\pm 2} m(\mathbf{I}) / k_B = 4\pi\, \Theta_m =$
$= 2.415992632 \cdot 10^{14}$ (K)
Threshold frequorce of photons at the annihilation-materialization of intervalinos, φ_t
$\varphi_t = 4\pi\, \varphi_m = 1/(c\hbar) = 3.159839191 \cdot 10^{25}$ (s^{-1})</td>
<td rowspan="5">DALINOS
—quanta of electric charge—
(Share = 1/8)
= Symmetric assembly of Intervalinos
$D^{(\pm 1/1,2,3,5,6,9,10,15,18,27,30,45,54,90,135,270)}$
—16 electric charged dalinos geometrically allowed by the intervalic symmetries of Nature—

Electron
$e = G_1 = D_{270} = 270\, \mathbf{I} = 540\, \gamma = 1080\, S$
Electron charge
$e = 270\, \mathbf{q_I} = 270\, \sqrt{}-(c^{-1}\hbar)$
Structural energy balance
$I - I^{-1} - E(J) =$
$= [\, c^{\pm 2}\, \hbar\, (270\, \mathbf{q_I})^{-2}\,] -$
$- [\, \tfrac{1}{2}\, (1/4\pi\varepsilon_0)\, e^2 / r_e\,] -$
$m_e\, \omega_J(e)^2\, r_e^2 = 0$

Total energy of primordial dalinos:
$\Sigma E(D^\pm) \equiv \Sigma E(D^0) = \tfrac{1}{2}\, \Sigma E(\mathbf{I}) =$
$= (1/16)\, c^9 = 1.222549194 \cdot 10^{75}$ (J)

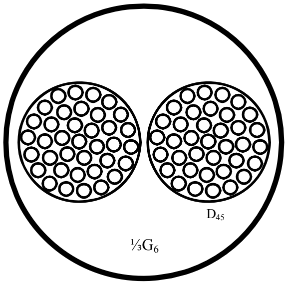
(Big Bang origin)</td>
<td rowspan="4">GAUDINOS
(Share = 1/16)
= Symmetric assembly of Dalinos
$G^{(\pm⅓,\, \pm⅔)}$: ***Nucleonic gaudinos***
$G^{(\pm)}$: ***Leptons-Charged Massive Bosons***
—16 elementary charged gaudinos geometrically allowed by the intervalic symmetries of Nature—

Muon, Tau,
$\boldsymbol{Z^\pm, W^\pm, Y^\pm, X^\pm}$</td>
<td rowspan="3">LISZTINOS$^{(\pm⅓,\, \pm⅔)}$
(Share = 1/32)
= Symmetric assembly of gaudinos
Quarks
(49 quarks = 7 lisztinian families × × 7 dalinar symmetries)
Inasmuch as the vast majority of ZCMB decayed into quarks, and as the vast majority of primordial quarks decayed finally into the isoquark $L_3 3G_6 18D_{45}^{(⅓,\, ⅔)}$—former *quarks up* and *down*—, we can deduce the *maximum number of nucleonic isoquarks* generated at the primordial Universe (taking roughly $m(q) \sim 313$ MeV/c^2):
$n(q) \leq \Sigma m(L^{\pm⅓,\, \pm⅔}) / \Sigma m(q) =$
$1.218937472 \cdot 10^{85}$</td>
<td rowspan="2">MONTEVERDINOS
= Assembly of 3 lisztinos$^{(\pm⅓,\, \pm⅔)}$
Baryons</td>
<td>PALESTRINOS
Nuclei: $1 < A \leq 3$</td>
</tr>
<tr><td>PSEUDO-PALESTRINOS
Nuclei: $A > 3$</td></tr>
<tr><td>MONTEVERDINOS
= Assembly of 2 Lisztinos$^{(\pm⅓,\, \pm⅔)}$
Mesons</td><td>7th. symmetry breaking</td></tr>
<tr><td>LISZTINOS$^{(0)}$
= Antisymmetric assembly of Gaudinos
Bileptons-Z.C.M.Bosons:
$\mathbf{Z^0, W^0, Y^0, X^0}$</td><td colspan="2">6th. symmetry breaking</td></tr>
<tr><td>ZERO CHARGED GAUDINOS
(Share = 1/16)
= Antisymmetric assembly of **D**
—25 zero charged gaudinos —
Dark matter</td><td colspan="3">ELEMENTARY CHARGE ATTRACTOR
5th. symmetry breaking</td></tr>
<tr><td>ZERO CHARGED DALINOS
(Share = 1/8)
= Antisymmetric assembly of **I**
—8 zero charged dalinos —
$D_{270}^0, D_{90}^0, D_{54}^0, D_{30}^0, D_{18}^0, D_{10}^0, D_6^0, D_2^0$
Dark matter</td><td colspan="4">INTERVALIC CHANGEFUL INTERACTION
(formerly weak interaction). 4th. symmetry breaking</td></tr>
<tr><td>GRAVITON
(Share = 1/4)
= Symmetric assembly of γ
$g = |\gamma\underline{\gamma}|_s = [|\gamma\gamma|, 2^{-½}\, |\gamma\underline{\gamma}|+|\underline{\gamma}\gamma|), |\underline{\gamma}\underline{\gamma}|]$
Dark energy</td><td colspan="5">Degree of freedom: **ELECTRIC CHARGE** → ELECTROMAGNETIC INTERACTION. 3rd. symmetry breaking</td></tr>
<tr><td>CHI
(Share = 1/2)
= Antisym. assembly of *S*
$¢ = 2^{-½}\, (|\uparrow\downarrow| - |\downarrow\uparrow|)$
Dark energy</td><td colspan="6">Degree of freedom: **MASS** → GRAVITATIONAL INTERACTION. DARK MATTER UNIVERSE. 2nd. symmetry breaking</td></tr>
<tr><td>INTERVALIC LENGTH</td><td colspan="7">Degree of freedom: **SPIN** → INTERVALIC CHANGELESS INTERACTION (formerly strong interaction). LIGHT UNIVERSE. 1st. symmetry breaking</td></tr>
<tr><td colspan="8">Degree of freedom: **INFORMATION** → INFORMATIONAL INTERACTION. INFORMATION UNIVERSE (TIMELESS). Zero symmetry breaking</td></tr>
</table>

INTERVALIC STRUCTURES
OF SUBATOMIC PARTICLES
ALLOWED BY THE INTERVALIC SYMMETRIES
(mass in MeV)

SIMETRÍA DALINAR	LEPTONES-BOSONES MASIVOS Y NEUTRINOS	QUARKS (LISZTINOS FRACCIONARIOS)
{D270}	$G_1D_{270}^{(\pm)}$ (0.5) = $e^{\pm}$ *electron* $v_{D270} = v_e$ *neutrino* ($1.1833119 \cdot 10^{-14}$)	-
{D135}	-	-
{D90}	-	-
{D54}	-	-
{D45}	$G_6D_{45}^{(\pm)}$ (106) = $\mu^{\pm}$ *muon* $v_{D45} = v_\mu$ *neutrino* ($2.0005108 \cdot 10^{-7}$)	$L_{⅓}⅓G_62D_{45}^{(⅓)}$ (35) *last radiant decay quark* $L_{⅔}⅔G_64D_{45}^{(⅓,\,⅔)}$ (69) *constituent quark of π meson* $L_11G_66D_{45}^{(⅓,\,⅔)}$ (104) $L_22G_612D_{45}^{(⅓,\,⅔)}$ (207) **$L_33G_618D_{45}^{(⅓,\,⅔)}$ (311)** *former quarks up, down* $L_44G_624D_{45}^{(⅓,\,⅔)}$ (414) $L_55G_630D_{45}^{(⅓,\,⅔)}$ (518) *former quark strange*
{D30}	$G_9D_{30}^{(\pm)}$ (373) - v_{D30} -	$L_{⅓}⅓G_93D_{30}^{(⅓)}$ (117) $L_{⅔}⅔G_96D_{30}^{(⅔)}$ (233) $L_11G_99D_{30}^{(⅓)}$ (350) $L_22G_918D_{30}^{(⅔)}$ (699) $L_33G_927D_{30}^{(⅓)}$ (1,049) **$L_44G_936D_{30}^{(⅔)}$ (1,399)** *former quark charm* $L_55G_945D_{30}^{(⅓)}$ (1,748)
{D27}	-	-
{D18}	$G_{15}D_{18}^{(\pm)}$ (1,777) = $\tau^{\pm}$ *tau* $v_{D18} = v_\tau$ *neutrino* ($2.6777745 \cdot 10^{-4}$)	$L_{⅓}⅓G_{15}5D_{18}^{(⅓)}$ (540) $L_{⅔}⅔G_{15}10D_{18}^{(⅔)}$ (1,079) $L_11G_{15}15D_{18}^{(⅓)}$ (1,619) $L_22G_{15}30D_{18}^{(⅔)}$ (3,238) **$L_33G_{15}45D_{18}^{(⅓)}$ (4,857)** *former quark bottom* $L_44G_{15}60D_{18}^{(⅔)}$ (6,476) $L_55G_{15}75D_{18}^{(⅓)}$ (8,095)
{D15}	-	-
{D10}	-	-
{D9}	-	-
{D6}	$G_{45}45D_6^{(\pm)}$ (46,565) $Z^{\pm}$ *massive boson* $L_22G_{45}90D_6^{(0)}$ (91,188) **Z^0 *massive boson*** v_{D6} *neutrino*	$L_{⅓}⅓G_{45}15D_6^{(⅓)}$ (14,571) $L_{⅔}⅔G_{45}30D_6^{(⅔)}$ (29,141) $L_11G_{45}45D_6^{(⅓)}$ (43,712) $L_22G_{45}90D_6^{(⅔)}$ (87,426) $L_33G_{45}135D_6^{(⅓)}$ (131,135) **$L_44G_{45}180D_6^{(⅔)}$ (174,846)** *former quark top* $L_55G_{45}225D_6^{(⅓)}$ (218,558)
{D5}	$G_{54}54D_5^{(\pm)}$ (80,423) **$W^{\pm}$ *massive boson*** $L_22G_{54}108D_5^{(0)}$(160,928) W^0 *massive boson* v_{D5} *neutrino*	$L_{⅓}⅓G_{54}18D_5^{(⅓)}$ (25,178) $L_{⅔}⅔G_{54}36D_5^{(⅓,\,⅔)}$ (50,356) $L_11G_{54}54D_5^{(⅓,\,⅔)}$ (75,534) $L_22G_{54}108D_5^{(⅓,\,⅔)}$ (151,068) **$L_33G_{54}162D_5^{(⅓,\,⅔)}$ (226,601)** $L_44G_{54}216D_5^{(⅓,\,⅔)}$ (302,134) $L_55G_{54}270D_5^{(⅓,\,⅔)}$ (377,668)
{D3}	$G_{90}90D_3^{(\pm)}$ (372,518) $Y^{\pm}$ *massive boson* $L_22G_{90}180D_3^{(0)}$ (745,037) **Y^0 *massive boson*** v_{D3} *neutrino*	$L_{⅓}⅓G_{90}30D_3^{(⅓)}$ (116,564) $L_{⅔}⅔G_{90}60D_3^{(⅓,\,⅔)}$ (233,128) $L_11G_{90}90D_3^{(⅓,\,⅔)}$ (349,693) $L_22G_{90}180D_3^{(⅓,\,⅔)}$ (699,384) $L_33G_{90}270D_3^{(⅓,\,⅔)}$ (1,049,078) **$L_44G_{90}360D_3^{(⅓,\,⅔)}$ (1,398,771)** $L_55G_{90}450D_3^{(⅓,\,⅔)}$ (1,748,463)
{D2}	$G_{135}135D_2^{(\pm)}$ (1,257,249) **$X^{\pm}$ *massive boson*** $L_22G_{135}270D_2^{(0)}$ (2,514,499) X^0 *massive boson* v_{D2} *neutrino*	$L_{⅓}⅓G_{135}45D_2^{(⅓)}$ (393,404) $L_{⅔}⅔G_{135}90D_2^{(⅓,\,⅔)}$ (786,808) $L_11G_{135}135D_2^{(⅓,\,⅔)}$ (1,180,213) $L_22G_{135}270D_2^{(⅓,\,⅔)}$ (2,360,424) $L_33G_{135}405D_2^{(⅓,\,⅔)}$ (3,540,638) $L_44G_{135}540D_2^{(⅓,\,⅔)}$ (4,720,850) $L_55G_{135}675D_2^{(⅓,\,⅔)}$ (5,901,063)
{D1}	-	-

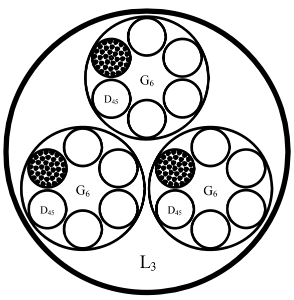
Lisztinian structure $L_{⅓}$
(quarks composed by 90 intervalinos)



Constituent quark of π meson.
Last radiant decay quark

(35) Quark $L_{⅓}⅓G_62D_{45}^{(⅓)}$
= 90 **I** = 180 γ = 360 S

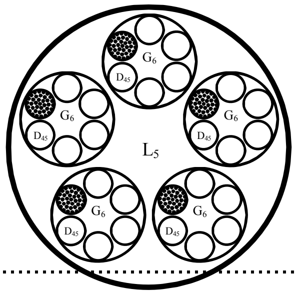
Lisztinian structure L_3
(quarks composed by 810 intervalinos)



Former quarks up, down

(311) Quark $L_33G_618D_{45}^{(⅓,\,⅔)}$
= 810 **I** = 1620 γ = 3240 S

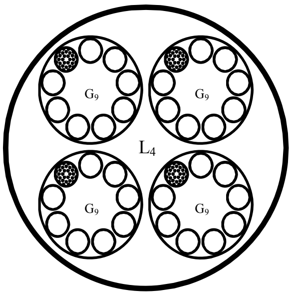
Lisztinian structure L_5
(quarks composed by 1350 intervalinos)



Former quark strange

(518) Quark $L_55G_630D_{45}^{(⅓,\,⅔)}$
= 1350 **I** = 2700 γ = 5400 S

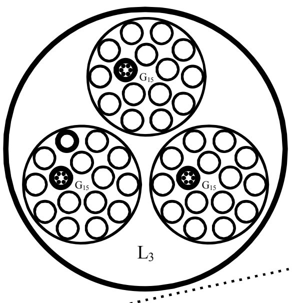
Lisztinian structure L_4
(quarks composed by 1080 intervalinos)



Former quark charm

(1,399) Quark $L_44G_936D_{30}^{(⅔)}$
= 1080 **I** = 2160 γ = 4320 S

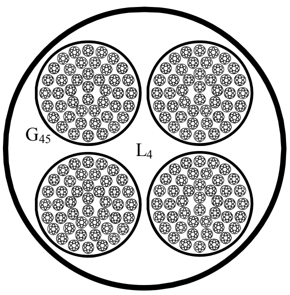
Lisztinian structure L_3
(quarks composed by 810 intervalinos)



Former quark bottom

(4,857) Quark $L_33G_{15}45D_{18}^{(⅓)}$
= 810 **I** = 1620 γ = 3240 S

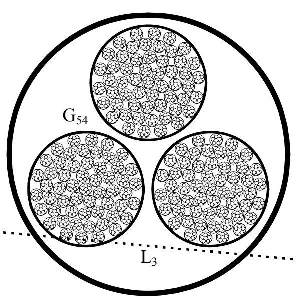
Lisztinian structure L_4
(quarks composed by 1080 intervalinos)



Former quark top

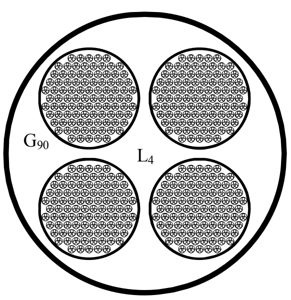
(174,846) Quark $L_44G_{45}180D_6^{(⅔)}$
= 1080 **I** = 2160 γ = 4320 S

Lisztinian structure L_3
(quarks composed by 810 intervalinos)

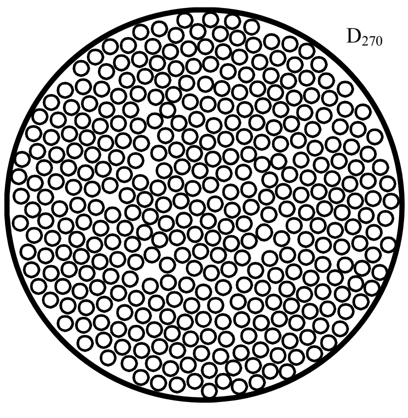
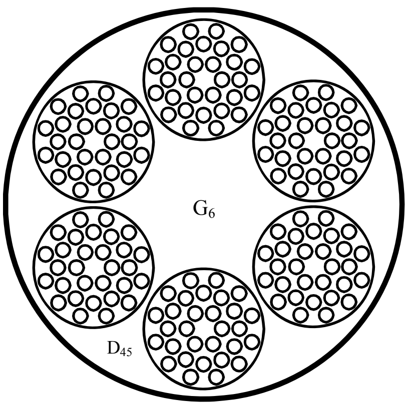
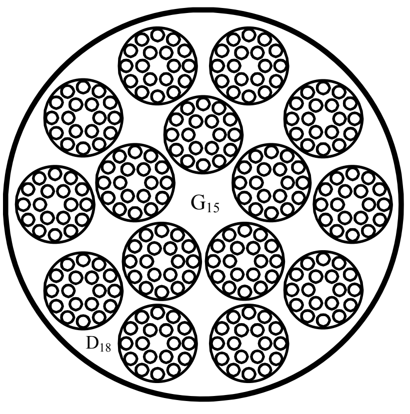
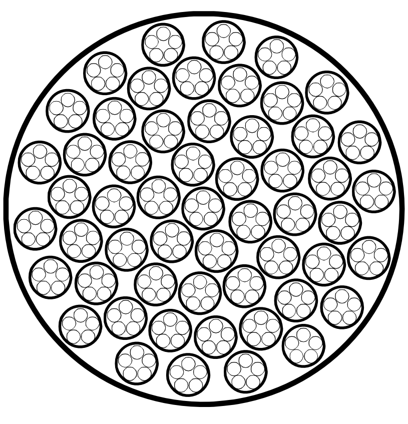
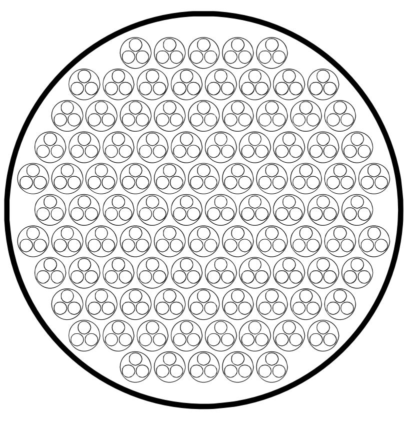
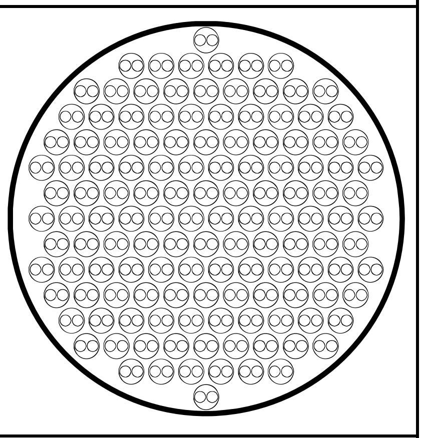
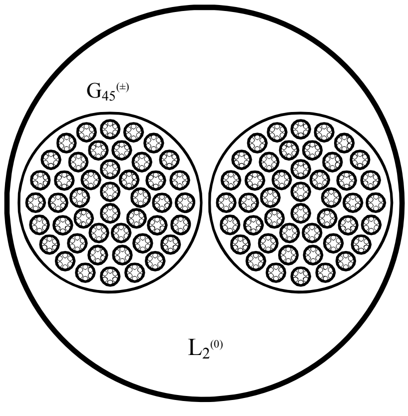
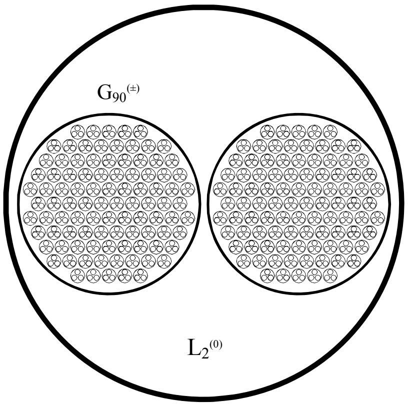
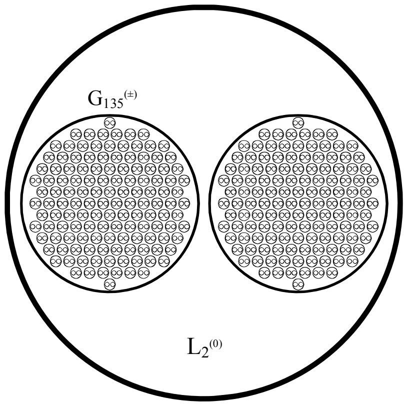


(226,601) Quark $L_33G_{54}162D_5^{(⅓,\,⅔)}$
= 810 **I** = 1620 γ = 3240 S

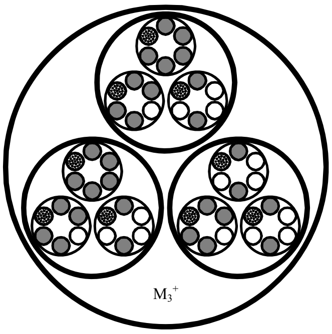
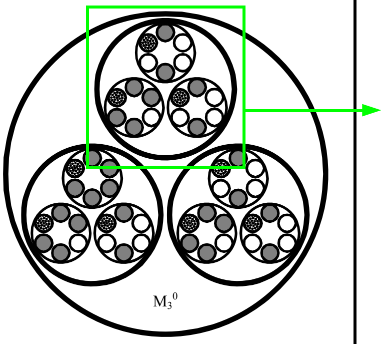
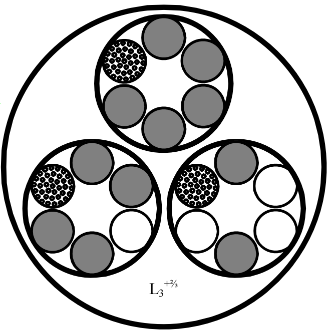
Lisztinian structure L_4
(quarks composed by 1080 intervalinos)

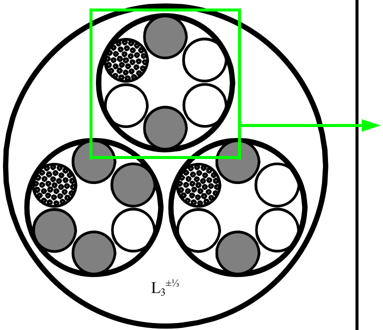
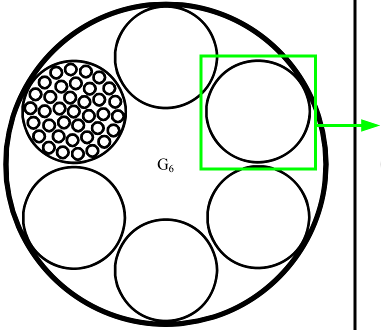
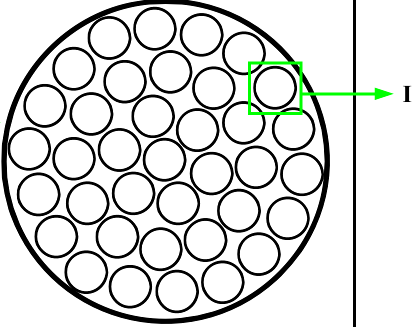


(1,398,771) Quark $L_44G_{90}360D_3^{(⅓,\,⅔)}$
= 1080 **I** = 2160 γ = 4320 S

Dimensional Basis of the Intervalic System of Units: (L, i) $\dim(\hbar) = L$ $\dim(c) = i^{-1}$	**INTERVALIC LEPTONS-CHARGED MASSIVE BOSONS**		
	ELECTRON (0.51099906 MeV/c^2)	**MUON (105.658389 MeV/c^2)**	**TAU (1,777 MeV/c^2)**
	$e = D_{270} = 270\ \mathbf{I} = 540\ \gamma = 1080\ S$	$\mu = G_6 = 6\ D_{45} = 270\ \mathbf{I} = 540\ \gamma = 1080\ S$	$\tau = G_{15} = 15\ D_{18} = 270\ \mathbf{I} = 540\ \gamma = 1080\ S$
Intervalic structure			
Intervalic energy, I	$I(e) = c^{\pm 2}\ \hbar\ e^{-2} = 4.575639166 \cdot 10^{-14}$ (J) = = 0.285588809 (MeV/c^2)	$I(\mu) = \sum(c^{\pm 2}\ \hbar\ Q^{-2}) = c^{\pm 2}\ \hbar\ e^{-2}$ + + $6\ (c^{\pm 2}\hbar\ (45\ \mathbf{q_I})^{-2})$ = 61.9727717 (MeV/c^2)	$I(\tau) = \sum(c^{\pm 2}\ \hbar\ Q^{-2}) = c^{\pm 2}\ \hbar\ e^{-2}$ + + $15\ (c^{\pm 2}\hbar\ (18\mathbf{q_I})^{-2})$ = 964.1478215 (MeV/c^2)
Electromagnetic energy, U	$U(e) = c^{\pm 2}m(e) - I(e) = 3.611471925 \cdot 10^{-14}$ (J) = = 0.22541025 (MeV/c^2)	$U(\mu) = c^{\pm 2}m(\mu) - I(\mu) = 6.999210568 \cdot 10^{-12}$ (J) = = 43.6856173 (MeV/c^2)	$U(\tau) = c^{\pm 2}m(\tau) - I(\tau) = 1.302333333 \cdot 10^{-10}$ (J) = = 812.8521785 (MeV/c^2)
Spin energy, E_J	$E_J(e) = I(e) - U(e) = 9.64167241 \cdot 10^{-15}$ (J)	$E_J(\mu) = I(\mu) - U(\mu) = 2.929926422 \cdot 10^{-12}$ (J)	$E_J(\tau) = I(\tau) - U(\tau) = 2.42402449 \cdot 10^{-11}$ (J)
Radius, r	$r_e = ½\ (1/4\pi\varepsilon_0)\ e^2 / U(e) = 3.194098699 \cdot 10^{-15}$ (m)	$r_\mu = ½\ (1/4\pi\varepsilon_0)\ (270\ \mathbf{q_I})^2 / U(\mu) = 1.648099834 \cdot 10^{-17}$ (m)	$r_\tau = ½\ (1/4\pi\varepsilon_0)\ (270\ \mathbf{q_I})^2 / U(\tau) = 8.857484858 \cdot 10^{-19}$ (m)
Angular velocity due to spin, ω_J	$\omega_J(e) = (\ E_J(e)\ /\ m_e\ r_e^{\ 2}\ )^{½} = 3.220944289 \cdot 10^{22}$ (s^{-1})	$\omega_J(\mu) = (\ E_J(\mu)\ /\ m_\mu\ r_\mu^{\ 2}\ )^{½} = 7.567601581 \cdot 10^{24}$ (s^{-1})	$\omega_J(\tau) = (\ E_J(\tau)\ /\ m_\tau\ r_\tau^{\ 2}\ )^{½} = 9.87597042 \cdot 10^{25}$ (s^{-1})
Linear velocity due to spin on surface, v_J	$v_J(e) = \omega_J(e)\ r_e = 1.028801396 \cdot 10^8$ (m s^{-1}) = = 0.343171206 c	$v_J(\mu) = \omega_J(\mu)\ r_\mu = 1.247216291 \cdot 10^8$ (m s^{-1}) = = 0.416026573 c	$v_J(\tau) = \omega_J(\tau)\ r_\tau = 8.747625846 \cdot 10^7$ (m s^{-1}) = = 0.29178939 c
Intervalic quantum of charge $\mathbf{q_I} = \sqrt{-(c^{-1}\hbar)} = 1\ (i^{-1/2}L^{1/2})$ = $5.93398995 \cdot 10^{-22}$ (C)	**$W^\pm$ MASSIVE BOSON (80,423 MeV/c^2)**	**$Y^\pm$ MASSIVE BOSON (372,518 MeV/c^2)**	**$X^\pm$ MASSIVE BOSON (1,257,249 MeV/c^2)**
	$W^\pm = G_{54} = 54\ D_5 = 270\ \mathbf{I} = 540\ \gamma = 1080\ S$	$Y^\pm = G_{90} = 90\ D_3 = 270\ \mathbf{I} = 540\ \gamma = 1080\ S$	$X^\pm = G_{135} = 135\ D_2 = 270\ \mathbf{I} = 540\ \gamma = 1080\ S$
Intervalic structure			
Intervalic energy, I	$I(W^\pm) = \sum(c^{\pm 2}\ \hbar\ Q^{-2}) = c^{\pm 2}\ \hbar\ e^{-2}$ + + $54\ (c^{\pm 2}\hbar\ (5\ \mathbf{q_I})^{-2})$ = 44,970.24192 (MeV/c^2)	$I(Y^\pm) = \sum(c^{\pm 2}\hbar Q^{-2}) = c^{\pm 2}\hbar\ e^{-2} + 90\ (c^{\pm 2}\hbar\ (3\ \mathbf{q_I})^{-2})$ = $3.335645528 \cdot 10^{-8}$ (J) = 208,194.5279 (MeV/c^2)	$I(X^\pm) = \sum(c^{\pm 2}\hbar Q^{-2}) = c^{\pm 2}\hbar\ e^{-2} + 135\ (c^{\pm 2}\hbar\ (2\mathbf{q_I})^{-2})$ = = $1.125779279 \cdot 10^{-7}$ (J) = 702,655.8532 (MeV/c^2)
Electromagnetic energy, U	$U(W^\pm) = c^{\pm 2}m(W^\pm) - I(W^\pm) = 5.6801605 \cdot 10^{-9}$ (J) = = 35,452.76 (MeV/c^2)	$U(Y^\pm) = c^{\pm 2}m(Y^\pm) - I(Y^\pm) = 2.632758703 \cdot 10^{-8}$ (J) = = 164,323.802 (MeV/c^2)	$U(X^\pm) = m(X^\pm) - I(X^\pm) = 8.88557208 \cdot 10^{-8}$ (J) = = 554,593.547 (MeV/c^2)
Spin energy, E_J	$E_J(W^\pm) = I(W^\pm) - U(W^\pm) = 1.524869713 \cdot 10^{-9}$ (J) = = 9,517.484017 (MeV/c^2)	$E_J(Y^\pm) = I(Y^\pm) - U(Y^\pm) = 7.02886825 \cdot 10^{-9}$ (J) = = 43,870.726 (MeV/c^2)	$E_J(X^\pm) = I(X^\pm) - U(X^\pm) = 2.37222071 \cdot 10^{-8}$ (J) = = 148,062.307 (MeV/c^2)
Radius, r	$r_W = ½\ (1/4\pi\varepsilon_0)\ (270\ \mathbf{q_I})^2 / U(W^\pm) = 2.0308225 \cdot 10^{-20}$ (m)	$r_Y = ½\ (1/4\pi\varepsilon_0)\ (270\ \mathbf{q_I})^2 / U(Y^\pm) = 4.381482156 \cdot 10^{-21}$ (m)	$r_X = ½\ (1/4\pi\varepsilon_0)\ (270\ \mathbf{q_I})^2 / U(X^\pm) = 1.298215261 \cdot 10^{-21}$ (m)
Angular velocity due to spin, ω_J	$\omega_J(W^\pm) = (\ E_J(W^\pm)\ /\ m_W\ r_W^{\ 2}\ )^{½} = 5.0783155 \cdot 10^{27}$ (s^{-1})	$\omega_J(Y^\pm) = (\ E_J(Y^\pm)\ /\ m_Y\ r_Y^{\ 2}\ )^{½} = 2.34808191 \cdot 10^{28}$ (s^{-1})	$\omega_J(X^\pm) = (\ E_J(X^\pm)\ /\ m_X\ r_X^{\ 2}\ )^{½} = 7.92474925 \cdot 10^{28}$ (s^{-1})
Linear velocity due to spin on surface, v_J	$v_J(W^\pm) = \omega_J(W^\pm)\ r_W = 1.03131574 \cdot 10^8$ (m s^{-1}) = = 0.34400990 c	$v_J(Y^\pm) = \omega_J(Y^\pm)\ r_Y = 1.02880790 \cdot 10^8$ (m s^{-1}) = = 0.343173375 c	$v_J(X^\pm) = \omega_J(X^\pm)\ r_X = 1.02880304 \cdot 10^8$ (m s^{-1}) = = 0.343171755 c
Structural energy balance for subatomic particles $I - I^{-1} - E_J = 0$ $c^{\pm 2}\ \hbar\ Q^{-2}\ - [\ ½(1/4\pi\varepsilon_0)Q^2 / r\ ] - m\ r^2\omega_J^{\ 2}\ = 0$	**INTERVALIC BILEPTONS-ZERO CHARGED MASSIVE BOSONS**		
	Z^0 MASSIVE BOSON (91,188 MeV/c^2)	**Y^0 MASSIVE BOSON (745,037 MeV/c^2)**	**X^0 MASSIVE BOSON (2,514,499 MeV/c^2)**
	$Z^0 = L_2 = 2\ G_{45} = 90\ D_6 = 540\ \mathbf{I} = 1080\ \gamma = 2160\ S$	$Y^0 = L_2 = 2\ G_{90} = 180\ D_3 = 540\ \mathbf{I} = 1080\ \gamma = 2160\ S$	$X^0 = L_2 = 2\ G_{135} = 270\ D_2 = 540\ \mathbf{I} = 1080\ \gamma = 2160\ S$
Intervalic structure			

NUCLEON AND ITS CONSTITUENT ELECTROMAGNETIC PARTICLES

	PROTON	NEUTRON	QUARK UP
	$p = M_3 = 3\,L_3 = 9\,G_6 = 54\,D_{45} =$ $= 2430\,\mathbf{I} = 4860\,\gamma = 9720\,S$	$n = M_3 = 3\,L_3 = 9\,G_6 = 54\,D_{45} =$ $= 2430\,\mathbf{I} = 4860\,\gamma = 9720\,S$	$u^{+\frac{2}{3}} = L_3^{+\frac{2}{3}} = G_6^{+\frac{2}{3}} + G_6^{-\frac{1}{3}} + G_6^{+\frac{1}{3}} =$ $= 810\,\mathbf{I} = 1620\,\gamma = 3240\,S$
Intervalic Structure *(figured representation)*			
Intervalic energy I	$I(p)_{MLGD} = I(p)_M + I(u+u+d)_L + I[2(G_6^{\pm\frac{2}{3}}) + 7\,(G_6^{\pm\frac{1}{3}})]_G + 54I(D_{45})_D = 578.6029324\ (MeV/c^2)$	$I(n)_{MLGD} = I(n)_M + I(u+d+d)_L + I[(G_6^{\pm\frac{2}{3}}) + 8(G_6^{\pm\frac{1}{3}})]_G + 54I(D_{45})_D = 582.1727926\ (MeV/c^2)$	$I(u)_{LGD} = I(L_3^{+\frac{2}{3}}) + I(G_6^{+\frac{2}{3}}) + 2I(G_6^{\pm\frac{1}{3}}) + 18I\,(D_{45}) = 191.4872982\ (MeV/c^2)$
Electromagnetic energy U	$U(p)_{MLGD} = U(p)_M + U(u+u+d)_L + U[2(G_6^{\pm\frac{2}{3}}) + 7\,(G_6^{\pm\frac{1}{3}})]_G + 54U(D_{45})_D = 359.6693703\ (MeV/c^2)$	$U(n)_{MLGD} = U(n)_M + U(u+d+d)_L + U[(G_6^{\pm\frac{2}{3}}) + 8\,(G_6^{\pm\frac{1}{3}})]_G + 54U(D_{45})_D = 357.3928374\ (MeV/c^2)$	$U(u)_{LGD} = U(L_3^{+\frac{2}{3}}) + U(G_6^{+\frac{2}{3}}) + 2UI(G_6^{\pm\frac{1}{3}}) + 18U(D_{45}) = 120.6486320\ (MeV/c^2)$
Spin energy E_J	$E_J(p)_M = I(p)_M - 0 = 4.5756390 \cdot 10^{-14}\ (J) = 0.285588809\ (MeV/c^2)$	$E_J(n)_M = 0 - E_q(n)_M = 5.58841376 \cdot 10^{-14}\ (J) = 0.34880120\ (MeV/c^2)$	$E_J(u)_L = I(u)_L - E_q(u)_L = 2.573797104 \cdot 10^{-13}\ (J) = 1.60643710\ (MeV/c^2)$
Mass energy m	$m(p) = 938.2723027\ (MeV/c^2)$	$m(n) = 939.5656300\ (MeV/c^2)$	$m(u) = 312.1359302\ (MeV/c^2)$
Radius r	$r_N \approx \frac{1}{2}\,(r_{int} + r_{ext}) = 1.237448636 \cdot 10^{-15}\ (m)$	$r_N \approx \frac{1}{2}\,(r_{int} + r_{ext}) = 1.237448636 \cdot 10^{-15}\ (m)$	$r_u = 6.88054386 \cdot 10^{-16}\ (m)$
Angular velocity due to spin, ω_J	$\omega_J(p) = (E_J(p)_M / m_p\,r_p^2)^{\frac{1}{2}} = 4.252280621 \cdot 10^{21}\ (s^{-1})$	$\omega_J(n) = (E_J(n)_M / m_n\,r_n^2)^{\frac{1}{2}} = 4.696141808 \cdot 10^{21}\ (s^{-1})$	$\omega_J(u) = (E_J(u)_L / m_u\,r_u^2)^{\frac{1}{2}} = 3.125776462 \cdot 10^{22}\ (s^{-1})$
Linear velocity due to spin on surface, v_J	$v_J(p) = \omega_J(p)\,r_N = 5.230305164 \cdot 10^6\ (m\,s^{-1}) = 0.01744642\,c$	$v_J(n) = \omega_J(n)\,r_N = 5.776254424 \cdot 10^6\ (m\,s^{-1}) = 0.01926751\,c$	$v_J(u) = \omega_J(u)\,r_u = 2.150704204 \cdot 10^7\ (m\,s^{-1}) = 0.07173977\,c$

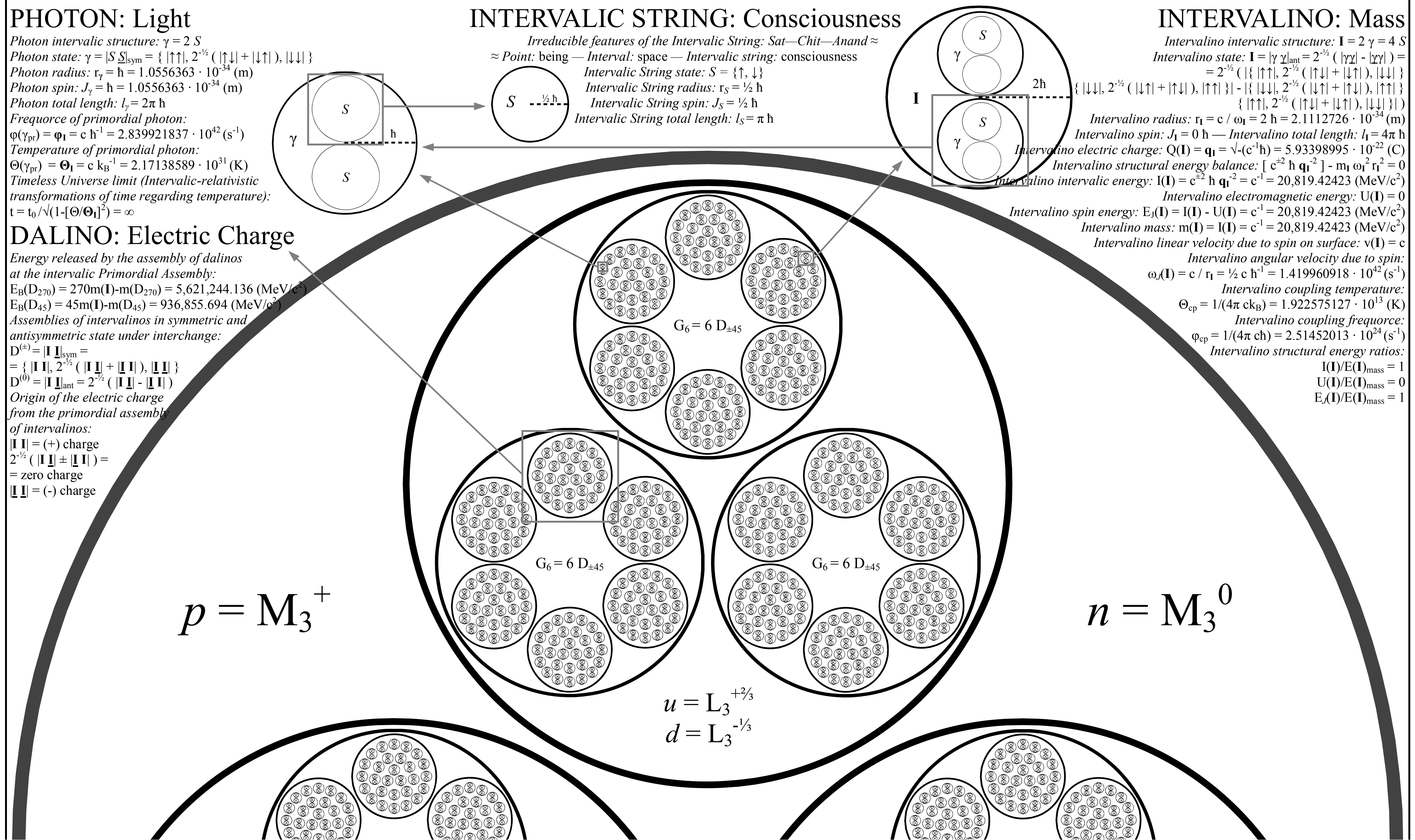
	QUARK DOWN	NUCLEONIC GAUDINOS	NUCLEONIC DALINO
	$d^{-\frac{1}{3}} = L_3^{-\frac{1}{3}} = G_6^{+\frac{1}{3}} + G_6^{-\frac{1}{3}} + G_6^{-\frac{1}{3}} =$ $= 810\,\mathbf{I} = 1620\,\gamma = 3240\,S$	$G_6^{+\frac{2}{3}} = 5D_{+45} + 1D_{-45} = 270\,\mathbf{I} = 540\,\gamma$ $G_6^{-\frac{1}{3}} = 2D_{+45} + 4D_{-45} = 270\,\mathbf{I} = 540\,\gamma$ $G_6^{+\frac{1}{3}} = 4D_{+45} + 2D_{-45} = 270\,\mathbf{I} = 540\,\gamma$	$D_{\pm45} = 45\,\mathbf{I} = 90\,\gamma = 180\,S$
Intervalic Structure *(figured representation)*			
Intervalic energy I	$I(d)_{LGD} = I(L_3^{-\frac{1}{3}}) + I(G_6^{-\frac{1}{3}}) + 2I(G_6^{\pm\frac{1}{3}}) + 18I\,(D_{45}) = 195.3427472\ (MeV/c^2)$	$I(G_6^{\pm\frac{1}{3}})_{GD} = 64.25748329\ (MeV/c^2)$ $I(G_6^{\pm\frac{2}{3}})_{GD} = 62.32975882\ (MeV/c^2)$	$I(D_{45})_D = c^{\pm2}\hbar\,(45\,\mathbf{q_I})^{-2} = c^{\pm2}\hbar\,[45\sqrt{-(c^{-1}h)}]^{-2} = 1.6472301\cdot10^{-12}\ (J) = 10.281197\ (MeV/c^2)$
Electromagnetic energy U	$U(d)_{LGD} = U(L_3^{-\frac{1}{3}}) + U(G_6^{-\frac{1}{3}}) + 2U(G_6^{\pm\frac{1}{3}}) + 18U(D_{45}) = 118.3721063\ (MeV/c^2)$	$U(G_6^{\pm\frac{1}{3}})_{GD} = 41.34633762\ (MeV/c^2)$ $U(G_6^{\pm\frac{2}{3}})_{GD} = 39.41861307\ (MeV/c^2)$	$U_{G6\pm\frac{1}{3}}(D_{45})_D = 6.409125138\ (MeV/c^2)$ $U_{G6\pm\frac{2}{3}}(D_{45})_D = 6.24848144\ (MeV/c^2)$
Spin energy E_J	$E_J(d)_L = I(d)_L - E_q(d)_L = 5.662353564 \cdot 10^{-13}\ (J) = 3.53416158\ (MeV/c^2)$	$E_J(G_6^{\pm\frac{1}{3}})_G = I(G_6^{\pm\frac{1}{3}})_G - E_q(G_6^{\pm\frac{1}{3}})_G = 5.133952133\ (MeV/c^2)$	$E_J(_{G6\pm\frac{1}{3}}D_{45})_D = I(D_{45})_D - U_{G6\pm\frac{1}{3}}(D_{45})_D = 3.873072012\ (MeV/c^2)$
Mass energy m	$m(d) = 313.7148535\ (MeV/c^2)$	$m(G_6^{\pm\frac{1}{3}}) = 105.6038198\ (MeV/c^2)$	$m_{G6\pm\frac{1}{3}}(D_{45}) = 16.69032229\ (MeV/c^2)$
Radius r	$r_d = 6.88054386 \cdot 10^{-16}\ (m)$,	$r_{G6} = 8.299740193 \cdot 10^{-17}\ (m)$	$r_{G6\pm\frac{1}{3}}(D_{45}) = 3.12047512 \cdot 10^{-18}\ (m)$
Angular velocity due to spin, ω_J	$\omega_J(d) = (E_J(d)_L / m_d\,r_d^2)^{\frac{1}{2}} = 4.624593827 \cdot 10^{22}\ (s^{-1})$	$\omega_J(G_6^{\pm\frac{1}{3}}) = (E_J(G_6^{\pm\frac{1}{3}})_G / m_{G6}\,r_{G6}^2)^{\frac{1}{2}} = 7.964878478 \cdot 10^{23}\ (s^{-1})$	$\omega_{J\text{-}G6\pm\frac{1}{3}}(D_{45}) = (E_J(D_{45})_D / m_{D45}\,r_{D45}^2)^{\frac{1}{2}} = 4.628021876 \cdot 10^{25}\ (s^{-1})$
Linear velocity due to spin on surface, v_J	$v_J(d) = \omega_J(d)\,r_d = 3.181972066 \cdot 10^7\ (m\,s^{-1}) = 0.10613916\,c$	$v_J(G_6^{\pm\frac{1}{3}}) = \omega_J(G_6^{\pm\frac{1}{3}})\,r_{G6} = 6.610642204 \cdot 10^7\ (m\,s^{-1}) = 0.22050729\,c$	$v_{J\text{-}G6\pm\frac{1}{3}}(D_{45}) = \omega_J(D_{45})\,r_{D45} = 1.444162712 \cdot 10^8\ (m\,s^{-1}) = 0.48172083\,c$

INTERVALIC STRUCTURE OF NUCLEON

$p = M_3^{+} = udu = 3\ L_3\ (L_3^{+2/3}, L_3^{-1/3}, L_3^{+2/3}) = 9\ G_6\ \{(2G_6^{+2/3}, 4G_6^{-1/3}, 3G_6^{+1/3}) = (3G_6^{-1}, 3G_6^{+1}, 2G_6^{+2/3}, 1G_6^{-1/3})\} = 54\ D_{45}\ (30D_{+45}, 24D_{-45}) = 2430\ \mathbf{I} = 4860\ \gamma = 9720\ S$

$n = M_3^{0} = dud = 3\ L_3\ (L_3^{-1/3}, L_3^{+2/3}, L_3^{-1/3}) = 9\ G_6\ \{(1G_6^{+2/3}, 5G_6^{-1/3}, 3G_6^{+1/3}) = (3G_6^{-1}, 3G_6^{+1}, 1G_6^{+2/3}, 2G_6^{-1/3})\} = 54\ D_{45}\ (27D_{+45}, 27D_{-45}) = 2430\ \mathbf{I} = 4860\ \gamma = 9720\ S$

Intervalic structure levels: 0: Point, 1: Intervalic String (S), 2: Photon (γ), 3: Intervalino (**I**), 4: Dalino (D), 5: Gaudino (G), 6: Lisztino(L), 7: Monteverdino (M), 8: Palestrino (P)



PHOTON: Light

Photon intervalic structure: $\gamma = 2\ S$
Photon state: $\gamma = |S\ \underline{S}|_{sym} = \{\ |\uparrow\uparrow|, 2^{-1/2}\ (\ |\uparrow\downarrow| + |\downarrow\uparrow|\ ), |\downarrow\downarrow|\ \}$
Photon radius: $r_\gamma = \hbar = 1.0556363 \cdot 10^{-34}$ (m)
Photon spin: $J_\gamma = \hbar = 1.0556363 \cdot 10^{-34}$ (m)
Photon total length: $l_\gamma = 2\pi\ \hbar$
Frequorce of primordial photon:
$\varphi(\gamma_{pr}) = \boldsymbol{\varphi}_{\mathbf{I}} = c\ \hbar^{-1} = 2.839921837 \cdot 10^{42}\ (s^{-1})$
Temperature of primordial photon:
$\Theta(\gamma_{pr}) = \boldsymbol{\Theta}_{\mathbf{I}} = c\ k_B^{-1} = 2.17138589 \cdot 10^{31}$ (K)
Timeless Universe limit (Intervalic-relativistic transformations of time regarding temperature):
$t = t_0 / \sqrt{(1-[\Theta/\boldsymbol{\Theta}_{\mathbf{I}}]^2)} = \infty$

DALINO: Electric Charge

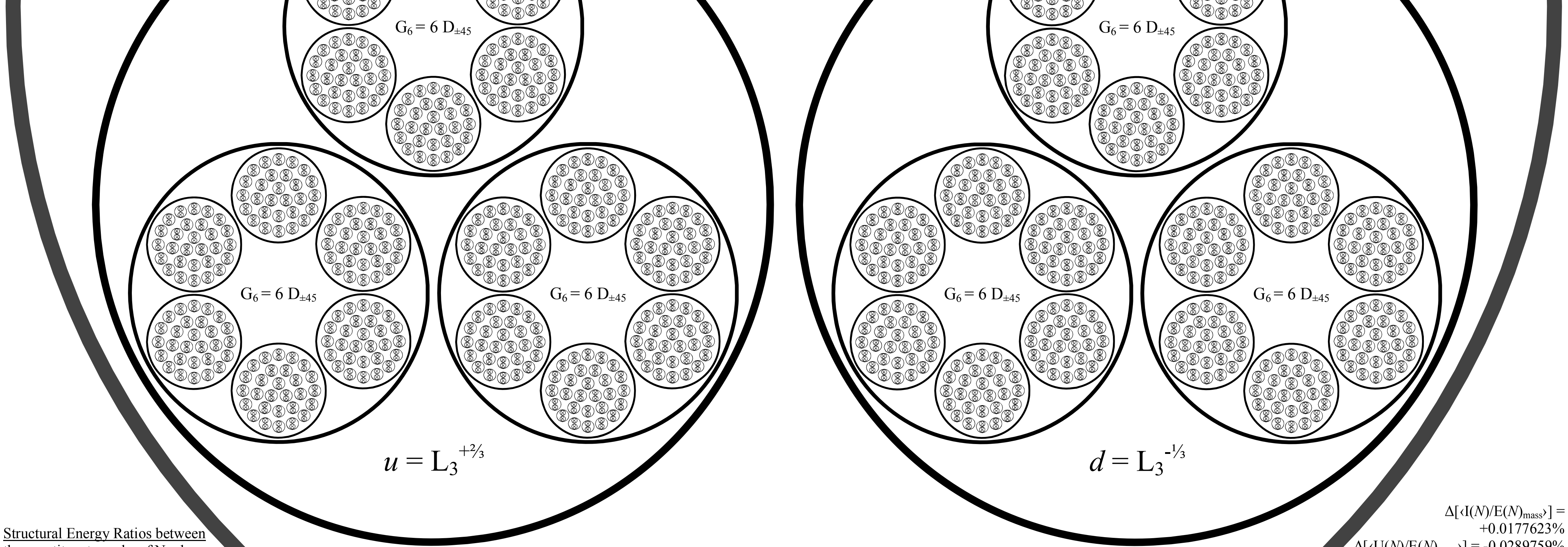
Energy released by the assembly of dalinos at the intervalic Primordial Assembly:
$E_B(D_{270}) = 270m(\mathbf{I})\text{-}m(D_{270}) = 5{,}621{,}244.136\ (MeV/c^2)$
$E_B(D_{45}) = 45m(\mathbf{I})\text{-}m(D_{45}) = 936{,}855.694\ (MeV/c^2)$
Assemblies of intervalinos in symmetric and antisymmetric state under interchange:
$D^{(\pm)} = |\mathbf{I}\ \underline{\mathbf{I}}|_{sym} =$
$= \{\ |\mathbf{I}\ \mathbf{I}|, 2^{-1/2}\ (\ |\mathbf{I}\ \underline{\mathbf{I}}| + |\underline{\mathbf{I}}\ \mathbf{I}|\ ), |\underline{\mathbf{I}}\ \underline{\mathbf{I}}|\ \}$
$D^{(0)} = |\mathbf{I}\ \underline{\mathbf{I}}|_{ant} = 2^{-1/2}\ (\ |\mathbf{I}\ \underline{\mathbf{I}}| - |\underline{\mathbf{I}}\ \mathbf{I}|\ )$
Origin of the electric charge from the primordial assembly of intervalinos:
$|\mathbf{I}\ \mathbf{I}|$ = (+) charge
$2^{-1/2}\ (\ |\mathbf{I}\ \underline{\mathbf{I}}| \pm |\underline{\mathbf{I}}\ \mathbf{I}|\ ) =$
= zero charge
$|\underline{\mathbf{I}}\ \underline{\mathbf{I}}|$ = (-) charge

INTERVALIC STRING: Consciousness

Irreducible features of the Intervalic String: Sat—Chit—Anand ≈
≈ *Point:* being — *Interval:* space — *Intervalic string:* consciousness
Intervalic String state: $S = \{\uparrow, \downarrow\}$
Intervalic String radius: $r_S = ½\ \hbar$
Intervalic String spin: $J_S = ½\ \hbar$
Intervalic String total length: $l_S = \pi\ \hbar$

INTERVALINO: Mass

Intervalino intervalic structure: $\mathbf{I} = 2\ \gamma = 4\ S$
Intervalino state: $\mathbf{I} = |\gamma\ \underline{\gamma}|_{ant} = 2^{-1/2}\ (\ |\gamma\underline{\gamma}| - |\underline{\gamma}\gamma|\ ) =$
$= 2^{-1/2}\ (\ |\{\ |\uparrow\uparrow|, 2^{-1/2}\ (\ |\uparrow\downarrow| + |\downarrow\uparrow|\ ), |\downarrow\downarrow|\ \}$
$\{\ |\downarrow\downarrow|, 2^{-1/2}\ (\ |\downarrow\uparrow| + |\uparrow\downarrow|\ ), |\uparrow\uparrow|\ \}| - |\{\ |\downarrow\downarrow|, 2^{-1/2}\ (\ |\downarrow\uparrow| + |\uparrow\downarrow|\ ), |\uparrow\uparrow|\ \}$
$\{\ |\uparrow\uparrow|, 2^{-1/2}\ (\ |\uparrow\downarrow| + |\downarrow\uparrow|\ ), |\downarrow\downarrow|\ \}|\ )$
Intervalino radius: $r_{\mathbf{I}} = c\ /\ \omega_{\mathbf{I}} = 2\ \hbar = 2.1112726 \cdot 10^{-34}$ (m)
Intervalino spin: $J_{\mathbf{I}} = 0\ \hbar$ — *Intervalino total length:* $l_{\mathbf{I}} = 4\pi\ \hbar$
Intervalino electric charge: $Q(\mathbf{I}) = \mathbf{q}_{\mathbf{I}} = \sqrt{-(c^{-1}\hbar)} = 5.93398995 \cdot 10^{-22}$ (C)
Intervalino structural energy balance: $[\ c^{\pm 2}\ \hbar\ \mathbf{q}_{\mathbf{I}}^{-2}\ ] - m_{\mathbf{I}}\ \omega_{\mathbf{I}}^2\ r_{\mathbf{I}}^2 = 0$
Intervalino intervalic energy: $I(\mathbf{I}) = c^{\pm 2}\ \hbar\ \mathbf{q}_{\mathbf{I}}^{-2} = c^{-1} = 20{,}819.42423\ (MeV/c^2)$
Intervalino electromagnetic energy: $U(\mathbf{I}) = 0$
Intervalino spin energy: $E_J(\mathbf{I}) = I(\mathbf{I}) - U(\mathbf{I}) = c^{-1} = 20{,}819.42423\ (MeV/c^2)$
Intervalino mass: $m(\mathbf{I}) = I(\mathbf{I}) = c^{-1} = 20{,}819.42423\ (MeV/c^2)$
Intervalino linear velocity due to spin on surface: $v(\mathbf{I}) = c$
Intervalino angular velocity due to spin:
$\omega_J(\mathbf{I}) = c\ /\ r_{\mathbf{I}} = ½\ c\ \hbar^{-1} = 1.419960918 \cdot 10^{42}\ (s^{-1})$
Intervalino coupling temperature:
$\Theta_{cp} = 1/(4\pi\ ck_B) = 1.922575127 \cdot 10^{13}$ (K)
Intervalino coupling frequorce:
$\varphi_{cp} = 1/(4\pi\ c\hbar) = 2.51452013 \cdot 10^{24}\ (s^{-1})$
Intervalino structural energy ratios:
$I(\mathbf{I})/E(\mathbf{I})_{mass} = 1$
$U(\mathbf{I})/E(\mathbf{I})_{mass} = 0$
$E_J(\mathbf{I})/E(\mathbf{I})_{mass} = 1$



Structural Energy Ratios between
the constituent quarks of Nucleons
$I(n)_L\ /\ I(p)_L = 1.5000000000$
$U(p)_L\ /\ U(n)_L = 1.5000000000$
Quark Up Structural Energy Ratios
$I(u)/U(u) = 1.587148524$
$I(u)/E(u)_{mass} = 0.613474065$
$U(u)/E(u)_{mass} = 0.386525934$
Quark Down Structural Energy Ratios
$I(d)/U(d) = 1.650243062$
$I(d)/E(d)_{mass} = 0.622676118$
$U(d)/E(d)_{mass} = 0.377323881$
Nucl. Quarks Structural Energy Ratios
$\langle I(d)/U(d)\rangle = 1.618695793 \sim \Phi$
$\langle I(d)/E(d)_{mass}\rangle = 0.618075091 \sim \Phi^{-1}$
$\langle U(d)/E(d)_{mass}\rangle = 0.381924907 \sim 1\text{-}\Phi^{-1}$

Deviation from the Golden Mean
Golden Mean, $\Phi = 1.61803398875$
$\Delta[\langle I(d)/U(d)\rangle] = +0.0409018\%$
$\Delta[\langle I(d)/E(d)_{mass}\rangle] = +0.0066505\%$
$\Delta[\langle U(d)/E(d)_{mass}\rangle] = -0.0107624\%$

DIFFERENCE OF MASS BETWEEN PROTON AND NEUTRON
Experimentally: $m(n) - m(p) = 1.29332 \pm 0.00028\ (\mathrm{MeV}/c^2)$.
According to the Intervalic Theory:
$$m(n) - m(p) = [I(n)_{ML} + U(n)_{ML}] - [I(p)_{ML} + U(p)_{ML}] =$$
$$= [(I(M_3^0)+I(u)+2I(d)) + (U(M_3^0)+U(u)+2U(d))] -$$
$$- [(I(M_3^+)+2I(u)+I(d)) + (U(M_3^+)+2U(u)+U(d))] =$$
$$= [(0+0.64257483+5.14059860) + (0+0.465068250+0.232534124)] -$$
$$- [(0.28558880+1.2851497+2.5702993)+(0+0.9301365+0.116267062)]$$
$$= 5.78317343+0.697602374-4.1410378-1.046403562 = 1.293334442\ (\mathrm{MeV}/c^2)$$

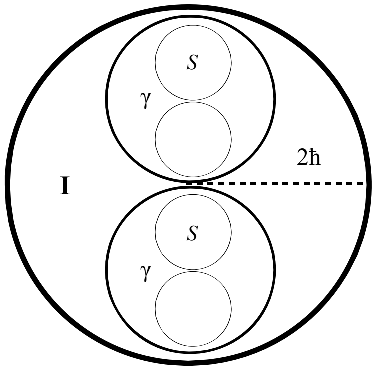
$\Delta[\langle I(N)/E(N)_{mass}\rangle] =$
$+0.0177623\%$
$\Delta[\langle U(N)/E(N)_{mass}\rangle] = -0.0289759\%$

Proton Structural Energy Ratios
$I(p)/U(p) = 1.60871148$
$I(p)/E(p)_{mass} = 0.616668452$
$U(p)/E(p)_{mass} = 0.383330671$
$E_J(p)/E(p)_{mass} = 0.233337781$
Neutron Structural Energy Ratios
$I(n)/U(n) = 1.628947324$
$I(n)/E(n)_{mass} = 0.61961908$
$U(n)/E(n)_{mass} = 0.38038006$
$E_J(n)/E(n)_{mass} = 0.23923902$
Nucleon Structural Energy Ratios
$\langle I(N)/U(N)\rangle = 1.618829402 \sim \Phi$

Deviation from the Golden Mean
Golden Mean, $\Phi =$
1.61803398875
$\Delta[\langle I(N)/U(N)\rangle] =$
$+0.0491593\%$

	NUCLEONIC DALINO	NUCLEONIC GAUDINOS	QUARK UP	QUARK DOWN	PROTON	NEUTRON
Intervalic energy, I	$I(D_{45})_D = c^{\pm2}\hbar\ (45\ \mathbf{q}_I)^{-2} = c^{\pm2}\hbar\ [45\sqrt{-(c^{-1}h)}]^{-2} =$ $= 1.6472301\cdot10^{-12}\ (J) = 10.281197\ (\mathrm{MeV}/c^2)$	$I(G_6^{\pm1/3})_{GD} = 64.25748329\ (\mathrm{MeV}/c^2)$ $I(G_6^{\pm2/3})_{GD} = 62.32975882\ (\mathrm{MeV}/c^2)$	$I(u)_{LGD} = I(L_3^{+2/3}) + I(G_6^{+2/3}) + 2I(G_6^{\pm1/3})$ $+ 18I(D_{45}) = 191.4872982\ (\mathrm{MeV}/c^2)$	$I(d)_{LGD} = I(L_3^{-1/3}) + I(G_6^{-1/3}) + 2I(G_6^{\pm1/3}) +$ $+ 18I(D_{45}) = 195.3427472\ (\mathrm{MeV}/c^2)$	$I(p)_{MLGD} = I(p)_M + I(u+u+d)_L + I[2(G_6^{\pm2/3}) +$ $+ 7(G_6^{\pm1/3})]_G + 54I(D_{45})_D = 578.6029324\ (\mathrm{MeV}/c^2)$	$I(n)_{MLGD}=I(n)_M + I(u+d+d)_L + I[(G_6^{\pm2/3}) +$ $+ 8(G_6^{\pm1/3})]_G + 54I(D_{45})_D = 582.1727926\ (\mathrm{MeV}/c^2)$
Electromagnetic energy, U	$U_{G6\pm1/3}(D_{45})_D = 6.409125138\ (\mathrm{MeV}/c^2)$ $U_{G6\pm2/3}(D_{45})_D = 6.24848144\ (\mathrm{MeV}/c^2)$	$U(G_6^{\pm1/3})_{GD} = 41.34633762\ (\mathrm{MeV}/c^2)$ $U(G_6^{\pm2/3})_{GD} = 39.41861307\ (\mathrm{MeV}/c^2)$	$U(u)_{LGD} = U(L_3^{+2/3}) + U(G_6^{+2/3}) + 2UI(G_6^{\pm1/3})$ $+ 18U(D_{45}) = 120.6486320\ (\mathrm{MeV}/c^2)$	$U(d)_{LGD} = U(L_3^{-1/3}) + U(G_6^{-1/3}) + 2U(G_6^{\pm1/3})$ $+ 18U(D_{45}) = 118.3721063\ (\mathrm{MeV}/c^2)$	$U(p)_{MLGD} = U(p)_M + U(u+u+d)_L + U[2(G_6^{\pm2/3}) +$ $+ 7(G_6^{\pm1/3})]_G + 54U(D_{45})_D = 359.6693703\ (\mathrm{MeV}/c^2)$	$U(n)_{MLGD}=U(n)_M + U(u+d+d)_L + U[(G_6^{\pm2/3}) +$ $+ 8(G_6^{\pm1/3})]_G + 54U(D_{45})_D = 357.3928374\ (\mathrm{MeV}/c^2)$
Spin energy E_J	$E_J(_{G6\pm1/3}D_{45})_D = I(D_{45})_D - U_{G6\pm1/3}(D_{45})_D =$ $= 3.873072012\ (\mathrm{MeV}/c^2)$	$E_J(G_6^{\pm1/3})_G = I(G_6^{\pm1/3})_G - E_q(G_6^{\pm1/3})_G =$ $= 5.133952133\ (\mathrm{MeV}/c^2)$	$E_J(u)_L = I(u)_L - E_q(u)_L = 2.573797104\ \cdot$ $\cdot\ 10^{-13}\ (J) = 1.60643710\ (\mathrm{MeV}/c^2)$	$E_J(d)_L = I(d)_L - E_q(d)_L = 5.662353564\ \cdot$ $\cdot\ 10^{-13}\ (J) = 3.53416158\ (\mathrm{MeV}/c^2)$	$E_J(p)_M = I(p)_M - 0 = 4.5756390\cdot10^{-14}\ (J) =$ $= 0.285588809\ (\mathrm{MeV}/c^2)$	$E_J(n)_M = 0 - E_q(n)_M = 5.58841376\cdot10^{-14}\ (J) =$ $= 0.34880120\ (\mathrm{MeV}/c^2)$
Mass energy m	$m_{G6\pm1/3}(D_{45}) = 16.69032229\ (\mathrm{MeV}/c^2)$ $m_{G6\pm2/3}(D_{45}) = 16.52967859\ (\mathrm{MeV}/c^2)$	$m(G_6^{\pm1/3}) = 105.6038198\ (\mathrm{MeV}/c^2)$ $m(G_6^{\pm2/3}) = 101.7483708\ (\mathrm{MeV}/c^2)$	$m(u) = 312.1359302\ (\mathrm{MeV}/c^2)$	$m(d) = 313.7148535\ (\mathrm{MeV}/c^2)$	$m(p) = 938.2723027\ (\mathrm{MeV}/c^2)$	$m(n) = 939.5656300\ (\mathrm{MeV}/c^2)$
Radius r	$r_{G6\pm1/3}(D_{45}) = 3.12047512\cdot10^{-18}\ (m)$	$r_{G6} = 8.299740193\cdot10^{-17}\ (m)$	$r_u = 6.88054386\cdot10^{-16}\ (m)$	$r_d = 6.88054386\cdot10^{-16}\ (m),$	$r_N \approx \frac{1}{2}\ (r_{int} + r_{ext}) = 1.237448636\cdot10^{-15}\ (m)$	$r_N \approx \frac{1}{2}\ (r_{int} + r_{ext}) = 1.237448636\cdot10^{-15}\ (m)$
Angular velocity due to spin, ω_J	$\omega_{J\text{-}G6\pm1/3}(D_{45}) = (E_J(D_{45})_D\ /\ m_{D45}\ r_{D45}^2)^{1/2} =$ $= 4.628021876\cdot10^{25}\ (s^{-1})$	$\omega_J(G_6^{\pm1/3}) = (E_J(G_6^{\pm1/3})_G\ /\ m_{G6}\ r_{G6}^2)^{1/2} =$ $= 7.964878478\cdot10^{23}\ (s^{-1})$	$\omega_J(u) = (E_J(u)_L\ /\ m_u\ r_u^2)^{1/2} =$ $= 3.125776462\cdot10^{22}\ (s^{-1})$	$\omega_J(d) = (E_J(d)_L\ /\ m_d\ r_d^2)^{1/2} =$ $= 4.624593827\cdot10^{22}\ (s^{-1})$	$\omega_J(p) = (E_J(p)_M\ /\ m_p\ r_p^2)^{1/2} =$ $= 4.252280621\cdot10^{21}\ (s^{-1})$	$\omega_J(n) = (E_J(n)_M\ /\ m_n\ r_n^2)^{1/2} =$ $= 4.696141808\cdot10^{21}\ (s^{-1})$
Linear velocity due to spin on surface, v_J	$v_{J\text{-}G6\pm1/3}(D_{45}) = \omega_J(D_{45})\ r_{D45} =$ $= 1.444162712\cdot10^{8}\ (m\ s^{-1}) = 0.48172083\ c$	$v_J(G_6^{\pm1/3}) = \omega_J(G_6^{\pm1/3})\ r_{G6} = 6.610642204\ \cdot$ $\cdot\ 10^{7}\ (m\ s^{-1}) = 0.22050729\ c$	$v_J(u) = \omega_J(u)\ r_u = 2.150704204\ \cdot$ $\cdot\ 10^{7}\ (m\ s^{-1}) = 0.07173977\ c$	$v_J(d) = \omega_J(d)\ r_d = 3.181972066\ \cdot$ $\cdot\ 10^{7}\ (m\ s^{-1}) = 0.10613916\ c$	$v_J(p) = \omega_J(p)\ r_N =$ $= 5.230305164\cdot10^{6}\ (m\ s^{-1}) = 0.01744642\ c$	$v_J(n) = \omega_J(n)\ r_N =$ $= 5.776254424\cdot10^{6}\ (m\ s^{-1}) = 0.01926751\ c$

INTERVALINO



Intervalic structure	$\mathbf{I} = 2^{-½} (\lvert\gamma\underline{\gamma}\rvert - \lvert\underline{\gamma}\gamma\rvert) = 2\ \gamma = 4\ S$
Intervalic energy, I	$I(\mathbf{I}) = c^{\pm 2}\ \hbar\ \mathbf{q_I}^{-2} = c^{-1} = 20{,}819.42423\ (MeV/c^2)$
Electromagnetic energy, U	$U(\mathbf{I}) = 0$
Spin energy, E_J	$E_J(\mathbf{I}) = I(\mathbf{I}) - U(\mathbf{I}) = c^{-1} = 20{,}819.42423\ (MeV/c^2)$
Structural energy balance	$[\ c^{\pm 2}\ \hbar\ \mathbf{q_I}^{-2}\ ] - m_I\ \omega_I^2\ r_I^2 = 0$
Energy ratios	$I(\mathbf{I})/E(\mathbf{I})_{mass} = 1$ $U(\mathbf{I})/E(\mathbf{I})_{mass} = 0$ $E_J(\mathbf{I})/E(\mathbf{I})_{mass} = 1$
Radius, r	$r_I = 2\ \hbar = 2.1112726 \cdot 10^{-34}\ (m)$
Angular velocity due to spin, ω_J	$\omega_J(\mathbf{I}) = c\ /\ r_I = ½\ c\ \hbar^{-1} = 1.419960918 \cdot 10^{42}\ (s^{-1})$
Linear velocity due to spin on surface, v_J	$v_J(\mathbf{I}) = 2.99792458 \cdot 10^{8}\ (m\ s^{-1}) = c$

The intervalino is the first particle with *mass*, generated by the synthesis of two photons in antisymmetric state under interchange, whose threshold frequency *—coupling frequency of matter*— must be greater than: $\varphi_{cp} = 1\ /\ (4\pi\ c\ \hbar) = 2.51452013 \cdot 10^{24}\ (s^{-1})$ for the synthesis may occur, so that intervalinos could eventually be synthesized artificially in the laboratory.

The physical properties of intervalino are extraordinary, because it is the only particle with an electric charge that has no electromagnetic energy —which only particles *with structure* can have, being this a basic definition of the physical laws that has forgotten the standard model—, so it is logically necessary the existence of a fundamental particle, for the electromagnetic interaction, with these extraordinary physical features: an indivisible electric charge and, by this reason, without electromagnetic potential energy.

The electric charge of the intervalino is the *intervalic quantum of electrical charge*: $\mathbf{q_I} = \sqrt{}\text{-}(c^{-1}\,\hbar) = 1\ (i^{-1/2}\,L^{1/2}) = 5.93398995 \cdot 10^{-22}\,(C)$, which is the fundamental charge of Nature, whose geometric value is exactly 1/270 of the elementary charge, *e*.

Its mass energy, which comes exclusively from the equivalent energy of the previous intervalic quantum of electric charge, $I\ (\mathbf{I}) = c^{\pm 2}\ \hbar\ \mathbf{q_I}^{-2} = c^{-1} = 20{,}819.42423\ (MeV/c^2)$, is also the *intervalic quantum of mass*: $\mathbf{m_I} = 1\ (i) = c^{-1} = 20{,}819.42423\ (MeV/c^2)$, while its spin energy is equally c^{-1}.

Its radius is twice the photon radius, i.e., twice the *intervalic quantum of length*: $\mathbf{r_I} = 2\ \mathbf{l_I} = 2\ \hbar = 2.1112726 \cdot 10^{-34}\,(m)$.

The antisymmetric state of the two constituents photons of the intervalino can be visualized as two photons traveling in opposite directions which are coupled tangentially, so that opposite ends to the coupling point of each photon —which are situated in the centre of the intervalino— continue moving at the speed of light, c, as it can not be otherwise, since all non massive particle always moves at the speed of light in intervalic space-time, hence the linear velocity on the “surface” of the intervalino is precisely c.

INTERVALIC PRIMORDIAL ASSEMBLY

Structure Level	*Intervalic structure*	*Degree of freedom*	*Interaction introduced*	*Particles assembled*	*Symmetry breaking*
0	Point	Ø	Ø	Intervalic String	goes to next structure level
				Intervalic Length	-
1	Intervalic String	Space	Informational	Photon	goes to next structure level
				Chi	dark energy
2	Photon	Spin	Intervalic Changeless —strong—	Intervalino	goes to next structure level
				Graviton	dark energy
3	Intervalino	Mass	Gravitational	16 Dalinos: *electron*	goes to next structure level
				Bintervalino	dark matter
4	Dalino	Electric charge	Electromagnetic	40 Gaudinos: *nucl. Gs, leptons-CMBs*	goes to next structure level
				Bidalino	dark matter
5	Gaudino	Electric charge structure	Intervalic Changeful —weak—	Lisztinos: *49 quarks*	goes to next structure level
				Lisztinos: *bileptons-ZCMBs*	decay
6	Lisztino	Elementary charge	Elementary charge attractor	Monteverdinos: *baryons*	goes to next structure level
				Monteverdinos: *mesons*	decay
7	Monteverdino	ø	ø	Palestrinos: *nuclei*: 1< *A* ≤ 3	-
				Pseudopalestrinos: *nuclei: A > 3*	-

THE TOTAL ENERGY OF THE INTERVALIC UNIVERSE: SHARE OF PARTICLES AT THE INTERVALIC PRIMORDIAL ASSEMBLY

At each level of the Intervalic Primordial Assembly the two branches of particles assembled vanish between themselves (one branch is in symmetric state under interchange and the other is antisymmetric). This remarkable logical economy of the Intervalic Universe reminds the perfect Yin-Yang balance of Nature according to *Tao te King*, which traditionally was believed to ruling only on the organic world.

Particles share at the
Intervalic Primordial Assembly:

- Photons: > 0
- Chis: ½ = 50%
- Intervalinos: ~ 0
- Gravitons: ¼ = 25%
- Dalinos: ~ 0
- Zero charged dalinos: < 1/8 = 12.5%
- Gaudinos: ~ 0
- Zero charged gaudinos: < 1/16 = 6.25%
- Lisztinos (quarks): < 1/16 = 6.25%

Grouping them in terms of
the darkness of matter:

- Dark energy: ½ = 50%
- Dark matter: < 3/16 = 18.75%
- Visible matter: < 1/16 = 6.25%
- Gravitons: ¼ = 25%
- Photons: > 0

Please note the fine match of the relations:

- Dark matter + Visible matter = Gravitons
- Dark matter + Visible matter + Gravitons = Chis

of time —which came into existence just at the beginning of the 2nd phase or photon-synthesis. The dalino-synthesis released the fabulous amount of energy (in form of photons and neutrinos) of:

$$E_B(D_{270}) = m(270\ \mathbf{I}) - m(D_{270}) = 5{,}621{,}244.136\ (\text{MeV}/c^2)$$
$$E_B(D_{45}) = m(45\ \mathbf{I}) - m(D_{45}) = 936{,}855.694\ (\text{MeV}/c^2)$$

respectively for each electron (D_{270}) and each nucleonic dalino (D_{45}) synthesized. The dalino-synthesis began as early as the temperature of the primordial Universe fell below the threshold temperatures of synthesis for each dalino:

$$\Theta_B\ (D_{270}) < E_B(D_{270})\ /\ k_B = 6.523179514 \cdot 10^{16}\ (\text{K})$$
$$\Theta_B\ (D_{45}) < E_B(D_{45})\ /\ k_B = 1.087175336 \cdot 10^{16}\ (\text{K}),$$

since above these threshold temperatures the 16 dalinos allowed by the intervalic symmetries are in a state of recombination (symmetries that will permanently last below those temperatures, but not as *real* states but as *virtual* states):

$$D_{270} \leftrightarrow 2\ D_{135} \leftrightarrow 3\ D_{90} \leftrightarrow 5\ D_{54} \leftrightarrow 6\ D_{45} \leftrightarrow 9\ D_{30} \leftrightarrow 10\ D_{27} \leftrightarrow 15\ D_{18} \leftrightarrow 18\ D_{15} \leftrightarrow 27\ D_{10} \leftrightarrow 30\ D_9 \leftrightarrow 45\ D_6 \leftrightarrow 54\ D_5 \leftrightarrow 90\ D_3 \leftrightarrow 180\ D_2 \leftrightarrow 270\ D_1 \leftrightarrow$$

This extraordinary release of energy in the primordial Universe is what is known as the Big Bang.

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The Intervalic Theory explains in a different way from the standard model all known experimental results to date. This is done with crushing logic, with geometric precision, and without using a single arbitrary constant. In this way are deduced all the physical properties of the 147 subatomic particles of Nature, both visible as dark. Besides this, it can be highlighted the following physical explanations, among others:

- The deduction of the annihilation ratio and the partial decay widths of all leptons-charged massive bosons (that reach up to the value 1/70) and bileptons-zero charged massive bosons (that reach up to the value 1/30), both detected to date as like as undetected yet.
- The shape of the curve of the binding energy per nucleon and its value

~ 8 (MeV/c^2), since according to the Intervalic Theory *all nuclei with mass number A > 3 are not composed by nucleons but by quarks*, being those ~ 8 (MeV/c^2) the structural energy required to synthesize or “arm” the structure of the nucleon at the last level —the monteverdic one— from three quarks to leaving the nucleus synthetized in a nucleon. This “arming” energy for synthetizing that monteverdic structure is constant regardless of the mass number. *Only nuclei with mass number A ≤ 3 are composed by nucleons.* This explains simply and clearly why deuterons release a huge amount of energy when merging to make a helium nucleus: because they lose the last level of the intervalic structure, whose energy per nucleon is ~ 8 (MeV/c^2), as the Helium is a monteverdino composed by quark, while the deuteron is a palestrino composed by nucleons. That amount of energy is what is released in fusion reactions.

- The *neutron to proton ratio* of the Universe, which is derived exclusively from the intervalic structure of nucleon in two independent ways, both yielding virtually the same result: ~ 22%.

- The *intervalic structure of stars*, whose life in the twilight go through the same phases of the primordial intervalic synthesis, only in reverse, thus having quarks stars, gaudinos stars and dalinos stars. Intervalinos star is only reached at the Big Crunch.

- The *intervalic cosmology*, which establishes a model of indefinitely oscillating Universe , that “bounces” between a Big Crunch and a Big Bang.

- The nature of the former weak and strong nuclear interactions, which are now, respectively, the *changeful* and *changeless intervalic interactions*, as well as the explanation of the intervalic structures involved in the beta decay, the exchange intervalic structure that explains the inner dynamic state of nucleon and π meson, etc.

- All the apparent paradoxes of quantum mechanics, which are but pseudo problems born of the ignorance of symmetries and of ultimate foundations of physics, including from the uncertainty principle assumption to the experiment of double slit, etc., which now have finally been revealed by the Intervalic theory.

- The nature of *vacuum* and of three-dimensional space, which is not a *continuum* at all and not even a discrete space, but simply the folding of a one-dimensional physical space —the only real physical substance— in a three-dimensional mathematical space, just as the nature of time is also virtual, mathematical: *imaginary space*. Since all massive particles is composed by intervalinos, and intervalino is composed by two photons, and photon is composed by two intervalic strings —whose volume and surface are zero (as intervalic strings are but one-dimensional space intervals in a finite number)—, we reach to the surprising conclusion that both actual total volume and actual total area of the Universe are just zero.

- The nature and intervalic symmetries of antigravity, and the theoretical way to generate an antigravity field.
- The nature of *information* and the discovery of the geometric equivalence between energy and information, which forms a further branch of the Intervalic Theory.
- Being constituted all subatomic particles, ultimately, by the synthesis of intervalic strings, its intervalic structure can alternatively be expressed as a quantum-informational state that is named the *intervalic code* of subatomic particles. For example, the intervalic code of the particles synthesized before the dalino-synthesis (which released the energy of the Big Bang) is:

THE INTERVALIC CODE
of first subatomic particles

Intervalic string:
$S = \{\uparrow, \downarrow\}$

Photon = synthesis of intervalic strings in symmetric state under interchange:
$\gamma = \{ |\uparrow\uparrow|, 2^{-1/2} (|\uparrow\downarrow| + |\downarrow\uparrow|), |\downarrow\downarrow| \}$

Chi = synthesis of intervalic strings in antisymmetric state under interchange:
$¢ = 2^{-1/2} (|\uparrow\downarrow| - |\downarrow\uparrow|)$

Intervalino = synthesis of photons in antisymmetric state under interchange:

$$\mathrm{I} = 2^{-1/2} (|\gamma\underline{\gamma}| - |\underline{\gamma}\gamma|) = 2^{-1/2} (|\{ |\uparrow\uparrow|, 2^{-1/2} (|\uparrow\downarrow| + |\downarrow\uparrow|), |\downarrow\downarrow| \} \{ |\downarrow\downarrow|, 2^{-1/2} (|\downarrow\uparrow| + |\uparrow\downarrow|), |\uparrow\uparrow| \}| - |\{ |\downarrow\downarrow|, 2^{-1/2} (|\downarrow\uparrow| + |\uparrow\downarrow|), |\uparrow\uparrow| \} \{ |\uparrow\uparrow|, 2^{-1/2} (|\uparrow\downarrow| + |\downarrow\uparrow|), |\downarrow\downarrow| \}|)$$

Graviton = synthesis of photons in symmetric state under interchange:

$$g = |\gamma\underline{\gamma}|_s = [|\gamma\gamma|, 2^{-1/2} (|\gamma\underline{\gamma}| + |\underline{\gamma}\gamma|), |\underline{\gamma}\underline{\gamma}|] = [|\{ |\uparrow\uparrow|, 2^{-1/2} (|\uparrow\downarrow| + |\downarrow\uparrow|), |\downarrow\downarrow| \} \{ |\uparrow\uparrow|, 2^{-1/2} (|\uparrow\downarrow| + |\downarrow\uparrow|), |\downarrow\downarrow| \}|, 2^{-1/2} (|\{ |\uparrow\uparrow|, 2^{-1/2} (|\uparrow\downarrow| + |\downarrow\uparrow|), |\downarrow\downarrow| \} \{ |\downarrow\downarrow|, 2^{-1/2} (|\downarrow\uparrow| + |\uparrow\downarrow|), |\uparrow\uparrow| \}| + |\{ |\downarrow\downarrow|, 2^{-1/2} (|\downarrow\uparrow| + |\uparrow\downarrow|), |\uparrow\uparrow| \} \{ |\uparrow\uparrow|, 2^{-1/2} (|\uparrow\downarrow| + |\downarrow\uparrow|), |\downarrow\downarrow| \}|), |\{ |\downarrow\downarrow|, 2^{-1/2} (|\downarrow\uparrow| + |\uparrow\downarrow|), |\uparrow\uparrow| \} \{ |\downarrow\downarrow|, 2^{-1/2} (|\downarrow\uparrow| + |\uparrow\downarrow|), |\uparrow\uparrow| \}|]$$

The Intervalic Theory performs a complete reformulation of physics without introducing a single arbitrary constant, deducting all, in a logical and necessary way, from the intervalic system of physical quantities, which is the *natural* system of units, from which emerge the fundamental symmetries of physics and the underlying fundamental geometry of Nature, without whose knowledge no further progress is possible. Therefore, the heuristic key lies in the discovery of the intervalic dimensional basis of the intervalic or natural system of physical quantities (and not their units as they themselves are secondary). From an epistemological point of view it is interesting to note that the intervalic or natural dimensional basis could have been uncovered by different logical ways:

- From the definition of *time* as *imaginary space*, T = *i*L, which is the route used by the Intervalic Theory in Music, that historically led to the postulation of the Intervalic Theory.
- From the physical interpretation of the Planck's quantum of action as a pattern of length, which was warned by Lancelot Law Whyte in his *Critique of Physics:* "Planck's constant (in appropriate combinations) determines the linear scale of the structure of matter and of radiation, in terms of the selected unit of length".
- From the classic formulation of special relativity by Minkowski in 1908, where he introduces the imaginary number, *i*, in the temporal component of the equations of relativity, which in his own words, leads to define the speed of light as: $c = i$. In fact, the formulation of Einstein-Minkowski does work because it uses —although partial and unconsciously— the dimensions of the intervalic system of physical quantities.
- From the definition of the fine structure constant, since we know that is value is the square of the elementary charge *in natural units*, which necessarily implies that, in natural units, $e = 270$. From here the logical deduction of the intervalic or natural dimensional basis is immediate.
- From the empirical data showing conclusively that the masses of massive subatomic particles detected to date are proportional to the inverse square of 270, 45, 30, 18, 6 and 5.
- From the finding that the *frames of reference* used by the methodology of the classical-quantum metric (usually an *observer* external to the system), are *arbitrary* and *privileged*, which is a serious epistemological inconsistency. This methodological paradigm —subliminal and unconscious, and therefore much more difficult to detect and to correct— results in partial or erroneous measurements and interpretations, being therefore replaced by the intervalic metric, where there are no arbitrary and privileged observers, but each particle has its own reference system (in fact, the physical features

of subatomic particles can only be expressed with and from this intervalic metric). Henceforth it is understood that the Intervalic Theory could be seen as the development and logical continuation of the philosophy that emanates from relativity, so it can be said that there has been a historical progression towards intervalicity, which has gone through three progressive stages: classical mechanics, relativistic mechanics and intervalic mechanics. A somewhat surprising way, this is the route used by the Intervalic Theory in Economics, which is, likewise, the *natural* theory of economics.

Any of these six ways implies, when being developed with the blind ruthlessness of logic, the deduction of the intervalic dimensional basis and, consequently, of the Intervalic Theory, which is deduced in full from the intervalic or natural system of physical quantities. The fact that this rigorous logical deduction has not been made previously by some of these ways, indicates how difficult it is for the human mind to get out of the classical-quantum current paradigm, whose false dogmas prevent even start the developing of something as implacable as it is logic.

Chapter 1

INTERVALIC SYSTEM OF PHYSICAL QUANTITIES

The Dimensional Foundations of Physics

Physics thinking is expressed within a determined *dimensional system*, which is like the base signs of a language. It was supposed that all physical languages were equivalent, but the mere existence of the Intervalic System of Physical Quantities *demonstrates* that all dimensional systems are *not* equivalent since they yield *different* Physics. From now, the physical knowledge and the quest for a faultless theory should begin by choosing the most reliable —and presumably *universal*— dimensional system of physical quantities. There must be only *one* dimensional system which is based on the *last fundamental units* of the Universe, still unknown. The Intervalic System of Physical Quantities claims to be this *natural* dimensional system.

INTRODUCTION TO DIMENSIONAL SYSTEMS OF PHYSICAL QUANTITIES

The dimensional basis (L, M, T, I, Θ, J, 1) of the traditional system of units is really a mere *assumption* whose logical arguments are in no way preferable to other hypothetical assumptions, such as, i.e., dimensional basis with three, five or eight proper dimensions. It can be pointed two precisions regarding the usual dimensional system (L, M, T, I, Θ, J, 1): first, we have added the dimensionless (1) to its basis since it really appears in some physical quantities (like cycles, radians or the Avogadro constant), and its existence can't be freely supposed; and second, the intensity (J) should not be put along with the rest of dimensions because it is more a psychophysical quantity than a physical one.

It is quite disconcerting the little attention bestowed to the epistemological research on dimensional systems of physical quantities since they conform the foundations of the Physics building. Nowadays, when String Theory is trying to derive all physical quantities from vibrations, that is to say, from space-time, it should be questioned what number of physical quantities would be preferable for a dimensional basis. If a system with one proper dimension (like the one used in String Theory) is sufficient for representing all physical quantities, it should implies, by Occam's razor, that the rest of supposed proper dimensions are superfluous. Unfortunately the *degenerate dimensions* —wrongly called "geometrized" since they are geometryless— used in String Theory only can work if the calculus of its final results are translated into traditional physical quantities and units. This means that degenerate dimensions are not in practice an *independent* system of dimensions. The question now is: could be proposed a reliable system of physical quantities one-proper-dimension-based that really works?

Other *tacit assumptions* that underlies on all known dimensional systems of physical quantities up to date are: first, the proper dimensions must be composed by powers of real numbers; and second, if any, there is one dimensionless physical quantity, (1). Once more, there is no logical reason to prefer these assumptions to any others. Moreover, due to the growing and outstanding role played by imaginary or complex numbers in Physics, it could be expected that these numbers will do appear in the dimensional basis of a system of physical quantities. Once more, the problem is: how could they appear —if possible— in a consistent, independent and useful system of physical quantities?

Although mathematics involved in this essay are very simple, the right comprehensiveness of the transcendence of the intervalic dimensional system is far to be immediate, and it is only achieved when the intervalic dimensions are known by heart. Then, and only then, the traditional becomes as absurd as irrelevant. Before describing it, or in order to describe it, lets go to comment briefly some logical foundations of its mother: the Intervalic Theory (abbreviated as IT).

LOGICAL FOUNDATIONS OF THE INTERVALIC THEORY

> In fact we have not yet made enough direct experiments to know even whether the dimensional system which is used for electrons is correct. Since no electron velocity has ever been directly measured we cannot be sure that the dimensions of the new constant 'h' —called Planck's constant— are really what we suppose, energy multiplied by time.
>
> LANCELOT L. WHYTE
> *Archimedes or The Future of Physics*

All postulates and every step in the Intervalic Theory is intended to be the most logically simple. Thus the theory postulates principles of *simplicity* and *economy* as some of the highest rules for its own logical development. In this way, all Physics should be based on the last and simplest combinations of the ultimate units, and in a successful theory the theoretical laws of Physics should have the epistemological rank of *geometrical statements*.

According to that, we can comment some epistemological and aesthetic *desiderata* that we would hope to find in a theory of everything: the theory shouldn't have arbitrary constants; all phenomena *allowed* by an elegant theory should exist in the Universe, since we think the demiurge does not waste time; if a physical quantity or dimension has a physical meaning, it is expected that its *inverse* value also should have a proper physical meaning; the conservation laws of energy, charge, etc. not only are verified, but the total sum of any of these quantities in the Universe must be zero (this is called the *intervalic zero assumption*); the preferable qualitative number of elements for the last foundations of physics —such as the qualitative number of proper dimensions of the dimensional basis— it is expected to be related with the elemental logical values: zero (0), one (1) or infinite (∞).

These logical constrains involve that, first of all, we need to determinate which are the last and simplest reliable units of physics, and we also need to find a dimensional system of physical quantities that verifies the above *de-*

siderata. Since the last blocks or units of physics are to be expressed in some dimensional system of physical quantities, the faithful determination of such a system may be the most important task for any Physics theory that aspires to be final —in some degree—. Although the String Theory appears to satisfy these *desiderata*, the truth is that it satisfy neither of them, as we will see along this paper.

The analysis of dimensions is perhaps one of the most forgotten field in Physics. It is often put sideways in text books as a not important theme. This judgment is based on the assumption that all dimensional systems of physical quantities are *equivalent* for describing the nature of physic world. If all of them are equivalent, then it is irrelevant the question about its trueness or falseness.

Well, since according to this, we can choose any dimensional system of physical quantities without affecting the meaning of physics, now we are going to define and to choose one system: the *intervalic* one. As stated below, it is supposed that this detail is irrelevant for the physics knowledge and can not affect physics foundations and principles anyway.

The intervalic system of physical quantities is based simply on a statement which belongs to (and now is shared with) the Intervalic Theory in Music. It says that *time is imaginary space*, that is to say, in mathematical form:

$$T = i\,L$$

where T is time, L is longitude and i is $\sqrt{-1}$. If we define time as: $T = i^{-1}\,L$, instead of: $T = i\,L$, we obtain an equivalent —really an identical— dimensional system of physical quantities.

Hence, if now we are going to reformulate the whole Physics within the *intervalic system of physical quantities*, we will obtain, surprisingly… an entirely new Physics! This unexpected fact demonstrates that our previous assumption about the equivalence of all systems of physical quantities was completely wrong. Indeed, the mere existence of the intervalic system proves that not all dimensional systems of physical quantities are equivalent. This is a little earthquake in the foundations of Physics, since in this new situation the question about the trueness or falseness of the dimensional systems of physical quantities becomes absolutely relevant and transcendent. Really, according to scientific methodology, we would have to take a decision about which is the most reliable dimensional system of physical quantities for the description of the physical world, since the intervalic one yields a Physics substantively different from the other dimensional systems of physical quantities known to date. It is very important to point out that all the Intervalic Theory of Particle Physics is based solely on a purely change of the dimensional system of physical quantities. From here, the whole theory is *logically* and *necessarily* derived, without introducing a single arbitrary constant nor any assumption or adjustement made by hand.

If the Intervalic Theory in Physics would be false and finish here, its logical consequence shall be similar for Physics as the Gödel's theorem about the formally undecided propositions was for Mathematics. But the Intervalic Theory don't finish here; it starts from this point. Moreover, the intervalic system of physical quantities claims to be not only the more reliable among all known dimensional systems, but the only truthful system of physical quantities: in other words: the unique and genuine *natural* system of physical quantities.

By this reason, and although the task could looks somewhat painful at first sight, the correct scientific aim and the serious application of the scientific method request us ineluctably to *reformulating* the whole body of Physics according to the new dimensions of the intervalic system of physical quantities. We have noticed —or simply remember, since it was already known from the XXth. century— that the huge building of Physics have feet of clay, and now we cannot look to another place, but to solve the problem. We can be sure that it is worth it.

INTERVALIC DIMENSIONS

When reformulating all physical quantities within intervalic dimensions ($L = L$, $T = iL$, $M = T/L = i$), where $i = \sqrt{-1}$, we obtain the following finite set composed by 40 quantized dimensions, named the *intervalic group* (some of these physical quantities will be briefly commented at due course):

1	Permitivity, momentum-inertia, entropy, Boltzmann constant
-1	Permeability, gravitational potential
i	Invervelocity-mass, impedance
i^{-1}	c, velocity-energy, temperature, specific heat capacity, conductance
L	ħ, length, action, capacitance
-L	Antilength, inductance
$i\,L$	Time
$i^{-1}L$	Antitime
L^{-1}	Wavevector
$-L^{-1}$	Acceleration, power, gravitational field
$i\,L^{-1}$	Linear perdensity, antifrequorce
$i^{-1}L^{-1}$	Frequorce (frequency-force), linear tension, conductivity
L^2	Area

SYMMETRIES OF THE INTERVALIC GROUP

The 40 physical quantities and dimensions of the Universe
in bidimensional representation: semigroup (-1) at left, semigroup (+1) at right.
(Note that physical quantities can not exist in the shadowed squares of the axes)

$(-i^{-1}L^{3}) = (i\,L^{3})$	$(-i^{-1/2}L^{3}) = (i^{1/2}L^{3})$	$(-L^{3})$ antivolume	$(-i^{1/2}L^{3}) = (i^{-1/2}L^{3})$	$(-i\,L^{3}) = (i^{-1}L^{3})$
$(-i^{-1}L^{5/2}) = (i\,L^{5/2})$	$(-i^{-1/2}L^{5/2}) = (i^{1/2}L^{5/2})$	$(-L^{5/2})$	$(-i^{1/2}L^{5/2}) = (i^{-1/2}L^{5/2})$	$(-i\,L^{5/2}) = (i^{-1}L^{5/2})$
$(-i^{-1}L^{2}) = (i\,L^{2})$	$(-i^{-1/2}L^{2}) = (i^{1/2}L^{2})$	$(-L^{2})$ antiarea	$(-i^{1/2}L^{2}) = (i^{-1/2}L^{2})$	$(-i\,L^{2}) = (i^{-1}L^{2})$
$(-i^{-1}L^{3/2}) = (i\,L^{3/2})$	$(-i^{-1/2}L^{3/2}) = (i^{1/2}L^{3/2})$	$(-L^{3/2})$	$(-i^{1/2}L^{3/2}) = (i^{-1/2}L^{3/2})$	$(-i\,L^{3/2}) = (i^{-1}L^{3/2})$
$(-i^{-1}L) = (i\,L)$	$(-i^{-1/2}L) = (i^{1/2}L)$	$(-L)$ inductance, antilength	$(-i^{1/2}L) = (i^{-1/2}L)$	$(-i\,L) = (i^{-1}L)$
$(-i^{-1}L^{1/2}) = (i\,L^{1/2})$	$(-i^{-1/2}L^{1/2}) = (i^{1/2}L^{1/2})$	$(-L^{1/2})$	$(-i^{1/2}L^{1/2}) = (i^{-1/2}L^{1/2})$	$(-i\,L^{1/2}) = (i^{-1}L^{1/2})$
$(-i^{-1}) = (i)$	$(-i^{-1/2}) = (i^{1/2})$	(-1) permeability, gravitational	$(-i^{1/2}) = (i^{-1/2})$	$(-i) = (i^{-1})$
$(-i^{-1}L^{-1/2}) = (i\,L^{-1/2})$	$(-i^{-1/2}L^{-1/2}) = (i^{1/2}L^{-1/2})$	$(-L^{-1/2})$	$(-i^{1/2}L^{-1/2}) = (i^{-1/2}L^{-1/2})$	$(-i\,L^{-1/2}) = (i^{-1}L^{-1/2})$
$(-i^{-1}L^{-1}) = (i\,L^{-1})$	$(-i^{-1/2}L^{-1}) = (i^{1/2}L^{-1})$	$(-L^{-1})$ acceleration, power, gravitat. field	$(-i^{1/2}L^{-1}) = (i^{-1/2}L^{-1})$	$(-i\,L^{-1}) = (i^{-1}L^{-1})$
$(-i^{-1}L^{-3/2}) = (i\,L^{-3/2})$	$(-i^{-1/2}L^{-3/2}) = (i^{1/2}L^{-3/2})$	$(-L^{-3/2})$	$(-i^{1/2}L^{-3/2}) = (i^{-1/2}L^{-3/2})$	$(-i\,L^{-3/2}) = (i^{-1}L^{-3/2})$
$(-i^{-1}L^{-2}) = (i\,L^{-2})$	$(-i^{-1/2}L^{-2}) = (i^{1/2}L^{-2})$	$(-L^{-2})$ area power	$(-i^{1/2}L^{-2}) = (i^{-1/2}L^{-2})$	$(-i\,L^{-2}) = (i^{-1}L^{-2})$
$(-i^{-1}L^{-5/2}) = (i\,L^{-5/2})$	$(-i^{-1/2}L^{-5/2}) = (i^{1/2}L^{-5/2})$	$(-L^{-5/2})$	$(-i^{1/2}L^{-5/2}) = (i^{-1/2}L^{-5/2})$	$(-i\,L^{-5/2}) = (i^{-1}L^{-5/2})$
$(-i^{-1}L^{-3}) = (i\,L^{-3})$	$(-i^{-1/2}L^{-3}) = (i^{1/2}L^{-3})$	$(-L^{-3})$ irradiance, StefanBoltzman constant	$(-i^{1/2}L^{-3}) = (i^{-1/2}L^{-3})$	$(-i\,L^{-3}) = (i^{-1}L^{-3})$

The 40 physical quantities and dimensions of the Universe
in bidimensional representation: semigroup (-1)

$(i^{-1}L^{3})$ Fermi weak interaction constant	$(i^{-1/2}L^{3})$	(L^{3}) volume	$(i^{1/2}L^{3})$	$(i\,L^{3})$ inertia volume momentum
$(i^{-1}L^{5/2})$	$(i^{-1/2}L^{5/2})$	$(L^{5/2})$	$(i^{1/2}L^{5/2})$	$(i\,L^{5/2})$
$(i^{-1}L^{2})$	$(i^{-1/2}L^{2})$	(L^{2}) area	$(i^{1/2}L^{2})$	$(i\,L^{2})$ inertia area momentum
$(i^{-1}L^{3/2})$	$(i^{-1/2}L^{3/2})$	$(L^{3/2})$	$(i^{1/2}L^{3/2})$ Bohr magneton	$(i\,L^{3/2})$
$(i^{-1}L)$ antitime	$(i^{-1/2}L)$	(L) ħ, length, action, capacitance	$(i^{1/2}L)$	$(i\,L)$ time, G_N, inertia line momentum
$(i^{-1}L^{1/2})$	$(i^{-1/2}L^{1/2})$ electric charge	$(L^{1/2})$	$(i^{1/2}L^{1/2})$ magnetic charge, magnetic flux	$(i\,L^{1/2})$
(i^{-1}) c, velocity, energy, temperature	$(i^{-1/2})$	(1) permitivity, momentum-inertia, entropy	$(i^{1/2})$	(i) c^{-1}, mass, invervelocity, impedance
$(i^{-1}L^{-1/2})$	$(i^{-1/2}L^{-1/2})$ magnetic inverflux	$(L^{-1/2})$	$(i^{1/2}L^{-1/2})$ current, electric potential	$(i\,L^{-1/2})$
$(i^{-1}L^{-1})$ force, frequency, conductivity	$(i^{-1/2}L^{-1})$	(L^{-1}) wavevector	$(i^{1/2}L^{-1})$	$(i\,L^{-1})$ antifrequorce, linear perdensity
$(i^{-1}L^{-3/2})$	$(i^{-1/2}L^{-3/2})$ electric polarization	$(L^{-3/2})$	$(i^{1/2}L^{-3/2})$ electric and magnetic field	$(i\,L^{-3/2})$
$(i^{-1}L^{-2})$ surface tension	$(i^{-1/2}L^{-2})$	(L^{-2}) viscosity	$(i^{1/2}L^{-2})$	$(i\,L^{-2})$ inflexion, area perdensity
$(i^{-1}L^{-5/2})$	$(i^{-1/2}L^{-5/2})$	$(L^{-5/2})$	$(i^{1/2}L^{-5/2})$ charge density, current density	$(i\,L^{-5/2})$
$(i^{-1}L^{-3})$ energy-tension density, pressure	$(i^{-1/2}L^{-3})$	(L^{-3}) fluctuation	$(i^{1/2}L^{-3})$	$(i\,L^{-3})$ density, volume perdensity

The 40 physical quantities and dimensions of the Universe
in bidimensional representation: semigroup (+1)

$-L^2$	Antiarea
$i\,L^2$	Inertia area momentum
$i^{-1}L^2$	?
L^{-2}	Viscosity
$-L^{-2}$	Area power
$i\,L^{-2}$	Inflexion, area perdensity
$i^{-1}L^{-2}$	Surface tension
L^3	Volume
$-L^3$	Antivolume
$i\,L^3$	Inertia volume momentum
$i^{-1}L^3$	Fermi weak interaction constant
L^{-3}	Fluctuation
$-L^{-3}$	Volume power, irradiance, Stefan-Boltzmann constant
$i\,L^{-3}$	Density volume perdensity
$i^{-1}L^{-3}$	Pressure, energy-tension density
$i^{1/2}L^{1/2}$	Magnetic charge, magnetic flux
$i^{-1/2}L^{1/2}$	Electric charge
$i^{1/2}L^{-1/2}$	Current, electric potential, magnetic vector potential
$i^{-1/2}L^{-1/2}$	Magnetic inverflux
$i^{1/2}L^{3/2}$	Bohr magneton
$i^{-1/2}L^{3/2}$	?
$i^{1/2}L^{-3/2}$	Electric field, magnetic field, magnetic flux density
$i^{-1/2}L^{-3/2}$	Electric polarization
$i^{1/2}L^{5/2}$	?
$i^{-1/2}L^{5/2}$	?
$i^{1/2}L^{-5/2}$	Charge density, current density
$i^{-1/2}L^{-5/2}$	?

The *intervalic dimensional basis* that corresponds —and generates— this system of physical quantities is, as will be explained later:

(L, i)

As we can see, the set of intervalic dimensions have some differences with the other dimensional systems:

1. The number of physical quantities is a *finite* and *ordered* set.
2. There does not exist physical quantities whose equation of dimensions have more than the real or unfolded dimensions of real space (3) and time (1). It can't be more than *one* time dimension in the intervalic system because of the proper definition of time as iL —it is determined by the mathematical properties of the *i* number—.

3. There are no different physical quantities with the same equation of dimensions (as in the traditional system), nor different dimensions with the same physical quantity (as in the wrong called “geometrized” units system since they do not define any kind of geometry).

All differences between the intervalic system of physical quantities and units and the remaining dimensional systems will be described at the end of chapter No. 3.

Although systems showing the opposite to these properties was tolerated or put slanted for the Classic Physics, in the Intervalic Theory this situations is not allowed, and the theory asserts that those systems are logically inconsistent and physically wrong. Thus, the intervalic system of physical quantities incorporates an *epistemological rank* previously unknown.

Moreover, with this new vistas there has no sense to maintain the traditional separation between physical quantities and its corresponding equation of dimensions, and between those and the system of physical units. By means of its new epistemological rank, the intervalic system of physical quantities reaches a remarkable unification of all these three concepts in a unique one.

THE DIMENSIONAL BASIS OF THE INTERVALIC SYSTEM OF UNITS: c (i^{-1}) AND ħ (L)

In the intervalic system of physical quantities all physical quantities are consistently defined as a systematic and nontrivial *combination of the two reliable fundamental constants of Nature: c and ħ.* Every physical quantity is defined as a combination of the intervalic dimensions of c (i^{-1}) and ħ (L). The intervalic dimensions of the two fundamental constants are *just* those that conform the *dimensional basis* of the intervalic system of dimensions: (i^{-1}) —or (i) which would yield an entirely equivalent system— and (L), respectively.

The extraordinary fact that the dimensional basis of the intervalic system of dimensions is just composed only by the two fundamental constants, c and ħ, allows that any physical quantity can be expressed as a *universal* dimensionless ratio in intervalic units.

It can be said that the criterion to drawn the dimensional basis of the intervalic units is just opposite to the criterion followed by the wrongly called “geometrized units”, which eliminates the two fundamental constants of Nature making them dimensionless, yielding a misleading and useless system.

MERGING OF PHYSICAL QUANTITIES

In the intervalic system of physical quantities we can affirm that if two physical quantities have the same intervalic dimensions, the are indeed the same underlying physical quantity —although probably viewed in different *scales of observation*, which make the illusion of distinct phenomenology—. By this way, some remarkable merges of physical quantities have been discovered, such as velocity-energy, acceleration-power, frequency-force, etc.

The interpretation of those unifications of physical quantities is a beautiful task for a Physics class. Let us think i.e. the inner nature of velocity-energy and frequency-force regarding the huge differences between its coupled magnitudes at quantum scale and at macroscopic scale. It can be seen that magnitudes of velocity-energy at quantum scale are relatively small, while the acceleration-power and the frequency-force at the same quantum scale are enormous magnitudes. We have to conclude that the macroscopic physical quantities are anthropological concepts —rather deformed— of the genuine quantum physical quantities. Another intuitive example which makes a lot of sense by itself: why does not have been described and correctly named a magnitude as important as the power of a gravitational field? The answer is because they are the same underlying physical quantity, ($-L^{-1}$), so the *acceleration* of a gravitational field is identical to its *power*.

DIMENSIONLESSNESS OF FUNDAMENTAL CONSTANTS IN THE INTERVALIC SPACE

A crucial challenge to any dimensional system of physical quantities is the dimensions that adopt the fundamental constants of physics when written in such a system. Of course, the vast majority of fundamental constants should be no other thing that mere *proportionality constants* in a Physics theory geometrically consistent, and therefore they should be *dimensionless*.

Really, this simple proof can be definitive for the epistemological rank bestowed to a dimensional system of physical quantities, because probably it may be necessary and sufficient to be a reliable system of physical dimensions.

It must be noted the remarkable exception of the Planck's constant which is not a *proportionality* constant by no means, since it establishes a fundamental *quantum* instead of a relation of proportionality between physi-

DIMENSIONS OF PROPORTIONALITY CONSTANTS

Name	*Symbol*	*Traditional dimension*	*Intervalic dimension*
Speed of light	c	$\mathrm{L\,T^{-1}}$	i^{-1}
Permitivity of vacuum	ε_0	$\mathrm{L^{-3}\,M^{-1}\,T^{4}\,I^{2}}$	1
Permeability of vacuum	μ_0	$\mathrm{L\,M\,T^{-2}\,I^{-2}}$	-1
Impedance of vacuum	Z_0	$\mathrm{L^{2}\,M\,T^{-3}\,I^{-2}}$	i
Electric constant	k	$\mathrm{L^{3}\,M\,T^{-4}\,I^{-2}}$	1
Magnetic constant	k_m	$\mathrm{L\,M\,T^{-2}\,I^{-2}}$	-1
Boltzmann constant	k_B	$\mathrm{L^{2}\,M\,T^{-2}\,\Theta^{-1}}$	1
Electromagnetic interaction coupling constant	α	1	1
Strong interaction coupling constant	α_s	1	1
Weak interaction coupling constant	$G_w/(c\hbar)^3$	$\mathrm{L^{-4}\,M^{-2}\,T^{4}}$	-1
	G_w	$\mathrm{L^{5}\,M\,T^{-2}}$	$i^{-1}\mathrm{L}^{3}$
Gravitational interaction coupling constant	G_N	$\mathrm{L^{3}\,M^{-1}\,T^{-2}}$	$i\mathrm{L}$

cal quantities. In this way, it can be expected that the Planck's constant should ideally have the single dimension of the dimensional basis of the system, as it is in the intervalic system of physical quantities.

The proportionality constants in the traditional system of physical quantities are not dimensionless. This fact means that we are compelled to choose logically between two options: the traditional systems of physical quantities are wrong, or the intervalic system is wrong. It is not necessary to say that we have chosen the first option. Therefore, the traditional dimensions shall be derivations or combinations of a pristine and basic set of dimensions: those than compose the dimensional basis of the intervalic system of physical quantities.

Of course, this crucial proof can't be accepted if it is passed in a trivial manner, such as, i.e., the degenerate system used in Quantum Field Theory or in String Theory. Moreover, the degenerate —"geometrized"— dimensional system, although naive and inconsistent, doesn't even pass this proof in a trivial way.

The equation of dimensions of the principal proportionality constants when written in traditional and in intervalic dimensions are shown in the table. As can be easily seen, all of them are dimensionless with the exception of the weak interaction and the gravitation constants. This notable fact may mean that we have not found yet the reliable dimensionless constant for weak interaction and gravitation, or that those interactions, having not a dimensionless proportionality constant, are physically quantized someway. Meanwhile it can be a useful guidance for the discovering of genuine theories of gravitational and weak interactions, since now we know that the truthful dimension of Newton constant is, surprisingly, *time* (iL), instead of the insignificant traditional dimension ($L^3 M^{-1} T^{-2}$); and the present dimension of Fermi constant is a still unknown physical quantity: ($i^{-1}L^3$).

The discussion about the intervalic dimensions of the coupling constants of the four traditional forces of Nature (grouped at the end of the table), which corresponding theories are renormalizable only if their intervalic dimension is dimensionless, will be suitably treated in other site.

INTERVALIC DIMENSION OF MASS

The intervalic dimension of mass, (T/L = i), can be deduced from a constellation of facts which have in common the symmetry and economy laws of the intervalic geometry. Perhaps one of these postulates considered alone should not be sufficient for a rigorous deduction of the intervalic dimension of mass, but considered as a whole they conform a puzzle where all pieces fit in their just place. Since the description of these kinds of symmetry of the Intervalic Space cannot be resumed in a few lines, we are going to expose only a very simple deduction "by exclusion" of the intervalic dimension of mass. Thus, if we construct a dimensional system with dimensions (L), ($T = iL$), (M), and write down a table containing all physical quantities —like our table with the 40 physical quantities of the Intervalic Group— we obtain a strange picture in which there is easily seen that the intervalic dimension of mass only can be (i) —i.e., there is a blank square for the basic dimension (i), indicating that it should correspond necessarily to a fundamental physical quantity, and it can only be the mass, since we don't think that we have no evidence of all fundamental physical quantities at present—. All these reasons allow us to deduce the intervalic dimensions of mass joining several symmetric laws in the Intervalic Space, instead of postulating its dimension by definition in an axiomatic way: $M = T/L = iL/L = i$. In any case, the physical analysis of the final result would be the same.

Please note that another way in which the intervalic dimensions of mass could have been deduced is directly to taking an assumption almost noticed by Lancelot L. Whyte, when he commented extensively in his excellent book ***Critique of Physics*** that the genuine dimension of Planck constant was not action but length. Really, if we take by definition: dim. ħ = L, we have:

$$\text{dim. } \hbar = L = L^2\, M\, T^{-1}$$
$$M = L^{-1}T$$

Of course, the omitted important detail that allows this relation makes sense is the luminous idea named the first intervalic principle about the nature of time, ($T = iL$), whose almost insulting simplicity does not make us to forget that the last fundamental and underlying principles of Physics must be of an extreme simplicity, as have been pointed out by the most outstanding physicist in the history of Physics.

As can be easily seen, the intervalic dimension of mass is just the inverse of the intervalic dimension of velocity-energy, that is to say, invervelocity. By this reason we can unify both physical quantities and call mass as invervelocity-mass. Expressing this result in differential language, we can say that if velocity-energy is the change of space by unit of time, invervelocity-mass is the change of time by unit of space. When String Theory is trying to derive subatomic matter from vibrations in space-time, we reach a more general and simple result, based on a new dimensional analysis, and valid in microcosmic scale as well as in macrocosmic scale. Both velocity-energy and invervelocity-mass are, to say this way, imaginary features in space-time: the first, $(L/T) = (i^{-1})$, and the second, $(T/L) = (i)$.

An important thing we have reached with the intervalic dimensions is to solve one of the most awkward problems of Physics: to find a logical explanation for the dimension of matter that *makes sense*. The ancient Natural Philosophy considered the question of matter as unsolvable *par excellence*: “Only two things can’t be defined anyway: God and matter” (J. Scoto Eriugena, ***Periphyseon de divisione naturæ***). The same James Clerk Maxwell said in his article *Atom* for the ***Encyclopedia Britannica*** (1875) that “the first desideratum of a whole theory of matter is to explain: first, mass, and second, gravitation. But to explain mass seems an absurd achievement”.

Moreover, invervelocity-mass is a physical quantity that can be geometrically derived as a ±180º rotation —by means of the antizator $c^{\pm 2}$ (-1)— in the Intervalic Dimensional Space starting from the generator velocity-energy, being its equivalence:

$$E = c^{\pm 2}\, m$$

This equation is no more than a *geometrical statement,* a geometrical equivalence between physical quantities that we call the *intervalic principle of equivalence between mass and energy* which obviously is similar —but not equal due to the physical interpretation of its intervalic dimensions— to the famous Einstein equation, $E = mc^2$.

Finally, the most rigorous way to deduce the intervalic dimension of mass is simply through the dimensional analysis of the above equation, which give us immediately the intervalic dimension of mass. Showing the dimension of each physical quantity between brackets, we have:

$$E\,(i^{-1}) = m\,(x)\; c^2(-1)$$
$$(i^{-1}) = (x)\,(-1)$$
$$(x) = (i^{-1}) \,/\, (-1) = (-i^{-1}) = (i)$$

INTERVALIC DIMENSION OF TEMPERATURE

Temperature is a physical quantity that does not have strong dimensional bonds with the rest of dimensions. Richard Feynman (***Quantum Electrodynamics***) has pointed out as one of the important step in the development of Physics the discovering about the nature of heat phenomena. It was understood that they could be explained in terms of movement. In this view, temperature would be similar to radiant energy: both phenomena could be explained like a sort of movement —or vibration, that is to say, movement— at subatomic scale of observation. Therefore, if we hope that a system of

TRADITIONAL AND INTERVALIC DIMENSIONS OF THERMODYNAMICS PHYSICAL QUANTITIES

Name	*Symbol*	*Traditional dimension*	*Intervalic dimension*
Boltzmann constant	k_B	$L^2 M T^{-2} \Theta^{-1}$	1
Entropy	S	$L^2 M T^{-2} \Theta^{-1}$	1
Heat capacity	C	$L^2 M T^{-2} \Theta^{-1}$	1
Molar gas constant	R	$L^2 M T^{-2} \Theta^{-1}$	1
Specific heat capacity	c	$L^2 T^{-2} \Theta^{-1}$	$\imath^{-1}$
Stefan-Boltzmann constant	σ	$M T^{-3} \Theta^{-4}$	$-L^{-3}$
Temperature	T	Θ	$\imath^{-1}$
Thermal conductivity	λ	$L M T^{-3} \Theta^{-1}$	$\imath^{-1} L^{-2}$

physical quantities be meaningful, it is reasonable to expect that temperature would have just the same dimension as velocity-energy.

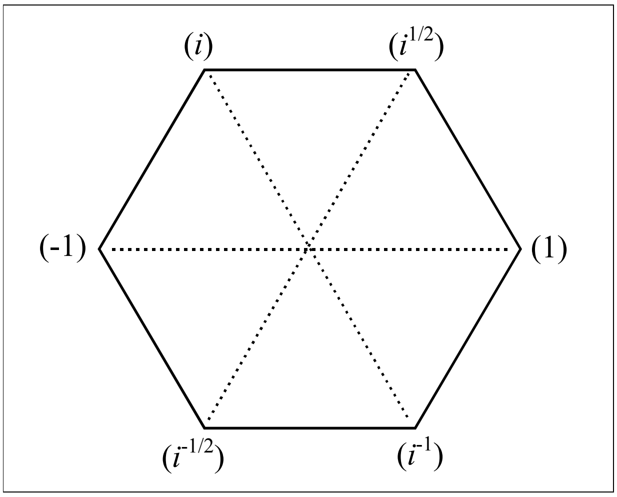
When writing physical equations that incorporate that assumption in intervalic dimensions, we find that all makes sense. The traditional and the intervalic dimensions of basic thermodynamics physical magnitudes can be seen in the table. We find that Stefan-Boltzmann constant and molar gas constant are dimensionless, as expected. Due to its relations within *information theory*, the entropy is a physical quantity that must be necessarily dimensionless, as it is in intervalic dimensions. The specific heat capacity has intervalic dimension of energy, which is a meaningful fact since this physical magnitude is a measurement of the "thermal internal energy" inside the matter of chemical substances. The dimension of the Stefan-Boltzmann constant shows us that it is a sort of "voluminic power" that probably merits further discussion. The intervalic dimension of temperature is the same as velocity-energy one, as commented below. And finally, we see that thermal conductivity has the same intervalic dimension of surface tension, a result that introduces new light on thermodynamics phenomena and also merits further commentaries in other sites.

A very important think about the intervalic dimensions of the intervalic system of physical quantities is that they are, for first time, epistemologically consistent. This means that they have an estimable heuristic value for physics research because now they are meaningful, instead of the traditional dimensions, whose internal and logical relations among them was absolutely insignificant.

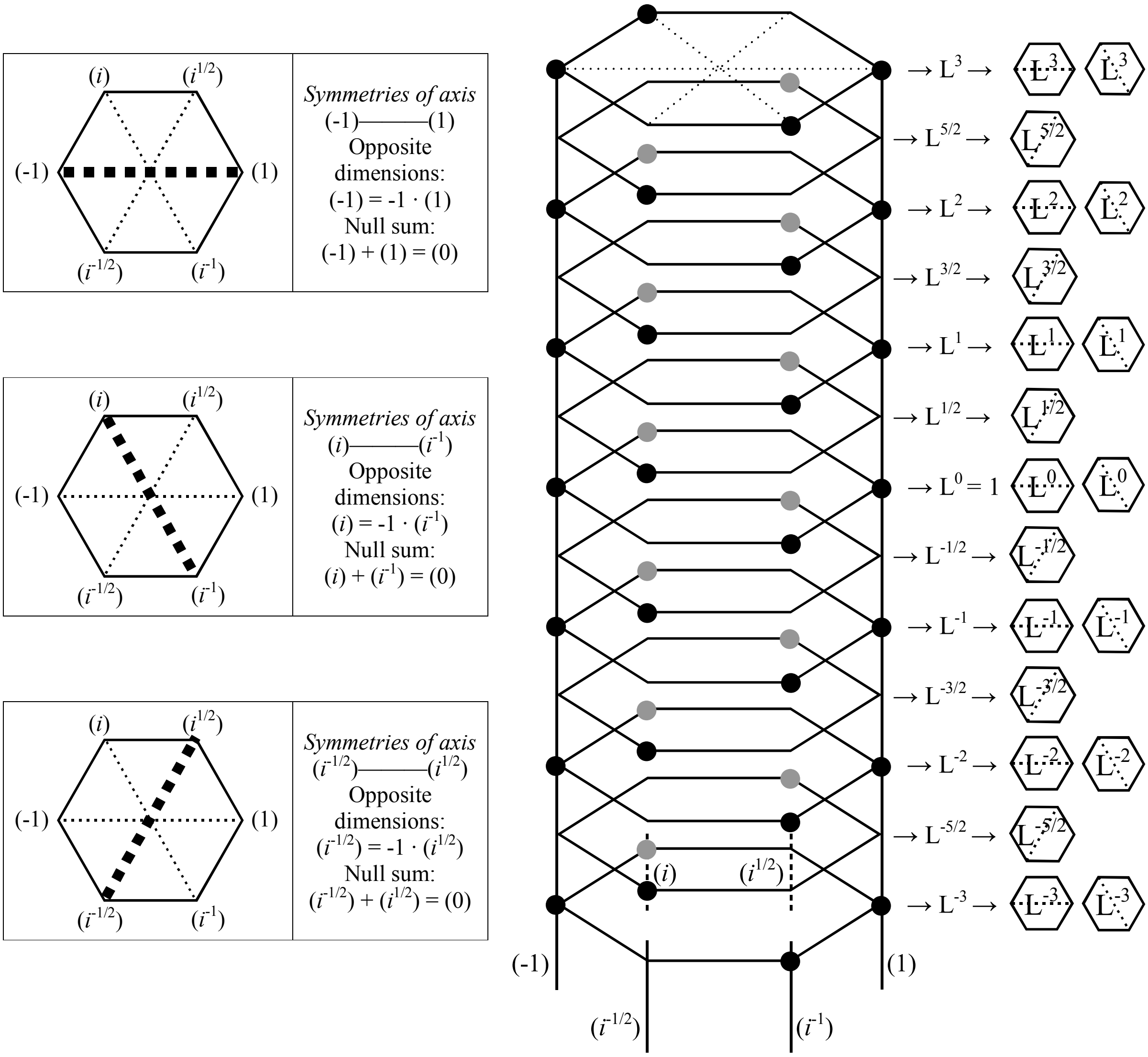
INTERVALIC GROUP

The whole set of intervalic physical quantities shows clearly a well ordered structure and conforms the *intervalic group*, a finite set integrated by 40 quantized o limited dimensions. Of them, 28 have got gravitational nature —those with *integers* powers— and 12 have got electromagnetic nature —those with *half* powers—. Since two of the first are dimensionless —(1) and (-1)—, there are 26 proper gravitational physical quantities (a meaningless coincidence with the number of 26 topological dimensions in String Theory).

On the other hand, a total of 26 physical quantities have *imaginary* numbers in their equation of dimensions (another completely meaningless coincidence with the number of 26 topological dimensions in String Theory), and the remaining 14 quantities have *real* numbers. We can name them respectively time-like and space-like physical quantities.



According to the *intervalic zero assumption*, the sum of all physical quantities and dimensions of the Universe is zero. In any hexagon the opposite intervalic dimensions vanishes between themselves, being the total result *zero*.



Symmetries of axis
(-1)———(1)
Opposite dimensions:
$(-1) = -1 \cdot (1)$
Null sum:
$(-1) + (1) = (0)$

Symmetries of axis
(i)———(i^{-1})
Opposite dimensions:
$(i) = -1 \cdot (i^{-1})$
Null sum:
$(i) + (i^{-1}) = (0)$

Symmetries of axis
$(i^{-1/2})$———$(i^{1/2})$
Opposite dimensions:
$(i^{-1/2}) = -1 \cdot (i^{1/2})$
Null sum:
$(i^{-1/2}) + (i^{1/2}) = (0)$

Symmetries of the 40 physical quantities of the Intervalic Group in tridimensional representation

CORRESPONDENCE BETWEEN THE NUMBER OF REAL SPATIAL DIMENSIONS IN THE UNIVERSE AND THE INTERVALIC GROUP	
Number of dimensions of real space	*Corresponding number of physical quantities in the intervalic group*
0	0
1	16
2	28
3	40
4	52
5	64
6	76
7	88
8	100
9	112
10	124

In the same way as the classification of the elements by Mendeleiev on a periodic table, the intervalic group makes a classification of the physical quantities, similar to another periodic table (although more complex because the organization of the physical quantities have the aspect of a symmetric Lie algebra), and shows us that we only know 35 of the 40 allowed or existing physical quantities, and 5 of them have not been described yet.

There may have some representations for the symmetries of the intervalic group. We have think up a bidimensional representation into two planes (as for equations with imaginary numbers) and a tridimensional representation. The first picture can be seen below in the chapter titled ‘Intervalic Dimensions’ and the later can be seen nearby these lines.

It can be seen now that the number of physical quantities is finite and it is univocally *determined* by the unfolded dimensions of real space. Thus, if our Universe would have only 2 real spatial dimensions, the intervalic group will have 28 physical quantities; if the Universe would have 4 real spatial dimensions, the intervalic group will have 52 physical quantities; etc., being obviously the recurrent formula:

$$Q = 4 + 12D$$

where Q is the number of physical quantities and D the number of real spatial dimensions.

Apart from this, we have made a table with an individual description of the 40 intervalic physical quantities, which are related with the tridimensional representation of the intervalic group.

CLASSIFICATION OF PHYSICAL QUANTITIES IN THE INTERVALIC GROUP		
Criterion of classification	*Number of physical quantities*	*Feature of the set of physical quantities*
Integer vs. half integer powers	26	Gravitational
	14	Electromagnetic
Real vs. imaginary numbers	14	Space-like
	26	Time-like
Integer vs. fractal dimensions	10	Integer
	30	Fractal
Dimensionful vs. dimensionless	38	Dimensionful
	2	Dimensionless

FRACTAL DIMENSIONS OF PHYSICAL QUANTITIES

(This paragraph is a mere curiosity and may be skipped if desired).

The fractal geometry developed by Benoît Mandelbrot from the concept of Hausdorff-Besicovitch dimension can be applied to the physical quantities in the Intervalic Dimensional Space since they now are geometrically related. According to Mandelbrot, the fractal dimension —of a mathematical function— can be viewed as a measurement of the "recovering degree" of that function on a *n*-plane with respect to its topological dimension, *n*. Applying this analogy to the matter-energy *ratio* of the physical quantities we can obtain the Hausdorff-Besicovitch dimension of all intervalic physical quantities. As defined by Mandelbrot, the dimension of a function is *fractal* if, and only if, its dimension is *lesser* than its topological dimension. This ratio can be obtained from the intervalic principle of equivalence between mass, energy and electric charge, as have been explained in other site. In this line, the equivalent energy ratio between the electric charge and the mass of electron is:

$$\mathrm{I}(e) / \mathrm{E}(m_e) = \mathrm{c}^{\pm 2}\hbar\, e^{-2} / \mathrm{c}^{\pm 2} m_e = 0.558320$$

Therefore this ratio can be applied also to its respective dimensions, and since we can operate algebraically with fully consistence with the intervalic dimensions, we have:

$\dim (i^{-1/2}\mathrm{L}^{1/2} / i) = 0.558320$
$\dim (i^{1/2}) = 1.116640$
$\dim (i^{-1/2}) = 0.895544$

And the fractal dimension of (i) would be:

$\dim (i) = 0.801999$
$\dim (i^{-1}) = 1.246885$

The topological and fractal dimensions of all physical quantities can be seen in the last table. The only integers —no fractal— physical quantities are those with intervalic dimension $\mathrm{L}^{\pm n}$ (with $n = 1, 2, 3$) and the dimensionless ones (1) and (-1), that is to say, only 10 of the whole set of physical quantities of the intervalic group have an integer —non fractal— dimension (another one curious and meaningless coincidence with the number of 10 topological dimensions in the traditional String Theory).

It is intriguing to see that *time* have not and integer Hausdorff-Besicovitch dimension:

$$\dim (\mathrm{T} = i\mathrm{L}) = 0.801999$$

The interpretation of this result is that physical time does not cover completely the whole topological dimension of time. It only could be possible if the speed of light was infinite. In this hypothetical and unreal case the electromagnetic energy would have a greater share in the structural energy of subatomic particles and the preceding electron energy ratio would reach just the following limit:

$$\mathrm{I}(e) / \mathrm{E}(m_e) = \mathrm{c}^{\pm 2}\hbar\, e^{-2} / \mathrm{c}^{\pm 2} m_e = \tfrac{1}{2}$$

PHYSICAL QUANTITIES AND PARTITION OF SPACE IN REGULAR POINT-LATTICES

(This paragraph is a mere curiosity and may be skipped if desired).

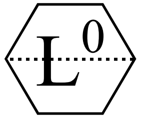
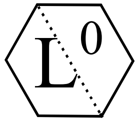
We have seen some apparently meaningless coincidences between the number of physical quantities in the Intervalic Theory and the number of topological dimensions in String Theory. There is another curious coincidence between the number of physical quantities and the regular partitions of space. We can think that it is meaningless, as it appears to be, but perhaps someone could think that it is an still unknown property of the Nature's forms.

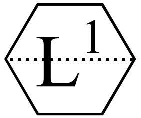
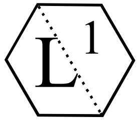
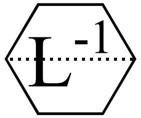
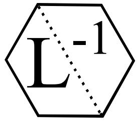
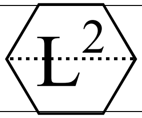
There are only one regular isotropic partition of space: the *cuboctahedral* point-lattice, and there is only one regular non-isotropic partition of space: the *cubical* point-lattice. Both of them are well known in crystallography. The first is the natural close-packing of *spheres* and the second the natural close-packing of *cubes*. To obtain a perfect close-packing of a sphere with spheres, 12 spheres are needed (the centres of these 13 tangent spheres coincide with the vertices of a cuboctahedron); in a similar way, to recover perfectly a cube with cubes takes 26 cubes.

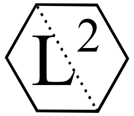
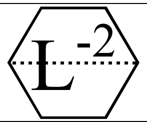
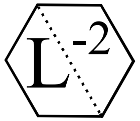
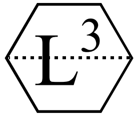
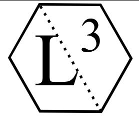
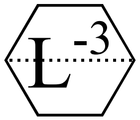
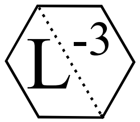
Thus, the number of electromagnetic physical quantities (12) coincides with the number of spheres needed for the only possible close-packing in a regular isotropic partition of space: 12; and the number of gravitational physical quantities (26) coincides with the number of cubes needed for the only possible close-packing in a regular non-isotropic partition of space: 26. Moreover, the central sphere and the central cube of these regular point-lattices matches with the two remaining dimensionless physical quantities, being its total sum —(12+1) + (26+1) = 40— just the number of physical quantities of the intervalic group: 40.

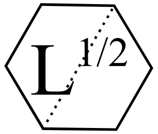
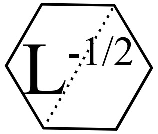
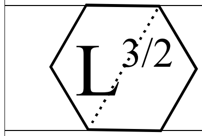
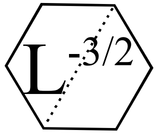
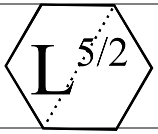
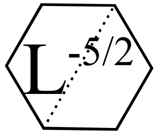
Someone may think that there are too many coincidences to be all of them meaningless. Although by now we can't make further speculations, it appears to exist some unknown deep relation between the *electromagnetic* phenomena and the *cuboctahedral* point-lattice, and between the *gravitational* phenomena and the *cubical* point-lattice, and surely it would be very interesting to discover such possible relation. In other case, this would be another curious and irrelevant coincidence without any significance.

THE 40 PHYSICAL QUANTITIES OF THE INTERVALIC GROUP

Representation	*Intervalic dimension*	*Physical quantity*	*Traditional dimension*	*Symbol*	*Fractal dimension*
	1	Permitivity	$L^{-3} M^{-1} T^{4} I^{2}$	ε	0
		Momentum (momentum-inertia)	$L M T^{-1}$	p	
		Boltzmann constant	$L^{2} M T^{-2} \Theta^{-1}$	k_B	
		Entropy	$L^{2} M T^{-2} \Theta^{-1}$	S	
	-1	Permeability	$L M T^{-2} I^{-2}$	μ	0
		Gravitational potential	$L^{2} T^{-2}$	Φ	
		Antimomentum	-	p_a	
	i	Mass (invervelocity-mass)	M	m	0.801999
		Invervelocity (invervelocity-mass)	$L^{-1} T$	v^{-1}	
		Impedance	$L^{2} M T^{-3} I^{-2}$	Z	
	i^{-1}	Velocity (velocity-energy)	$L T^{-1}$	v	1.246885
		Energy (velocity-energy)	$L^{2} M T^{-2}$	E	
		Temperature	Θ	T	
		Specific heat capacity	$L^{2} T^{-2} \Theta^{-1}$	c	
		Conductance	$L^{-2} M^{-1} T^{3} I^{2}$	G	

Representation	*Intervalic dimension*	*Physical quantity*	*Traditional dimension*	*Symbol*	*Fractal dimension*
	L	Length (real space)	L	L	1
		Planck constant, action	$L^2 M T^{-1}$	$\hbar$	
		Capacitance	$L^{-2} M^{-1} T^4 I^2$	C	
	-L	Antilength	-	L_a	1
		Inductance	$L^2 M T^{-2} I^{-2}$	L	
	i L	Time (imaginary space)	T	T	0.801999
		Gravitational constant	$L^3 M^{-1} T^{-2}$	G	
	i^{-1} L	Antitime	-	T_a	1.246885
	L^{-1}	Wavevector	L^{-1}	k	1
	$-L^{-1}$	Acceleration (acceleration-power)	$L T^{-2}$	a	1
		Gravitational field	$L T^{-2}$	g	
		Power (acceleration-power)	$L^2 M T^{-3}$	W	
	$i L^{-1}$	Antifrequorce	-	φ_a	0.801999
		Linear Perdensity	-	Δ^1	
	$i^{-1} L^{-1}$	Frequorce (frequency-force)	-	φ	1.246885
		Frequency	T^{-1}	ν	
		Force	$L M T^{-2}$	F	
		Linear Tension	T^{-1}	σ	
		Conductivity	$L^{-3} M^{-1} T^3 I^2$	σ	
	L^2	Area	L^2	S	2
	$-L^2$	Antiarea	-	S_a	2

Representation	*Intervalic dimension*	*Physical quantity*	*Traditional dimension*	*Symbol*	*Fractal dimension*
	$i\ L^2$	Inertia area momentum	$L^2 M$	I^2	1.603998
	$i^{-1}L^2$	?	-	-	2.493769
	L^{-2}	Viscosity (dynamic)	$L^{-1} M\ T^{-1}$	η	1/2
	$-L^{-2}$	Area Power	-	W^2	1/2
	$i\ L^{-2}$	Area Perdensity	-	Δ^2	0.400999
		Inflexion	$L\ T^{-3}$	i	
	$i^{-1}L^{-2}$	Surface Tension	$M\ T^{-2}$	σ^2	0.623442
	L^3	Volume	L^3	V	3
	$-L^3$	Antivolume	-	V_a	3
	$i\ L^3$	Inertia volume momentum	-	I^3	2.405997
	$i^{-1}L^3$	Fermi weak interact. constant	$L^5 M\ T^{-2}$	G_w	3.740654
	L^{-3}	Fluctuation	$L\ T^{-4}$	f	1/3
	$-L^{-3}$	Voluminic Power	-	W^3	1/3
		Irradiance	$M\ T^{-3}$	E_e	
		Stefan-Boltzmann constant	$M\ T^{-3}\ \Theta^{-4}$	σ	
	$i\ L^{-3}$	Density	$L^{-3} M$	ρ	0.267333
		Voluminic Perdensity	$L^{-3} M$	Δ^3	
	$i^{-1}L^{-3}$	Pressure	$L^{-1} M\ T^{-2}$	P	0.415628
		Energy-tension density	$L^{-1} M\ T^{-2}$	u	

Representation	*Intervalic dimension*	*Physical quantity*	*Traditional dimension*	*Symbol*	*Fractal dimension*
	$i^{1/2}L^{1/2}$	Magnetic charge	$L^2 M T^{-2} I^{-1}$	θ	0.558320
		Magnetic flux	$L^2 M T^{-2} I^{-1}$	Φ	
	$i^{-1/2}L^{1/2}$	Electric charge	$T I$	q	0.447772
	$i^{1/2}L^{-1/2}$	Current	I	I	2.233280
		Electric potential	$L^2 M T^{-3} I^{-1}$	V	
		Magnetic vector potential	$L M T^{-2} I^{-1}$	A	
	$i^{-1/2}L^{-1/2}$	Magnetic inverflux	-	Φ^{-1}	1.791088
	$i^{1/2}L^{3/2}$	Bohr magneton	$L^2 I$	μ_B	1.674960
	$i^{-1/2}L^{3/2}$	?	-	-	1.343316
	$i^{1/2}L^{-3/2}$	Electric field strength	$L M T^{-3} I^{-1}$	Є	0.744427
		Magnetic field strength	$L^{-1} I$	H	
		Magnetic flux density	$M T^{-2} I^{-1}$	B	
	$i^{-1/2}L^{-3/2}$	Electric polarization	$L^{-2} T I$	P	0.597029
	$i^{1/2}L^{5/2}$	?	-	-	2.791600
	$i^{-1/2}L^{5/2}$	?	-	-	2.238859
	$i^{1/2}L^{-5/2}$	Charge density	$L^{-3} T I$	ρ	0.446656
		Current density	$L^{-2} I$	J	
	$i^{-1/2}L^{-5/2}$	?	-	-	0.358218

Chapter 2

INTERVALIC QUANTA, INTERVALIC LIMITS

The Geometrical Heights of Nature

The intervalic system of physical quantities determines necessarily the *quantization* or *limitation* of all physical quantities, which conform a finite set with remarkable symmetries named the intervalic group. Intervalic quanta and intervalic limits have not been arranged by hand, like the traditional Planck's physical quantities. On the contrary, both their magnitudes and their dimensions are exclusive combinations derived univocally from ħ and c —the last fundamental constants of Nature— in a systematic theoretical way. These new heights *geometrize* the mathematical conception of physical quantities and are a part of the underlying and comprehensive *Intervalic Geometry* which makes the foundations of a new Physics.

In this paper are described the fundamental quanta and limits of Nature, being commented some of them individually, such as the intervalic mass, the intervalic velenergy, the intervalic frequorce, the intervalic length, the intervalic electric charge, the intervalic magnetic charge or the intervalic temperature. Also are explained the geometric equivalences among intervalic quanta and limits, and the introduction of the intervalic quanta as a reliable scale for a universal system of units.

INTERVALIC QUANTA AND INTERVALIC LIMITS

> There has always been an attempt to find a unifying theoretical basis for all these [various branches of Physics]… from which all the concepts and relationships among the individual disciplines might be derived by a logical process. This is what we mean by the search of a foundation of the whole of Physics. The confident belief that this ultimate goal may be reached is the wellspring of the passionate devotion that has always motivated the researcher.
>
> ALBERT EINSTEIN
> *The Fundamentals of Theoretical Physics,*
> *"Science" 91, 24.05.1940*

When using intervalic dimensions (L = L, T = *i*L, M = T/L = *i*), with *i* = √-1, a new set of fundamental quanta —the term 'quanta' is here used in geometric sense— is necessarily yielded: the *intervalic quanta*. This logical fact can be considered as unexpected and almost magic, since no quanta nor any other physic phenomena should be obtained from a mere change in the dimensional system of physical quantities used.

Unlike the so named Planck quanta which involves complex combinations of three constants, the intervalic ones are reliably *fundamental* since there are composed only by the simplest combinations of the two genuine constants of Nature: the speed of light, c, and the intervalic length, ħ —which replace the action quantum, h—. On the contrary, Planck's quanta are dimensional combinations *ad hoc* of c, h, and the gravitational constant, G, carefully prepared by hand to obtain the desired quantum of longitude, time, mass, etc. Those combinations may have had some value as an *empirical* approximation to the value of the primordial scale of the physical forces, since till the postulation of IT we didn't have other way to determine it. But by means of the intervalic dimensions we can determine faithfully the exact *theoretical* value of that scale. Moreover, the intervalic quanta can do that because they have the truly epistemological rank of *quantum*, whereas Planck's quanta do not have really that logical rank, although they have been freely treated as if they would have it.

Besides, the fact that Planck's quanta are scarcely different from the intervalic quanta means that some of the involved constants (c, ħ or G) have slightly wrong magnitudes. Since the magnitude of c is taken by definition, we will see that the deviated magnitude is that one of G, being despicable — from an theoretical point of view— the deviation in the magnitude of ħ. On the contrary, the deviation in the magnitude of G, although small, might be physically meaningful as will be explained in other site.

The comparison of magnitudes between different physical quantities has no sense in the traditional system of dimensions nor in the degenerate dimensions. This is correct because these systems do not have —and they can't know whether they have— a genuine *geometrical relation* among its physical quantities. On the contrary, the so named Intervalic Dimensional Space is like an extended Argand space where *all physical quantities are generated* by successive *rotations* of ±90º by means of the geometrical *transformer*: the fundamental constant of proportionality between real and imaginary axes, the speed of light, c, whose intervalic dimension is L/T = i^{-1}, and its inverse transformer, c^{-1}, with intervalic dimension T/L = i. So we can compare any *real* physical quantity with its corresponding *imaginary* one, that is to say, we can compare any physical quantity with intervalic dimension X, with its corresponding i^nX (where $n = \pm 1, \pm 2, \pm 3, \pm 4$); and vice versa.

Best physicists suspect that we don't know yet the genuine geometry of physics, the underlying fundamental geometry of the Universe. It is hoped that this sort of geometry should be based on principles of astonishing simplicity and, of course, leaded continuously by the signs of logical inevitability and mathematical elegance. In short, it should transform all or a great number of physical equations and formulae into pure *geometric statements* (as partially did General Relativity with gravitation). As we will understand immediately, the inner nature of the *intervalic quanta and limits* is purely *geometrical*, since the intervalic dimensions define a new type of *geometrical* relations among physical quantities.

This situation is very different from the traditional dimensional system or from the degenerate —wrongly called 'geometrized'— system (dim. c = 1, dim. ħ = 1), where, if the dimensional logic would have to be rigorously applied, we would obtain absolutely absurd results such as, i.e., the inverse value of Planck mass should be the quantum of length, and vice versa, since in that trivial system $L = M^{-1}$. In any way it can be qualified as fully consistent or elegant.

Regarding the dimensions of c and h, it is evident that its traditional dimensions (LT^{-1} and L^2MT^{-1}) are not single or elemental dimensions, being this desideratum an important and almost definitive heuristic rule for investigation. In degenerate units c and h are both dimensionless, (1), which is an arbitrary supposition that finally would end in grave inconsistence. Really, it is a little surprising that such dimensional system have been seriously used. In this system the dimensions of all physical quantities are *trivial* and lack of

INTERVALIC QUANTA AND LIMITS

(shadowed traditional quanta are shown for comparison)

Name	*Intervalic dimension*	*Geometric rank*	*Intervalic value*	*Value SI*	*Definition*
Intervalic mass	i	subatomic limit	1	$3.3356409 \cdot 10^{-9}$ (kg)	$\mathbf{m_I} = c^{-1}$
Planck mass	i	subatomic limit	6.525616	$2.176711 \cdot 10^{-8}$ (kg)	$\mathbf{m_P} = \sqrt{}(hc/G)$
Intervalic energy	i^{-1}	subatomic limit	1	$2.9979246 \cdot 10^{8}$ (J) $1.8711569 \cdot 10^{21}$ (MeV)	$\mathbf{E_I} = c$
Planck energy	i^{-1}	subatomic limit	6.525616	$1.956330 \cdot 10^{9}$ (J) $1.2210449 \cdot 10^{22}$ (MeV)	$\mathbf{E_P} = \sqrt{}(hc^5/G)$
Intervalic length	L	quantum	1	$1.0556363 \cdot 10^{-34}$ (m)	$\mathbf{l_I} = \hbar$
Planck length	L	quantum	0.153088	$1.616051 \cdot 10^{-35}$ (m)	$\mathbf{l_P} = \sqrt{}(hG/c^3)$
Intervalic time	i L	quantum	1	$3.5212226 \cdot 10^{-43}$ (s)	$\mathbf{t_I} = c^{-1}\hbar$
Planck time	i L	quantum	0.153088	$5.390563 \cdot 10^{-44}$ (s)	$\mathbf{t_P} = \sqrt{}(hG/c^5)$
Intervalic electric charge	$i^{-1/2}\,L^{1/2}$	quantum	1	$5.9339900 \cdot 10^{-22}$ (C)	$\mathbf{q_I} = \sqrt{}\text{-}(c^{-1}\hbar)$
Intervalic thermal mass	i	quantum	k_B	$4.6053793 \cdot 10^{-32}$ (kg)	$\mathbf{m_\Theta} = c^{-1}k_B$
Intervalic velocity	i^{-1}	absolute limit	1	$2.9979246 \cdot 10^{8}$ (m/s)	$\mathbf{v_I} = c$
Intervalic frequency	$i^{-1}\,L^{-1}$	absolute limit	1	$2.8399227 \cdot 10^{42}$ (s^{-1})	$\boldsymbol{\varphi_I} = c\hbar^{-1}$
Intervalic temperature	i^{-1}	absolute limit	k_B^{-1}	$2.1713738 \cdot 10^{31}$ (K)	$\boldsymbol{\Theta_I} = c\ k_B^{-1}$
Elementary charge	$i^{-1/2}\,L^{1/2}$	subatomic quantum	270	$1.602177 \cdot 10^{-19}$ (C)	$e = 270\ \mathbf{q_I}$
Intervalic magnetic charge	$i^{1/2}\,L^{1/2}$	subatomic quantum	1	$1.7789652 \cdot 10^{-13}$ (Wb)	$\boldsymbol{\Phi_I} = \sqrt{}\text{-}(c\hbar)$
Magnetic flux quantum	$i^{1/2}\,L^{1/2}$	subatomic quantum	π / 270	$2.069963 \cdot 10^{-15}$ (Wb)	$\boldsymbol{\Phi_0} = \pi\hbar/e$

a truthful physical meaning. Anyway, none of them do yield reliable fundamental dimensions for c and ħ.

Besides, as a result of the geometrical conformation of the Intervalic Dimensional Space and the exclusive logical rank of the intervalic dimensions, we can say that *all physical quantities are intervalically quantized or limited*. This have to be interpreted in the sense that the macroscopic physical laws are only a comfortable approximation of the pristine subatomic physical laws, since the quantum values have no relevance in the measurement of the macroscopic world. But we ever must remember that all these last measurements are *multiple* of the quantum values.

This can be easily understood when dealing with the *minimum* quanta like the intervalic length, the intervalic time or the intervalic electric charge. Each macroscopic measurement of length, time or electric charge must be necessarily a multiple value of its corresponding intervalic quanta. But we also have logically defined other *maximum* limits, like the intervalic velocity, the intervalic mass, the intervalic energy, the intervalic frequency or the intervalic temperature. What is the meaning of these limits, since they are not the smallest bricks of Nature? Of course, they are the greatest bricks allowed in Nature. Thus, the intervalic mass and the intervalic energy are the greatest values allowed for a single —not composite— subatomic particle, and likewise the intervalic temperature, the intervalic frequency and the intervalic velocity are the maximum values allowed for a single subatomic particle —and *a fortiori*, for that physical quantity—.

We have done a meaningful table with the principal intervalic quanta and limits. Now lets go to comment briefly some of these new quanta. Their three possible geometric ranks —subatomic limit, quantum, absolute limit— are shown in the table.

INTERVALIC MASS

$\mathbf{m_I} = c^{-1} = 3.3356409 \cdot 10^{-9}$ (kg) = 20,819.42423 (MeV/c^2)
Intervalic dimension: (T/L) = (iL/L) = (i)

If the quantum of mass would be a reliable value of Nature it is expected it must be a single value, but not a combination of other constants. In this way the comparison between the definitions of the intervalic mass and the Planck mass speaks by themselves. The last one is not a single constant but a combination of other three constants (c, h, G, where only c and h are truly fundamental constants). On the contrary, the intervalic mass is the inverse value —and also has the inverse dimension, $1/i^{-1} = i$— of one of the two reliable constants of nature, c, the speed of light (being the other ħ). It is difficult to imagine more simplicity and logical economy:

$\mathbf{m_I} = c^{-1}$
$\mathbf{m_P} = \sqrt{}(hc/G)$

Besides, the value of the intervalic mass is much more suited to expected for quantum gravity than the value of Planck mass. As have been pointed out by Roger Penrose, 'one graviton' effects will appear when mass magnitude is of order 10^{-7} g. It is hoped that some formula leads to a smaller mass than Planck's one. (Roger Penrose, *Newton, Quantum Theory and Reality,* in ***300 Years of Gravitation***, edited by S. W. Hawking & W. Israel). But this value is nearer the intervalic mass, which is around seven times smaller than the Planck mass. And, above all, it is a truthful fundamental magnitude, instead of Planck mass, which is not by no means. As mentioned, its magnitude and its dimension can't be more simple indeed: the inverse value of the speed of light, c^{-1} (i) = 20,819.42423 (MeV/c^2).

INTERVALIC VELENERGY
$\mathbf{v_I} = c = 2.9979246 \cdot 10^8$ (m s^{-1})
$\mathbf{E_I} = c = 2.9979246 \cdot 10^8$ (J)
Intervalic dimension: (i^{-1})

Briefly, since the intervalic dimension of the speed of light is velenergy or velocity-energy, the fundamental geometrical constant of the Intervalic Dimensional Space, c, can be also interpreted as the geometric height of energy, $\mathbf{E_I}$, which is a subatomic limit, being the magnitude of this energy equivalent to that of the intervalic mass:

$$\mathbf{E_I} = c^2 \, \mathbf{m_I} = c^2 \, c^{-1} = c$$

INTERVALIC FREQUORCE
$\boldsymbol{\varphi_I} = c\hbar^{-1} = 2.8399227 \cdot 10^{42}$ (s^{-1})
Intervalic dimension: ($i^{-1}L^{-1}$)

Starting from the value of the intervalic energy limit, the value of the intervalic frequorce —frequency-force— limit is straightforwardly yielded :

$$\mathbf{E_I} \equiv c = \hbar \, \boldsymbol{\varphi_I}$$

$\boldsymbol{\varphi_I} = c\,\hbar^{-1}$

INTERVALIC LENGTH
$\mathbf{l_I} = \hbar = 1.0556363 \cdot 10^{-34}$ (m)
$\mathbf{S_I} = \hbar = 1.0556363 \cdot 10^{-34}$ (J s)
Intervalic dimension: (L)

“Since no electron velocity has ever been directly measured [inside the atom] we cannot be sure that the dimensions of the new constant ‘h’ —called Planck’s constant— are really that we suppose, energy multiplied by time”. (Lancelot Law Whyte, ***Archimedes or The Future of Physics***). Continuing with Whyte, in the excellent book ***Critique of Physics***, he spends some pages to remark the truthful function and meaning of the Planck’s quantum, *h*. Lets hear him:

“The appearance of *h as a constant having the dimensions of action* is an arbitrary historical fact determined by the general form of the physical theories current at the time it was introduced, whereas its *empirical* function, i.e. in connection with empirical data, is in all cases except that of statistical averages to supply in combination with the other constants a universal standard of *length*. […]

“The primary function of Planck’s constant, *h*, in combination with the atomic constants, is to provide physical theory with standards of length in terms of which all directly measurable lengths of theoretical importance can be described… Wherever *h* appears in a fundamental equation (not referring to statistical assemblies), the empirical content of the equation is the correlation of a *measured length* with other quantities. Equations that contain *h* and do not at first sight appear to determine a measurable length have to be transformed into assertions about measurable lengths (wave lengths, crystal lattice constants, etc.) before they have a direct relation to experiment. This fact is concealed by the original introduction of the constant as a unit of action, but any revision of physical concepts must render explicit the primary function of *h*:

“PLANCK’S CONSTANT (IN APPROPRIATE COMBINATIONS) DETERMINES THE LINEAR SCALE OF THE STRUCTURE OF MATTER AND OF RADIATION, in terms of the selected unit of length”.

The fact that the intervalic dimension of *h* is length, (L), is of capital importance since the intervalic quantum of length is not a combination of other quantities or constants (as in the formula of the Planck’s length) but it is an absolutely original and fundamental length, not a derived one. Of course, since we only admit two constants to be reliable fundamental, c and *h*, it was necessary that the quanta of length was just *h*, but till now no dimensional system have been capable to get this result in a faithfully simple and radical way. Indeed, when using intervalic dimensions *h* is directly formulated in units of length: dim $h = (L^2MT^{-1}) = (L^2\, i\, i^{-1}L^{-1}) = (L)$

Perhaps some readers may have seen that any equation in which appears $c^{\pm n}$ can be interpreted in terms of rotations in the Intervalic Dimensional Space. But probably the reader don't believe that all physic equations, and not only those involving the factor $c^{\pm n}$, can be interpreted in a geometrical way within the Intervalic Dimensional Space. The famous Einstein's equation for the energy of photon, $E = h\,\nu$, is a good example to show the astonishing simplicity in which the theory transforms all physics formulae. If we postulate the existence of a absolute minimal element of space, the quantum of length, $\mathbf{l_I}$, then, any other longitude of the Universe, s, will have to be multiple of that quantum:

$s = n\,\mathbf{l_I}$ (being *n* an integer)

Now let us write the most simple geometrical relation between the real (L) and the imaginary axes (iL = T) in the Intervalic Dimensional Space, that is to say, the classical definition of velocity, v:

$v = L/T = L/iL$

$v = s / t$

Remember that in intervalic dimensions we have the following *identities*:

1) *velocity* is identical to *energy*: $v \equiv E$

2) *invertime,* t^{-1}, is identical to *frequorce*: $t^{-1} \equiv \varphi$

3) *frequorce* is the unification of *frequency* and *force* in a single physical quantity: $\varphi \equiv \nu \equiv F$

Therefore the preceding *definition* of velocity can be written in 16 different but equivalent ways when using intervalic dimensions:

$v = s / t = n\,\hbar / t$

$v = s \cdot \nu = n\,\hbar \cdot \nu$

$v = s \cdot F = n\,\hbar \cdot F$

$v = s \cdot \varphi = n\,\hbar \cdot \varphi$

$E = s / t = n\,\hbar / t$
$E = s \cdot \nu = n\,\hbar \cdot \nu$
$E = s \cdot F = n\,\hbar \cdot F$
$E = s \cdot \varphi = n\,\hbar \cdot \varphi$

All these formulae are distinct manners of expressing an unique and fundamental geometric relation:

$$v \equiv E = s/t = n\hbar\ \varphi$$

The physical task is precisely to interpret and to connect rightly with natural phenomena the geometric statements deduced by logical means.

In this case we are, although, working *a posteriori*, finding that old physic laws apparently unconnected, are in fact the same equation but expressed in different scales of observation. This is the case, for example, of the equations for macroscopic and microscopic energy, respectively:

$E = s \cdot F$
$E = n\hbar \cdot \nu$

As can be seen, the classic equation is only an approximation of the last one. Since in the macroscopic world the quantum of real space is too much small to be relevant in any measurement, we simple write 's' instead of the accurate expression '$n\hbar$'. Identity between them probably can be easily seen when they are derived from the same basic equation writing down their intervalic dimensions:

$v(i^{-1}) \ \equiv E(i^{-1}) = n\hbar(L)\ \varphi(i^{-1}\,L^{-1}) = s(L)\ F(i^{-1}\,L^{-1})$
$v(i^{-1}) \ \equiv E(i^{-1}) = n\hbar(L)\ \varphi(i^{-1}\,L^{-1}) = n\hbar(L)\ \nu(i^{-1}\,L^{-1})$

Besides, the unification of frequency and force in a underlying new physical quantity can be viewed as the merge between the two faces of the physic reality: particles and waves. As Lancelot Whyte affirmed in his quoted book, "it will therefore be necessary to discard entirely the terms and particles in fundamental synthetic theory. Waves and particles are conceptions derived from macroscopic phenomena which provide partial and misleading descriptions of two complementary aspects of one microscopic phenomenon. 'Light and matter are unitary physical phenomena, their apparent duality arises from the essential inadequacy of our language' (Heisenberg). 'The waves and particles should be regarded as two abstractions which are useful in describing the same physical reality' (Dirac)". Now, at least, by means of the introduction of the physical quantity named *frequorce* it is avoided the “essential inadequacy of our language”.

Finally, another interpretation of Einstein’s equation in intervalic dimensions also explain why appears h instead of ħ. Really, if the elongation of electromagnetic waves is just the intervalic length as we suppose, the length of the transversal path described by a photon in a cycle is $2\pi \mathbf{l_I} = 2\pi\hbar = h$. It is also clear that the fundamental constant is ħ instead of *h*, which is defined as $h = 2\pi\hbar$. Thus, a more meaningful enunciation of Einstein’s equation would be:

$$E = 2\pi \, \hbar\nu$$

Although the magnitude of Planck’s length is near from the magnitude of the intervalic length, it must be pointed out that the first one is not a fundamental quanta but a derived physical quantity, and, what is worse, according to the *intervalic geometry* of Nature, such magnitude is absolutely wrong because it is outside the underlying geometric architecture of Nature defined by the intervalic dimensions.

INTERVALIC ELECTRIC CHARGE

$\mathbf{q_I} = \sqrt{}\text{-}(c^{-1}\hbar) = 5.9339900 \cdot 10^{-22}$ (C)
Intervalic dimension: $(L^{3/2}M^{1/2}T^{-1} = L^{3/2}i^{1/2}i^{-1}L^{-1} = i^{-1/2}\,L^{1/2})$

By means of the intervalic dimensional analysis of the electric charge it is deduced that there must be two types of electric charge, positive and negative, because there are two mathematical solutions for a square root. The almost insulting simplicity of this result should not do us to ignore its importance. It was expected that a faultless theory would explain the existence of the two charge signs; but that was not expected is that it would be reached in a so simple way: from the dimensional analysis of the electric charge.

Sometimes the high specialization reached in Physics make us to forget the real basis of the discipline. I think that the permanent insight on the foundations of any discipline is what distinguish the great minds from the rest. With respect to the dimension of the electric charge, Lancelot Law Whyte advises us that “in fact we have not yet made enough direct experiments to know even whether the dimensional system which is used for electrons is correct” (Lancelot L. Whyte, ***Archimedes or The Future of Physics***). I suppose there is not necessary to comment that the charge in the traditional dimensional system is not a fully “consistent” dimension, and in the “geometrized” system is clumsily trivial (as it is the whole system). Besides, if these systems were right, why they do not yield logically any *fundamental* quanta from its dimensional analysis? Of course, because they are not.

The intervalic quantum of electric charge, $\mathbf{q_I}$, is defined as:

$$\mathbf{q_I} = \surd\text{-}(c^{-1}ħ) = 5.9339900 \cdot 10^{-22}\ (C)$$

Since this is the last and fundamental quantum of this physical quantity, all electric charges in Nature *must be multiple of the intervalic charge,* $\mathbf{q_I}$, in the same way as all lengths in Nature *must be multiple of the intervalic length,* ħ.

Thus, the elementary charge, *e*, is exactly defined as an integer multiple of the intervalic charge:

$$e = 270\ \mathbf{q_I} = 270\ \surd\text{-}(c^{-1}ħ)$$

The extraordinary importance of that equation is to get by first time a theoretical definition of the elementary charge in terms of the two fundamental constants of Nature, c and ħ. Therefore, the elementary charge would already not be a last fundamental constant of Nature but a derived one.

Moreover, it provides an exact theoretical definition of the electromagnetic coupling constant, α, as we have seen in other site, whose exact geometric value is:

$$\alpha = 270^2 \cdot 10^{-7} = 7.2900000 \cdot 10^{-3} = 1/137.1742112$$

According to experimental measurements of *e*, the proposed relation implies a deviation of around 5/10,000 in some of the magnitudes, together considered, of c, ħ and *e*, with respect to their experimental values. If we suppose that the experimental values of *e* and c are most reliable than the value of ħ, since the last one is related with the elementary charge in measurement experiments, we would have the following set of values taking the experimental values of *e* and c as exact magnitudes:

$$e = 270\ \surd\text{-}(c^{-1}ħ) = 1.6021773 \cdot 10^{-19}\ (C)$$
$$c = 270^2\ ħ\ e^{-2} = 2.9979246 \cdot 10^{8}\ (m/s)$$
$$ħ = 270^{-2}\ c\ e^{2} = 1.0556363 \cdot 10^{-34}\ (m)$$

On the other hand, if a picturesque prediction of String Theory is right, there would be 16 fractional charges of the elementary charge in Nature. Now, according to the intervalic charge and remembering the high principle of economy that leads all our steps, if *e* is an elementary charge it must be the strongest *state of minimal energy* of the electric charge (instead of the intervalic charge, $\mathbf{q_I}$), and the following states of minimal energy of the electric charge will have to be the set of integers divisors of *e*, which are the following ones:

1, 2, 3, 5, 6, 9, 10, 15, 18, 27, 30, 45, 54, 90, 135, 270.

The number of elements of this set is just 16, according to String Theory. Since the concrete values predicted by both theories are quite different, the determination of those values would be a crucial experiment for the confirmation or falsation of any of the two theories (after viewing the extremely simple and beautiful intervalic structures directly yielded by the intervalic quanta, needless to say which is true and which is false).

Finally, when seeing the surprising result $e = 270\ \mathbf{q_I}$ we can question: what would be the consequences for Physics of that result? To understand that result we need to research and to know the new intervalic symmetries introduced in Physics by the definition $e = 270\ \mathbf{q_I}$. In the worst case those symmetries would add nothing to Physics and we would obtain an equivalent system of dimensions, but in other case they could lead to the discovery of a new Physics, which has been just the case. What is clear is that the values of the elementary charge in the traditional systems of dimensions do not involve and do not introduce any symmetries in Physics: therefore those systems are surely poorer than the intervalic one as they do not incorporate — nor can do it in any way— that new geometry in the last basis of Physics.

The physical meaning of the **FINE STRUCTURE CONSTANT**, α, is usually interpreted in Physics textbooks as *a measurement of the elementary charge squared, e^2,* ***in natural units****,* which involves $e \approx 270$ in those unknown *natural units*. Till today no one system of units has been able to derive the elementary charge value through theoretical means (not set by hand). And consequently there has had no system which claimed to be the natural one. However the Intervalic Units are postulated to be just the **natural units**, and its theoretical definition of the *elementary charge* —deduced logical and unavoidably *from the own Intervalic System of Dimensions*— clearly matches with the fine structure constant empirical value. Therefore, we must conclude necessarily that the Intervalic System of Dimensions and Units —which anyway is the only system which is *not equivalent to all the remaining ones*— is just the unique and truthful **Nature's system of units**.

$$\mathbf{q_I} = \surd\text{-}(c^{-1}\hbar) = 1\ (i^{-1/2}L^{1/2}) = 5.93398995 \cdot 10^{-22}\ (C)$$
$$e = 270\ \mathbf{q_I} = 270\ \surd\text{-}(c^{-1}\hbar) = 1.60217733 \cdot 10^{-19}\ (C)$$
$$\alpha = 270^2 \cdot 10^{-7} = 1/137.1742112\ (1) \text{ —exact value—}$$

INTERVALIC MAGNETIC CHARGE

$\mathbf{\Phi_I} = \sqrt{}\text{-}(c\hbar) = 1.7789652 \cdot 10^{-13}$ (Wb)

Intervalic dimension: ($i^{1/2}$ $L^{1/2}$)

As we have seen in other site, the magnetic charge can be dimensionally yielded by a -90º rotation —c (i^{-1})— of the electric charge in the Intervalic Space. Therefore, the deduction of the intervalic quantum of magnetic charge is immediate:

$$\mathbf{\Phi_I} = c\, \mathbf{q_I} = c\, \sqrt{}\text{-}(c^{-1}\hbar) = \sqrt{}\text{-}(c\hbar)$$

Due to the curious mathematical properties of the *i* number, the same result is obtained when rotating the electric charge quantum clockwise, 90º —c^{-1} (*i*)—, in intervalic dimensions:

$$\mathbf{\Phi_I} = c^{-1}\, \mathbf{q_I} = c^{-1}\, \sqrt{}\text{-}(c^{-1}\hbar) = \sqrt{}\text{-}(c^{-3}\hbar)$$

Since this value is not in the root scale, we shall rotate it ±360º in the Intervalic Space —multiplying it by the dimensionless scalizator $c^{\pm 4}$ (1)— in order to obtain it:

$$\mathbf{\Phi_I} = \sqrt{}\text{-}(c^{-3}\hbar) \approx \sqrt{}\text{-}(c^{5}\hbar) \approx \sqrt{}\text{-}(c\hbar)$$

It is obvious that the relation between electric and magnetic intervalic quanta is the speed of light (or the equivalent energy of the intervalic mass):

$$\mathbf{\Phi_I} / \mathbf{q_I} = \sqrt{}(c\hbar)/\sqrt{}(c^{-1}\hbar) = c$$

Besides, its product makes the intervalic length, ħ:

$$\mathbf{\Phi_I} \cdot \mathbf{q_I} = \sqrt{}(c\hbar)/\sqrt{}(c^{-1}\hbar) = \hbar$$

This equation is very similar to that postulated by P.A.M. Dirac for the magnetic monopole:

$$e\, m = n\hbar$$

where *m* is the charge of the magnetic monopole and *n* an integer number.

The predicted value for the intervalic magnetic charge is, though, very different to that postulated by Dirac. The relation between the intervalic magnetic charge —the intervalic magnetic monopole— and the electron charge is:

$\mathbf{\Phi_I} / e = 1.109783 \cdot 10^6$

INTERVALIC TEMPERATURE
$\mathbf{\Theta_I} = c\ k_B^{-1} = 2.1713738 \cdot 10^{31}$ (K)
Intervalic dimension: (i^{-1})

As discussed in other site, it is a remarkable fact that the temperature has the same dimensions than the velenergy —velocity-energy— when written in intervalic dimensions. Moreover, Boltzmann constant is *dimensionless* when written in intervalic dimensions, which is a very important fact for the reliability of this constant. Indeed, it is hoped that all reliable fundamental constants of Nature must be dimensionless in intervalic dimensions, since they are simple geometrical constants of proportionality in the Intervalic Dimensional Space. In this sense, it is absolutely meaningful that all fundamental proportionality constants are really dimensionless when written in intervalic dimensions (with the notable exception of the Newton gravitational constant, which has been discussed in other site).

If we write the known classical formula for the conversion between temperature and energy, we can substitute the energy value by its corresponding quantum of energy in the Intervalic Space, that is to say, c (i^{-1}), and directly is obtained the intervalic temperature, $\mathbf{\Theta_I}$:

$T = E / k_B$
$\mathbf{\Theta_I} = c / k_B$

The meaning of this geometric limit is similar to the speed of light: it is the maximum temperature allowed in the Universe for any kind of matter or energy, as like as the speed of light is the maximum velocity allowed in a similar way.

For those who feel the deduction of the intervalic temperature too much easy, they can make the following deduction using the intervalic frequorce, $\boldsymbol{\varphi_I} = c\hbar^{-1}$. This frequorce is likewise the highest frequorce allowed in the Universe. Indeed, this is a geometrical limit that can't never be reached, and there are other limits for the gravitational frequorce and also for the electromagnetic frequorce that are both smaller than the value of the intervalic frequorce. These limits are geometrical and meaningfully related.

$$\boldsymbol{\Theta_I} = E\ k_B^{-1} = \hbar\ \boldsymbol{\varphi_I}\ k_B^{-1} = \hbar\ c\ \hbar^{-1}\ k_B^{-1} = c\ k_B^{-1}$$

Of course, to be fully satisfied, we would perhaps be able to get a *geometrical definition* of the Boltzmann constant inside the Intervalic Dimensional Space. In that case we would have a *non arbitrary* formula —unlike the classic one— to convert velocity-energy in its equivalent temperature and vice versa.

It is hard to believe that modern Physics has not been yet aware of the logical impossibility of the existence of unlimited values for the temperature. As Richard Feynman already commented, both energy and temperature can be finally understood in terms of *movement*. But if the movement of any massive body in the Universe is limited by the speed of light, how is possible that its temperature was not limited likewise by a related limit? So, in the mere exposition of the first intervalic quanta which arise immediately from the intervalic dimensions, we already have got a new important geometric limit of Nature: the intervalic temperature, $\boldsymbol{\Theta_I}$, whose behaviour and geometric features are very similar to those of the speed of light.

INTERVALIC QUANTIZATION OR LIMITATION OF PHYSICAL QUANTITIES

The principal quanta and limits described till now are not the unique in the intervalic system of physical quantities and units. Indeed, all physical quantities are quantized because the dimensions that appear in the equation of dimensions of all of them are, precisely, combinations of (L) and (*i*), and both dimensional bases are intervalically quantized by ħ and c. We could say that the intervalic quantization or limitation is transmitted like a domino effect among physical quantities. No one physical quantity can leave free of quantization or limitation because all of them are dimensionally interconnected and geometrically derived from the same fundamental constants: the quantum ħ and the limit c.

If we think about it, as philosophers in Ancient Greek already did, there *must be* a limit for the division of Nature. The contrary should end in absurdity. Physics has used —and abused— of the mathematical concept of infinite since it was discovered in the Renaissance. As a result, the magnitudes of physical quantities was erroneously conceived as a mathematical continuum with no ends or limits. But this classic conception has proved to be misleading repeatedly and without doubt, and it is not easy for anybody to understand why it still lies in the unconscious minds of Physics.

In this view, the intervalic quantization or limitation of physical quantities is a logical premise which is totally necessary for the internal consistence in any explanation of the physical world. This conception offers us a new view of the physical quantities like a well organised and finite set, composed by 40 physical quantities —the *intervalic group*—, whose elements are interrelated, and where logical laws are applied in a systematic way, in every case and not only in certain cases for some chosen or privileged physical quantities, like occurs in the traditional system. Moreover, not only they are interrelated, but all of them are *generated* from geometrical transformations of the dimensional base, say (L), in the Intervalic Dimensional Space. These intervalic *transformations* are realized by successive algebraic rotations mediated by (i). But the intervalic dimensions of $\hbar$ and c are respectively (L) and (i^{-1}), that is to say, just the dimension of the *generator* and the *transformer* in the dimensional geometry of the Intervalic Dimensional Space. Thus, $\hbar$ and c generates dimensionally all physical quantities, and since they are quantized or limited, all physical quantities must be quantized or limited too.

From systematic definitions (see tables) of intervalic quanta and intervalic limits it is evident that there are geometrical equivalences among them, which are mediated by the transformer in the Intervalic Space, the speed of light —c (i^{-1}) or c^{-1} (i)—, because from now mathematical operations between dimensions are fully algebraically consistent, and therefore, all mathematical and geometrical properties of the i number, etc., must be valid when they appear in the intervalic dimensions of physical quantities.

The wholeness and elegance of that intervalic conception is far from the total absence of an evolving and global organization on physical quantities that poorly shows the rest of known dimensional systems up to date. In the following tables is shown the intervalic quanta and the intervalic limits of all physical quantities of the intervalic group.

GEOMETRIC EQUIVALENCES AMONG INTERVALIC QUANTA AND LIMITS

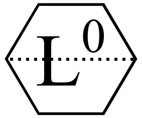
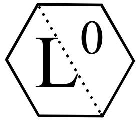
> We may in fact regard [geometry] as the most ancient branch of Physics.
>
> ALBERT EINSTEIN
> *Sidelights on Relativity*

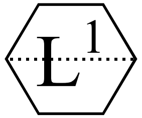
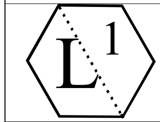
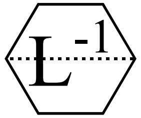
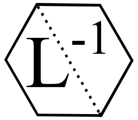
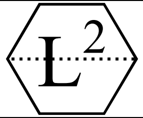
From the above definitions of intervalic quanta and limits it is evident that there are a set of *equivalences* among them, and that these equivalences are mediated by the speed of light, c. And since the *i* number is involved in the intervalic dimensions of the speed of light, c (i^{-1}) —or c^{-1} (i)—, those equivalences have a *geometrical* representation as rotations of physical quantities. At first sight, we can see straightforwardly the following geometric equivalences:

$\mathbf{m}_\mathbf{I} = c^{-1}\,\mathbf{p}_\mathbf{I}$
$\mathbf{E}_\mathbf{I} = c\,\mathbf{p}_\mathbf{I}$
$\mathbf{m}_\mathbf{I} = c^{\pm 2}\,\mathbf{E}_\mathbf{I}$
$\mathbf{E}_\mathbf{I} = c^{\pm 2}\,\mathbf{m}_\mathbf{I}$
$\mathbf{t}_\mathbf{I} = c^{-1}\mathbf{l}_\mathbf{I}$
$\mathbf{a}_\mathbf{I} = c^{\pm 2}\mathbf{k}_\mathbf{I}$
$\mathbf{W}_\mathbf{I} = c^{\pm 2}\mathbf{k}_\mathbf{I}$
$\mathbf{a}_\mathbf{I} = c\,\boldsymbol{\varphi}_\mathbf{I}$
$\mathbf{W}_\mathbf{I} = c\,\boldsymbol{\varphi}_\mathbf{I}$
$\boldsymbol{\varphi}_\mathbf{I} = c\,\mathbf{k}_\mathbf{I}$
$\mathbf{i}_\mathbf{I} = c^{-1}\boldsymbol{\eta}_\mathbf{I}$
$\boldsymbol{\rho}_\mathbf{I} = c^{-1}\mathbf{f}_\mathbf{I}$
$\mathbf{u}_\mathbf{I} = c^{\pm 2}\boldsymbol{\rho}_\mathbf{I}$
$\boldsymbol{\theta}_\mathbf{I} = c^{-1}\mathbf{q}_\mathbf{I}$
$\boldsymbol{\Phi}_\mathbf{I} = c^{-1}\mathbf{q}_\mathbf{I}$
$\mathbf{I}_\mathbf{I} = c^{-1}\boldsymbol{\Phi}^{-1}{}_\mathbf{I}$
$\mathbf{V}_\mathbf{I} = c^{-1}\boldsymbol{\Phi}^{-1}{}_\mathbf{I}$
$\mathbf{H}_\mathbf{I} = c^{-1}\mathbf{P}_\mathbf{I}$

All the above relations among intervalic quanta and limits are really simple combinations between the two fundamental constants of the Intervalic Dimensional Space, c and ħ. Because of it, there is clear that nobody can have any doubt about their strong logical consistency. However, if we make a logical *induction* on those geometrical equivalences, we will obtain some surprising results. Actually, we only have to substitute in those relations the *intervalic quanta and limits* by its corresponding *physical quantities*. The logical step from the first geometrical relation to the second is incontrovertible, and it is hard (or probably impossible) to accept the first equivalences without doing the same with the second ones.

INTERVALIC QUANTA AND INTERVALIC LIMITS OF PHYSICAL QUANTITIES

Represen-tation	*Intervalic dimension*	*Physical quantity*	*Definition*	*Geometrical rank*	*SI value*	*SIU value*
	1	Permitivity	$\boldsymbol{\varepsilon}_\mathbf{I} = \hbar^{-1}\hbar$	subatomic limit	1 (F m^{-1})	1 (1)
		Momentum (momentum-inertia)	$\mathbf{p}_\mathbf{I} = c^{-1}c$	subatomic limit	1 (kg m s^{-1})	1 (1)
		Boltzmann constant	k_B	-	-	-
		Entropy	S	-	-	-
	-1	Permeability	$\boldsymbol{\mu}_\mathbf{I} = c^{\pm 2}$	conversion factor	$1.112650 \cdot 10^{-17}$ (H m^{-1})	1 (-1)
		Gravitational potential	Φ	-	-	-
		Antimomentum	$\mathbf{-p}_\mathbf{I} = c^{\pm 2}$	conversion factor	$8.987552 \cdot 10^{16}$ (-kg m s^{-1})	1 (-1)
	*i*	Mass (invervelocity-mass)	$\mathbf{m}_\mathbf{I} = c^{-1}$	subatomic limit	$3.3356409 \cdot 10^{-9}$ (kg)	1 (*i*)
		Invervelocity (invervelocity-mass)	$\mathbf{v}^{-1}{}_\mathbf{I} = c^{-1}$	subatomic limit	$3.3356409 \cdot 10^{-9}$ (s m^{-1})	1 (*i*)
	i^{-1}	Velocity (velocity-energy)	$\mathbf{v}_\mathbf{I} = c$	absolute limit	$2.9979246 \cdot 10^{8}$ (m s^{-1})	1 (i^{-1})
		Energy (velocity-energy)	$\mathbf{E}_\mathbf{I} = c$	subatomic limit	$2.9979246 \cdot 10^{8}$ (J) $1.8711569 \cdot 10^{21}$ (MeV)	1 (i^{-1})
		Temperature	$\boldsymbol{\Theta}_\mathbf{I} = c\ k_B^{-1}$	absolute limit	$2.1713738 \cdot 10^{31}$ (K)	1 k_B^{-1} (i^{-1})

Represen-tation	*Intervalic dimension*	*Physical quantity*	*Definition*	*Geometrical rank*	*SI value*	*SIU value*
	L	Length (real space)	$\mathbf{l_I} = \hbar$	quantum	$1.055636 \cdot 10^{-34}$ (m)	1 (L)
		Action	$\mathbf{S_I} = \hbar$	quantum	$1.055636 \cdot 10^{-34}$ (J s)	1 (L)
		Capacitance	$\mathbf{C_I} = \hbar$	quantum	$1.055636 \cdot 10^{-34}$ (F)	1 (L)
	-L	Antilength	$\mathbf{-l_I} = c^{\pm2}\hbar$	conversion factor	$9.487583 \cdot 10^{-18}$ (-m)	1 (-L)
		Inductance	$\mathbf{L_I} = c^{\pm2}\hbar$	quantum	$9.487583 \cdot 10^{-18}$ (H)	1 (-L)
	i L	Time (imaginary space)	$\mathbf{t_I} = c^{-1}\hbar$	quantum	$3.5212226 \cdot 10^{-43}$ (s)	1 (iL)
	i^{-1} L	Antitime	$\mathbf{-t_I} = c\,\hbar$	conversion factor	$3.164717 \cdot 10^{-26}$ (-s)	1 (i^{-1} L)
	L^{-1}	Wavevector	$\mathbf{k_I} = \hbar^{-1}$	absolute limit	$9.472962 \cdot 10^{33}$ (m^{-1})	1 (L^{-1})
	$-L^{-1}$	Acceleration (acceleration-power)	$\mathbf{a_I} = c^{\pm2}\hbar^{-1}$	absolute limit	$8.513874 \cdot 10^{50}$ (m s^{-2})	1 ($-L^{-1}$)
		Gravitational field	$\mathbf{g_I} = c^{\pm2}\hbar^{-1}$	absolute limit	$8.513874 \cdot 10^{50}$ (m s^{-2})	1 ($-L^{-1}$)
		Power (acceleration-power)	$\mathbf{W_I} = c^{\pm2}\hbar^{-1}$	absolute limit	$8.513874 \cdot 10^{50}$ (W)	1 ($-L^{-1}$)
	$i\,L^{-1}$	Antifrequorce	$\mathbf{-\varphi_I} = c^{-1}\hbar^{-1}$	conversion factor	$3.163026 \cdot 10^{25}$ ($-s^{-1}$)	1 ($i\,L^{-1}$)
		Linear Perdensity	$\mathbf{\Delta^1{}_I} = c^{-1}\hbar^{-1}$	absolute limit	$3.163026 \cdot 10^{25}$ (kg m^{-1})	1 ($i\,L^{-1}$)
	$i^{-1}\,L^{-1}$	Frequorce (frequency-force)	$\mathbf{\varphi_I} = c\hbar^{-1}$	absolute limit	$2.8399227 \cdot 10^{42}$ (s^{-1})	1 ($i^{-1}\,L^{-1}$)
		Frequency	$\mathbf{\nu_I} = c\hbar^{-1}$	absolute limit	$2.8399227 \cdot 10^{42}$ (Hz)	1 ($i^{-1}\,L^{-1}$)
		Force	$\mathbf{F_I} = c\hbar^{-1}$	absolute limit	$2.8399227 \cdot 10^{42}$ (N)	1 ($i^{-1}\,L^{-1}$)
		Conductivity	$\mathbf{\sigma_I} = c\hbar^{-1}$	absolute limit	$2.8399227 \cdot 10^{42}$ (S m^{-1})	1 ($i^{-1}\,L^{-1}$)
	L^2	Area	$\mathbf{S_I} = \hbar^2$	quantum	$1.114367 \cdot 10^{-68}$ (m^2)	1 (L^2)
	$-L^2$	Antiarea	$\mathbf{-S_I} = c^{\pm2}\hbar^2$	conversion factor	$1.001544 \cdot 10^{-51}$ ($-m^2$)	1 ($-L^2$)

Represen-tation	*Intervalic dimension*	*Physical quantity*	*Definition*	*Geometrical rank*	*SI value*	*SIU value*
L^{2}	$i\,L^{2}$	Inertia area momentum	$\mathbf{I^{2}_{I}} = c^{-1}\hbar^{2}$	quantum	$3.717129 \cdot 10^{-77}$ (kg m^{2})	1 ($i\,L^{2}$)
	$i^{-1}L^{2}$	?	$c\,\hbar^{2}$	-	$3.340789 \cdot 10^{-60}$ (J m^{2})	1 ($i^{-1}L^{2}$)
L^{-2}	L^{-2}	Viscosity (dynamic)	$\boldsymbol{\eta}_{\mathbf{I}} = \hbar^{-2}$	absolute limit	$8.973701 \cdot 10^{67}$ (Pa s)	1 (L^{-2})
	$-L^{-2}$	Area Power	$\mathbf{W^{2}_{I}} = c^{\pm 2}\hbar^{-2}$	absolute limit	$8.065161 \cdot 10^{84}$ (-m^{-2})	1 ($-L^{-2}$)
L^{-2}	$i\,L^{-2}$	Area Perdensity	$\mathbf{\Delta^{2}_{I}} = c^{-1}\hbar^{-2}$	absolute limit	$2.993305 \cdot 10^{59}$ (kg m^{-2})	1 ($i\,L^{-2}$)
		Inflexion	$\mathbf{i_{I}} = c^{-1}\hbar^{-2}$	absolute limit	$2.993305 \cdot 10^{59}$ (m s^{-3})	1 ($i\,L^{-2}$)
	$i^{-1}L^{-2}$	Surface Tension	$\boldsymbol{\sigma}_{\mathbf{I}} = c\,\hbar^{-2}$	absolute limit	$2.690248 \cdot 10^{76}$ (N m^{-1})	1 ($i^{-1}L^{-2}$)
L^{3}	L^{3}	Volume	$\mathbf{V_{I}} = \hbar^{3}$	quantum	$1.176366 \cdot 10^{-102}$ (m^{3})	1 (L^{3})
	$-L^{3}$	Antivolume	$\mathbf{-V_{I}} = c^{\pm 2}\hbar^{3}$	conversion factor	$1.057265 \cdot 10^{-85}$ (-m^{3})	1 ($-L^{3}$)
L^{3}	$i\,L^{3}$	Inertia volume momentum	$\mathbf{I^{3}_{I}} = c^{-1}\hbar^{3}$	quantum	$3.923935 \cdot 10^{-111}$ (kg m^{3})	1 (iL^{3})
	$i^{-1}L^{3}$	Fermi constant physical quantity	$c\,\hbar^{3}$	quantum	$3.526657 \cdot 10^{-94}$ (kg m^{3})	1 ($i^{-1}L^{3}$)
L^{-3}	L^{-3}	Fluctuation	$\mathbf{f_{I}} = \hbar^{-3}$	absolute limit	$8.500756 \cdot 10^{101}$ (m s^{-4})	1 (L^{-3})
	$-L^{-3}$	Voluminic Power	$\mathbf{W^{3}_{I}} = c^{\pm 2}\hbar^{-3}$	absolute limit	$7.640098 \cdot 10^{117}$ (-m^{-3})	1 ($-L^{-3}$)
		Irradiance	$\mathbf{E_{eI}} = c^{\pm 2}\hbar^{-3}$	absolute limit	$7.640098 \cdot 10^{117}$ (W m^{-2})	1 ($-L^{-3}$)
L^{-3}	$i\,L^{-3}$	Density	$\boldsymbol{\rho}_{\mathbf{I}} = c^{-1}\hbar^{-3}$	absolute limit	$2.835547 \cdot 10^{93}$ (kg m^{-3})	1 ($i\,L^{-3}$)
		Voluminic Perdensity	$\mathbf{\Delta^{3}_{I}} = c^{-1}\hbar^{-3}$	absolute limit	$2.835547 \cdot 10^{93}$ (kg m^{-3})	1 ($i\,L^{-3}$)
	$i^{-1}L^{-3}$	Pressure	$\mathbf{P_{I}} = c\,\hbar^{-3}$	absolute limit	$2.548463 \cdot 10^{110}$ (Pa)	1 ($i^{-1}L^{-3}$)
		Energy-tension density	$\mathbf{u_{I}} = c\,\hbar^{-3}$	absolute limit	$2.548463 \cdot 10^{110}$ (J m^{-3})	1 ($i^{-1}L^{-3}$)

Represen-tation	*Intervalic dimension*	*Physical quantity*	*Definition*	*Geometrical rank*	*SI value*	*SIU value*
$L^{1/2}$	$i^{1/2}L^{1/2}$	Magnetic charge	$\mathbf{\theta_I} = \sqrt{}\text{-}(c\hbar)$	subatomic limit	$1.778965 \cdot 10^{-13}$ (Wb)	1 ($i^{1/2}L^{1/2}$)
		Magnetic flux	$\mathbf{\Phi_I} = \sqrt{}\text{-}(c\hbar)$	subatomic limit	$1.778965 \cdot 10^{-13}$ (Wb)	1 ($i^{1/2}L^{1/2}$)
	$i^{-1/2}L^{1/2}$	Electric charge	$\mathbf{q_I} = \sqrt{}\text{-}(c^{-1}\hbar)$	quantum	$5.933989 \cdot 10^{-22}$ (C)	1 ($i^{-1/2}L^{1/2}$)
$L^{-1/2}$	$i^{1/2}L^{-1/2}$	Current	$\mathbf{I_I} = \sqrt{}\text{-}(c\hbar^{-1})$	absolute limit	$1.685207 \cdot 10^{21}$ (A)	1 ($i^{1/2}L^{-1/2}$)
		Electric potencial	$\mathbf{V_I} = \sqrt{}\text{-}(c\hbar^{-1})$	absolute limit	$1.685207 \cdot 10^{21}$ (V)	1 ($i^{1/2}L^{-1/2}$)
		Magnetic vector potential	$\mathbf{A_I} = \sqrt{}\text{-}(c\hbar^{-1})$	absolute limit	$1.685207 \cdot 10^{21}$ (Wb m^{-1})	1 ($i^{1/2}L^{-1/2}$)
	$i^{-1/2}L^{-1/2}$	Magnetic inverflux	$\mathbf{\Phi^{-1}_I} = \sqrt{}\text{-}(c^{-1}\hbar^{-1})$	subatomic limit	$5.621246 \cdot 10^{12}$ (Wb^{-1})	1 ($i^{-1/2}L^{-1/2}$)
$L^{3/2}$	$i^{1/2}L^{3/2}$	Bohr magneton phys. quantity	$\mathbf{\mu_{BI}} = \sqrt{}\text{-}(c\hbar^{3})$	quantum	$1.877940 \cdot 10^{-47}$ (J T^{-1})	1 ($i^{1/2}L^{3/2}$)
	$i^{-1/2}L^{3/2}$	?	$\sqrt{}\text{-}(c^{-1}\hbar^{3})$	-	$6.264133 \cdot 10^{-56}$ (T^{-1})	1 ($i^{-1/2}L^{3/2}$)
$L^{-3/2}$	$i^{1/2}L^{-3/2}$	Electric field strength	$\mathbf{\epsilon_I} = \sqrt{}\text{-}(c\hbar^{-3})$	absolute limit	$1.596390 \cdot 10^{55}$ (V m^{-1})	1 ($i^{1/2}L^{-3/2}$)
		Magnetic field strength	$\mathbf{H_I} = \sqrt{}\text{-}(c\hbar^{-3})$	absolute limit	$1.596390 \cdot 10^{55}$ (A m^{-1})	1 ($i^{1/2}L^{-3/2}$)
		Magnetic flux density	$\mathbf{B_I} = \sqrt{}\text{-}(c\hbar^{-3})$	absolute limit	$1.596390 \cdot 10^{55}$ (T)	1 ($i^{1/2}L^{-3/2}$)
	$i^{-1/2}L^{-3/2}$	Electric polarisation	$\mathbf{P_I} = \sqrt{}\text{-}(c^{-1}\hbar^{-3})$	absolute limit	$5.324984 \cdot 10^{46}$ (C m^{-2})	1 ($i^{-1/2}L^{-3/2}$)
$-L^{5/2}$	$i^{1/2}L^{5/2}$	?	$\sqrt{}\text{-}(c\hbar^{5})$	-	$5.858725 \cdot 10^{-39}$ ( )	1 ($i^{1/2}L^{5/2}$)
	$i^{-1/2}L^{5/2}$	?	$\sqrt{}\text{-}(c^{-1}\hbar^{5})$	-	$1.954260 \cdot 10^{-47}$ (C^{-1} m^{3})	1 ($i^{-1/2}L^{5/2}$)
$L^{-5/2}$	$i^{1/2}L^{-5/2}$	Charge density	$\mathbf{\rho_I} = \sqrt{}\text{-}(c\hbar^{-5})$	absolute limit	$5.117026 \cdot 10^{46}$ (C m^{-3})	1 ($i^{1/2}L^{-5/2}$)
		Current density	$\mathbf{J_I} = \sqrt{}\text{-}(c\hbar^{-5})$	absolute limit	$5.117026 \cdot 10^{46}$ (A m^{-2})	1 ($i^{1/2}L^{-5/2}$)
	$i^{-1/2}L^{-5/2}$	?	$\sqrt{}\text{-}(c^{-1}\hbar^{-5})$	-	$1.706856 \cdot 10^{38}$ ( )	1 ($i^{-1/2}L^{-5/2}$)

Chapter 3

INTERVALIC SYSTEM OF UNITS
The Nature's System of Units

> I do not like it when it can be done this way or that way. It should be: This way or not at all.
>
> ALBERT EINSTEIN
> *Abraham Pais, A Tale of Two Continents*

The intervalic system of dimensions determines unavoidably the existence of the intervalic group of physical quantities. Since all physical quantities of Nature are derived and defined as *combinations* of ħ and c in intervalic dimensions, they are necessarily *quantized* or *limited* by its own dimensional geometry, and a new set of intervalic quanta and intervalic limits is yielded. The magnitudes and dimensions of these quanta and limits determines logically the allowed values inside a geometrical rank for each physical quantity, being at the same time the most simple, elegant and useful theoretical values conceivable up to date for a reliable and truly universal system of units, which is called the intervalic system of units. There are also treated the underlying geometric meaning of the uncertainty principle and the question about how can affect a change in the values of fundamental constants to the physical world.

LOGICAL AND PHYSICAL FOUNDATIONS OF THE INTERVALIC UNITS

When using intervalic dimensions (L = L, T = *i*L, M = T/L = *i*), with *i* = √-1, a new fundamental set of *intervalic quanta* and *intervalic limits* is necessarily yielded from the very own *dimensional basis* of the Intervalic System of Dimensions and Units. We already have pointed out in the preceding chapter (Intervalic Quanta, Intervalic Limits) that this logical fact can be considered as unexpected and almost magic, since no quanta nor any other physic phenomena should be obtained from a mere change in the dimensional system used.

It is clear that if a *quantum* is, by definition, the smallest magnitude allowed for a physical quantity, the most simple magnitude for that quantum is the unity: 1.

On the other hand, the magnitude for a intervalic *limit* is not determinate at first sight like the magnitude for the intervalic quanta. Actually, we need a powerful constraint that determinates logically and necessarily the most logic and simple magnitude for those limits, since in a faultless theory we can't determinate them *by hand*.

Finally, the definition of that system of physical quantities and units must be related only to the last fundamental constants of Nature, that is to say, c and ħ. Therefore, the units and dimensions of all physical quantities must be defined only in terms of the units and dimensions of these two constants. Perhaps it is difficult to conceive a singular system of units with so extreme simplicity which verifies these powerful logic postulates. But we have found it.

In resume, we have to achieve to join a dimensional system, a set of physical quantities, a set of quanta and limits, and a system of units which can be based, all of them, solely and exclusively on the *single* dimensions and *single* magnitudes of the last fundamental constants of Nature: c and ħ.

The intervalic system of physical quantities is a system one-proper-dimension based, which only needs to fixing the value of the unit of real space, (L), to be geometrically determinate, since the unit of imaginary space depends on the magnitude of the *i* number, √-1, and it is intended to be 1 for obvious geometric reasons. (We ever will write dimensions and physic units between brackets).

Now, the intervalic dimensions of ħ and c are, just and respectively, (L) and (i^{-1}). This means precisely that all existing physical quantities expressed in intervalic dimensions are *combinations* of these two single base dimensions of the two last fundamental constants of Nature, ħ and c.

(Please note that if we would choose (*i*) instead of (i^{-1}) as the intervalic dimension of the speed of light, we will obtain the same dimensional system).

Unlike the other dimensional systems known up to date, the own geometry of the intervalic system of dimensions determinates, surprisingly and necessarily, a *singular* magnitude for *each* physical quantity: they are the *intervalic quanta* and the *intervalic limits*, which we have described previously. If all physical quantities are combinations of ħ and c —which are a quantum and a limit respectively—, it is logical that all physical quantities must be geometrically quantized or limited too.

Thus, the intervalic quanta and the intervalic limits provide us with a reliable reference for determinate an universal system of units, since the values of c and ħ are valid in all the Universe and the intervalic quanta and limits are composed only by these two fundamental constants of nature.

Nothing could be more natural than the magnitude of ħ as the unit of length —or 'real space', (L), in intervalic dimensions—. As Lancelot L. Whyte pointed out usefully in his books ***Critique of Physics*** (W. W. Norton, New York, 1931) and ***Archimedes or The Future of Physics*** (E. P. Dutton, New York, 1928), today lamentably forgotten, the essential and truly function of ħ in all physical equations is not to be an 'action' but to introduce a unit of *length*. It is still more logical in any dimensional system one-proper-dimension-based, whatsoever it is. And the only known dimensional system that verifies those apparently inevitable postulates is just the intervalic one, since any other dimensional system which verifies these postulates will be equivalent to the intervalic system. Finally, the intuitive meaning of ħ is now very simple, since it is the transversal path of electromagnetic waves according to one of the various interpretations of Planck's equation of energy when it is written in intervalic dimensions.

Regarding the speed of light, it is not a quantum but a limit, and therefore it is needed a powerful geometrical constraint that sets univocally a singular magnitude for c. In a faultless theory we can't determine it *by hand*, as String Theory have done cheerfully. As we have described in other site, the fact that the intervalic dimension of c is (i^{-1}), involves a *geometrical* relation between the speed of light and all the rest of physical quantities. Since physical quantities are geometrically invariant under rotations of ±360º in the Intervalic Space —that is to say, under multiplications by the dimensionless *transformer* $c^{\pm 4}$—, the magnitude of the speed of light must be 1 in order to conserve the invariance of physical magnitudes under rotations of ±360º in all physical cycles of successive turns.

This means, unexpectedly, that all system of units with a magnitude for the speed of light different from the unit, $c \neq 1$, are inevitably *not-singular* systems. Those systems have partial symmetry —*left* or *right*— under rotations in the Intervalic Dimensional Space. But when checking all possible groups of rotations in the Intervalic Dimensional Space it is clear that there is no any rule nor any trace to think that our dimensions and physical quantities have a partial symmetry. Inside those systems of units, rotations of all physical quantities are unconsciously broken for nothing and they only run in one sense, which is not simple, not elegant, not necessary, and finally, absurd. That is to say, their dimensions and physical quantities have only an arbitrary *half* symmetry, which verifies that a turn by +360º —$c^{-4}(1)$— is different from a turn by -360º —$c^{+4}(1)$—, and a rotation by +180º —$c^{-2}(-1)$— is not equal to a rotation by -180º —$c^{+2}(-1)$— (!).

We can hardly understand the radical non sense of that half symmetry, since our traditional system of dimensions is, unfortunately, one of those poor and primitive systems. But when all Physics equations and forces of Nature are transformed into a pure and rich *geometry* as the Intervalic Theory does, we understand that this arbitrary half symmetry showed by not-singular systems of units is a serious lack typical of those primitive systems which is due to a wrong choice in the magnitude and dimension of the speed of light. Starting from here, algebra laws makes its work and some backward creatures can think that their equations do describe correctly the foundations of physics phenomena, but they don't because they are not deduced starting from the underlying fundamental geometry of Nature.

Hence, we are compelled to establish 1 as a *singular* magnitude for the speed of light in intervalic dimensions, since this is the only value that preserves the symmetry of dimensions and physical quantities in the Intervalic Dimensional Space.

In resume, if a dimensional system is physically reliable and fully consistent its measurement units should be determinated by the last fundamental constants of Nature. This means that the physical quantities that compose the dimensional basis of the system should coincide with the two fundamental constants, c and ħ. Neither of the known dimensional systems verifies this powerful logical constraint: the definitions of the units of length, time, mass, etc. in the traditional system is almost grotesque, and the same or worst is valid for the degenerate —formerly named "geometrized"— units.

A dimensional system geometrically conformed as the intervalic one, has an additional advantage on the other systems because to the geometrical tools at its disposition. In this case, we can see that all the intervalic physical quantities of the intervalic group can be represented on a sort of Argand Space. In this space we have as *real* axes the dimensionless (±1) or the dimensionful physical quantities (±L raised to any power), and as *imaginary* axes the results derived of their successive rotations by the *i* number.

For the univocal determination of the measurement units of that dimensional geometry we only need to establish the value of the unique dimensional base (L), which is placed along the real axes, and the value of the *conversion constant* between real and imaginary axes, that is to say, the associated physical magnitude for (*i*). After a look to the physical quantities of the intervalic group we find that the intervalic dimensions of these two values coincide precisely with the intervalic dimensions of the two fundamental constants of nature, c and ħ. But this *geometrical result* just satisfies the powerful logical constraint described below about the physical quantities that compose the dimensional basis, which must coincide with the two fundamental constants of nature, c and ħ.

It is interesting to point that we have reached to join the *two* fundamental constants of Nature with the desired *one*-proper-dimension-based system, and it has been possible due to the magic introduction of the imaginary numbers in its dimensional basis —along with its algebraic and geometrical properties—. Thus the imaginary numbers not only appear in the most powerful equations of Physics, but they dwell in the very heart of Physics: in the dimensional basis. We can say that the vast majority of the principal relations and symmetries of Physics can not be yielded without the imaginary numbers, with whom there are composed the last foundations of Physics.

Please note the huge abysm that separates the *intervalic system of units*, SIU:

$\hbar = 1\ (L)$
$c = 1\ (i^{-1})$

with the trivial degenerate system of units. Although the magnitudes for c and ħ are the same, their respective dimensions are completely different:

$\hbar = 1\ (1)$
$c = 1\ (1)$

The interpretation of physics world are totally different in both systems and therefore they yield necessarily different Physics. Besides, unlike degenerate units, the intervalic units do not need to be converted into SI units to be meaningful at any time of the calculus.

Of course, it is very important to understand that no faultless theory will be reached by the mankind meanwhile Physics will continue to being expressed into wrong systems of dimensions, physical quantities, quanta and units. Perhaps this is the most serious challenge Physics have to confront in modern times, but its future depends on the result of that test. To pass this test implies to reformulate all Physics corpus into intervalic dimensions, physical quantities, quanta and units, but until then we will not go in a Physics truly *universal*. After reading this book, it will be understood that the Intervalic Theory in Physics is the only physics knowledge that can be shared with hypothetical extraterrestrial intelligences for many logical reasons of universality, simplicity, elegance, etc. which we can't enumerate at this moment. I believe that a civilization can considerate itself to be scientifically *advanced* when the Intervalic Theory is discovered because it presuppose a lot of physical achievements —necessarily reached by the theory— and because it opens the doors to a reliable knowledge of the Universe.

ALLOWED RANKS OF PHYSICAL QUANTITIES

Magnitudes for all physical quantities are *geometrically limited* by the Intervalic Theory: each physical quantity has a low height —a intervalic quantum— *or* a high height —a intervalic limit—. Magnitudes of physical quantities are not allowed outside these heights.

In intervalic units, the allowed ranks are the following, being 'x' any magnitude:

Quantum: $x \geq 1$
Limit: $0 \leq x \leq 1$

Measurable magnitudes of any physical quantity which has a *quantum* must be a multiple (integer) of that quantum, since they are *quantized* physical quantities.

Limits can be *subatomic* or *absolute*. In the first case a magnitude only can be greater than its subatomic limit if it is a sum of various subatomic magnitudes, like occurs in macroscopic measurements of some physical quantities at human scale.

Seeing the allowed ranks, it shall be noted that proper *negative magnitudes* (not due to the use of relative coordinates) are not defined in intervalic units. Only *units* can be positive *or* negative (or positive *and* negative, like the electromagnetic units) depending on its intervalic dimension. If we have a negative magnitude, its sign must be passed to its dimension, and then we obtain a different physical quantity. This detail is an unknown and surprising logical property of the intervalic dimensions and units: their signs can *operate algebraically* with the signs of its corresponding magnitude, as we have explained in other site.

SPECIFIC VALUES OF |c| AND |ħ| IN NATURAL UNITS

The Avogadro number, N_A, is referred to the SI mass unit of gram. Its value could be meaningless for the intervalic dimensional analysis because the gram is not a natural unit. However if the Avogadro number could be referred to the *intervalic quantum of mass*, $\mathbf{m_I} = c^{-1}$, then such new number —named the *Avogadro intervalic number*, $N_{\mathbf{IA}}$— should be directly related to the number of intervalic strings assembled at the beginning of the primordial Universe, *n*(S), and hereinafter to the speed of light (since starting from the energy of vacuum we have got the relation $n(S) = c^8$, which is valid exclusively in non-singular units, that is to say, with $c \neq 1$). This is the most logically simple and economic assumption that can be made, and in this way we have got the *Avogadro intervalic number*, $N_{\mathbf{IA}}$:

$N_{\mathbf{IA}} / \mathbf{m_I} = N_A / 10^3$

$N_{\mathbf{IA}} = c^{-1}\, 10^{-3}\, N_A = 2.008770344 \cdot 10^{12}$ (1)

It is found by exclusion that the unique simple relation available between the Avogadro intervalic number and the number of intervalic strings assembled is: $N_{\mathbf{IA}} = n(S)^{1/4} = |c^2|$. (It must be remembered that $c^{\pm 2}$ is the conversion factor *par excellence* in the Intervalic Dimensional Space, which yields the most important geometric equivalences). Thus the specific value of the speed of light in natural units, |c|, is:

$|c| = (1/10)\, N_A^{1/3} = 8.444689071 \cdot 10^7\ (i^{-1})$

As natural units verify the following geometric relation: $c^{\pm 4}\, ħ = 1$, it may also be derived the specific value of the *intervalic length* in natural units, |ħ|:

$|ħ| = 10^4\, N_A^{-4/3} = c^{-4} = 1.966370477 \cdot 10^{-32}$ (L)

These results define specific values of non-singular units of length and time:

$|l| = 0.005368450717$ (m)

$|t| = 0.001512209393$ (s)

HOW CAN AFFECT TO THE PHYSICAL WORLD A CHANGE IN THE VALUES OF FUNDAMENTAL CONSTANTS

Finally, a late comment on the transcendence of the values of the physical constants. It is heard that if the value of only one constant would be slightly different the Universe will not be able to exist. Of course, this would be true if it is possible, but it is not within the intervalic system of dimensions. The underlying conception for that fantastic assumption is the traditional one, which is absolutely misleading, since it conceives a lot of *independent* physical constants and physical quantities. But as we have seen, there are only two reliable fundamental constants, c and ħ —being this an *affirmation*, not an *assumption* like in String Theory, because their intervalic dimensions just coincide with the intervalic dimensional basis—, and all the rest constants and physical quantities are combinations of these two.

Therefore, if hypothetically the values of c or ħ would be fixed in a different magnitude between the Big Crunch and the Big Bang, all the other constants and physical quantities *composed* by c or ħ would change in the same way. Therefore, a Universe with a bigger value of c would be a Universe *at scale* where all *imaginary* physical quantities (i.e., time) would be greater according to its powers of c which appears in its intervalic dimension. In the same way, a Universe with a bigger value of ħ would be likewise a Universe *at scale* where all *real* physical quantities (i.e., length) would be greater according to its powers of ħ which appears in its intervalic dimension. In this view the values acquired by c and ħ at the beginning of the Universe can be chosen at random. Indeed, they are irrelevant, since the two fundamental constants are incommensurable between them, and their values yield entirely similar models of Universes anyway, where the only difference would be the scale in *real* and/or *imaginary* physical quantities. Certainly, there has no sense to inquiry about those scales, since they could be only compared between different Universes.

Of course, we can make anthropic comments, such as, i.e. regarding the size of the Universe and the human scale, the value of the speed of light is ridiculously small. We could imagine another Universe with a much greater c, where time and all imaginary physical quantities will run more quickly with respect to the present Universe. But this lucubration has little sense because there is no manner anyway to distinguish between both models. Really, we could live in a Universe with *any* value of c and ħ and we probably could be not capable to appreciate the difference, since dimensionless *ratios* between physical quantities would be exactly the same in all cases, but only in intervalic dimensions! because *real* and *imaginary* dimensions *vanish separately* to leave dimensionless ratios. The dimensional magic arises in intervalic dimensions because we have a *dimensional duality which is just connected with the two fundamental constants.* It does not occur when using physical magnitudes in other systems of dimensions, which lack of that duality and connection, and therefore the vanishing of the dimensional basis has no relation with the dimensions of c and ħ. Besides, traditional experimental values of constants lack of a geometric basis and their ratios are not defined with the mathematical exactness of a geometric theory.

Moreover, there is no way to determine properly the values of c and ħ with respect other phenomena, since they are the only *independent* and *last* fundamental constants of nature, those that control the scale of the *real* space and the *imaginary* space in the intervalic geometry of Universe.

Please note the great difference between the intervalic system of dimensions which yields this quiet intervalic conception of paramount simplicity about the fundamental constants and the physical quantities of nature, where all of them are dependent and interrelated, and the clumsy and arranged-by-hand traditional conception of the Universe and the physical laws yielded by the other systems of dimensions, where all phenomena runs almost by an unexplained miracle on the exactness of fundamental constants and the smallest fluctuation on its values will lead inevitably to a universal crash and the ruin of Physics.

This fantastic scene is not allowed within intervalic dimensions, because all constants are derived as combinations of the two fundamental *geometrical* constants, c and ħ. For example, it is heard that if the value of the elementary charge, *e*, would change a millionth part, the world could not exist. This is an ordinary deceit, since the intervalic charge, $\mathbf{q_I}$, —and *a fortiori* the elementary charge— is a combination of the fundamental constants, c and ħ, and therefore a supposed change in *e* involves necessarily similar changes in the values of c and/or ħ:

$$e = 270\ \mathbf{q_I} = 270\ \sqrt{}\text{-}(c^{-1}\hbar)$$

Of course, any change in c or ħ implies correlative changes in *all* fundamental —and also in all not fundamental— constants, since all of them are derived from c and ħ, as we have seen in the definitions of intervalic quanta and intervalic limits. To finish with the example, if the value of *e* would be, say, the double, the values of c or ħ would *previously* be:

$c = 270^2\ \hbar\ (2e)^{-2}$, if ħ remains unchanged, or
$\hbar = 270^{-2}\ c\ (2e)^2$, if c remains unchanged; and of course, there are possible any other gradation of values comprised between these two limits.

In any case, please note that the pristine relation $e = 270\ \mathbf{q_I}$ does not vary. This means that whatsoever it be the values of c and ħ supposedly set at the beginning of the Universe, the intervalic symmetries derived from the relation $e = 270\ \mathbf{q_I}$ stay mysteriously unaltered.

Hence, we can affirm that our model of Universe —or other models entirely similar to this one— can be yielded from *any* value of c and ħ in intervalic dimensions. *"God does not play dice"*.

The intervalic dimensional structure of the Universe with its intervalic geometry —which generates all constants of nature— does not depend on the magnitude of the fundamental geometrical constants, c and ħ, like the general properties of a rectangle does not depend on the size of its sides. As a naïve comparison, we can say that the physical quantities and the physical laws of our intervalic Universe come from the geometrical properties of a sort of "rectangle", whose sides c and ħ —whose magnitudes are dimensionally independent and incommensurable between them— can adopt any value without changing the general geometric properties of the "rectangle". Thus, the ancient question about the unexplained fine adjust in the constants of nature is not solved by an impossible answer, but by the vanishing of the problem, which is revealed as *irrelevant* by means of the intervalic dimensions.

A NEW ERA OF TRUTHFULLY *UNIVERSAL* KNOWLEDGE

As we are going to see along this book, IT opens at last a new era of reliable and truthfully *universal* knowledge in Physics and in Music, as IT does not include any concept or magnitude based on local units or frame of references because all physical quantities are dimensionally expressed as an unique and irreducible combination of the two fundamental constants of Nature: c and ħ. Therefore, any arbitrariness is avoided in the choosing of a local system of dimensions since our intervalic system of dimensions is actually given by Nature as it is the unique dimensional system in which any physical quantity is expressed in terms of c and ħ, the two unique fundamental constants. In other words, there is solved the following problem: to make a dimensional system in which the dimensions of all physical quantities are simple combination of the dimensions of c and ħ. The problem has only one answer: dim c = $i^{\pm 1}$, dim ħ = X, where X is some physical dimension. To interpret X as some kind of space, X = L, is immediate, and the choosing between c = i or c = i^{-1} is irrelevant as both give the same dimensional system: the intervalic system of dimensions (!). Of course, the setting of *singular* units (c = 1 and ħ = 1) is the most simple assumption, but it is still irrelevant for the definition of the dimensional system, and we can work perfectly in intervalic dimensions with whatever not-singular units ($c \neq 1$, $\hbar \neq 1$). To conclude, we arrive to the discovery of the intervalic system of dimensions and units when we are able to allow ourselves to hear without prejudices what Nature is forever quietly whispering.

By this reasons IT in Physics could be communicated and understood across the Universe by any other advanced intelligence. And the same is valid to IT in Music. We can be sure that if an extraterrestrial life make advanced Physics and Music, both will be *intervalic* ones. Since the underlying symmetries of Nature can not be deduced by no means from any other dimensional system, but only from the intervalic system of dimensions, the knowledge of IT is a reliable clue of the scientific degree of development of any civilization. Moreover, the awareness of IT could serve to differentiate an advanced civilization from a primitive one (if this is the case, IT might not be discovered and understood yet by these little human beings, inasmuch as it is doubtful that we really can consider our bellicose civilization as an advanced one).

Surprisingly, the awareness of IT by any civilization can be communicated by the most simple device: it only has to show the knowledge of the geometric equation $e = 270\ \mathbf{q_I}$, which singular value is clearly 270. Therefore, any electromagnetic signal transmitting 270 pulses in any way can be considered as a secure clue for the knowledge of the Intervalic Theory. And to reinforce this message, the frequorce of the signal could be chosen as precisely one of the most important derived constants of Nature (after the two only fundamental ones, c and ħ): $G_{\mathbf{I}}^{-1}$, being $G_{\mathbf{I}}$ (iL) the intervalic constant of gravitation, which is derived from c and ħ in the Intervalic Space. The meaning and geometric relations of $G_{\mathbf{I}}$, whose magnitude is slightly different form the traditional Newtonian constant G_N, introduces some fascinating new subjects in Physics which can not be fully treated in this book but in other one devoted to Intervalic Cosmology.

By this way we can see once more the deep relation existing between Music, Physics and Mathematics. It was not by chance that the vast majority of the best physicists of the XXth. century were also musicians. The negligence of music only advise for a limited insight to understand the language of Nature, which is just one and the same both for Music and for Physics. As Don Campbell has described in his best-selling books on *The Mozart Effect,* the musical brain uses the two cerebral hemispheres, while the rational brain only uses the left hemisphere. But it is clear that for understanding Nature we need the whole brain. A lot of experiments have proved that what makes the difference between a creative brain and a non-creative one is just musical education.

I am absolutely sure that if Einstein or any other of the best physicists of the XXth. century would have received only a brief note describing the intervalic dimensional basis, any of them would have immediately comprehended the extraordinary importance and transcendence of the theoretical discovery and the implications which would be logical and necessarily derived from the intervalic system of physical quantities.

INTERVALS AND RATIOS

Long time ago physicists were aware that a truthful and universal Physics should perhaps be expressed in *dimensionless ratios* instead of *dimensionful magnitudes*. However, till now only a very few measurements have been able to be expressed in dimensionless ratios, such as velocity (v/c) or some ratios between subatomic particles. Has solved or not this deep problem the intervalic system of units?

The Intervalic Theory in Music has brought about a change in paradigm, as well as in our way of seeing or thinking about music; one no longer works with or thinks in terms of *notes* but in terms of metrical *intervals* instead. Notes relies on the frame of reference chosen, whilst intervals don't, as they are invariant. The organisation of the musical sound according to this new block yields an entirely new musical space: the intervalic space. Really, this is the origin of the term *intervalic* which denotes the theory.

History has demonstrated that the conception and the inner geometry of the physical space and of the musical space in every era are just the same. If we think a little about it, we reach the conclusion that it can't be in other way: mankind has a unique global thought along the epochs, and this unique thinking is expressed through different mediums: sciences, arts, etc. Among them, the most precise in both fields are Physics and Music, and it is a fascinating task to identify the isomorphism between both disciplines in every era. Usually Physics goes chronologically before Music, but sometimes the arts has gone before science, as in the Renaissance, when Filippo Brunelleschi and Leon Battista Alberti invented the perspective geometry and the concept of infinite (cfr. the famous and celebrated essay by Erwin Panofsky, ***The Perspective as Symbolic Form*** (Berlin, 1927)).

Therefore, since the Intervalic Theory in Music has been postulated, we can deduce that there must exist an isomorphic theory which expresses the same thought in Physics, defining a new physical intervalic space. In such physical theory we only have to substitute notes by intervals. Since a *interval* is, *by definition*, the relation between two notes (being a note just a magnitude of any of the metrical qualities of sound: frequency, time and intensity), it is analogous to a *ratio*, which is, *by definition*, the relation between two magnitudes. Henceforth, a physical theory whose measurements was completely expressed in *ratios* would be isomorphic to a musical theory wholly expressed in metric *intervals*. Of course, such theory is just the Intervalic Theory in Music.

A great difference between the intervalic units and the other systems is that the intervalic physical quantities conforms a *finite* and *ordered* set —the already described intervalic group— and every physical quantity can not acquire any value, as each of them are geometrically closed by its corresponding height: an intervalic quanta or limit. Therefore, a magnitude expressed in intervalic units comprises, apart from the usual meaning of a *dimensionful magnitude*, an additional meaning of a *dimensionless ratio*. Moreover, the value of both ones is just the same. That is to say, if we say, as example, that some magnitude of frequorce is $\varphi = \frac{1}{2} (i^{-1}L^{-1})$, the same magnitude expressed as a dimensionless ratio is: $\varphi = \frac{1}{2} (i^{-1}L^{-1}) / \boldsymbol{\varphi}_\mathbf{I} = \frac{1}{2} (1)$. On the contrary a frequency ratio of ½ in any other system of units means nothing because there is no defined any quanta or limit for every physical quantity (with the exception of velocity due to the existence of the limit of the speed of light). Thus, we could say that in intervalic units all physical quantities can be expressed in the same way as we write the velocity as v/c in traditional units. Thus physical quantities become dimensionless and the system of units is transformed into geometry.

The claim of the supposed "geometrized" units to be thus geometric is entirely a fraud because any system of units, including the traditional SI units, can be "geometrized" in that way giving all the magnitudes expressed as dimensionless ratios. However, all those ratios only have got meaning inside every one of those system of units because there is neither natural nor universal magnitudes for every physical quantity (with the only exception of the speed of light). For example, the degenerate units pretends that Planck's length or mass, to say only their stronger physical quantities, are universal magnitudes which serve as a patter of measurement for dimensionless ratios. Far enough. Inasmuch as Planck's length is as universal as a metre or a yard and Planck's mass is as universal as a kilogram or a pound, the so called "geometrized" units are absolutely a fake. If that was the case, *any* system of *singular* units —singular units means $c = 1$ and $\hbar = 1$ regardless of the dimensions of c and $\hbar$— should yield the same dimensionless ratios. However this is simply false as the mere existence of the intervalic units does have demonstrated.

Although modern Physics has lamentably forgotten the importance of the system of *dimensions* and has confounded it with the system of *units*, the fact is that the important one is the dimensional basis, but not the value of the units. It is this way because whatsoever system of singular units or of non-singular units expressed in *intervalic dimensions* —intervalic dimensions means c ($i^{\pm1}$) and ħ (L) regardless of the value of c and ħ— will yield exactly the same dimensionless ratios of universal validity. On the contrary, without intervalic dimensions —c ($i^{\pm1}$), ħ (L)— any system of units yield different dimensionless ratios of local (non-universal) validity. By this reason, along this book we may use conventional *units* but with intervalic *dimensions*, because they yield the same universal dimensionless ratios as of singular units —or any other units— but always in intervalic dimensions.

Of course, the units of the intervalic dimensions are unique because it is the only system of units whose units are not arbitrary, like the metre or Planck's length, but they are the genuine geometric heights of Nature: the *intervalic quanta* and the *intervalic limits*. Really this is an essential difference between the intervalic units and all the other systems: it can be said that the intervalic dimensions do not have usual *units* in the usual sense —which by implicit definition are arbitrary and are set by mankind or by any other civilization— but instead *quanta* and *limits* —which are reliable magnitudes of universal validity and are set by Nature—.

We can express completely music and physics through intervals or ratios. The simplicity and elegance introduced by the features of the intervalic units in Physics should already be, in absence of any other further developments, a sufficient reason to adopt them insofar as the aim of science is the understanding of Nature. It is sure that a better understanding of Nature will be followed by practical achievements in technology, but this is not the reason that leads the scientific thinking. Nevertheless, the layperson will foolishly say: so what? It was supposed that neither music nor physics *did not rely* on the dimensional system and units chosen, but against all expected, this traditional supposition has proved to be absolutely *false*, both in music as in physics.

The dramatic fact that the two fundamental constants of Nature define unavoidably a quantum of electric charge which is an exact fraction of the elementary charge, involves that subatomic particles are not *structureless* but *structureful* and *composite*: they must be *states of minimal energy* reached at primordial times by means of a *primordial assembly* of intervalic charges.

THE LOGICAL EXISTENCE OF GEOMETRIC HEIGHTS IN ALL PHYSICAL QUANTITIES

The existence of *infinite* magnitudes is a plague in Physics of XXth. century. In the work ***De Rerum Natura*** by Titus Lucretius Carus, the disciple of Epicure gave the first demonstration for the *logical necessity* of the existence of a *minimal height* in Nature. As a theoretical thinking it is still completely valid up to present time. However, modern Physics ignores scandalously such logical constraint of physical quantities. Up to the postulation of Special Relativity the magnitude of whatsoever physical quantity could freely be *as great or as small* as desired, *without theoretical limit.* After Einstein postulated the existence of a maximum height, c, for the velocity, the own Einstein postulated the quantization of energy through the introduction of another minimum height: the Planck's action quantum, ħ, which led to the born of Quantum Mechanics. So, these are the two only heights existing in modern Physics, both introduced by Albert Einstein.

Once the intervalic units have been postulated it can be understood that if a magnitude increases near infinite, it can distortion or "go out" from the geometry of intervalic-relativistic space-time. Even worst, there is a logical contradiction in the own existence of an *isolated* limit of the speed of light with respect to the remaining physical quantities. There was thought that the velocity of a body was limited by c, but the remaining physical quantities did not. The contradiction is still more apparent when considering physical quantities closely related with velocity, such as acceleration of gravitational field strength. If the velocity of a body is limited by c, how is possible that its acceleration or its gravitational field strength can be augment infinitely? Meaningfully, both physical quantities have identical intervalic dimensions, $(-L^{-1})$, and are geometrically limited by the intervalic limit of acceleration-power (or poweleration): $c^{\pm 2}\hbar^{-1} = 1\ (-L^{-1}) = 8.513874 \cdot 10^{50}\ (m\ s^{-2})$.

In a similar way, if the action is quantized by the Planck's constant, its related physical quantities such as space or time should also be quantized. But as all physical quantities are dimensionally interrelated, it is absolutely impossible to admit that one, two or three alone physical quantities have got a geometrical height and the remaining ones have not got it yet.

Since in intervalic dimensions every physical quantity is a combination of the dimensions of the limit c and the quantum ħ, we gave got a precise definition of such corresponding quantum or limit for all physical quantities. Therefore, every physical quantity must logically have a geometrical height: a maximum one —*limit*— or a minimum one —*quantum*—. The capital difference between the intervalic units and the remaining systems of units is that the first one give us a precise definition of such *geometric heights* and the others can't make such heights.

The measurement of all *limited* physical quantities (see tables to identify them marked with the legend "absolute limit") must have, say, a "geometric distortion" because any measurement of such magnitudes can't be greater than their corresponding geometric limits. This "geometric distortion" is a consequence of the existence of those limits, and it would not exist if there was not such limits. They affect not only to *velocity,* as postulated by Special Relativity, but to all physical quantities limited by the intervalic geometry. The Lorentz-Einstein transformations with respect to velocity is the traditional name of only *one* of those 18 intervalic physical quantities (that one of *velocity*), but there are seventeen ones more; but as some intervalic dimensions gather more than one traditional physical quantities, the number of limits according to the traditional physical quantities is greater, as it can be seen in detail in the tables of intervalic units at the final of the chapter. Writing down only one physical quantity per every limited intervalic dimension we have:

- Velocity: $\mathbf{v_I} = c = 2.9979246 \cdot 10^{8}$ (m s^{-1})
- Temperature: $\mathbf{\Theta_I} = c\, k_B{}^{-1} = 2.1713738 \cdot 10^{31}$ (K)
- Wavevector: $\mathbf{k_I} = \hbar^{-1} = 9.472962 \cdot 10^{33}$ (m^{-1})
- Poweleration: $\mathbf{a_I} = c^{\pm 2}\hbar^{-1} = 8.513874 \cdot 10^{50}$ (m s^{-2})
- Linear perdensity: $\mathbf{\Delta^1{}_I} = c^{-1}\hbar^{-1} = 3.163026 \cdot 10^{25}$ (kg m^{-1})
- Frequorce: $\boldsymbol{\varphi}_\mathbf{I} = c\, \hbar^{-1} = 2.8399227 \cdot 10^{42}$ (s^{-1})
- Viscosity (dynamic): $\boldsymbol{\eta}_\mathbf{I} = \hbar^{-2} = 8.973701 \cdot 10^{67}$ (Pa s)
- Area power: $\mathbf{W^2{}_I} = c^{\pm 2}\hbar^{-2} = 8.065161 \cdot 10^{84}$ ($-m^{-2}$)
- Inflexion: $\mathbf{i_I} = c^{-1}\hbar^{-2} = 2.993305 \cdot 10^{59}$ (m s^{-3})
- Surface tension: $\boldsymbol{\sigma}_\mathbf{I} = c\, \hbar^{-2} = 2.690248 \cdot 10^{76}$ (N m^{-1})
- Fluctuation: $\mathbf{f_I} = \hbar^{-3} = 8.500756 \cdot 10^{101}$ (m s^{-4})
- Voluminic power: $\mathbf{W^3{}_I} = c^{\pm 2}\hbar^{-3} = 7.640098 \cdot 10^{117}$ ($-m^{-3}$)
- Density: $\boldsymbol{\rho}_\mathbf{I} = c^{-1}\hbar^{-3} = 2.835547 \cdot 10^{93}$ (kg m^{-3})
- Pressure: $\mathbf{P_I} = c\, \hbar^{-3} = 2.548463 \cdot 10^{110}$ (Pa)
- Electric potential: $\mathbf{V_I} = \sqrt{}\text{-}(c\hbar^{-1}) = 1.685207 \cdot 10^{21}$ (V)
- Electric field strength: $\boldsymbol{\epsilon}_\mathbf{I} = \sqrt{}\text{-}(c\hbar^{-3}) = 1.596390 \cdot 10^{55}$ (V m^{-1})
- Electric polarisation: $\mathbf{P_I} = \sqrt{}\text{-}(c^{-1}\hbar^{-3}) = 5.324984 \cdot 10^{46}$ (C m^{-2})
- Charge density: $\boldsymbol{\rho}_\mathbf{I} = \sqrt{}\text{-}(c\hbar^{-5}) = 5.117026 \cdot 10^{46}$ (C m^{-3})

All of them are logically deduced and physically interpreted as a simple and characteristic feature of the Intervalic Geometry in IT. As desired by heuristic rules of Epistemology, the former Lorentz-Einstein transformations remain as a special case —the most simple one— subsumed into a more general and powerful geometry of Physics.

MACROSCOPIC CONTINUITY *VERSUS* MICROSCOPIC DISCONTINUITY (OR WHY THE UNCERTAINTY PRINCIPLE IS UNCERTAIN)

At this paragraph we can't avoid to be very critical because we are dealing with one of the most misleading and captious principles of Quantum Mechanics which has blocked a lot of possible developments. It can be said that from the postulation of such deceitful principle, all Quantum Mechanics was unfortunately infected by the philosophy which is derived without any mental rigour from such idea. By no means and under no circumstances, we regret to say that this can not be called ‘good science’.

The nauseating relations with nazis of Werner Heisenberg, showed in the impressive and well documented book by Paul Lawrence Rose ***Heisenberg and the Nazi Atomic Bomb Project.* A study in German Culture** (University of California Press, 1998) is not relevant for our purpose now.

As Relativity, the uncertainty principle was historically born as a consequence of the troubles which arose in Physics when going into the study of macroscopic and microscopic scales respectively. The first one was symbolized by Einstein’s limit, the speed of light, c, and the second by Planck’s quantum of action, ħ. However, today we can see that these troubles appear necessarily when we are going to approximate near anyone of the intervalic *limits* or *quanta* of Nature. This means that there is a astonishing simple explanation for such troubles in terms of the intervalic *geometry* of nature. Let us begin with the speed of light.

The links with the postulation of Special Relativity, such as the Michelson-Morley experiment, etc., are very interesting but we have to suppose that they are already known by the reader. *Massful* particles can not travel quicker than *massless* particles which move at the speed of light, *ergo* c must be a fundamental limit of Nature. The trouble appears when we have a massive particle approaching to the velocity c. If we supply more and more energy to such particle, why it can’t finally move faster that light? Hypothetically the particle could shock abruptly with such barrier, but this naïve and coarse possibility is not the way of Nature, but to approaching asymptotically to those limits without touching them never —what we usually know as the Lorentz-Einstein transformations—. This was one of the great contributions of Albert Einstein to Physics, which now we can place and interpret in a wider theory of Nature.

As soon as the experimental devices will be available, we will see how the temperature of a particle follows a behaviour similar to its velocity when approaching to its intervalic limit, the intervalic temperature, $\boldsymbol{\Theta}_{\mathbf{I}} = c\ k_B^{-1} = 2.1713738 \cdot 10^{31}$ (K). And in an analogous way, we will see that regardless the energy supplied to a particle, it can never surpass the geometric intervalic limits, like the intervalic acceleration, $\mathbf{a}_{\mathbf{I}} = c^{\pm 2}\hbar^{-1} = 8.513874 \cdot 10^{50}$ (m s^{-2}), or the intervalic frequency, $\boldsymbol{\varphi}_{\mathbf{I}} = c\ \hbar^{-1} = 2.8399227 \cdot 10^{42}$ (s^{-1}), and so on. Please let us note that this could not be other way because all physical quantities are made from dimensional combinations of c and ħ, and these two ones are respectively limited and quantized.

Since the Lorentz-Einstein transformations —and the enhanced intervalic transformation of physical quantities in the Intervalic Space— give us the new way of *measurement* of any physical quantity when approaching to the intervalic limits, we have not found too many troubles with the maximum heights (limits).

On the contrary, when dealing with the minimal heights (quanta), we have not got a new mode of measurement at microscopic scale for such physical quantities, and therefore troubles will surely arise… if we do not know the underlying geometry of Nature. According to the deluding Heisenberg interpretation, there is an essential uncertainty in Nature at microscopic scale. It does not say that we are not able to measure at such scale, but that Nature is *essentially undetermined* at that level of reality. As we are going to see straightaway, this is a gross mistake. The only thing which is essentially undetermined is the Copenhagen interpretation of the physical world.

It would be very recommended to know the reasoning of ancient Greeks about the *logic necessity* of the existence of a final limit —whatever it be— in the division of matter. To anyone with a peer reason it becomes evident that there must exist some kind of limit to the *continuity* of matter as we progress towards the microscopic scale. And this must be certain for a lot of features of Nature. In other way, the process of division of matter would not be endless and infinite, as Greeks were already aware. This means that, at some level, we have to find some kind of discontinuity. The stuff of which is made such *discontinuity* will be the elemental *blocks* of Nature corresponding *to that level* of the measurement scale. And of course, there must be a final level with its corresponding final block of Nature.

To a better understanding we can illustrate it with a suitable comparison with plastic arts. Lets imagine the poster of a movie in a wall. When we are watching it at large or medium distance, we see an almost infinite tones of colours, that is to say, we see *continuity* in colour. However, if we watch the poster at 20 cm. or less, we will discover that there are only three or four colours: cyan, magenta and yellow (and possibly black depending on the printing system). In other words, we have crossed some threshold about “measurement” and have seen the underlying *discontinuity* of colour at the psycho physic level. Now Heisenberger would say that the nature of colour is “undetermined” at small scale; and he would explain it affirming that there is an “essential uncertainty” of colour at small scale in Nature. However, as anyone can easily see, the colour is neither ‘undetermined’ nor there is an ‘uncertainty’, as we see clearly three colours —CMY— fully determined. What we have got is simply a *discontinuity* in the colour when the observation becomes closer to the poster, a fact that a smart child may understand. Instead the almost infinite tones of colour that can be seen at longer distance, we discover that all those colours are only made from three fundamental ones, the corresponding blocks at this level, the *primary colours*: red, yellow and blue.

To affirm that there is an “essential uncertainty” of *colour* is just the same as Heisenberg did with *action*, which intervalic dimensions is that of *length*. At macroscopic scale space is obviously *continuous*. However, when approaching progressively to the scale of the intervalic length, $\mathbf{l_I} = \hbar = 1.0556363 \cdot 10^{-34}$ (m), the space becomes granulated, and finally arises the fundamental block of length at such microscopic scale. What was continuous at great scales becomes *discontinuous* at this level, in the same way as colour. There is no ‘uncertainty’, but simple ‘discontinuity’ when we move near the scale of every one intervalic quanta.

The above reasoning can surely be understood by a kid of five years. Please note that to hold the existence of a continuous space at any scale, that is to say, *ad infinitum*, is just the same that to affirm the existence of the medieval *ether,* in vogue up to the postulation of Special Relativity. Thus, a *continuous* space involves necessarily the existence of a *universal ether* (this is no other than the *absolute space* of Newton). Really, both concepts are interchangeable. Someone might say that Heisenberg postulated uncertainty with the aim to saving the *continuity* of space, which was a concept hardly rooted in Classic Physics. Once more we can see that an unconscious philosophy may damage seriously the Physics research. In order to maintain a *continuous space*, Heisenberg paid the price to introduce ‘uncertainty’ in the heart of Physics, where it only was discreteness or discontinuity, but by no means indeterminacy.

Another comparison: this is just the same as if we have a ruler divided in millimetres to measure the distances of a picture drawn on a sheet paper. Lets suppose that the millimetre of the ruler is like the intervalic length, ħ. It is clear that if we try to make a measurement with a precision smaller than the millimetre, we will go into a trouble. To this trouble the cute Heisenberg answered that the own picture was undetermined, instead to conclude that the ruler, composed by millimetres, can not make any measurement smaller that the last block of the ruler, the millimetre.

Unfortunately, Physics followed such absurdity. In Music there happened a similar scene, although it was discarded in a few years: the undetermined and random music was in vogue at the middle of the XXth. century by means of some unscrupulous composers. However, soon after the common sense come back to Music and everybody comprehended and agreed that *the composer does not play dice*. And if the composers —the little creators of the artificial branch of Music (the musical works)— do not play dice, how can we pretend that the supreme creator of the natural branch of Music (that is to say, the Universe) does play dice?

In the Intervalic Space the discreteness of physical quantities affects to all physical quantities whose intervalic unit is a quantum. As with the intervalic limits, a single intervalic dimension may gather more than one traditional physical quantity, as can be seen in the tables. Some of these quanta are:

- Length, $\mathbf{l_I} = \hbar = 1.0556363 \cdot 10^{-34}$ (m),
- Inductance: $\mathbf{L_I} = c^{\pm 2}\hbar = 9.487583 \cdot 10^{-18}$ (H)
- Time: $\mathbf{t_I} = c^{-1}\hbar = 3.5212226 \cdot 10^{-43}$ (s)
- Area: $\mathbf{S_I} = \hbar^2 = 1.114367 \cdot 10^{-68}$ (m^2)
- Area inertia momentum: $\mathbf{I^2_I} = c^{-1}\hbar^2 = 3.717129 \cdot 10^{-77}$ (kg m^2)
- Volume: $\mathbf{V_I} = \hbar^3 = 1.176366 \cdot 10^{-102}$ (m^3)
- Inertia volume momentum: $\mathbf{I^3_I} = c^{-1}\hbar^3 = 3.923935 \cdot 10^{-111}$ (kg m^3)
- Fermi constant physical quantity: $c\,\hbar^3 = 3.526657 \cdot 10^{-94}$ (kg m^3)
- Electric charge: $\mathbf{q_I} = \surd\text{-}(c^{-1}\hbar) = 5.933989 \cdot 10^{-22}$ (C)
- Bohr magneton: $\boldsymbol{\mu}_{\mathbf{BI}} = \surd\text{-}(c\hbar^3) = 1.877940 \cdot 10^{-47}$ ($J\ T^{-1}$)

Please be aware that any measurement involving any of those intervalic quanta (and not only the length) is geometrically subdued to discreteness when approaching to the scale of its corresponding intervalic quantum. Thus, for example, discontinuity will arise immediately in everyone of the following measurements at microscopic scale (the intervalic dimensions are showed between brackets):

$\Delta l\ (L) \cdot \Delta p\ (1) \geq \mathbf{l_I} = \hbar\ (L)$
$\Delta t\ (iL) \cdot \Delta p\ (1) \geq \mathbf{t_I} = c^{-1}\hbar\ (iL)$
$\Delta q\ (i^{-1/2}L^{1/2}) \cdot \Delta p\ (1) \geq \mathbf{q_I} = \surd\text{-}(c^{-1}\hbar)$
$\Delta l\ (L) \cdot \Delta m\ (i) \geq \mathbf{t_I} = c^{-1}\hbar\ (iL)$
$\Delta S\ (L) \cdot \Delta m\ (i) \geq \mathbf{t_I} = c^{-1}\hbar\ (iL)$
$\Delta t\ (iL) \cdot \Delta v\ (i^{-1}) \geq \mathbf{l_I} = \hbar\ (L)$
$\Delta t\ (iL) \cdot \Delta E\ (i^{-1}) \geq \mathbf{l_I} = \hbar\ (L)$
$\Delta p\ (1)\ /\ \Delta\varphi\ (i^{-1}L^{-1}) \geq \mathbf{t_I} = c^{-1}\hbar\ (iL)$
$\Delta l\ (L)\ /\ \Delta\varphi\ (i^{-1}L^{-1}) \geq \mathbf{I^2_I} = c^{-1}\hbar^2\ (iL^2)$
$\Delta t\ (iL)\ /\ \Delta a\ (-L^{-1}) \geq c\,\hbar^2\ (i^{-1}L^2)$
$\Delta t\ (iL)\ /\ \Delta W\ (-L^{-1}) \geq c\,\hbar^2\ (i^{-1}L^2)$
$\Delta m\ (i)\ /\ \Delta a\ (-L^{-1}) \geq \mathbf{-t_I} = c\,\hbar\ (i^{-1}L)$
$\Delta m\ (i)\ /\ \Delta g\ (-L^{-1}) \geq \mathbf{-t_I} = c\,\hbar\ (i^{-1}L)$
$\Delta\theta\ (i^{1/2}L^{1/2}) \cdot \Delta\Phi\ (-1) \geq \mathbf{q_I} = \surd\text{-}(c^{-1}\hbar)$
$\Delta p\ (1)\ /\ \Delta A\ (i^{1/2}L^{-1/2}) \geq \mathbf{q_I} = \surd\text{-}(c^{-1}\hbar)$
$\Delta V\ (i^{1/2}L^{-1/2}) \cdot \Delta t\ (iL) \geq \mathbf{q_I} = \surd\text{-}(c^{-1}\hbar)$
…

The first relation of the above ones is no other than the infamous *Heisenberg uncertainty principle*, which is only one among many others of the intervalic quanta which appears inasmuch as we make some measurements near the microscopic scale. Quantum philosophy did not hesitate to sacrifice ‘determinacy’ to save ‘continuity’ in Physics, postulating that the world was *undetermined* and *continuous* at Planck scale, while the truth is absolutely just the opposite: Nature is *determined* and *discrete* at the scale of her last blocks —the intervalic quanta—.

To conclude, please let us note that all bodies of the Universe are composed in the same manner: with single blocks. Why all physical bodies of Nature would not be composed in the same way? A continuous matter or stuff divisible *ad infinitum* simply does not exist, and probably can not exist. Continuity is only a macroscopic appearance, a very useful one for human perception. At the last geometric foundations of Nature there is no universal ether, there is no absolute space, there is no a doubtful uncertainty… but only a clever discreteness.

THE GROSS MISTAKE OF THE UNCERTAINTY PRINCIPLE AND OF THE COPENHAGEN INTERPRETATION

Among all gross errors along the history of Physics there is one which stands out among the remaining ones. It is perhaps the greatest hoax passed off in science: the so called *uncertainty principle*, postulated by Werner Heisenberg, greatly acclaimed by all sorts of Relativisms. It is said that such misleading idea was proposed to avoid the granular conception of space, unacceptable to the physics community by that time. But the Copenhagen interpretation made things even worst: according to it, there is an essential uncertainty in Nature at microscopic scale. It does not say that we are not able to measure at such scale, which is a simple fact, but that Nature is unavoidably undetermined at that level of reality. This affirmation is completely a gross mistake, mistake which besides blocked and prevented the physics research on the underlying geometry of Nature during decades.

To a better understanding we can illustrate it with a suitable comparison with plastic arts. Lets imagine the poster of a film in a wall. When we are watching it from a large distance, we see an almost infinite tones of colours, that is to say, we see *continuity* in colour. However, if we watch the poster at 20 cm. or less, we will discover that there are only four colours: cyan, magenta, yellow and black. In other words, we have cross the threshold of a scale of "measurement" and have seen the underlying *discontinuity* of colour at a lesser scale. Now Heisenberg would say that the nature of colour is "uncertain" at small scale; and he would explain it affirming that there is an "essential uncertainty" of colour at small scale in Nature. However, as anyone can easily see, the colour is neither 'undetermined' nor there is any 'uncertainty', as we see clearly four colours.

To affirm that there is an essential uncertainty of *colour* is just the same as Heisenberg did with *action*, which intervalic dimensions is that one of *length*. At macroscopic scale, space is obviously *continuous*. However, when approaching progressively to the scale of the intervalic length, $\mathbf{l}_\mathbf{I} = \hbar = 1.0556363 \cdot 10^{-34}$ (m), the space becomes granulated, and finally arises the fundamental block of length. What was continuous at great scales becomes *discontinuous* at this level, in the same way as colour. There is no 'uncertainty', but simple 'discontinuity' when we move near the scale of *each intervalic quanta*, and not only the intervalic quantum of *length* but all of them, since the intervalic dimension of every intervalic quanta is made from a combination of the intervalic dimensional basis (L, *i*). For example:

$$\begin{array}{ll}
\Delta l\ (L) \cdot \Delta p\ (1) \geq \mathbf{l}_\mathbf{I} = \hbar\ (L) & \Delta l\ (L) / \Delta\varphi\ (i^{-1}L^{-1}) \geq \mathbf{I}^\mathbf{2}{}_\mathbf{I} = c^{-1}\hbar^2\ (iL^2) \\
\Delta t\ (iL) \cdot \Delta v\ (i^{-1}) \geq \mathbf{l}_\mathbf{I} = \hbar\ (L) & \Delta q\ (i^{-1/2}L^{1/2}) \cdot \Delta p\ (1) \geq \mathbf{q}_\mathbf{I} = \sqrt{}\text{-}(c^{-1}\hbar) \\
\Delta l\ (L) \cdot \Delta m\ (i) \geq \mathbf{t}_\mathbf{I} = c^{-1}\hbar\ (iL) & \Delta p\ (1) / \Delta\varphi\ (i^{-1}L^{-1}) \geq \mathbf{t}_\mathbf{I} = c^{-1}\hbar\ (iL) \\
\Delta t\ (iL) / \Delta a\ (-L^{-1}) \geq c\,\hbar^2\ (i^{-1}L^2) & \Delta m\ (i) / \Delta a\ (-L^{-1}) \geq \mathbf{-t}_\mathbf{I} = c\,\hbar\ (i^{-1}L)
\end{array}$$

The uncertainty principle is absolutely useless because of the disparate scales of measuring involved. It affirms a simple irrelevance: we can not measure the position of a subatomic particle —which radius is around 10^{-15} (m)— with a precision greater than $\hbar = 1.0556363 \cdot 10^{-34}$ (m). To make this would be applicable in practice we should need to know the values of the electron or nucleon radii with a precision of 20 to 28 non zero digits. This only would be possible if the values of the intervalic dimensional basis, c and ħ (the speed of light and the Planck's constant) would have equally got 20 to 28 significant digits.

But the uncertainty principle is wrong in theory too. The *intervalic state* of any subatomic particle —determined by the allowed intervalic symmetries of the constituent particles of the exchange intervalic structure— is always in perpetual exchange interaction; and besides each intervalic structure, in every level, is spinning with a linear velocity on surface whose value is in the order of the speed of light. It is a plain misunderstanding to talk about the size of an object out of the value of its scale of measurement. This elemental reasoning can surely be understood by a child of five years, but surprisingly it couldn't and wasn't by the Copenhagen physicists.

Finally and by the way, Copenhagen fans should read perhaps the book by Paul Lawrence Rose, *Heisenberg and the Nazi Atomic Bomb Project,* UCP, 1998.

INTERVALIC QUANTA,
INTERVALIC LIMITS,
INTERVALIC UNITS

Intervalic dimens.	*Physical quantity*	*Definition*	*Geometrical rank*	*Equivalence:* *SIU magnit.(unit) = SI magnit.(unit)*
1	Permitivity	$\boldsymbol{\varepsilon}_\mathbf{I} = \hbar^{-1}\hbar$	subatomic limit	1 (1) = 1 (F m^{-1})
	Momentum	$\mathbf{p_I} = c^{-1}c$	subatomic limit	1 (1) = 1 (kg m s^{-1})
	Boltzmann constant	k_B	-	-
	Entropy	S	-	-
-1	Permeability	$\boldsymbol{\mu}_\mathbf{I} = c^{\pm 2}$	conversion factor	1 (-1) = 1.112650 · 10^{-17} (H m^{-1})
	Gravitational potential	Φ	-	-
	Antimomentum	$\mathbf{-p_I} = c^{\pm 2}$	conversion factor	1 (-1) = 8.987552 · 10^{16} (-kg m s^{-1})
i	Mass (invervelocity-mass)	$\mathbf{m_I} = c^{-1}$	subatomic limit	1 (*i*) = 3.3356409 · 10^{-9} (kg)
	Invervelocity-mass	$\mathbf{v^{-1}{}_I} = c^{-1}$	subatomic limit	1 (*i*) = 3.3356409 · 10^{-9} (s m^{-1})
i^{-1}	Velocity (velenergy)	$\mathbf{v_I} = c$	absolute limit	1 (i^{-1}) = 2.9979246 · 10^{8} (m s^{-1})
	Energy (velenergy)	$\mathbf{E_I} = c$	subatomic limit	1 (i^{-1}) = 2.9979246 · 10^{8} (J) 1 (i^{-1}) = 1.8711569 · 10^{21} (MeV)
	Temperature	$\boldsymbol{\Theta}_\mathbf{I} = c\ k_B^{-1}$	absolute limit	1 k_B^{-1} (i^{-1}) = 2.1713738 · 10^{31} (K)
L	Length (real space)	$\mathbf{l_I} = \hbar$	quantum	1 (L) = 1.055636 · 10^{-34} (m)
	Action	$\mathbf{S_I} = \hbar$	quantum	1 (L) = 1.055636 · 10^{-34} (J s)
	Capacitance	$\mathbf{C_I} = \hbar$	quantum	1 (L) = 1.055636 · 10^{-34} (F)

Intervalic dimens.	*Physical quantity*	*Definition*	*Geometrical rank*	*Equivalence: SIU magnit.(unit) = SI magnit.(unit)*
-L	Antilength	$\mathbf{-l_I} = c^{\pm2}\hbar$	conversion factor	1 (-L) = 9.487583 · 10^{-18} (-m)
	Inductance	$\mathbf{L_I} = c^{\pm2}\hbar$	quantum	1 (-L) = 9.487583 · 10^{-18} (H)
i L	Time (imaginary space)	$\mathbf{t_I} = c^{-1}\hbar$	quantum	1 (*i*L) = 3.5212226 · 10^{-43} (s)
i^{-1} L	Antitime	$\mathbf{-t_I} = c\,\hbar$	conversion factor	1 (i^{-1} L) = 3.164717 · 10^{-26} (-s)
L^{-1}	Wavevector	$\mathbf{k_I} = \hbar^{-1}$	absolute limit	1 (L^{-1}) = 9.472962 · 10^{33} (m^{-1})
$-L^{-1}$	Acceleration (poweleration)	$\mathbf{a_I} = c^{\pm2}\hbar^{-1}$	absolute limit	1 ($-L^{-1}$) = 8.513874 · 10^{50} (m s^{-2})
	Gravitational field	$\mathbf{g_I} = c^{\pm2}\hbar^{-1}$	absolute limit	1 ($-L^{-1}$) = 8.513874 · 10^{50} (m s^{-2})
	Power (poweleration)	$\mathbf{W_I} = c^{\pm2}\hbar^{-1}$	absolute limit	1 ($-L^{-1}$) = 8.513874 · 10^{50} (W)
i L^{-1}	Antifrequorce	$\mathbf{-\varphi_I} = c^{-1}\hbar^{-1}$	conversion factor	1 (*i* L^{-1}) = 3.163026 · 10^{25} ($-s^{-1}$)
	Linear Perdensity	$\mathbf{\Delta^1_I} = c^{-1}\hbar^{-1}$	absolute limit	1 (*i* L^{-1}) = 3.163026 · 10^{25} (kg m^{-1})
i^{-1} L^{-1}	Frequorce (frequency-force)	$\mathbf{\varphi_I} = c\hbar^{-1}$	absolute limit	1 (i^{-1} L^{-1}) = 2.8399227 · 10^{42} (s^{-1})
	Frequency (frequorce)	$\mathbf{\nu_I} = c\hbar^{-1}$	absolute limit	1 (i^{-1} L^{-1}) = 2.8399227 · 10^{42} (Hz)
	Force (frequorce)	$\mathbf{F_I} = c\hbar^{-1}$	absolute limit	1 (i^{-1} L^{-1}) = 2.8399227 · 10^{42} (N)
	Conductivity	$\mathbf{\sigma_I} = c\hbar^{-1}$	absolute limit	1 (i^{-1} L^{-1}) = 2.8399227 · 10^{42} (S m^{-1})
L^2	Area	$\mathbf{S_I} = \hbar^2$	quantum	1 (L^2) = 1.114367 · 10^{-68} (m^2)
$-L^2$	Antiarea	$\mathbf{-S_I} = c^{\pm2}\hbar^2$	conversion factor	1 ($-L^2$) = 1.001544 · 10^{-51} ($-m^2$)

Intervalic dimens.	*Physical quantity*	*Definition*	*Geometrical rank*	*Equivalence: SIU magnit. (unit) = SI magnit. (unit)*
$i\ L^2$	Inertia area momentum	$\mathbf{I^2_I} = c^{-1}\hbar^2$	quantum	$1\ (i\ L^2) = 3.717129 \cdot 10^{-77}\ (kg\ m^2)$
$i^{-1}L^2$	?	$c\,\hbar^2$	-	$1\ (i^{-1}L^2) = 3.340789 \cdot 10^{-60}\ (J\ m^2)$
L^{-2}	Viscosity (dynamic)	$\boldsymbol{\eta_I} = \hbar^{-2}$	absolute limit	$1\ (L^{-2}) = 8.973701 \cdot 10^{67}\ (Pa\ s)$
$-L^{-2}$	Area Power	$\mathbf{W^2_I} = c^{\pm 2}\hbar^{-2}$	absolute limit	$1\ (-L^{-2}) = 8.065161 \cdot 10^{84}\ (-m^{-2})$
$i\ L^{-2}$	Area Perdensity	$\boldsymbol{\Delta^2_I} = c^{-1}\hbar^{-2}$	absolute limit	$1\ (i\ L^{-2}) = 2.993305 \cdot 10^{59}\ (kg\ m^{-2})$
	Inflexion	$\mathbf{i_I} = c^{-1}\hbar^{-2}$	absolute limit	$1\ (i\ L^{-2}) = 2.993305 \cdot 10^{59}\ (m\ s^{-3})$
$i^{-1}L^{-2}$	Surface Tension	$\boldsymbol{\sigma_I} = c\,\hbar^{-2}$	absolute limit	$1\ (i^{-1}L^{-2}) = 2.690248 \cdot 10^{76}\ (N\ m^{-1})$
L^3	Volume	$\mathbf{V_I} = \hbar^3$	quantum	$1\ (L^3) = 1.176366 \cdot 10^{-102}\ (m^3)$
$-L^3$	Antivolume	$\mathbf{-V_I} = c^{\pm 2}\hbar^3$	conversion factor	$1\ (-L^3) = 1.057265 \cdot 10^{-85}\ (-m^3)$
$i\ L^3$	Inertia vol. momentum	$\mathbf{I^3_I} = c^{-1}\hbar^3$	quantum	$1\ (iL^3) = 3.923935 \cdot 10^{-111}\ (kg\ m^3)$
$i^{-1}L^3$	Fermi const. phys. qty.	$c\ \hbar^3$	quantum	$1\ (i^{-1}L^3) = 3.526657 \cdot 10^{-94}\ (kg\ m^3)$
L^{-3}	Fluctuation	$\mathbf{f_I} = \hbar^{-3}$	absolute limit	$1\ (L^{-3}) = 8.500756 \cdot 10^{101}\ (m\ s^{-4})$
$-L^{-3}$	Voluminic Power	$\mathbf{W^3_I} = c^{\pm 2}\hbar^{-3}$	absolute limit	$1\ (-L^{-3}) = 7.640098 \cdot 10^{117}\ (-m^{-3})$
	Irradiance	$\mathbf{E_{eI}} = c^{\pm 2}\hbar^{-3}$	absolute limit	$1\ (-L^{-3}) = 7.640098 \cdot 10^{117}\ (W\ m^{-2})$
$i\ L^{-3}$	Density	$\boldsymbol{\rho_I} = c^{-1}\hbar^{-3}$	absolute limit	$1\ (i\ L^{-3}) = 2.835547 \cdot 10^{93}\ (kg\ m^{-3})$
	Voluminic Perdensity	$\boldsymbol{\Delta^3_I} = c^{-1}\hbar^{-3}$	absolute limit	$1\ (i\ L^{-3}) = 2.835547 \cdot 10^{93}\ (kg\ m^{-3})$
$i^{-1}L^{-3}$	Pressure	$\mathbf{P_I} = c\,\hbar^{-3}$	absolute limit	$1\ (i^{-1}L^{-3}) = 2.548463 \cdot 10^{110}\ (Pa)$
	Energy-tension density	$\mathbf{u_I} = c\,\hbar^{-3}$	absolute limit	$1\ (i^{-1}L^{-3}) = 2.548463 \cdot 10^{110}\ (J\ m^{-3})$

Intervalic dimens.	*Physical quantity*	*Definition*	*Geometrical rank*	*Equivalence: SIU magnit. (unit) = SI magnit. (unit)*
$i^{1/2}L^{1/2}$	Magnetic charge	$\boldsymbol{\theta}_\mathbf{I} = \surd\text{-}(c\hbar)$	subatomic limit	$1\ (i^{1/2}L^{1/2}) = 1.778965 \cdot 10^{-13}$ (Wb)
	Magnetic flux	$\boldsymbol{\Phi}_\mathbf{I} = \surd\text{-}(c\hbar)$	subatomic limit	$1\ (i^{1/2}L^{1/2}) = 1.778965 \cdot 10^{-13}$ (Wb)
$i^{-1/2}L^{1/2}$	Electric charge	$\mathbf{q}_\mathbf{I} = \surd\text{-}(c^{-1}\hbar)$	quantum	$1\ (i^{-1/2}L^{1/2}) = 5.933989 \cdot 10^{-22}$ (C)
$i^{1/2}L^{-1/2}$	Current	$\mathbf{I}_\mathbf{I} = \surd\text{-}(c\hbar^{-1})$	absolute limit	$1\ (i^{1/2}L^{-1/2}) = 1.685207 \cdot 10^{21}$ (A)
	Electric potential	$\mathbf{V}_\mathbf{I} = \surd\text{-}(c\hbar^{-1})$	absolute limit	$1\ (i^{1/2}L^{-1/2}) = 1.685207 \cdot 10^{21}$ (V)
	Magnetic vector potential	$\mathbf{A}_\mathbf{I} = \surd\text{-}(c\hbar^{-1})$	absolute limit	$1\ (i^{1/2}L^{-1/2}) = 1.685207 \cdot 10^{21}$ (Wb m^{-1})
$i^{-1/2}L^{-1/2}$	Magnetic inverflux	$\boldsymbol{\Phi}^{-1}{}_\mathbf{I} = \surd\text{-}(c^{-1}\,\hbar^{-1})$	subatomic limit	$1\ (i^{-1/2}L^{-1/2}) = 5.621246 \cdot 10^{12}$ (Wb^{-1})
$i^{1/2}L^{3/2}$	Bohr magneton ph. qty.	$\boldsymbol{\mu}_\mathbf{BI} = \surd\text{-}(c\hbar^{3})$	quantum	$1\ (i^{1/2}L^{3/2}) = 1.877940 \cdot 10^{-47}$ (J T^{-1})
$i^{-1/2}L^{3/2}$	?	$\surd\text{-}(c^{-1}\hbar^{3})$	-	$1\ (i^{-1/2}L^{3/2}) = 6.264133 \cdot 10^{-56}$ (T^{-1})
$i^{1/2}L^{-3/2}$	Electric field strength	$\boldsymbol{\epsilon}_\mathbf{I} = \surd\text{-}(c\hbar^{-3})$	absolute limit	$1\ (i^{1/2}L^{-3/2}) = 1.596390 \cdot 10^{55}$ (V m^{-1})
	Magnetic field strength	$\mathbf{H}_\mathbf{I} = \surd\text{-}(c\hbar^{-3})$	absolute limit	$1\ (i^{1/2}L^{-3/2}) = 1.596390 \cdot 10^{55}$ (A m^{-1})
	Magnetic flux density	$\mathbf{B}_\mathbf{I} = \surd\text{-}(c\hbar^{-3})$	absolute limit	$1\ (i^{1/2}L^{-3/2}) = 1.596390 \cdot 10^{55}$ (T)
$i^{-1/2}L^{-3/2}$	Electric polarisation	$\mathbf{P}_\mathbf{I} = \surd\text{-}(c^{-1}\hbar^{-3})$	absolute limit	$1\ (i^{-1/2}L^{-3/2}) = 5.324984 \cdot 10^{46}$ (C m^{-2})
$i^{1/2}L^{5/2}$	?	$\surd\text{-}(c\hbar^{5})$	-	$1\ (i^{1/2}L^{5/2}) = 5.858725 \cdot 10^{-39}$ ( )
$i^{-1/2}L^{5/2}$	?	$\surd\text{-}(c^{-1}\hbar^{5})$	-	$1\ (i^{-1/2}L^{5/2}) = 1.954260 \cdot 10^{-47}$ (C^{-1} m^{3})
$i^{1/2}L^{-5/2}$	Charge density	$\boldsymbol{\rho}_\mathbf{I} = \surd\text{-}(c\hbar^{-5})$	absolute limit	$1\ (i^{1/2}L^{-5/2}) = 5.117026 \cdot 10^{46}$ (C m^{-3})
	Current density	$\mathbf{J}_\mathbf{I} = \surd\text{-}(c\hbar^{-5})$	absolute limit	$1\ (i^{1/2}L^{-5/2}) = 5.117026 \cdot 10^{46}$ (A m^{-2})
$i^{-1/2}L^{-5/2}$	?	$\surd\text{-}(c^{-1}\hbar^{-5})$	-	$1\ (i^{-1/2}L^{-5/2}) = 1.706856 \cdot 10^{38}$ ( )

Main differences between the INTERVALIC SYSTEM of PHYSICAL QUANTITIES and all other systems of units and dimensions

- The Intervalic System is the unique dimensional system whose **dimensional basis —(L, *i*)—** is just composed by the single intervalic dimensions of the **last fundamental constants of Nature, ħ and c**: dim ħ = (L), dim c (i^{-1}). Of course, the system has two formulations: dim c = (i^{-1}) or dim c = (i), which are absolutely equivalent.
- Existing physical quantities are *generated* by all algebraic combinations between the two dimensional basis —L and *i*— which makes a *finite* and *ordered* set of **40 physical quantities**. The *number of physical quantities* is given by the formula: 4 + 12*n*, being *n* the number of actual dimensions of space.
- There are no physical quantities whose equation of dimensions have more than the *actual dimensions* of space (3) and time (1), as in other systems, which is absolutely a nonsense or, at least, an inconsistency.
- There are neither different physical quantities with the same equation of dimensions (as in traditional units), nor different dimensions with the same physical quantity (as in the misleading called "geometrized" units, which is the poorest system of units ever made, not even being consistent).
- The intervalic dimensions of all physical quantities can *operate algebraically* with the signs of its corresponding magnitudes in any equation.
- The own definition of all existing physical quantities as an algebraic combination of c (i^{-1}) and ħ (L) yields unavoidably a *geometric height* for every physical quantity, making the full set of INTERVALIC QUANTA and INTERVALIC LIMITS, which form not only the Intervalic Units, but above all, the foundations of the **underlying fundamental geometry of Nature**, from which are derived the genuine **intervalic symmetries of Nature**, long time searched by Physics.
- Therefore, every physical quantity can not acquire any value, as each of them is *geometrically* closed by its corresponding height: an intervalic quanta or limit, which is another great difference between the intervalic system of units and the remaining systems, which like to play with infinites and singularities.
- Being the intervalic dimensions the truthful units of Nature, the intervalic physical quantities have got an *epistemological rank* by means

of their equations of dimensions have got an *heuristic value*, which is lacked in other systems. The most important example is the merging of two traditional physical quantities into a new one because their intervalic dimensions are identical. That is the case of: velenergy (velocity-energy), frequorce (frequency-force) and poweration (power-acceleration)-gravitational field strength. The merged physical quantities means that they are really the same underlying physical quantity, although in phenomenology there may appear as different in incomplete or false dimensional systems. All this allow to unify intervalic dimensions, physical quantities and units in a unique concept, if desired.

- When applying basic geometry to the intervalic dimensions inside the Argand-like Intervalic Dimensional Space, a full set of invariant **Intervalic Transformations** of physical quantities is *geometrically* derived. The Intervalic Transformations comprise the former Lorentz-Einstein transformations of Special Relativity, which stays as a specific case inside a much wider geometry.
- Contrarily to supposed, the Intervalic System of Dimensions is the unique system which is **not equivalent** to all the remaining dimensional systems of units (which are, from now on, irrelevant in Physics research).
- All results yielded in the Intervalic Theory of Particle Physics are *geometric statements* logical and unavoidably deduced from the *intervalic quanta and limits* of the **Intervalic System of Units** *without using any mathematical formalism.*
- The Intervalic Theory is the unique Physics theory ever postulated which has *no one arbitrary constant.*
- Inasmuch as c and ħ are universal constants, the *intervalic quanta and limits* are reliable physical quantities of *universal validity*. The Intervalic System of Units is not an arbitrary one but the genuine **system of units of Nature**. It must be noted that the *intervalic symmetries of Nature* can not be deduced by means of any other dimensional system, but only from the intervalic one. Thus its knowledge might be viewed as a clue of the scientific degree of development of a civilization, and so it is also apparent that the Intervalic Units are the unique which could be shared with hypothetical advanced extraterrestrial intelligences.
- Any value expressed in *intervalic units* can be interpreted as a *dimensionless interval or ratio* and Physics really becomes truthful Geometry. Hence the name of the Intervalic Theory.

Chapter 4

INTERVALIC GEOMETRY OF THE SPEED OF LIGHT

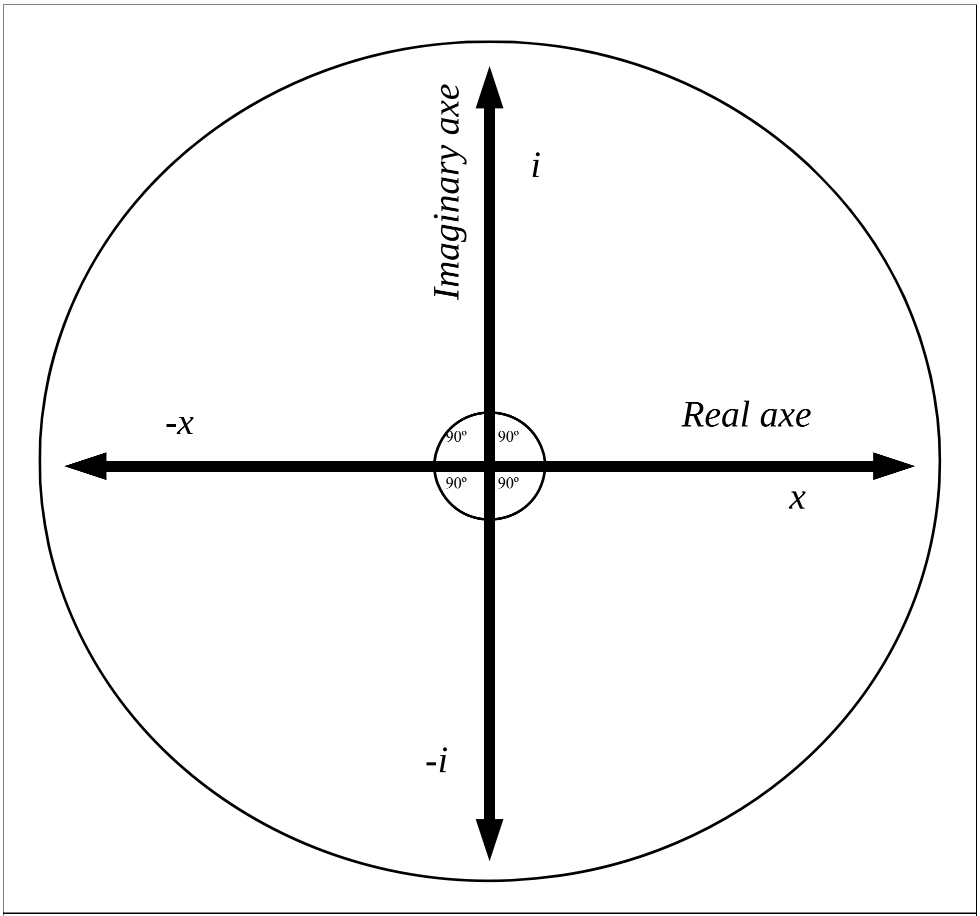
GEOMETRICAL PROPERTIES OF THE SPEED OF LIGHT IN THE INTERVALIC SPACE

As we know, the speed of light or *intervalic velenergy*, $\mathbf{v}_\mathbf{I}$ = c (i^{-1}), is one of the two fundamental constants of nature, being the other one the *intervalic length*, $\mathbf{l}_\mathbf{I}$ = ħ (L) —the former Planck constant—. The first geometrical constant is *the intervalic limit* and the second one the *intervalic quantum* of the Intervalic Space.

The speed of light establishes the ratio of conversion between *real* and *imaginary* dimensions —and therefore, between physical quantities— in the Intervalic Dimensional Space (for now on 'Intervalic Space' for short). Hence, the speed of light determines a systematic set of *geometrical relations* among physical quantities.

These geometrical properties are due to the extraordinary fact that the intervalic dimension of the speed of light is precisely the *i* number, that is to say, c (i^{-1}) —or c^{-1} (i)—. Unlike traditional dimensions, the intervalic dimensions are *algebraically consistent* within themselves as well as with the magnitudes of physical quantities. This remarkable fact involves that we can make use of the well known Argand space to represent the axes of the real and the imaginary intervalic dimensions in that frame of reference, which we will name the *Intervalic Space*. However, in the Argand space it is only meaningful the real axe, being meaningless the imaginary axe, which only serves for projecting their measurements on the real axe. On the contrary, in the Intervalic Space both real and imaginary axes are always totally meaningful. Really, it is hard to believe that after having used the Argand space the discovery of the Intervalic Space has not been postulated till our days. But this way is the tortuous way of the human progress in Physics.

To say it in other manner. The great difference between the Intervalic Space and the traditional frames of reference of Physics is that the frames of reference in the Intervalic Space have an additional meaning because they are *dimensionally* coherent, whilst the traditional ones are not. It is like to have got two frames of reference in one: the measurement system plus the dimensional system. The axes of the Intervalic Space are dimensionally alive and have new *dimensional* geometric relations between them. In traditional or modern Physics this can never be possible because the *dimensions* of the physical quantities do no have *geometric relations* between themselves. For example, we can represent space and time as usually, in two orthogonal axes,

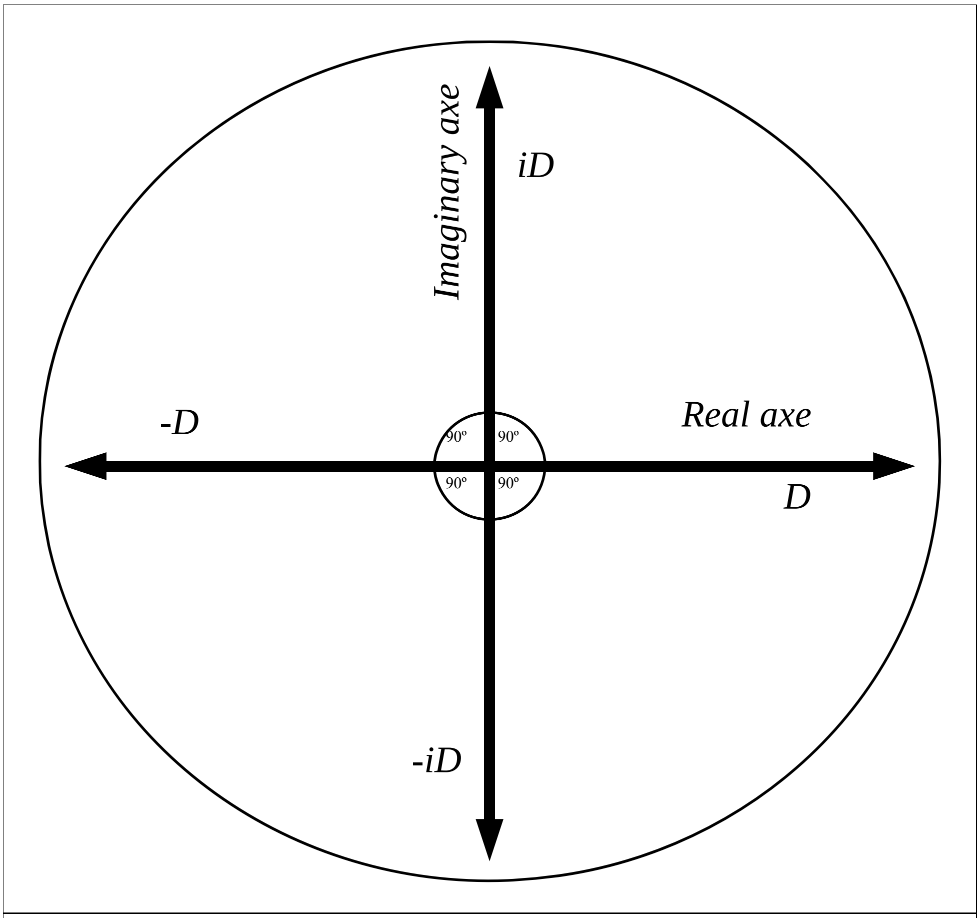


THE ARGAND SPACE
It is dimensionally consistent only if the dimension
of the physical quantity of the real axe is dimensionless (1).

but there is no geometric relations of any kind between their *dimensions* of space and time. On the contrary, space and time in the Intervalic Space are geometrically related by their intervalic dimensions, which are respectively (L) and (*i*L).

Actually, we can operate algebraically with the dimensions of the physical quantities in any equation. This is a totally new field of *dimensional algebra* of the physical quantities which is absolutely unthinkable in modern Physics. It may be viewed as a strange fact of the destiny that modern Physics has reached to uncover some hidden relations of Nature but has not found one of the most important and simple of it, those ones of the own dimensional system. The irony is that the so called “geometrized” units claims to be geometric but they have not seen the inner and fundamental geometry of the own physical dimensions.

We usually take the dimension (*i*) as a rotation of +90º in the Intervalic Space and its inverse (-*i)* as a rotation of -90º. Obviously, their magnitudes are respectively: c^{-1} (i) and c (i^{-1}). Therefore we will call the speed of light as



THE INTERVALIC SPACE
Their axes are always dimensionally consistent.
(D) represents the intervalic dimension of any physical quantity.

the geometrical *transformer* in the Intervalic Space. The rising of the *i* number to the successive integers powers produce other intervalic transformers: c^{-2} (-1) and c^2 (-1), which rotates respectively +180º and -180º; c^{-3} (i^{-1}) and c^3 (i), which rotates respectively +270º and -270º; and finally c^{-4} (1) and c^4 (1), which rotates respectively +360º and -360º.

As can be easily understood, the four last transformers are redundant because they are equivalent respectively to -90º, +90º, -0º and +0º; besides, the rotation by c^{-2} (-1) or by c^2 (-1) makes the same geometrical final result.

These groups of rotations are governed by the curious mathematical properties of the *i* number, which still appear more strange, in a classical Physics context, when applying to physical quantities. Nevertheless, we don't know any phenomena which breaks the invariance of the geometrical rotations, and therefore the Intervalic Space must conserve such invariance. Moreover, as we will see suitably, invariance of physical quantities and physical equations can be interpreted as a simple consequence derived and due to the geometrical properties inside the Intervalic Space. Geometric relations are invariant in themselves. Hence, the laws of Physics must be geometrically invariant under rotations by +360º —c^{-4} (1)— or by -360º —c^4 (1)—. Of course, this only can be valid in a *singular* system of units, that is to say, a system where the magnitude of c is set to 1. The singular system of units in intervalic dimensions is named the Intervalic System of Units, which we have also described in other site.

Now, lets take any physical quantity, 'x', with intervalic dimension (D). Its rotations in the Intervalic Space are the following:

-0º: x (D)
-90º: cx (i^{-1}D)
-180º: c^2x (-D) ≈ +180º: c^{-2}x (-D)
-270º: c^3x (iD) ≈ +90º: c^{-1}x (iD)
-360º: c^4x (D) ≈ +0º: x (D)

+0º: x (D)
+90º: c^{-1}x (iD)
+180º: c^{-2}x (-D) ≈ -180º: c^2x (-D)
+270º: c^{-3}x (i^{-1}D) ≈ -90º: cx (i^{-1}D)
+360º: c^{-4}x (D) ≈ -0º: x (D)

The physical quantity 'x' is therefore called a *generator* in the Intervalic Space. It is very important to notice that all existing physical quantities known up to date (plus five more ones unknown yet) are logically generated by a unique generator in the Intervalic Space: the *intervalic length*, ħ —the former Planck constant—. The solely properties of the *dimensional product*

THE GROUP OF GEOMETRICAL *TRANSFORMERS* IN THE INTERVALIC SPACE

System of Units	*Name*	*Rotation*	*Magnitude*	*Intervalic dimension*
Intervalic system of units and *singular* systems of units (c = 1)	Direct Ortizator	+90º	c^{-1}	i
	Inverse Ortizator	-90º	c^{1}	i^{-1}
	Antizator	±180º	$c^{\pm2}$	$i^{\pm2} = -1$
	Direct Pseudortizator	+270º = -90º	c^{-3}	$i^{3} = i^{-1}$
	Inverse Pseudortizator	-270º = +90º	c^{3}	$i^{-3} = i$
	Scalizator	±360º	$c^{\pm4}$	$i^{\pm4} = 1$
Traditional systems of units and *not-singular* systems of units (c ≠ 1)	Direct Ortizator	+90º	c^{-1}	i
	Inverse Ortizator	-90º	c^{1}	i^{-1}
	Direct Antizator	+180º	c^{-2}	$i^{2} = -1$
	Inverse Antizator	-180º	c^{2}	$i^{-2} = -1$
	Direct Pseudortizator	+270º = -90º	c^{-3}	$i^{3} = i^{-1}$
	Inverse Pseudortizator	-270º = +90º	c^{3}	$i^{-3} = i$
	Direct Scalizator	+360º	c^{-4}	$i^{4} = 1$
	Inverse Scalizator	-360º	c^{4}	$i^{-4} = 1$

between the intervalic length, ħ and the transformers of the Intervalic Space, $c^{\pm n}$, yields all the *derived physical quantities*. In this way it can be generated by means of simple rotations all the physical quantities existing in the Intervalic Space, which is a remarkable characteristic that shows the logical simplicity and elegance of mediums in the Intervalic Space.

The rotations produced by a generator reveal unavoidably a *geometrical equivalence* between physical quantities. Some of these equivalences were unknown till this moment, and other now acquire a new physical meaning. Many of these equivalences were expressed in Classic Physics as *equations*. It can be said that now these physical equations leave to be so, and acquire the epistemological rank of simple *geometrical statements*. The study of those geometrical equivalences is a fascinating task which conforms a new branch of Physics: the *Intervalic Geometry,* which we can not treat in this book.

When translate those geometrical statements to traditional dimensions, *only a half* of the symmetries are conserved. Moreover, there is no known rule to determine which way of a intervalic rotation will be conserved when passing to traditional dimensions: if clockwise or the contrary. This arbitrariness reinforce our affirmation about the not-basic rank and the epistemological foundationlessness of the traditional system of units. Broken half symmetry showed by physical quantities in traditional dimensions is not a truthful property of Nature but a serious lack of the ancient theory.

GEOMETRICAL EQUIVALENCES AMONG PHYSICAL QUANTITIES IN THE INTERVALIC SPACE

Some *geometrical equivalences* between diverse physical quantities will probably be understand after a look to the following pictures. It is very important to remark that these equivalences are totally *independent* from the traditional Physics equations known up to date. Therefore, we have find an unexpected independent way to *deduce* geometrically some physical relations which has nothing in common in its origin with the traditional physical work. Nevertheless, its validity is absolutely reliable due to the impressive simplicity involved in the intervalic geometry, where there no exists any assumption that has other origin than the most elemental logical postulates.

The problem is that we have a huge amount of information, and perhaps we have too much new physical relations to be processed at once. And don't forget that above we have not written down all the possible rotations of physical quantities in the Intervalic Space. In example, no one of the rotations of electromagnetic physical quantities —those with fraction powers in its intervalic equation of dimensions— have been drawn up. In the following tables we have written the most familiar expressions for the rotations by ±180º, choosing the half symmetry which is experimentally conserved —known or predicted— in traditional units. This provisional facility don't have to make us to forget that the reliable geometrical symmetries are the intervalic ones, but not the traditional ones.

Some of the geometrical equivalences derived from rotations in the Intervalic Space are unknown, and others coincide with already known equations. For the last ones we now have a powerful and independent way to verify its truthfulness. Moreover, a big part of Physics —as a minimum, all Physics equations involving the speed of light, and probably many equations involving the intervalic length (the former Planck's quantum)— has been immediately converted into pure *geometry*, an unexpected achievement which is widely considered as one of the most reliable *advances* which can be realized in Physics, in a similar way as Einstein did partially General Relativity.

Regarding the unknown geometrical equivalences, it is important to notice the systematic work from which they have been born of. Although at first sight some of them might seem wrong, the logical —and systematic— deduction involved have been applied in the same manner in all physical quantities. Therefore, we are compelled to think that what is wrong, if any, shall be any step in our traditional definition and conception of physical quantities (some of them clearly obsolete and inadequate), but not the logical deductions yielded from the intervalic physical quantities. Really, all scientific knowledge is based on the Pythagorean assumption about the reliability of the *number* and its *geometrical* relations. If the Universe is composed by numbers, as Pythagoras said, there is no logical reason to think that a part of Physics verifies that postulate, and other part —such as the dimensional analysis and the dimensional relations among physical quantities— does not do it. In fact, there is hard —and surely wrong— to affirm that physical quantities are composed by numbers but physical dimensions are not, since the concept of 'dimension' is logically *before* the concept of 'magnitude'.

As P.A.M. Dirac said with great *finezza*, equations are ever more intelligent than their authors. In my case, equations are ever much more intelligent than his author. Really, the true work of the physicist is *to interpret* suitably the results yielded trough mathematical processes. And they must try ever to minimize the logical assumptions underlying in physical concepts and equations. Since the logical basis underlying the intervalic dimensions are by far more simple than those shivering ones which are holding the traditional dimensions, I think that physicists have now an exceptionally good opportunity to make a significant advance in the most important —and forgotten— theme of Physics: its foundations.

In order to finish this epigraph we can list some of the physical quantities born from ortizations, that is to say, from a rotation of ±90º in the Intervalic Space:

Time: $T = c^{-1} L$
Antitime: $T_a = c L$
c-velocity: $v_c = c^{-1} v$
c-mass: $m_c = c v^{-1}$
c-momentum: $p_c = c^{-1} p$
Energy: $E = c p$
Wavevector: $\lambda^{-1} = c^{-1} \varphi$
Power: $W = c \varphi$
Antifrequorce: $\varphi_a = c^{-1} \lambda^{-1}$

In the same way, we have the following physical quantities generated by antizations —or rotations of ±180º— in the Intervalic Space:

Antispace: $L_a = c^{\pm 2} L$
Mass: $m = c^{\pm 2} E$
Energy: $E = c^{\pm 2} m$
Antimomentum: $p_a = c^{\pm 2} p$
Antifrequorce: $\varphi_a = c^{\pm 2} \varphi$
Acceleration: $a = c^{\pm 2} \lambda^{-1}$

Here we can’t explain no one of these statements, but only to point out that the logical deduction of the following known formulas as mere geometrical statements yielded from the simplest rotations of physical quantities in the Intervalic Space. Written in traditional units:

Time: $T = c^{-1} L$
Energy: $E = c p$
Wavevector: $\lambda^{-1} = c^{-1} \varphi$
Mass: $m = c^{-2} E$
Energy: $E = c^{2} m$

Among equations unknown to date, the following are interesting at first sight because they join traditional macrocosmic physical magnitudes (W, a) with the microcosmic ones (ν, λ). Besides, the first of them make trivial the photoelectric effect since introduces a relation between power and frequorce:

Power: $W = c \varphi$
Acceleration: $a = c^{\pm 2} \lambda^{-1}$

Among other dimensional symmetries, we have the following between basic physical quantities in the Intervalic Space:

Symmetries of 0º —these ones are indeed *unifications* between physical quantities—
Velocity—Energy (= velenergy)
Invervelocity—Mass
Acceleration—Power (= poweleration)
Frequency—Force (= frequorce)
Momentum—Inertia

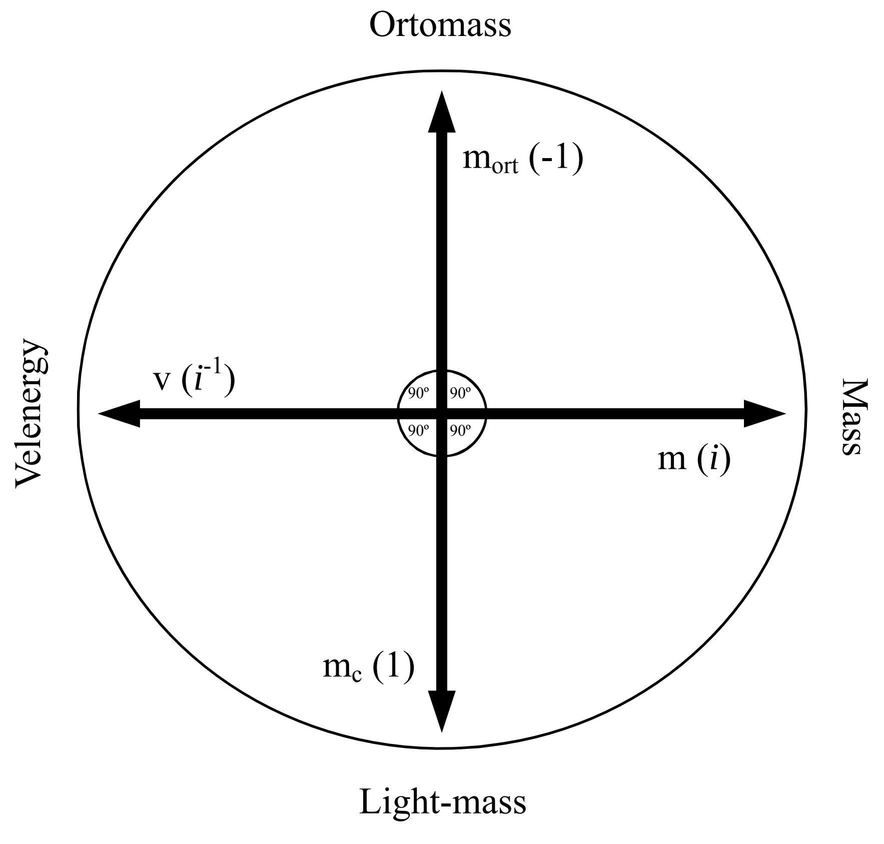
Symmetries of 90º
Space—Time
Velenergy—Momentum
Frequorce—Wavevector
Frequorce—Poweleration
Wavevector—Antifrequorce

Symmetries of 180º
Invervelocity-Mass—Velenergy
Poweleration—Wavevector

For the sake of illustration I give some pictures with the groups of intervalic transformations of some physical quantities, a subject pertaining (as really all this chapter) to the Intervalic Geometry, but not to Particle Physics. There is no place in this book to explain them, so if you do not understand something, feel free to take a quick look at them and skip to the next paragraph where we will describe briefly the basics of the dimensional geometry in the Intervalic Space, a theme of great importance which is linked with all fields of Physics because the whole Special Relativity is completely deduced in an independent way as a limit case of the group of intervalic transformations in the Intervalic Space.

THE GROUP OF INTERVALIC TRANSFORMATIONS OF MASS

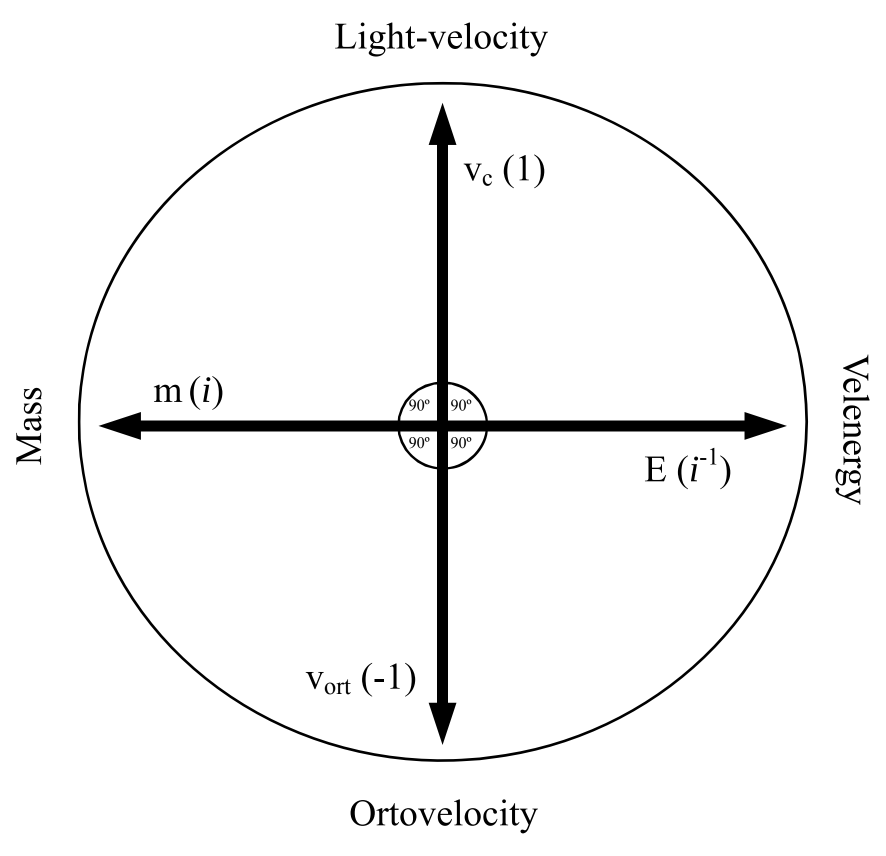
Generator	*Transformer*	*Rotation*	*Value and dimension*	*Derived physical quantity and dimension*	*Geometrical equivalence in intervalic units / traditional units*
Mass m (*i*)	Direct Ortizator	+90º	c^{-1} (*i*)	Ortomass-Direct antizator m_{ort} (-1)	$m_{ort} = c^{-1} v^{-1}$ $Ant_{dir} = c^{-2}$ (for $m = c^{-1}$)
	Inverse Ortizator	-90º	c^{1} (i^{-1})	Light-mass m_c (1)	$m_c = c\ v^{-1}$
	Antizator	±180º	$c^{\pm 2}$ (-1)	Velenergy v (i^{-1})	$E = c^{\pm 2}\ m$ $v = c^{2}\ m$ By definition: v ≡ E $E = c^{2}\ m$



TRANSFORMATIONS OF MASS IN THE INTERVALIC SPACE

THE GROUP OF INTERVALIC TRANSFORMATIONS OF VELENERGY

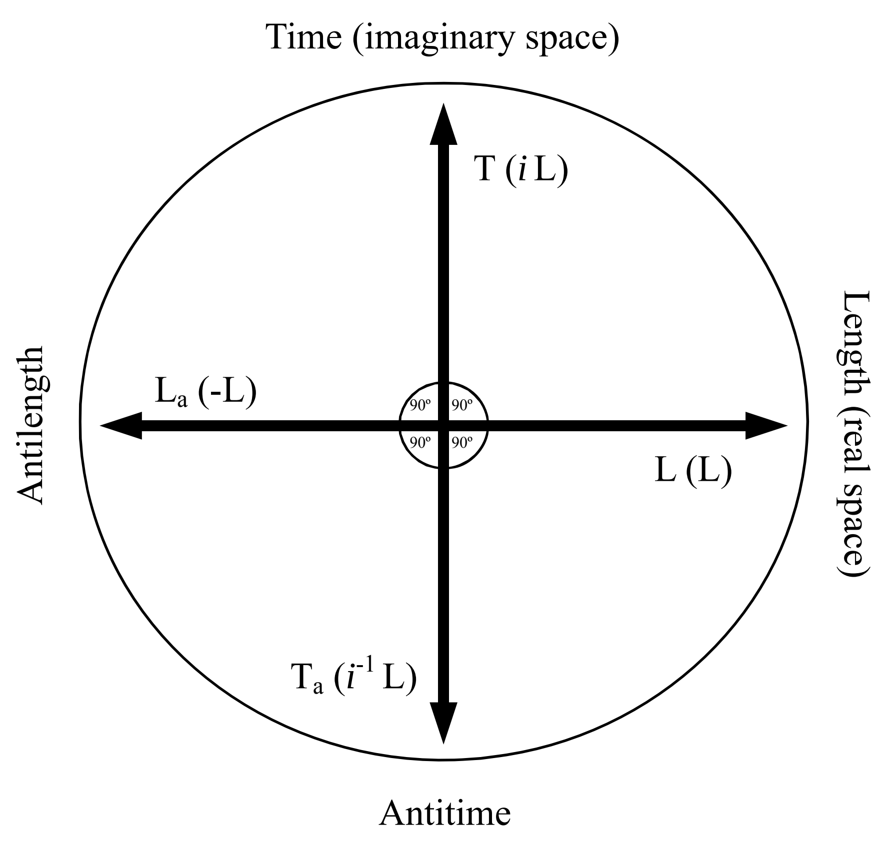
Generator	*Transformer*	*Rotation*	*Value and dimension*	*Derived physical quantity and dimension*	*Geometrical equivalence in intervalic units / traditional units*
Velenergy v (i^{-1}) E (i^{-1})	Direct Ortizator	+90º	c^{-1} (i)	Light-velocity v_c (1)	$v_c = c^{-1}$ v
	Inverse Ortizator	-90º	c^{1} (i^{-1})	Ortovelocity-Inverse antizator v_{ort} (-1)	v_{ort} = c v For: v = c: $Ant_{inv} = c^2$
	Antizator	±180º	$c^{\pm 2}$ (-1)	Mass m (i)	$m = c^{\pm 2}$ E $m = c^{-2}$ v By definition: v ≡ E $m = c^{-2}$ E



TRANSFORMATIONS OF VELENERGY IN THE INTERVALIC SPACE

THE GROUP OF INTERVALIC TRANSFORMATIONS OF LENGTH (REAL SPACE)

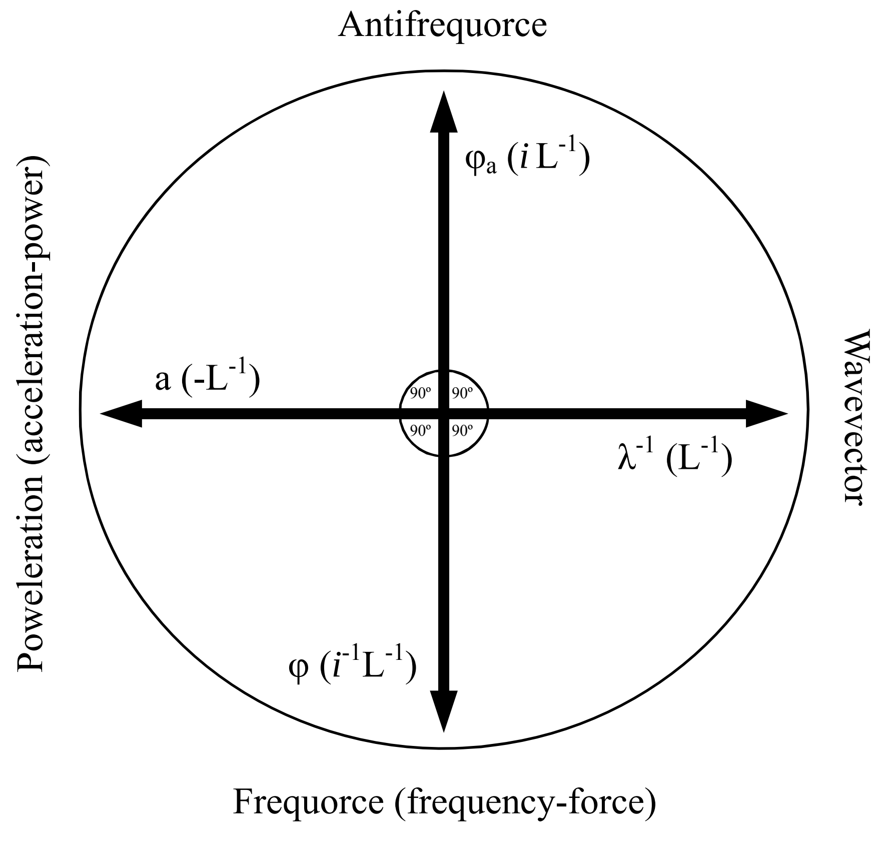
Generator	*Transformer*	*Rotation*	*Value and dimension*	*Derived physical quantity and dimension*	*Geometrical equivalence in intervalic units / traditional units*
Real space L (L)	Direct Ortizator	+90º	c^{-1} (i)	Time T (i L)	$T = c^{-1} L$
	Inverse Ortizator	-90º	c^{1} (i^{-1})	Antitime T_a (i^{-1} L)	$T_a = c L$
	Antizator	±180º	$c^{\pm 2}$ (-1)	Antilength L_a (-L)	$L_a = c^{\pm 2} L$ $L_a = c^2 L$



TRANSFORMATIONS OF LENGTH (REAL SPACE) IN THE INTERVALIC SPACE

THE GROUP OF INTERVALIC TRANSFORMATIONS OF WAVEVECTOR

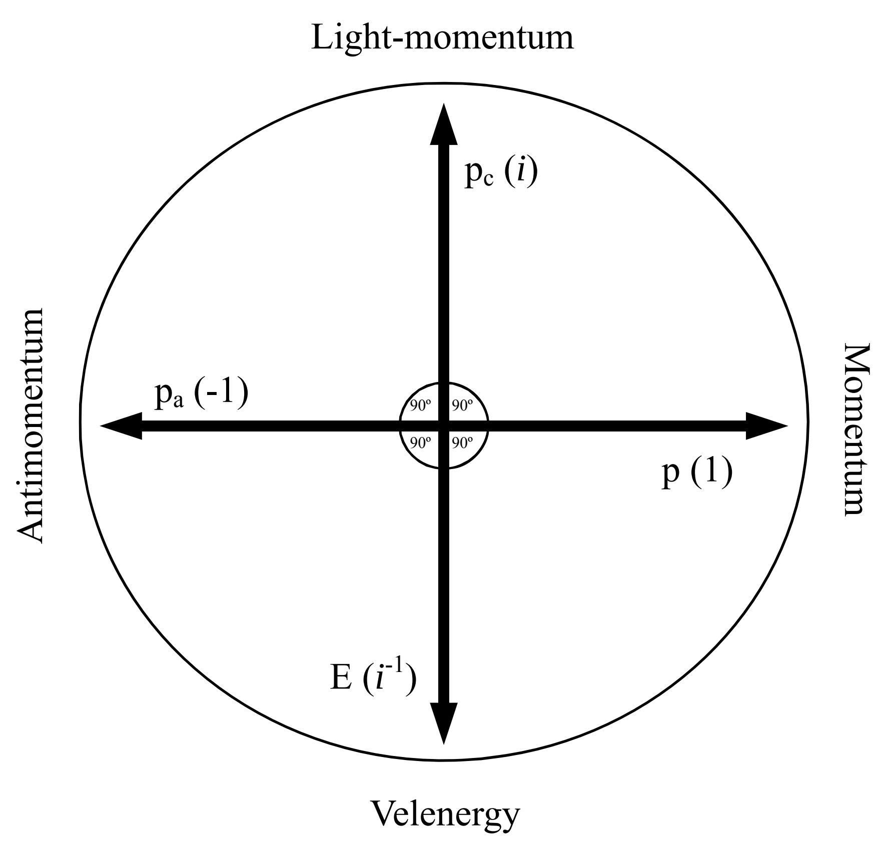
Generator	*Transformer*	*Rotation*	*Value and dimension*	*Derived physical quantity and dimension*	*Geometrical equivalence in intervalic units / traditional units*
Wavevector λ^{-1} (L^{-1})	Direct Ortizator	+90º	c^{-1} (i)	Anti-frequorce φ_a ($i\,L^{-1}$)	$\varphi_a = c^{-1} \lambda^{-1}$
	Inverse Ortizator	-90º	c^{1} (i^{-1})	Frequorce φ ($i^{-1}L^{-1}$)	$\varphi = c\, \lambda^{-1}$
	Antizator	±180º	$c^{\pm 2}$ (-1)	Acceleration-power a-W ($-L^{-1}$)	$a = c^{\pm 2} \lambda^{-1}$
					$a = c^{2} \lambda^{-1}$



TRANSFORMATIONS OF WAVEVECTOR IN THE INTERVALIC SPACE

THE GROUP OF INTERVALIC TRANSFORMATIONS OF MOMENTUM

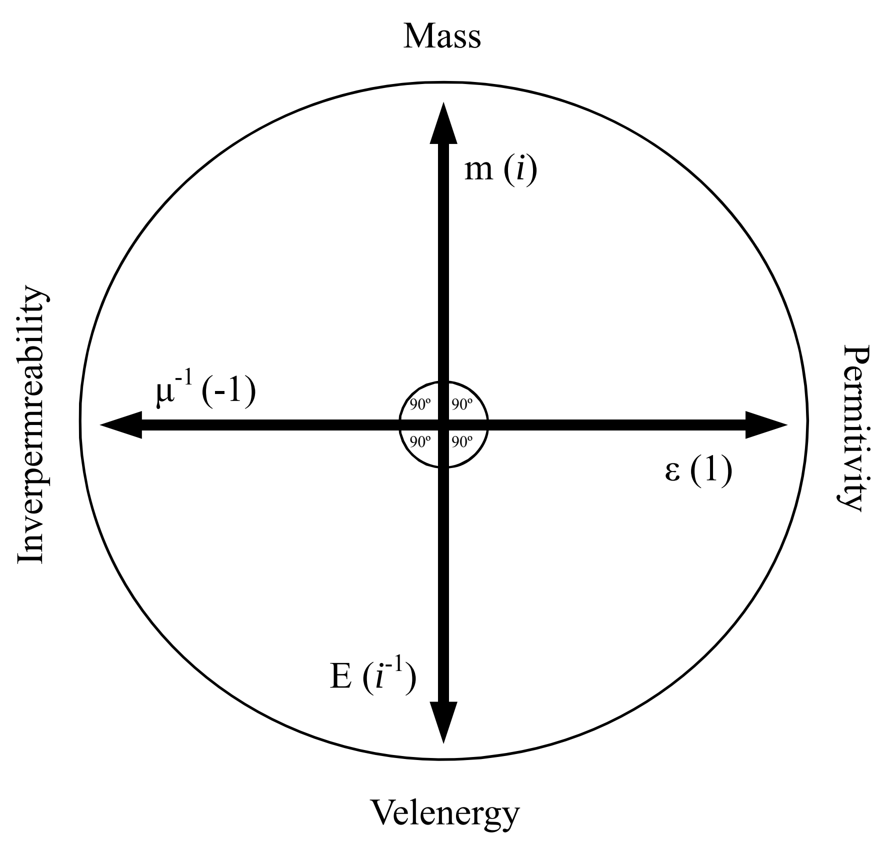
Generator	*Transformer*	*Rotation*	*Value and dimension*	*Derived physical quantity and dimension*	*Geometrical equivalence in intervalic units / traditional units*
Momentum p (1)	Direct Ortizator	+90º	c^{-1} (i)	Light-momentum p_c (i)	$p_c = c^{-1}\, p$
	Inverse Ortizator	-90º	c^{1} (i^{-1})	Velenergy E (i^{-1})	$E = c\, p$
	Antizator	±180º	$c^{\pm 2}$ (-1)	Antimomentum p_a (-1)	$p_a = c^{\pm 2}\, p$ $p_a = c^{-2}\, p$



TRANSFORMATIONS OF MOMENTUM IN THE INTERVALIC SPACE

THE GROUP OF INTERVALIC TRANSFORMATIONS OF PERMITIVITY

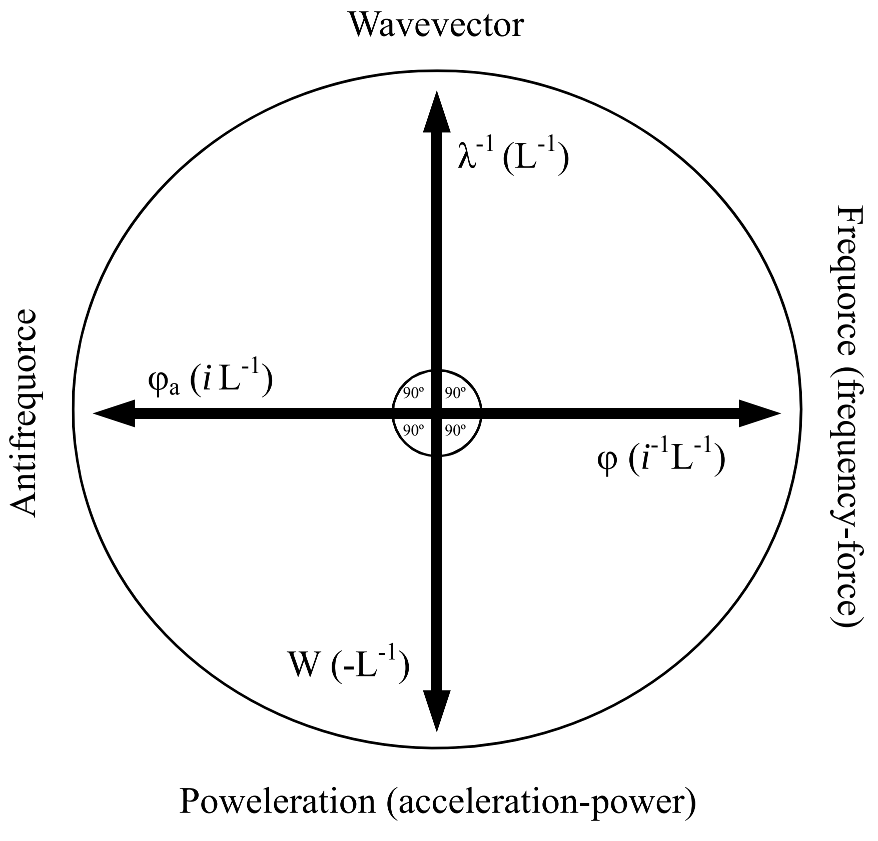
Generator	*Transformer*	*Rotation*	*Value and dimension*	*Derived physical quantity and dimension*	*Geometrical equivalence in intervalic units / traditional units*
Permitivity ε (1)	Direct Ortizator	+90º	c^{-1} (i)	Mass m (i)	$m = c^{-1}\,\varepsilon$
	Inverse Ortizator	-90º	c^{1} (i^{-1})	Velenergy E (i^{-1})	$E = c\,\varepsilon$
	Antizator	±180º	$c^{\pm 2}$ (-1)	Inver-permeability μ^{-1} (-1)	$\mu^{-1} = c^{\pm 2}\,\varepsilon$ $\mu^{-1} = c^{2}\,\varepsilon$



TRANSFORMATIONS OF PERMITIVITY IN THE INTERVALIC SPACE

THE GROUP OF INTERVALIC TRANSFORMATIONS OF FREQUORCE (FREQUENCY-FORCE)

Generator	*Transformer*	*Rotation*	*Value and dimension*	*Derived physical quantity and dimension*	*Geometrical equivalence in intervalic units / traditional units*
Frequorce φ ($T^{-1} = i^{-1}L^{-1}$)	Direct Ortizator	+90º	c^{-1} (i)	Wavevector λ^{-1} (L^{-1})	$\lambda^{-1} = c^{-1}\ \varphi$
	Inverse Ortizator	-90º	c^{1} (i^{-1})	Acceleration-power a-W ($-L^{-1}$)	$W = c\ \varphi$
	Antizator	±180º	$c^{\pm 2}$ (-1)	Anti-frequorce φ_a ($i\,L^{-1}$)	$\varphi_a = c^{\pm 2}\ \varphi$ $\varphi_a = c^{-2}\ \varphi$



TRANSFORMATIONS OF FREQUORCE (FREQUENCY-FORCE) IN THE INTERVALIC SPACE

THE GEOMETRY OF SPACE-TIME IN THE INTERVALIC SPACE

> Henceforth space by itself, and time by itself, are doomed to fade away into mere shadows, and only a kind of union of the two will preserve an independent reality.
>
> HERMANN MINKOWSKI
> *Space and Time* (1908)

All physical quantities exist in precise dimensional geometrical relations to other physical quantities in the Intervalic Space. This dimensional geometry affects not only to the pure equation of dimensions of the involved physical quantities, but to the whole relation comprising the magnitudes of the measurement and its intervalic dimensions insofar as the dimensions of the physical quantities operate algebraically along with the magnitudes. This is unthinkable in traditional and modern Physics where the dimensions pertain to an abstract, closed and endogamy realm, isolated from any kind of measurement, which never merges with any magnitude under no one circumstance. But in IT the situation of the physical quantities is very different: they "live" in the geometry of the Intervalic Space. They live in dimensional relation with other physical quantities, governed by the geometry of the speed of light. We already have seen some sites where they dwell: the dimensional frames of reference of the intervalic transformation of physical quantities described hereinbefore. For example, in the case of real space, it is always in geometric relation with time (90º), antilength (180º) or antitime (270º). Disregarding virtual states, we will also find the physical bodies existing in the quadrant delimited by real space (L) and imaginary space (*i*L), shadowed in the picture. Thus, any body may be measured with respect of space and time (space-time). The astonishing fact is that in this dimensional frame of reference it can be applied all statements of traditional Geometry. For example, we can determine the position of any body applying the usual tools of the theorem of Pythagoras operating algebraically with the involved intervalic dimensions. Moreover, the geometric results obtained in this way are *invariant* because they are derived from geometric statements —abstract statements— which do not rely on any physical frame of reference. Clearly any magnitude derived mathematically through the Pythagoras' theorem is, *a fortiori*, invariant because Geometry is an abstract science. Thus we do not have to make any probe to know whether any magnitude is or not invariant in the Intervalic Space: all of them are invariant insofar as all of them are purely geometric statements inside the Intervalic Space.

Being x_1, x_4 and s any dimensionless magnitudes in abscissas, ordinates and hypotenuse, we have:

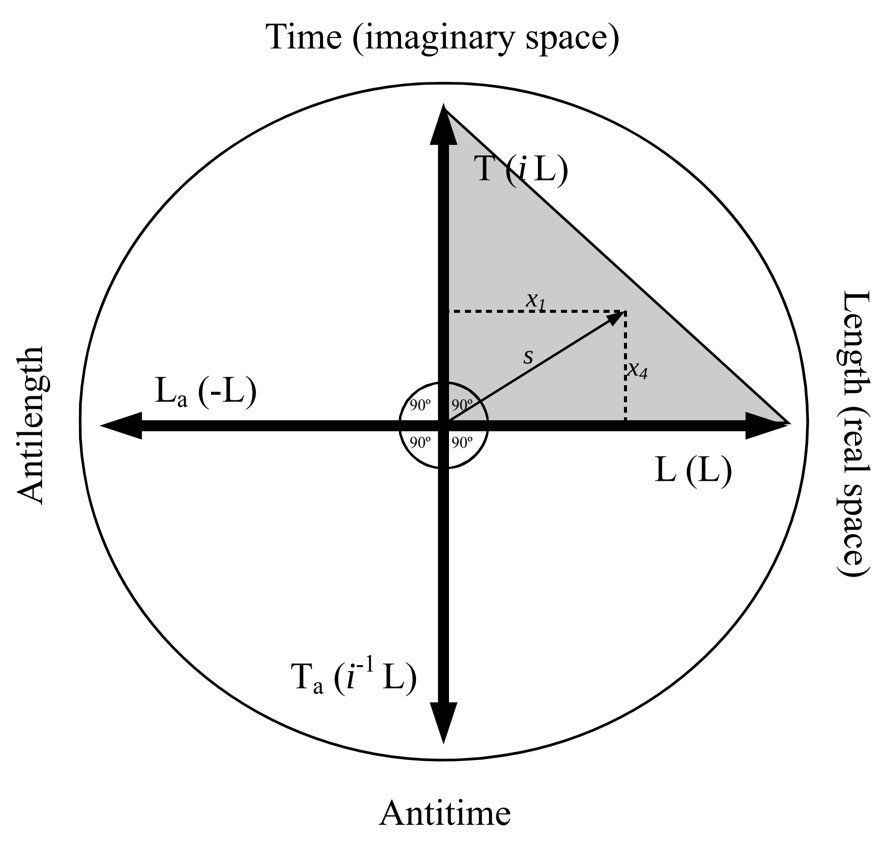
$$[x_1\,(\mathrm{L})]^2 + [x_4\,(i\mathrm{L})]^2 = [s\,(\mathrm{X})]^2$$

The X is the intervalic dimension of the hypotenuse and represent some dimension composed from (L) and (*i*L). Obviously this is not admissible for traditional Physics where all physical quantities have got a determined dimension, but it is unimaginable to have got a dimension which is not predetermined but determined by an algebraic relation from others, and which by this reason, that dimension can take itself several values.

For more generality we can add the other two real spatial dimensions to the above geometric statement, where x_2 and x_3 are their corresponding magnitudes:

$$[x_1\,(\mathrm{L})]^2 + [x_2\,(\mathrm{L})]^2 + [x_3\,(\mathrm{L})]^2 + [x_4\,(i\mathrm{L})]^2 = [s\,(\mathrm{X})]^2$$

If we repeat the measurement for that body after a differential of time, the magnitudes x_1, x_2, x_3, x_4 and s will now be interpreted as differential inter-



TRANSFORMATIONS OF LENGTH (REAL SPACE) IN THE INTERVALIC SPACE vals. Any physical body must be in that quadrant limited by the axis of real and imaginary spaces, so it will be comprised between the two following geometric limits:

- If $x_1 = x_2 = x_3 = 0$, the body is at rest in real space and moves only along the imaginary space —that is to say, along time—. Real space does not elapse for that event. Therefore its velocity, v, is zero: v = 0. And the dimension of X is time:

$$s\ (X) = x_4\ (iL)$$

- If $x_4 = 0$, the body is at rest in imaginary space and moves only along the real space. Imaginary space —time— does not elapse for that event. Therefore its velocity, v, is infinite: $v = \infty$. And the dimension of X is real space:

$$s\ (X) = \sqrt{}[x_1^2 + x_2^2 + x_3^2]\ (L)$$

Between these two limits cases we have, applying elemental algebra for operating with the intervalic dimensions:

$$[x_1\ (L)]^2 + [x_2\ (L)]^2 + [x_3\ (L)]^2 - [x_4\ (L)]^2 = [s\ (X)]^2$$
$$[x_1^2 + x_2^2 + x_3^2 - x_4^2]\ (L)^2 = s^2\ (X)^2$$
$$s\ (X) = \sqrt{}[x_1^2 + x_2^2 + x_3^2 - x_4^2]\ (L)$$

From here it can be yielded three cases:

- If $x_1^2 + x_2^2 + x_3^2 > x_4^2$, the dimension of X is (L) —that is to say: s (X) = $\sqrt{}x^2$ (L) = x (L)— and the interval s is *spatial*. It means the space distance between two events.

- If $x_1^2 + x_2^2 + x_3^2 < x_4^2$, the dimension of X is (iL) —that is to say: s (X) = $\sqrt{}$-x^2 (L) = $i\ x$ (L) = x (iL)— and the interval s is *temporal*. It means the time distance between two events.

- If $x_1^2 + x_2^2 + x_3^2 = x_4^2$, the dimension of X is not defined —that is to say: s (X) = $\sqrt{}0$ (L)— and the interval s is *zero*. It means that the undefined distance between these two events is zero, or in other words, such distance does not exist. It is obvious that it involves necessarily that the velocity of the body is just the speed of light, v = c. This case represent the so named *cone light* of Special Relativity. To be "at rest" in the Intervalic Space means to be moving at the speed of light. Thus the singular result $s = 0$ means strangely that neither space nor time elapse for light —or for the frame of reference of a photon—.

By the way, we can comment a curious detail in relation with the preceding result. If a photon is “at rest” in the Intervalic Space it means that the perception of the arrow of time is merely a limitation of our senses. In the same way as we do not see the complete dimension of the real space of the Universe, but only a diminutive part of it, we only see a diminutive part of the imaginary space. One may wonder about why the first perceptual limitation does not trouble our mind, but the second one certainly does. We do not say that real space is *unfolding* because we do not see it in its full size. Analogously we should not say that imaginary space —time— is unfolding because we can not see it in full. Both real and imaginary space are at once completely unfolded. There are only our perceptual limitations which impede to realize that fact in an oscillating Universe. In this way the speed of light would be better interpreted and measured as *energy* instead of *velocity*, just as Lancelot L. Whyte advised cleverly in his ***Critique of Physics***. Please remember that in the Intervalic Space energy and velocity have just the same underlying dimension: *velenergy,* what is meaningful due to the epistemological rank of the intervalic dimensions. Nevertheless you do not need to realize this detail to understand the intervalic geometry of light.

In our Universe there are only allowed events which occur inside the light cone, which means that there are allowed only *temporal* and *zero* intervals (for events involving *energy*). As we will see later, the existence of time in the Intervalic Space always involves necessarily the existence of energy, and vice versa. Nevertheless, *spatial* intervals are allowed for events which do not involve energy (that is to say, for events involving only *information*).

What we have done here with the intervalic geometry of space-time can be done in a similar way for every one of the physical quantities of the Intervalic Group, and specially with the 16 physical quantities containing integers powers of the *i* number in their equations of dimensions (the two dimensionless ones —(1) and (-1)— are generated by the powers of the *i* number). Thus we will obtain the intervalic geometry of, for example, frequorce-poweleration, etc. although the case of space-time is perhaps one of the most interesting ones due to its remarkable simplicity.

THE MINKOWSKI ANTECEDENT

After viewing this geometry it is obvious that the tetradimensional reformulation of Special Relativity by Minkowski in only a particular case of the intervalic geometry of physical quantities. The famous idea of Minkowski of substituting *by hand* the temporal variable by the expression *ict*, involves clearly the intervalic dimension for time. However, since imaginary dimensions were not allowed in the dimensional basis, Physics has not interpreted correctly this fact, but only as a good tool suitable for a better formulation of General Relativity, which probably had not existed without this reformulation. It is clear that the aim of Minkowski was to express the relation between space and time of Special Relativity in a manner which seems the Euclidian geometry. Then his substitution *ad hoc* of the temporal component by *ict*. Really the own Minkowski said this in his famous *Address* delivered at the 80th Assembly of German Natural Scientist and Physicians, at Cologne, 21 September, 1908:

> We can determine the ratio of units of length and time beforehand in such a way that the natural limit of velocity becomes $c = 1$. If we then introduce, further, $\sqrt{-1}\, t = s$ in place of t, the quadratic differential expression
>
> $$d\tau^2 = - dx^2 - dy^2 - dz^2 - ds^2$$
>
> Thus becomes perfectly symmetrical in x, y, z, s; and this symmetry is communicated to any law which does not contradict the world-postulate. Thus the essence of this postulate may be clothed mathematically in a very pregnant manner in the mystic formula
>
> $$3 \cdot 10^5 \text{ km} = \sqrt{-1} \text{ sec.}$$

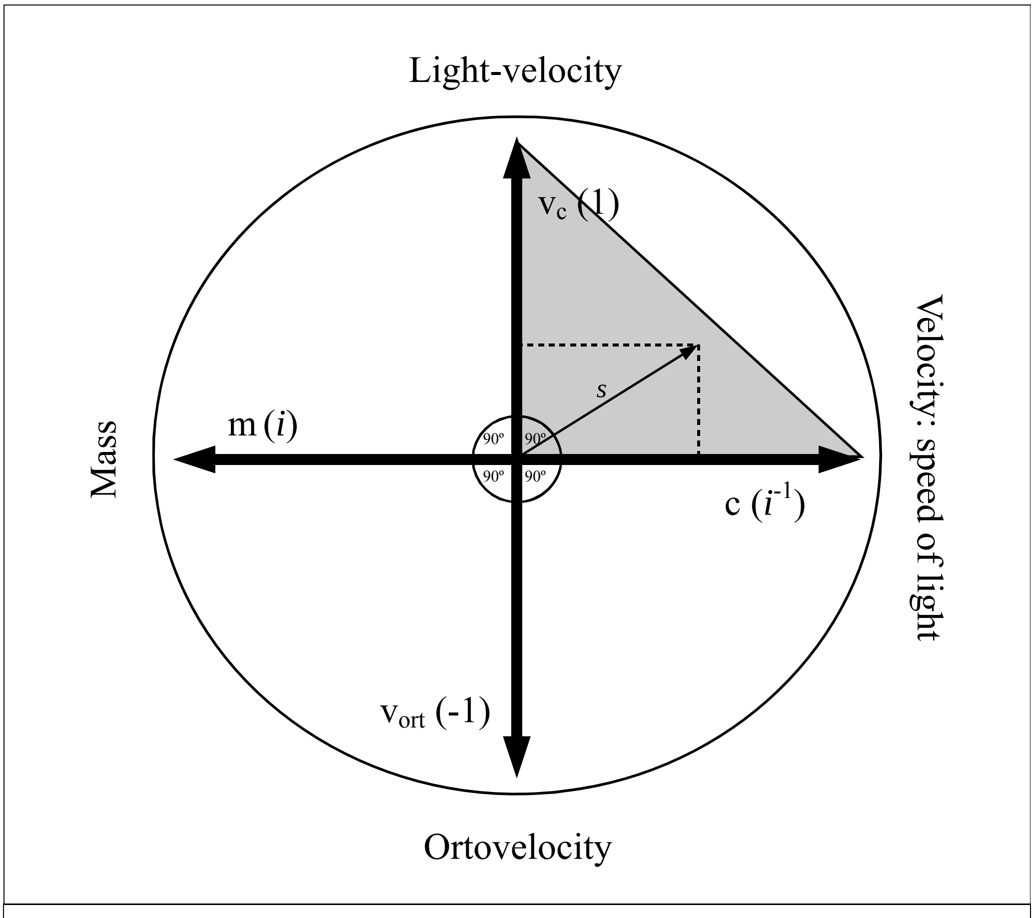
It can be said louder but not clearer: c = *i*. Please remember that the intervalic system of dimensions has two identical formulations: one with c (i) and the other with c (i^{-1}), which is what we have used in this book by no special reason. They both are absolutely equivalent. So it could be said that the seed of the intervalic system of dimensions was already planted by Minkowski in 1908, although the panic fear to the imaginary dimensions prevented the logic —and logically unavoidable— development of the germinal idea towards the conformation of a new physical system.

THE GEOMETRY OF VELOCITY IN THE INTERVALIC SPACE

We have seen the basic enouncement of the geometry of space-time in the Intervalic Space. Now let us go the describe the basics of the intervalic geometry of velocity. We already have make a picture with the dimensional transformation of velenergy in the Intervalic Space. The main difference of the intervalic geometry of velocity with respect to that one of space is that the intervalic unit of velocity is a *limit*, c (i^{-1}), whilst the intervalic unit of length is a *quantum*, ħ (L). Therefore we must incorporate such limit which is inherent to the own geometry of the Intervalic Space to any measurement made in the Intervalic space. When dealing with space there was no such problem because it is implicitly understood in the Intervalic Space that no one measurement smaller than the intervalic length, ħ, is allowed (and anyway is out of any possibility of practical measurement). So we have drawn this way in the picture near this lines, and applying straightforwardly the Pythagorean theorem —as if we would making any measurement in this intervalic frame of reference—, we have got the following dimensional relation, where v_c is the *light-velocity*, $v_c = c^{-1}v$, a dimensionless physical quantity which is usually written in relativistic Physics as $v_c = v/c$:

$$s^2 = c^2 + v_c^2$$

The magnitude of s^2 is an *interval*, and it is once more *invariant* as commented, since it states and comes from a geometrical theorem. Obviously the above relation can be extended to the other two remaining axes of the real space and we would have:



TRANSFORMATIONS OF VELOCITY IN THE INTERVALIC SPACE

$s^2 = c^2 + v_{c(x)}{}^2 + v_{c(y)}{}^2 + v_{c(z)}{}^2$

But as without lacking generality we can always choose a frame of reference where $v_{c(y)} = v_{c(z)} = 0$, we can maintain the first simpler formulation:

$s^2 = c^2 + v_c{}^2$, that is to say, $s = \surd(c^2 + v_c{}^2)$

With the only aim to make a formulation whose symbols were similar to those of Special Relativity —which is an insignificant detail without any relevance—, it can be introduced the *intervalic factor xi*, ξ, defined simply as the inverse of the invariant interval, s:

$\xi \equiv 1/s = 1/\surd(c^2 + v_c{}^2)$
$\xi^{-1} \equiv s = \surd(c^2 + v_c{}^2)$

The intervalic dimension of ξ is obviously $1/\surd(-1) = (i^{-1})$.

It must be noted that we have to introduce necessarily intervalic units in this expression in order to preserve its consistency, since both *c* and the *light-velocity* v_c appear inside the formula. Therefore, we are going to substitute c^2 by its corresponding magnitude in intervalic units, 1, and its dimension, (-1):

$\xi \equiv 1/s = 1/\surd[1(-1) + v_c{}^2]$

A before-mentioned property of the intervalic dimensions is that they operate algebraically with its corresponding magnitudes. That is to say, if 'x' is a magnitude and 'D' an intervalic dimension, we have:

$-x\ (D) = x\ (-D)$

Of course, the minus sign of a magnitude can never be interpreted as a value due to incompleteness of the system, as in Quantum Mechanics, but as a minus sign intrinsic value. For example, it is the same to have in the Intervalic Space -7 seconds or 7 antiseconds. Thus, operating algebraically with magnitudes and dimensions in the preceding formulation of the intervalic xi factor, we get the canonical —relativistic-like— expression of ξ (i^{-1}):

$\xi = 1/\surd(-1 + v_c{}^2)$

Since the intervalic dimension of ξ is (i^{-1}), this means that ξ is an *ortizator* in the Intervalic Space, just like c (i^{-1}). And since its expression is a simple theorem that refers to a geometrical relation, it can be used an ortizator instead of c (i^{-1}) to obtain a set of invariant transformations in the Intervalic

Space. Among the most simple of them, we have the rotations the five basic magnitudes: real space (L), imaginary space —that is to say, time— (iL), velenergy (i^{-1}), mass (i) and momentum (1):

- $L \cdot \xi^{-1}$ (i) = T_a ($i^{-1}L$), antitime
- $L \cdot \xi$ (i^{-1}) = T (i L), time
- $T \cdot \xi^{-1}$ (i) = L (L), space
- $T \cdot \xi$ (i^{-1}) = L_a (-L), antispace
- $E \cdot \xi^{-1}$ (i) = p_a (-1), antimomentum
- $E \cdot \xi$ (i^{-1}) = p (1), momentum
- $m \cdot \xi^{-1}$ (i) = p (1), momentum
- $m \cdot \xi$ (i^{-1}) = p_a (-1), antimomentum
- $p \cdot \xi^{-1}$ (i) = E (i^{-1}), velenergy
- $p \cdot \xi$ (i^{-1}) = m (i), mass

Now to get a most suitable expressions we can operate algebraically with the intervalic dimensions. If we multiply dimensionally the odd lines by (i) and the even lines by (i^{-1}), we get the full set of the so named Lorentz-Einstein transformations, which are only the below group of the intervalic invariant transformations with the *dimensionless* factor $\gamma = 1 / \sqrt{(1 - v_c^2)}$ instead of the dimensional one ξ (i^{-1}). The conversion of ξ (i^{-1}) into γ (1) is immediate when multiplying dimensionally by (i):

$$1/\sqrt{(-1 + v_c^2)} \cdot (\sqrt{-1}) = 1 / \sqrt{(1 - v_c^2)}$$
$$\xi\ (i^{-1}) \cdot (i) = \gamma\ (1)$$

Therefore, drawing the mentioned operations in odd and even lines, we get directly the Lorentz-Einstein transformations of Special Relativity as a simple invariant intervalic rotation in the Intervalic Space. It can be noted that which is logical and automatically obtained is, besides, the full basic set of relativistic transformations, that is to say, just the relativistic equations for the longitude, time, mass, energy and momentum, five relativistic physical quantities that coincide exactly with the five basic physical quantities of the Intervalic Space —logically born of the simplest geometrical relations among the intervalic dimensions—:

Longitude

$L_0 \cdot \xi^{-1}$ = antitime, T_a ($i^{-1}L$)

$L_0 \cdot \sqrt{(-1 + v_c^2)} \cdot (i) = (i^{-1}L) \cdot (i) \equiv L$

$L_0 \sqrt{(1 - v_c^2)} = L$

$L_0\, \gamma^{-1} = L$

Longitude
$L \cdot \xi =$ time, T_0 (i L_0)
$L \cdot [1 / \surd(-1 + v_c^2)] \cdot (i^{-1}) = (i\ L_0) \cdot (i^{-1}) \equiv L_0$
$L \cdot 1 / \surd(1 - v_c^2) = L_0$
$L = \surd(1 - v_c^2)\ L_0$
$L = \gamma^{-1}\ L_0$

Time
$T \cdot \xi^{-1} =$ space, L_0 (L)
$T \cdot \surd(-1 + v_c^2) \cdot (i) = L_0 \cdot (i) \equiv T_0$
$T \cdot \surd(1 - v_c^2) = T_0$
$T = T_0 / \surd(1 - v_c^2)$
$T = \gamma\ T_0$

Time
$T_0 \cdot \xi =$ antispace, L_a (-L)
$T_0 \cdot [1 / \surd(-1 + v_c^2)] \cdot (i^{-1}) = L_a \cdot (i^{-1}) = (-L) \cdot (i^{-1}) = i\ L \equiv T$
$T_0 \cdot 1 / \surd(1 - v_c^2) = T$
$T_0 \cdot \gamma = T$

Energy
$E \cdot \xi^{-1} =$ antimomentum, p_a (-1)
$E \cdot \surd(-1 + v_c^2) \cdot (i) = (-1) \cdot (i) = (-i) = (i^{-1}) \equiv E_0$
$E \cdot \surd(1 - v_c^2) = E_0$
$E = E_0 / \surd(-1 + v_c^2)$
$E = \gamma\ E_0$

Energy
$E_0 \cdot \xi =$ momentum, p (1)
$E_0 \cdot [1 / \surd(-1 + v_c^2)] \cdot (i^{-1}) = (1) \cdot (i^{-1}) = (i^{-1}) \equiv E$
$E_0 \cdot 1 / \surd(1 - v_c^2) = E$
$E_0 \cdot \gamma = E$

Mass
$m \cdot \xi^{-1} =$ momentum, p (1)
$m \cdot \surd(-1 + v_c^2) \cdot (i) = (1) \cdot (i) = (i) \equiv m_0$
$m \cdot \surd(1 - v_c^2) = m_0$
$m = m_0 / \surd(-1 + v_c^2)$
$m = \gamma\ m_0$

Mass
$m \cdot \xi =$ antimomentum, p_a (-1)

$m_0 \cdot [1 / \surd(-1 + v_c^2)] \cdot (i^{-1}) = (-1) \cdot (i^{-1}) = -(-i) \equiv m$
$m_0 \cdot 1 / \surd(1 - v_c^2) = m$
$m_0 \cdot \gamma = m$

Momentum
$p \cdot \xi^{-1}$ = velenergy, E (i^{-1})
$p \cdot \surd(-1 + v_c^2) \cdot (i) = (i^{-1}) \cdot (i) = (1) \equiv p_0$
$p \cdot \surd(1 - v_c^2) = p_0$
$p = p_0 / \surd(-1 + v_c^2)$
$p = \gamma\ p_0$

Momentum
$p \cdot \xi$ = mass, m (i)
$p_0 \cdot [1 / \surd(-1 + v_c^2)] \cdot (i^{-1}) = (i) \cdot (i^{-1}) = (1) \equiv p$
$p_0 \cdot 1 / \surd(1 - v_c^2) = p$
$p_0 \cdot \gamma = p$

Thus, the Lorentz-Einstein transformations of Special Relativity are less more than the enouncement of the Pythagoras' theorem in the Intervalic Space regarding velocity. And the famous relation $E = mc^2$ is merely an almost trivial geometric statement: the dimensional rotation of velenergy by 180º in the Intervalic Space: $E = c^{\pm 2}$ m. It must be noted once more that all *geometric relations* in the Intervalic Space are *invariant*. In fact it can't be in other way inasmuch as those geometric relations are mathematical theorems which do not depend on a system of coordinates. Troubles and pseudo problems arise often in modern Physics when using a dimensional system which is simply wrong or incomplete to describe the physical world, but never when using the unique right one which is according with the nature and the underlying geometry of our Universe.

THE GEOMETRY OF TEMPERATURE IN THE INTERVALIC SPACE

As we know, temperature has got the same dimensions than velenergy in intervalic dimensions, (i^{-1}). And Boltzmann constant is dimensionless, (1). If we write the known classical formula for the conversion between temperature and energy, we can substitute the energy value by its corresponding quantum of energy in the Intervalic Space, that is to say, c (i^{-1}), and directly is obtained the intervalic temperature, $\mathbf{\Theta_I}$:

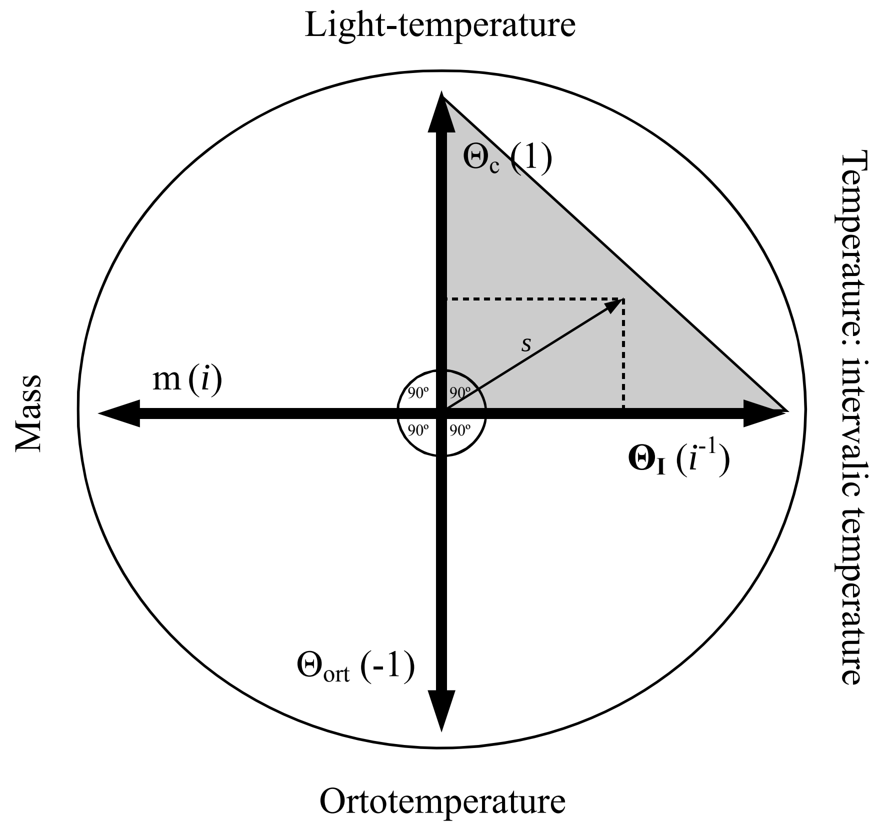
$\mathbf{\Theta_I} = c\ k_B^{-1} = 2.171374 \cdot 10^{31}$ (K)

The meaning of this quantum is similar to the speed of light: it is the maximum temperature allowed in the Universe for any kind of matter or energy, as like as the speed of light is the maximum velocity allowed in a similar way.

For those who feel the deduction of the intervalic temperature too much easy, they can make the following deduction using the intervalic frequorce, $\boldsymbol{\varphi_I} = c\hbar^{-1}$. This frequorce is likewise the highest frequorce allowed in the Universe. Indeed, this is a geometrical quantum limit that can't never be reached, and there are other limits for the gravitational frequorce and also for the electromagnetic frequorce that are both smaller that the intervalic frequorce. These limits are geometrical and meaningfully related.

$$\mathbf{\Theta_I} = E\ /\ k_B = \hbar\ \boldsymbol{\varphi_I}\ /\ k_B = \hbar\ c\ \hbar^{-1}\ /\ k_B = c\ /\ k_B$$

Due to the epistemological rank of the intervalic dimensions, we can assure that if two physical quantities have the same dimensions, they are solely one underlying physical quantity and have also the same physical properties,



TRANSFORMATIONS OF TEMPERATURE IN THE INTERVALIC SPACE although they may have apparently different behaviors at micro and macro-scales of observation. In short, we can predict that the measurement of *heat* bodies in the Intervalic Space —that is to say, its intervalic-relativistic behavior— is similar to the electrodynamics of *moving* bodies. The geometry of the *temperature* in the Intervalic Space will be very similar to the geometry of *velenergy* in the Intervalic Space. In this case, the roles of *velocity* and *speed of light* in the classical formulation are substituted respectively by *temperature* and *intervalic temperature*. In traditional terminology, it could be said that there is a Special Relativity regarding *temperature*, while the classic one would be the Special Relativity regarding *velocity*. The relativistic gamma factor regarding the temperature is:

$$\gamma(\Theta) = 1 / \sqrt{}(1 - \Theta_c^2)$$

where Θ_c is the *light-temperature*, defined as:

$$\Theta_c = \Theta/\boldsymbol{\Theta}_\mathbf{I}$$

Therefore, the corresponding intervalic transformations regarding temperature are, written in the relativistic classic mode:

$$L = L_0\, \gamma^{-1}(\Theta)$$
$$T = \gamma(\Theta)\, T_0$$
$$E = \gamma(\Theta)\, E_0$$
$$m = \gamma(\Theta)\, m_0$$
$$p = \gamma(\Theta)\, p_0$$

Since the intervalic temperature is terribly high, these transformations are hardly measurable in our world. Nevertheless, in the primitive Universe they could have played an important role. For example, if we think that in the beginning of the Universe the temperature of the primordial light egg reached the intervalic temperature, the measurement of the first seconds of the Big Bang would not be seconds, but years. With more precision, at the zero time, with just $\boldsymbol{\Theta}_\mathbf{I}$ temperature, the dilatation of time would be infinite, that is to say, the Universe would be timeless at this point. Of course, this is a fascinating problem of mathematical limits which we can not treat here.

Finally, a crucial experiment could be realized in order to determine a possible falsation or verification of these intervalic transformations regarding temperature. The high precision of the atomic clocks could measure the following dilation of time due to temperature:

$$T = \gamma(\Theta)\, T_0$$

INTERVALIC GEOMETRY OF SPACE

SPACE GEOMETRY IN THE INTERVALIC DIMENSIONAL SPACE

To determine the position of any body we can apply the usual tools of the Theorem of Pythagoras operating algebraically with the involved intervalic dimensions. Moreover, the geometric results obtained in this way will be *invariant* because they are derived from geometric statements which do not rely on the frame of reference.

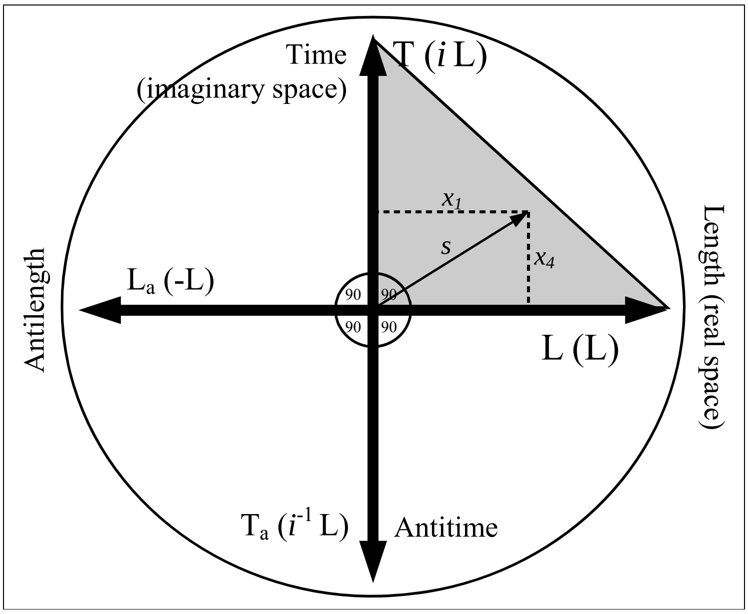
$$[x_1\ (\mathrm{L})]^2 + [x_2\ (\mathrm{L})]^2 + [x_3\ (\mathrm{L})]^2 + [x_4\ (i\mathrm{L})]^2 = [s\ (\mathrm{X})]^2$$

where x_1, x_2, x_3; x_4 and s are any dimensionless magnitudes and (X) some dimension composed from real space (L) and imaginary space (iL).

If we repeat the measurement for that body after a differential of time, the magnitudes x_1, x_2, x_3, x_4 and s will now be interpreted as differential intervals. Any physical body must be in that quadrant limited by the axis of real and imaginary spaces, so it will be comprised between the two following geometric limits:

- If $x_1 = x_2 = x_3 = 0$, the body is at rest in real space and moves only along the imaginary space —that is to say, along time—. Real space does not elapse for that event. Therefore its velocity, v, is zero: v = 0. And the dimension of (X) is time:

$s\ (\mathrm{X}) = x_4\ (i\mathrm{L})$



- If $x_4 = 0$, the body is at rest in imaginary space and moves only along the real space. Imaginary space —time— does not elapse for that event. Therefore its velocity, v, is infinite: v = ∞. And the dimension of (X) is real space:

$s\ (X) = \sqrt{}[x_1^2 + x_2^2 + x_3^2]\ (L)$

Between these two extreme cases we have, operating with intervalic dimensions:

$[x_1^2 + x_2^2 + x_3^2 - x_4^2]\ (L)^2 = s^2\ (X)^2$
$s\ (X) = \sqrt{}[x_1^2 + x_2^2 + x_3^2 - x_4^2]\ (L)$

From here it can be yielded three cases:

- If $x_1^2 + x_2^2 + x_3^2 > x_4^2$, the dimension of (X) is (L) —that is to say: $s\ (X) = \sqrt{x^2}\ (L) = x\ (L)$— and the interval s is *spatial*. It means the space distance between two events.
- If $x_1^2 + x_2^2 + x_3^2 < x_4^2$, the dimension of (X) is (iL) —that is to say: $s\ (X) = \sqrt{-x^2}\ (L) = i\ x\ (L) = x\ (iL)$— and the interval s is *temporal*. It means the time distance between two events.
- If $x_1^2 + x_2^2 + x_3^2 = x_4^2$, the dimension of (X) is not defined —that is to say: $s\ (X) = \sqrt{0}\ (L)$— and the interval s is *zero*. It means that the distance between these two events is zero, or in other words, such distance does not exist. It is obvious that it involves necessarily that the velocity of the body is just the speed of light, v = c. This case represent the so named *cone light* of Special Relativity. To be “at rest” in the Intervalic Space means to be moving at the speed of light. Thus the singular result $s = 0$ means that neither space nor time elapse for light, or for the frame of reference of a photon.

Since a photon is “at rest” in the Intervalic Space it means that the perception of the arrow of time is merely an illusion of our senses. In the same way as we do not see the complete dimension of the real space of the Universe, but only a diminutive part of it, we only see a diminutive part of the imaginary space. One may wonder about why the first perceptual limitation does not trouble our mind, but the second one certainly does. We do not say that real space is *unfolding* because we do not see it in its full size. Analogously we should not say that imaginary space —time— is unfolding because we can not see it in full. Both real and imaginary space are at once completely unfolded. There are only our perceptual limitations —that work immersed inside spacetime— which impede to realize that fact. And not only time but all physical quantities whose intervalic dimension contains some (*i*) factor make the illusion of being time-arrowed.

In our Universe there are only allowed *temporal* and *zero* intervals for events involving *energy*. The existence of time in the Intervalic Space always involves necessarily the existence of energy, and vice versa. Nevertheless, *spatial* intervals are allowed for events which do not involve energy, that is to say, for events involving only physical quantities whose intervalic dimension contains only some (L) factor, such as *information*, *space* or *consciousness*.

Finally, what has been done here for the intervalic geometry of *space*, can be done in a similar way for every one of the 40 physical quantities of the Intervalic Group.

Chapter 5

$I = c^{\pm 2} \hbar Q^{-2}$
INTERVALIC ENERGY
Intervalic Principles of Equivalence between Electric Charge, Energy and Matter

INTERVALIC PRINCIPLE OF EQUIVALENCE BETWEEN MASS AND ENERGY

> It follows from the theory of relativity that mass and energy are both different manifestations of the same thing —a somewhat unfamiliar conception for the average man—. Furthermore, $E = mc^2$, in which energy is put equal to mass multiplied with the square of the velocity of light, showed that a very small account of mass may be converted into a very large amount of energy… the mass and energy in fact were equivalent.
>
> ALBERT EINSTEIN
> *Alice Calaprice, The Expanded Quotable Einstein*

It can be said that there are three kinds of “substances” in the physical world: matter, energy and electric charge. Up to date Physics only knows the equivalence between two of them, matter and energy, through the famous Einstein equation: $E = mc^2$. It remains unknown the equivalence between matter and electric charge and between energy and electric charge. According to Intervalic Theory there are an extraordinary simple *geometrical equivalence* between all of them. Moreover, the equivalence between matter and energy is now defined as a mere *geometrical statement* derived from a rotation in the Intervalic Space. The former Einstein equation acquires a new meaning in intervalic dimensions and it is named inside the Intervalic Theory as the *intervalic principle of equivalence between matter and energy*:

$$E = c^{\pm 2}m$$

As usually, we use intervalic dimensions ($L = L$, $T = iL$, $M = T/L = i$). In traditional dimensions we have that the rotation of mass in the Intervalic Space by -180º —$E = c^2m$— is different to its rotation by +180º —$E = c^{-2}m$—; but this algebraic fact is due only to the partial symmetries of our traditional system of dimensions, and not to a *real* half symmetry showed by dimensions in Nature. In IT the famous Einstein equation is a mere *geometrical statement* about a ±180º rotation of mass in the Intervalic Space, and that formula is written as: $E = c^{\pm 2}m$, since $c^{+2}(-1) \equiv c^{-2}(-1)$ in intervalic units. Please note that the speed of light is ever placed in front of the other physical quantities in all equations because $c^{\pm n}$ is a mere *geometrical transformer* in the Intervalic Space. Showing its intervalic dimensions between brackets:

$$E\ (i^{-1}) = c^{\pm 2}\ (-1)\ m\ (i)$$

On the contrary, in traditional dimensions we have: -180º ≠ +180º. Obviously or not, this is due to the fact that SI or traditional systems are not *singular* systems of units —$c \neq 1$—, and of course, because the dimension of c^2 is different from the dimension of c^{-2} in traditional dimensions, since their physical quantities and dimensions don't have any *geometrical* properties.

When quantizing through substituting in that formula the mass, m, by the intervalic quantum of mass, $\mathbf{m_I} = c^{-1}\ (i)$, we have in the traditional half symmetry:

$$E\ (i^{-1}) = c^2\ (-1)\ \mathbf{m_I}\ (i) = c^2\ (-1)\ c^{-1}\ (i) = c\ (i)$$

which is, by definition, the intervalic quantum of energy: $\mathbf{E_I} = c\ (i)$

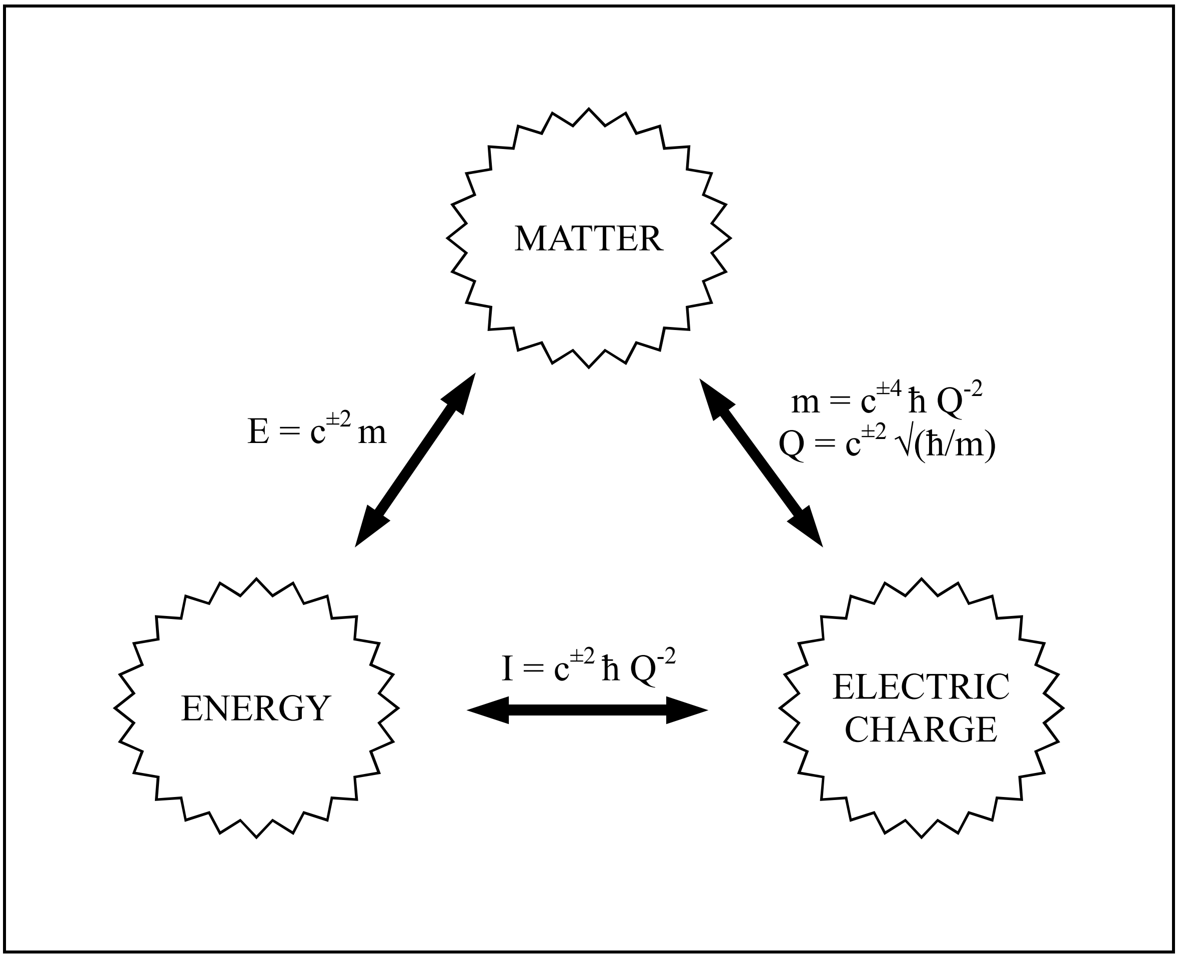
If we take the contrary rotation, which does not exist in traditional dimensions, we will got justly the same result (in a different *cycle* of powers of c —$c^{\pm 4n}\ (1)$—, which is geometrical and dimensionally equivalent):

$$E\ (i^{-1}) = c^{-2}\ (-1)\ \mathbf{m_I}\ (i) = c^{-2}\ (-1)\ c^{-1}\ (i) = c^{-3}\ (i) \approx c\ (i)$$

Thus, in intervalic dimensions we have anyway a *geometrical statement*, which is, *a fortiori*, *invariant*, since it is previously a geometrical property that does not depend on the system of coordinates chosen:

$$E\ (i^{-1}) = c^{\pm 2}\ (-1)\ \mathbf{m_I}\ (i) = c^{\pm 2}\ (-1)\ c^{-1}\ (i) = c\ (i)$$

Deductions made until here are unavoidable and without any possibility of logical choice. Nevertheless, when using intervalic dimensions arise up to three possible new sets of *intervalic symmetries* for the gravitational interaction between mass and energy. Since these three sets are equally *consistent* from a logical point of view we arrive to a crossroads where we have to choose one option and to discard the other two. Although a set of symmetries appears to be much more elegant than the others, the final choice only can be leaded by empirical results. Unfortunately, experimental Physics seems to be not capable to carry out the needed experiments yet.



INTERVALIC PRINCIPLE OF EQUIVALENCE BETWEEN ENERGY AND ELECTRIC CHARGE

Starting from the intervalic dimensional analysis of the electric charge, $Q = i^{-1/2} L^{1/2}$, it is straightforwardly and necessarily deduced a new relations between charge and the other intervalic physical quantities. Actually, we have:

$$Q = i^{-1/2} L^{1/2} = \sqrt{-T}$$
$$Q^2 = -T \equiv T_a$$

When antitime, T_a, is rotated ±180º —$c^{\pm 2}$ (-1)— in the Intervalic Space, we have:

$$Q^2 = c^{\pm 2}\, T$$
$$\varphi = c^{\pm 2}\, Q^{-2}$$

where φ is the frequorce —frequency-force—.

And finally, substituting the terms of the last equation in the intervalic definition of quantum velenergy, being *J* the spin and φ the frequorce: $E = 2\pi J\varphi$ —from which derives the known Einstein's formula, in intervalic dimensions: $E\ (i^{-1}) = h\ (L)\ \nu\ (i^{-1}L^{-1})$—, we directly obtain the desired intervalic geometrical equivalence:

$$I = c^{\pm 2}\, \hbar\, Q^{-2}$$

This is the equation of the *intervalic principle of equivalence between energy and electric charge*, perhaps the most important equation in Physics. Showing its intervalic dimensions:

$$I\ (i^{-1}) = c^{\pm 2}\ (-1)\ \hbar\ (L)\ Q^{-2}\ (iL^{-1})$$

In not-singular units, as the traditional ones, the half symmetry which is conserved is, obviously, the following:

$$I = c^{-2}\, \hbar\, Q^{-2}$$

which is the expression of the same principle written in any system of units with $c \neq 1$.

Now we can know which is, for example, the intervalic energy of the intervalic quantum of electric charge, $\mathbf{q}_\mathbf{I} = \sqrt{-(c^{-1}\hbar)}$:

$$I(\mathbf{q_I}) = c^{\pm 2}\,\hbar\,\mathbf{q_I}^{-2} = c^{\pm 2}\,\hbar\,[\sqrt{-}(c^{-1}\hbar)]^{-2} = c^{-1} = 1\ (i^{-1})$$

The same magnitude in SI units is:

$$I(\mathbf{q_I}) = c^{-2}\,\hbar\,\mathbf{q_I}^{-2} = c^{-1} = 3.3356409 \cdot 10^{-9}\ (J) = 3.7114011 \cdot 10^{-26}\ (kg)$$

Remembering that the elementary charge, *e*, is 270 times the intervalic charge, $\mathbf{q_I}$, the intervalic energy of the elementary charge is, in SIU units:

$$I(e) = c^{\pm 2}\,\hbar\,e^{-2} = c^{\pm 2}\,\hbar\,(270\ \mathbf{q_I})^{-2} = c^{\pm 2}\,\hbar\,[270\ \sqrt{(c^{-1}\hbar)}]^{-2} = 270^{-2}\ c^{-1}\ (i^{-1})$$

In traditional SI units this magnitude is:

$$I(e) = c^{-2}\,\hbar\,e^{-2} = 270^{-2}\ c^{-1} = 4.5756390 \cdot 10^{-14}\ (J) = 5.0910850 \cdot 10^{-31}\ (kg)$$

INTERVALIC PRINCIPLE OF EQUIVALENCE BETWEEN MATTER AND ELECTRIC CHARGE

Combining this principle with the equation of the intervalic geometrical equivalence between matter and energy, $E(i^{-1}) = c^{\pm 2}(-1)\ m(i)$, we obtain immediately the intervalic principle of equivalence between matter and electric charge:

$$m = c^{\pm 4}\,\hbar\,Q^{-2}$$
$$Q = c^{\pm 2}\,\sqrt{(\hbar/m)}$$

The same equivalence written in not-singular units is converted in:

$$m = c^{-4}\,\hbar\,Q^{-2}$$
$$Q = c^{-2}\,\sqrt{(\hbar/m)}$$

INTERVALIC ENERGY AND ELECTROMAGNETIC ENERGY

The difference between *intervalic* energy and *electromagnetic* energy is similar to that between *material* energy and *gravitational* energy. Intervalic and material energies are the equivalent energies of the two physical "substances" *at macroscopic scale*: electric charge and matter. Electric charge and matter, by themselves, can be viewed like huge “condensations” of energy (or “solidified” energy, as some authors have called them). On the contrary, electromagnetic and gravitational energies are like the “emanation” of those condensations (or “gaseous” energies, if it can be said, in order to follow the comparison). These energies are properly the energies of the *field* —electromagnetic or gravitational— created respectively by the electric charge and the matter around themselves.

Someone will be thinking that these commentaries are as evident as superfluous. But the truth is that traditional and modern Physics have confounded and mistaken these elemental concepts. Since the intervalic principle of equivalence between energy and electric charge was not known, the electromagnetic energy has been taken many times as it was intervalic energy (i.e., in the definition of the classical electron radius). Moreover, it is surprising how it can be usually managed the principle of equivalence between matter and energy, $E(m) = c^{\pm 2}m$ —formerly Einstein equation $E = mc^2$— without appreciating that there *must* exists an analogous equivalence between electric charge and energy. If somebody thinks that the *electromagnetic* energy covers the total energy of the electric charge, he also should think that *gravitational* energy recovers likewise the total energy of the matter. Of course, these energies are only the energies of the *field*, but not the *equivalent energies* of the own electric charge and matter, which are respectively the intervalic equations of equivalence: $I(Q) = c^{\pm 2}\hbar Q^{-2}$ and $E(m) = c^{\pm 2} m$.

INTERVALIC ENERGY AND MATERIAL ENERGY

The mass energy of a body or particle at rest is the sum of its constituent masses due: first, to electric charge, which is named *intervalic* energy; and second, the remaining energy —which will be named *material* energy— that has an *electromagnetic* origin.

$$E = c^{\pm 2}\hbar Q^{-2} + c^{\pm 2} m$$

Or in not-singular units:

$$E = c^{-2}\hbar Q^{-2} + c^{2} m$$

Of course, it is understood that the actual mass of subatomic particles is already that sum. Therefore, those different kinds of masses can be separated according to its different origins. Actual mass will be named *total* mass, m_{tot};

mass due to the electric charge will be named *intervalic* mass, m_{in}; and the remaining mass will be named *material* mass, m_{mat} —or *electromagnetic* mass, m_{em}, if it comes completely from electromagnetic sources—.

The *intervalic* mass is obviously the commonly named *intrinsic* mass of a subatomic particle. This is a very important result because we can explain that the ‘intrinsic mass’ of a particle is a concept that really does not exists, since there is no a kind of *mass* with an *intrinsic* origin in that sense. *Mass* appears to don’t be a primordial physical quantity, since every mass comes from an *intervalic* and/or *electromagnetic* energy, and both ones relies on the *electric charge*.

INTERVALIC ENERGY AT MICROSCOPIC AND MACROSCOPIC SCALES

It must be noted that contrarily to the equivalence between matter and energy, and against all expected, *electric charge is inversely proportional to energy* at quantum scale. At macroscopic scale we do not have got neither electric charge nor its equivalent energy, but the *sum* of the electric charges of subatomic particles and the *electromagnetic energy*, which is not by no means the *equivalent energy* of the charges themselves. This equivalence explains why the minimum state of energy of the 16 allowed subatomic charges predicted by the Intervalic Theory (but with very different values than those of the String Theory) is that of the elementary charge —which is the greater single charge: 270 $\mathbf{q_I}$—, instead of the intervalic charge —the smaller one, the intervalic quantum of electric charge: $\mathbf{q_I}$—.

	MATTER	ELECTRIC CHARGE
Equivalent energy	$E(m) = c^{\pm 2}\, m$	$I(Q) = c^{\pm 2}\, \hbar\, Q^{-2}$
Classic field energy	$U(m, r) = G\, m^2 / r$	$U(Q, r) = (1/4\pi\varepsilon)\, Q^2 / r$

The question may arise when passing through microscopic scale to macroscopic scale: until when is valid the quantum measurement of the intervalic energy? Really there is no contradiction because we have *never* measured *intervalic* energy at macroscopic scale but only *electromagnetic* energy. Really, the intervalic energy is only applicable to particles *assembled* by its corresponding *intervalic interaction*; since atoms and molecules of any macroscopic body are not assembled in this way, the intervalic energy of such a body as a whole is irrelevant, that is to say, it is zero.

Nevertheless and although it is completely useless, we can calculate the hypothetical intervalic energy of, for example, a macroscopic ball with radius = 0.01 (m), charged with 0.01 (C), their involved energies are, in SI units:

$$I(Q) = c^{\pm 2} \hbar\, Q^{-2} = 1.1745538 \cdot 10^{-47}\ (J)$$

Comparing it with the electromagnetic potential energy:

$$U(Q, r) = (3/5)(1/4\pi\varepsilon_0)\ Q^2 / r = 5.3925312 \cdot 10^{7}\ (J)$$

it is clear that this hypothetical magnitude of the intervalic energy at macroscopic scale is totally non measurable at laboratories.

Someone can be thinking that it is not intuitive that the intervalic energy decreases as the electric charge of a particle increases. Of course, intuition is not a reason in quantum Physics, but I can comment what I think about it. All physical idea must have an intuitive meaning; if it have not, it does not mean that the physical idea may be wrong, but our intuition has not grown to understand that new physical behaviour. As we progressively educate our intuition, the next generation of physicists will feel as intuitive concepts which were felt as awkward by earlier generations. Perhaps when we remember that the intervalic energy relies on *spin*, its behaviour could be better understood. Spin is a quantum number which becomes very small as soon as we go up to the structure levels of matter: subatomic particles, atoms, molecules, … and spin is already a despicable feature. It can be said that a macroscopic body has its spin, but it is practically despicable in the behaviour of the body at macroscopic scale. Well, something similar occurs with the intervalic energy, and I think this simple explanation is very intuitive.

RELATION BETWEEN INTERVALIC ENERGY AND THE STRUCTURE OF MATTER

Intervalic energy shows surprising features according to the usual manner of thinking Physics. Although it is known that the *form* of bodies can have influence on some of its physical properties —such as moment of inertia, angular momentum, etc.—, this is a not important detail that is not studied by the core of Physics. However the intervalic energy, responsible of almost all mass in our Universe, has an important relation with the *structure* of physical particles.

The intervalic energy of any body is a wide concept which has no sufficient precision to be rightly understood without further specifications. First of all, we have to distinguish the intervalic energy of the body as a whole from the sum of the individual intervalic energies of its constituent parts. This rule is applicable to all scales and levels, form the microscopic to the macroscopic world. Thus, the *total inner* intervalic energy of a body is the total sum of the partial intervalic energies corresponding to *all structure levels* that compounds the body, making a complex cascade which can be compared to a pyramid of energies.

Now it can be easily understood that a body can be uncharged at macroscopic scale but can enclose a great amount of intervalic energy in its inferior constituent levels. Really, by this simple way is produced the magic of the creation of *mass* in nature.

Let us examine the making of sense of this process. It involves by first time the *structure* of matter as a principal agent in Physics. Up to date, it was supposed that the *form* of bodies could have a sort of "translation" into the physical quantities as mere *information* —which anyway does not pertain to the core of Physics yet—. But now we are seeing that this form, this structure of matter is not only information but *energy*.

Really, when we say that the mass of a body is 'x', we are meaning that this mass is the total *sum* of all massive particles compounding the body. But this total sum does not run with the electric charge because it can be positive or negative. Thus the vast majority of bodies have null charge at macroscopic scale, but this does not mean in any manner that they have null charge at microscopic levels. This reasoning looks obvious, but it don't be so since it has not been questioned until now. It is evident that there is a fabulous organization along atomic and subatomic structures which involve a huge amount of energy. Where is and from where comes this energy? To say that it is the "intrinsic mass" does not solve the problem; and it is not *gravitational* nor *electromagnetic* energy (although the last one has been intended for). The answer is no other than the *intervalic energy*: $I = c^{\pm 2} \hbar Q^{-2}$.

Although it is not the subject of this chapter —which seem almost to be an essay of “classic physics”—, it can be pointed out that contrarily to the formula E = $c^{\pm 2}$ m, the equation I = $c^{\pm 2}$ ħ Q^{-2} is not only a principle of equivalence, as we have seen, but it is also the equation of the intervalic energy corresponding to its related interaction: the *intervalic interaction*, from which derives all the four supposed frequorces of Nature, as we will demonstrate circumstanciately along this book.

Needless to say that I hope there will be nobody that thinks about the *intervalic structure* of subatomic particles as rigid structures in a classical sense, as they are dynamic structures which shows perhaps one of the most clear phenomena of quantum behaviour. However, that quantum features are derived unexpectedly from the own *intervalic geometry,* the same one which yields the intervalic quanta and the intervalic symmetries of compositeness, leading to a new structurefulness Particle Physics, and *a fortiori*, to a new Physics.

DERIVATION OF COULOMB’S ELECTROMAGNETIC ENERGY FROM THE INTERVALIC ENERGY

As can be clearly viewed in the Intervalic System of Units, the economy is one of the greatest achievements in IT. All the 40 existing physical quantities and units recovers all possible logical combinations between the two fundamental constants of Nature, c and ħ. This means that the inverse of any dimensions, of any physical quantity and of any unit is also a meaningful dimension, physical quantity or unit. We can hope that this logical economy will appear at any place in the last foundations of a faultless theory. Therefore, we could check if the intervalic principle of equivalence between energy and electric charge, which seems to be to most important equation in Physics since all forces can be derived from it, verifies or not that logical economy reserved only for the last foundations of the theory. Let us write its inverse formulation: $I^{-1} = c^{\pm 2} ħ^{-1} Q^2$. Remembering that at macroscopic scale we have the identity $nħ \equiv r$, we have:

$$I^{-1} = c^{\pm 2} (nħ)^{-1} Q^2 = c^{\pm 2} Q^2 / r$$

This is just the Coulomb’s law written in intervalic units, where in place of the traditional electric constant $1/4\pi\varepsilon_0$ appears the dimensionless factor $c^{\pm 2}$ (-1). Remembering that in SI units is *set by definition* the value of the magnetic constant as $\mu_0/4\pi = 10^{-7}$ instead of 1, as would be more logical, we have to add finally this factor, which intervalic dimension is (-1). Since the intervalic dimensions are fully consistent and they operate algebraically, we have:

I^{-1} (i) · 1 (-1) = I^{-1} (i^{-1}). Therefore the dimension of I^{-1} is now energy in intervalic units, and the same in SI units:

$$E = c^2 \, 10^{-7} \, Q^2 / r \equiv (1/4\pi\varepsilon_0) \, Q^2 / r$$

Thus, Coulomb's law and the electromagnetic interaction is also derived from the intervalic principle of equivalence between energy and electric charge, $I = c^{\pm 2} \hbar \, Q^{-2}$.

INTERVALIC PRINCIPLE OF ENERGY BALANCE FOR SUBATOMIC PARTICLES

Following the above results, the total *mass energy,* E_{mass}, of any subatomic particle can be written in a surprisingly simple equation plenty of elegance. It is the sum of the *intervalic energy* plus its *inverse* —which is the electromagnetic potential energy—. In intervalic units:

$$E_{mass} = I + I^{-1} = c^{\pm 2} \hbar \, Q^{-2} + 1/(c^{\pm 2} \hbar \, Q^{-2})$$

Apart from them, a subatomic particle at rest only have the energy due to its intrinsic angular momentum: the *spin energy,* E(J). Thus adding the spin energy to the preceding mass energy we will obtain the total *structural energy,* E_{struc}, of a subatomic particle:

$$E_{struc} = I + I^{-1} + E(J)$$

And in a splendorous achievement of logical economy, IT has postulated that this structural energy is the same for all subatomic particles. Of course, that value is *zero*, which means that the sum of all structural energy of the Universe is zero:

$$I + I^{-1} + E(J) = 0$$

While the intervalic energy is always attractive, the spin energy has always a repulsive effect. For any intervalic structure with like charges the electromagnetic potential energy is opposite to the intervalic energy. Thus we can write the classic formulation of the *intervalic principle of energy balance for subatomic particles*:

$$I - I^{-1} - E(J) = 0$$

It must be noted that the above intervalic and electromagnetic energies are manifested as *mass energy*, while spin energy is not manifested as mass but as *kinetic energy*. In the Intervalic Theory of Particle Physics this principle is applied to deducting the features of subatomic particles, and astonishing results are obtained with great simplicity. It has to be noted that the Standard Model (SM) has a lack of underlying principles and it only has deduced some correct results adjusting by hand some constant and, at last, due to the great generality of Lagrangian formalism. To obtain the same —and more— results than SM, but in a *right* and suitable way, it is not necessary to use the Lagrangian formalism in IT. On the contrary, all known results yielded onerously from SM, now appears as a naïve set of results in IT. In a nutshell, the Lagrangian formalism allow to avoid the infinite quantum paths postulated by Quantum Theory between two states of energy. The great idea in IT is that these quantum paths are not introduced in the formalism, and the difference between two states of energy, called *energy interval*, is deduced by means of *geometrical relations* in the Intervalic Space. Really, IT convert Physics equations in *geometrical statements*, which are of course and *a fortiori*, *invariant* since they determine a *geometrical relation* in the Intervalic Space. By these reasons, it is surprising that IT in Physics has not been postulated half a century ago, but this is already history (a similar question could be commented about IT in Music, although its simple formalism is still hardly understood by some contemporary musicians without a minimal mathematical baggage).

DEFINITIONS OF POTENTIAL, ACTUAL AND PRIMORDIAL INTERVALIC ENERGIES

Potential intervalic energy is defined as the sum of all intervalino's intervalic energies accumulated into a body:

$$E_{pot} = \Sigma\, n(\mathbf{q}_\mathrm{I}) \cdot E(\mathbf{q}_\mathrm{I})_{in} = c^{-1}\, \Sigma\, n(\mathbf{q}_\mathrm{I})$$

Actual intervalic energy is the no other than the usual intervalic energy of a body:

$$E_{act} = c^{\pm 2}\, \hbar\, Q^{-2}$$

And *primordial* intervalic energy is the subtract between both energies, which was liberated when the primordial particle was assembled:

$$E_{prim} = E_{pot} - E_{act} = c^{-1}\ \Sigma\ n(\mathbf{q_I}) - c^{\pm 2}\ \hbar\ Q^{-2}$$

THE INTERVALIC DUALITIES OF ENERGY: MASS-ENERGY AND ELECTRIC CHARGE-ENERGY

The principle of equivalence between matter and energy has several physical interpretations, and the most of them can not be derived form the former Einstein equation $E = mc^2$, but only form the new one using intervalic dimensions, $E = c^{\pm 2} m$. One of these interpretations is shared with the intervalic principle of equivalence between energy and electric charge, $I = c^{\pm 2}\ \hbar\ Q^{-2}$, and refers to the dualities of energy: mass-energy and electric charge-energy.

Traditional Physics timidly suggests that the mass of a body could be balanced with the corresponding energy of its gravitational field. And since the gravitational energy is attractive, it has a minus sign; therefore both energies could be exactly compensated, being the total sum zero.

It is hard to conceive such lack of intellectual ambition in any discipline of human knowledge as this poor example showed by Physics. The principal problem from the traditional view is the us sign in gravitational energy. Can we deduce such serious affirmation from only a *conventional* minus sign? Surely we can’t, but when we look at these physical quantities in within the intervalic dimensions a radical change is operated. Actually, intervalic dimensions of mass (i) and energy (i^{-1}) are *opposite* —and *inverse* at once—. Therefore, its sum is not one of the intervalic dimensionless (±1) —which at last are the dimensions of some physical quantities—, but zero:

$$(i) + (i^{-1}) = (0)$$

Since (0) dimension is not defined in intervalic dimensions, it means the absence of any dimension, that is to say, dimensions of mass (i) and energy (i^{-1}) vanish when they are summed. So now the previous assumption is not based on a conventional sign, but on dimensional foundations.

If this assumption is naively developed in a systematic manner, we have we following balances, where Q is the electric charge, I is intervalic energy, M mass, U field energy, and K kinetic energy; all of them referred to the whole Universe:

$$\sum Q^{\pm} = 0$$
$$Q \leftrightarrow U(Q) + K(Q)$$

$Q = I(Q)$
$I(Q) = M(Q)$
$M(Q) \leftrightarrow U(M) + K(M)$

In English: first, the sum of positive and negative charges is zero.

Second, there is an exact balance between a part of the electric charge of the Universe and its corresponding electromagnetic and kinetic energies generated by the electric charge.

Third, there is an equality between the remaining part of the electric charge of the Universe and its corresponding energy determined by the intervalic principle of equivalence between energy and electric charge: $I = c^{\pm 2} \hbar Q^{-2}$.

Fourth, this intervalic energy has been converted into mass according to the intervalic principles of equivalence.

Fifth, there is an exact balance between the mass of the Universe and its corresponding gravitational and kinetic energies generated by the mass.

In the case of subatomic particles it is clear that a state of lowest energy must be already reached when it was created. Therefore some meaningful *balance* had to arise at any time of its involved structures. The intervalic postulate is that the intervalic energy has to be exactly balanced with the remaining ones —electromagnetic and kinetic—. In this case, the second and third equations of above take the following form:

$½Q \leftrightarrow U(Q) + K(\text{spin})$
$½Q = I(Q)$

The application of this balance —which coincides exactly with the *intervalic principle of energy balance for subatomic particles* (as macrocosmos, so microcosmos; “As above, so below”)—, developed for all particles, can be thoroughly viewed in IT, which substitutes the formalism of SM —whose complete name perhaps should preferably be the Standard Model of Structureless Particles, or simply the Structureless Model (abbreviated equally as SM)—.

According to these balances it is clear that all masses and energies of the Universe derive only from the electric charge. And since the sum of all electric charges is zero, the total sum of matter, energy and electric charge of the Universe is zero. This result is in agreement with the named *intervalic zero assumption* of IT: the sum of all magnitudes of physical quantities of the Universe is zero. And as I have already demonstrated in other site, the dimensional sum of all the 40 physical quantities —which conform the intervalic group— existing in the Universe is equally zero.

Intervalic Principles of Equivalence between Electric Charge, Energy and Mass

$$E = c^{\pm 2}\, m$$

$$I = c^{\pm 2}\, \hbar\, Q^{-2}$$

$$Q = c^{\pm 2}\, \sqrt{(\hbar/m)}$$

The most fundamental equations in Physics are merely *dimensional equivalences* —or simple *geometric statements*— in the Intervalic Dimensional Space. It should be noted that those intervalic equations are always *invariant* since they just describe a dimensional equivalence between physical quantities that does not depend on the frame of reference chosen.

For example, the famous Einstein equation is a mere *geometrical statement* which describes a ±180º rotation of mass in the Intervalic Dimensional Space, and that formula is written as: $E = c^{\pm 2}m$, since $c^{+2}\,(-1) \equiv c^{-2}\,(-1)$ in intervalic units. The equation just describes the *geometric equivalence* between energy and mass, a relation which is almost trivial inside the Intervalic Dimensional Space: $E\ (i^{-1}) = c^{\pm 2}\ (-1)\ m\ (i)$.

To deduce whether it is a intervalic equivalence between electric charge and energy, we start from the intervalic dimensional analysis of the electric charge, $Q = i^{-1/2}\ L^{1/2} = \sqrt{-T}$. Then: $Q^2 = -T \equiv T_a$. When antitime, T_a, is rotated ±180º —$c^{\pm 2}\,(-1)$— in the Intervalic Dimensional Space, we have: $Q^2 = c^{\pm 2}\, T$. Inverting the equation (since intervalic dimensions can operate algebraically) we have got: $\varphi = c^{\pm 2}\, Q^{-2}$, where φ is the frequorce. The geometric equivalence of the frequorce is: $\varphi\ (i^{-1}L^{-1}) = \hbar^{-1}\,(L^{-1})\ E\ (i^{-1})$, a simple statement which at macroscopic scale becomes the traditional equation: $E = n\hbar\ F = s\ F$, where s is *space* and F *force*. When it is applied to dalinoless particles s means the length of the string: $s = 2\pi J$ (being J the *spin* —or dynamic radius— of the particle) and the same equation becomes: $E = 2\pi J\ \varphi$, from which is derived the traditional Planck's equation —a special case for particles with spin 1—. As charged particles are dalinoful, substituting the geometric equivalence of the frequorce in the previous dimensional equation, it is obtained the geometric equivalence: $I = c^{\pm 2}\, \hbar\ Q^{-2}$. This is the **Intervalic Principle of Equivalence between Energy and Electric Charge**, perhaps the most important equation in Physics. Showing its intervalic dimensions:

$$I\ (i^{-1}) = c^{\pm 2}\,(-1)\ \hbar\ (L)\ Q^{-2}\,(i\ L^{-1})$$

In the remaining not-geometric or incomplete systems of units the half symmetry which is conserved is only the following one: $I = c^{-2}\, \hbar\ Q^{-2}$.

EQUIVALENT AND FIELD ENERGIES	Mass	Electric Charge
Equivalent energy	$\mathbf{E = c^{\pm 2}\, m}$	$\mathbf{I = c^{\pm 2}\, \hbar\ Q^{-2}}$
Classic field energy	$U = G\ m^2 / r$	$U = (1/4\pi\varepsilon)\ Q^2 / r$

Chapter 6

INTERVALINO

INTERVALIC ENERGY OF THE INTERVALIC CHARGE

Let us remember the equation of the *intervalic principle of equivalence between energy and electric charge*: $I = c^{\pm 2}\, ħ\, Q^{-2}$. Showing its intervalic dimensions between brackets:

$$I(i^{-1}) = c^{\pm 2}\,(-1)\, ħ\,(L)\, Q^{-2}\,(iL^{-1})$$

In not-singular units, as the traditional ones, only a half symmetry is conserved. It is obviously the following:

$$I = c^{-2}\, ħ\, Q^{-2}$$

which is the expression of the same principle written in any system of units with $c \neq 1$.

Now we can know how is the intervalic energy of the intervalic quantum of electric charge, $\mathbf{q_I} = \surd\text{-}(c^{-1}ħ)$:

$$I(\mathbf{q_I}) = c^{\pm 2}\, ħ\, \mathbf{q_I}^{-2} = c^{\pm 2}\, ħ\, [\surd\text{-}(c^{-1}ħ)]^{-2} = c^{-1}\,(i^{-1})$$

The same magnitude in SI units is:

$$I(\mathbf{q_I}) = c^{-2}\,\hbar\,\mathbf{q_I}^{-2} = c^{-1} = 3.335640952 \cdot 10^{-9}\,(J)$$

The mere existence of this fundamental quantum involves unavoidably compositeness —or structurefulness— in subatomic particles.

INTERVALINO ELECTRIC CHARGE

The *intervalino,* **I**, is the very last fundamental massful particle postulated by the IT, from which are structurefully composed all subatomic particles of Nature. According to IT the huge explosion at the Big Bang was due to the liberation of energy caused by the aggregation of intervalinos to compose material particles. All massive particles of the Standard Model and beyond can be easily explained as different assemblies of intervalinos.

The intervalino is intended to be the singlest primordial particle according to the values of the intervalic quanta. It is a particle which charge is the intervalic quantum of electric charge, $\mathbf{q_I} = \surd\text{-}(c^{-1}\hbar)\,(i^{-1/2}L^{1/2})$:

$$\mathbf{q_I} = \surd\text{-}(c^{-1}\hbar)\,(i^{-1/2}L^{1/2}) = 1\,(i^{-1/2}L^{1/2}) = 5.9339900 \cdot 10^{-22}\,(C)$$

Thus, the elementary charge is exactly defined as $e = 270\,\mathbf{q_I}$, which matches exactly with the actual experimental value, and therefore the magnitude of the fine structure constant has an exact theoretical value: $\alpha = 270^2 \cdot 10^{-7} = 7.29 \cdot 10^{-3} = 1/137.17421$.

The sign of the electric charge of an *isolated* intervalino is, according to IT, undetermined, that is to say, positive and negative *at once*: {±}. Only when an intervalino interacts with another intervalino the electric sign is *realized*: {+ +, + -, - +, - -}. This beautiful feature can be considered as the quintessence of the quantum uncertainty; moreover it does not involve a paradox like those of Einstein-Podolsky-Rosen or Schroedinger’s cat, but it defines clearly a physical state. “God does not play dice”.

If the electric charge of an *isolated* intervalino is {±}, it would imply that the electromagnetic energy of a single intervalino could not be defined, but it is just the case are we are going to see straightaway. Besides, it is clear that such a quantum uncertainty must be found at the *last* structure level of the intervalic structure in order to avoid the apparition of a *singularity* in the electromagnetic energy as the *radius* of the constituent subparticles becomes smaller.

INTERVALINO ELECTROMAGNETIC ENERGY

It can be remembered that the concept of *electromagnetic potential energy* is not applicable to a *single* particle, according to the well based traditional view, but only to *composite* particles which can disaggregate in fragments. Whereupon there is a serious contradiction inside SM since leptons and quarks are considered to be single particles without structure.

On the contrary, according to IT all subatomic particles are composite particles with structure (with the exception of the unique primordial particle: the *intervalino*, from which are derived all the rest particles). Then, all subatomic particles have both *intervalic* energy and *electromagnetic* potential energy, while intervalino must have only *intervalic* energy because it can't have the electromagnetic one. This deduction fully matches with the uncertainty of the electric charge sign in the *isolated* intervalino, which now makes further sense.

ORIGIN OF INTERVALINO MASS

The intervalic energy of the intervalino at rest is:

$I(\mathbf{I}) = c^{\pm 2} \hbar \, \mathbf{q_I}^{-2} = c^{-1} = 3.335640952 \cdot 10^{-9}$ (J)

Since the electric charge of the intervalino, **I**, is by definition the intervalic quantum of charge, the intervalic mass —formerly named "intrinsic" mass— of the intervalino is just the equivalent intervalic energy of the intervalic charge, $\mathbf{q_I}$:

$m(\mathbf{I}) = c^{\pm 4} \hbar \, Q^{-2} = c^{-3} = 3.711401092 \cdot 10^{-26}$ (kg) = 20,819.42423 (MeV/c^2)

Thus, the 100% of the intervalino mass has an *intervalic* origin and it has no *electromagnetic* mass. This is the simplest *creation* of matter starting from the two fundamental constants, c and ħ, that has ever been proposed in a physical theory.

INTERVALINO SPIN ENERGY

The Intervalic Theory in Particle Physics is a theory of *composite and structureful* particles, not a theory of *single and structureless* particles. Therefore, apart from the traditional physical interpretations of spin, IT adds one more interpretation of that fundamental quantum number. According to IT the energy of the intrinsic angular momentum of a subatomic particle is a *structural energy* which makes a perfect balance with the other two structural energies: the intervalic and the electromagnetic ones. This important law has been named *intervalic principle of energy balance.* It states the following balance for the total energy of subatomic particles:

$$\mathrm{I} - \mathrm{I}^{-1} - \mathrm{E}(J) = 0$$

where $\mathrm{I}^{-1} \equiv \mathrm{U}$ is the electromagnetic energy and the last term is the spin energy. It is important to note that I and U are *manifested* as *mass energies*, while $\mathrm{E}(J)$ is manifested as *kinetic energy*.

LINEAR VELOCITY DUE TO SPIN ON SURFACE

Applied to the intervalino, we have seen that it can't have electromagnetic energy. Therefore, its intervalic structure shows a balance between the intervalic energy in one part, and only the energy of the intrinsic angular momentum on the other part. Being $\mathrm{v}_{\mathbf{I}}$ the maximum linear velocity on intervalino's surface and $\omega_{\mathbf{I}}$ its angular velocity, we have:

$$\mathrm{I}(\mathbf{I}) - 0 = \mathrm{E}(J_{\mathbf{I}}) = 3.3356409 \cdot 10^{-9}\ (\mathrm{J})$$
$$\mathrm{c}^{\pm 2}\ \hbar\ \mathbf{q}_{\mathbf{I}}^{-2} - 0 = m_{\mathbf{I}}\ \mathrm{v}_{\mathbf{I}}^{2} = m_{\mathbf{I}}\ r_{\mathbf{I}}^{2}\ \omega_{\mathbf{I}}^{2}$$

As $\mathrm{c}^{\pm 2}\hbar\ \mathbf{q}_{\mathbf{I}}^{-2} = \mathrm{c}^{\pm 2} m_{\mathbf{I}}$, we obtain a very beautiful result which makes that intervalino becomes a *"geometric"* particle:

$$\mathrm{v}_{\mathbf{I}} = \mathrm{c}$$

This means that the constituent particles of intervalino —two photons in antisymmetric state under interchange—are turning at a linear velocity of just the speed of light due to spin, as may be expected of any light particle.

And of course we have:

$$\mathrm{v}_{\mathbf{I}} = r_{\mathbf{I}}\ \omega_{\mathbf{I}} = \mathrm{c}$$

INTERVALIC SCHWARZSCHILD INTERVALINO RADIUS AND INTERVALINO AS A GEOMETRIC LIMIT TO BE A BLACK HOLE

It can be noted the meaningful parallelism between this equation and the gravitational Schwarzschild radius, $r_{Schw} = 2Gm/c^2$, since the *intervalic* energy plays the same role as the *gravitational* one in the Schwarzschild equation, and the *spin* energy of the subatomic particle is analogous to the *kinetic* energy of the star. The maximum linear velocity on intervalino's surface can be interpreted as the *escape velocity* from intervalino; as it is just the speed of light, v = c, intervalino in just the *geometric* limit to be a black hole.

As it is well known, the Schwarzschild radius of a star is closely related with its mass. A star which is a supposed black hole can leave to be a black hole if its radius is augmented. On the contrary, the escape velocity of intervalino does not vary with the magnitude of the intervalino radius because such velocity —the speed of light— is a structural magnitude of intervalino which is, *a fortiori, invariant* since it is a *geometric* feature. Therefore, the intervalic Schwarzschild radius of intervalino may paradoxically take any value and intervalino will continue to be a geometric limit of black hole, with independence of its radius.

According to this, whatsoever particle which leaves intervalino must do it at precisely the speed of light (!). Now, what particles may leave the intervalino? The only particles which may leave the intervalino are just those equally composed, like the intervalino, by closed strings: they are only two: the *photon* and the *graviton*, and they must leave intervalino at just the speed of light (!).

In this way IT shows in a beautifully simple and intuitive manner the interaction between matter and electromagnetic and gravitational waves at the last scale of the intervalic length, ħ. Electromagnetic and gravitational waves interact with matter because the interacting block of matter is the *intervalino*, and all of them are equally composed by closed strings. Now Richard Feynman could know what to answer to his father, written in his autobiographic book ***Surely You're Joking, Mr. Feynman***, when he questioned to his son: "how can photons go out from electron?"

I believe that when we do not have an intuitive understanding of a physical feature, this unavoidably means that we do no know the underlying foundations of the feature, because our *intuition* always grow and go closely along with our *knowledge* of Nature. To pretend, as someone does, that intuition does not grow in mankind and that it is a primitive capacity of mind, is really a “primitive” assertion... Any knowledge of Physics which is still comprehended without intuition is really not comprehended, because such knowledge is with certainty a *partial* one yet (and the complexity of maths in modern Physics is not a valid objection because intuition —by definition— sees not under but over that complexity).

INTERVALINO RADIUS

We will begin with some approximations. Starting from previously viewed data we have:

$$r_{\mathbf{I}} = c / \omega_{\mathbf{I}}$$

There is an inferior limit for the magnitude of the intervalino radius, which is geometrically determined by the intervalic angular velocity $\omega_{\mathbf{I}}$:

$$\omega_{\mathbf{I}} = c\,\hbar^{-1} = 2.8399227 \cdot 10^{42}\,(s^{-1})$$

Therefore we would have:

$$r_{\mathbf{I}} \geq c / \omega_{\mathbf{I}} = \hbar = 1.0556363 \cdot 10^{-34}\,(m)$$

On the other hand, the maximum value of the intervalino radius can’t be greater than the predicted value for the dalino 1, D_1 —which is just composed by one intervalino— in the set G_1 of the 16 allowed dalinos (they are all the possible aggregations of intervalinos, which are those which constituent number of intervalinos is a divisor of 270, the number of the elementary charge: 1, 2, 3, 5, 6, 9, 10, 15, 18, 27, 30, 45, 54, 90, 135, 270). That magnitude is:

$$r_{\mathbf{I}} \leq r(D_1) \approx 6.0102597 \cdot 10^{-25}\,(m)$$

It corresponds to an angular velocity:

$$\omega_{\mathbf{I}} = c / r_{\mathbf{I}} = 4.9880117 \cdot 10^{32}\,(s^{-1})$$

Nevertheless, the intervalino radius postulated by IT is deduced from the epistemological rank of the intervalic dimensions. As the intervalic dimension of spin is *length*, this lead to interpret the spin of a subatomic particle as its resulting *dynamic radius* —from the sum of its constituent particles—. For example, photon has a spin 1 because it is a symmetric assembly of intervalic strings (spin ½), and therefore its resultant spin is:

$$J(\gamma) = J(S) + J(S) = ½ + ½ = 1$$

However, the antisymmetric assembly of intervalic strings yields a spin 0 particle (chi):

$$J(¢) = J(S) - J(S) = ½ - ½ = 1$$

In a similar way, we have that the spin of intervalino and graviton are respectively:

$$J(\mathbf{I}) = J(\gamma) - J(\gamma) = 1 - 1 = 0$$

$$J(g) = J(\gamma) + J(\gamma) = 1 + 1 = 2$$

Herein the intervalino (and graviton) radius is:

$$r_{\mathbf{I}} = 2\ \hbar = 2.1112726 \cdot 10^{-34}\ (\mathrm{m})$$

INTERVALINO ANGULAR VELOCITY

The angular velocity of intervalino due to spin will be:

$$\omega_J(\mathbf{I}) = \mathrm{c} / r_{\mathbf{I}} = ½\ \mathrm{c}\ \hbar^{-1} = 1.41996092 \cdot 10^{42}\ (\mathrm{s}^{-1})$$

THE EMPTINESS OF SUBATOMIC PARTICLES

The intervalino radius shows that subatomic world is much more empty than it was ever thought. If it is supposed that the intervalino “fills” a quantum sphere of radius $r_{\mathbf{I}}$, the intervalino volume would be:

$$\mathrm{V}(\mathbf{I}) = (4/3)\pi\, r_{\mathbf{I}}^3 = 3.9420447 \cdot 10^{-101}\ (\mathrm{m}^3)$$

On the other hand, supposed a quantum spherical form, the electron volume would be (taking the intervalic electron radius):

$V(e) = (4/3)\pi\, r_e^3 = 1.3650028 \cdot 10^{-43}\ (m^3)$

Since $e = 270\ \mathbf{q_I}$, the relation between “filled space” and “empty space” inside the electron quantum sphere would be:

$270V(\mathbf{I}) / V(e) = 2.8879389 \cdot 10^{-58}$

This fully demonstrates that subatomic particles are practically hollow, and consistency and other usual properties of matter are due to spin and electromagnetic phenomena.

THE EMPTINESS OF THE INTERVALIC UNIVERSE

THE EMPTINESS OF COSMIC SPACE

The average density of the Universe has been calculated in around one Hydrogen atom per cubic metre of cosmic space. Taking the Bohr radius, $a_0 = \alpha/4\pi R_\infty = 5.291772 \cdot 10^{-11}$ (m) for calculating a value for the volume of an Hydrogen atom, the relation between “filled space” and “empty space” in cosmic space would simply be:

$R(U) = (4/3)\pi\, a_0^3 / 1^3 = 6.207146 \cdot 10^{-31}$

THE EMPTINESS OF ATOMS

Being the intervalic proton radius, $r_p \approx 1.2374486 \cdot 10^{-15}$ (m), the relation between “filled and empty” space inside an Hydrogen atom would be:

$R(H) = (4/3)\pi\, r_p^3 / (4/3)\pi\, a_0^3 = r_p^3 / a_0^3 = 1.278728 \cdot 10^{-14}$

THE EMPTINESS OF MASSFUL SUBATOMIC PARTICLES

All massful subatomic particles have got an intervalic structure which is ultimately made from an assembly of intervalinos at successive structure levels. The intervalino radius shows that subatomic world is much more empty than it was ever thought. If it is supposed that the intervalino "occupies" a sphere of radius $r_{\mathbf{I}}$, the *intervalino volume* would be:

$$V(\mathbf{I}) = (4/3)\pi\, r_{\mathbf{I}}^3 = 3.9420447 \cdot 10^{-101}\ (\mathrm{m}^3)$$

Likewise, supposed a spherical form, the *electron volume* would be — taking the intervalic electron radius, $r_e = 3.194098699 \cdot 10^{-15}$ (m)—:

$$V(e) = (4/3)\pi\, r_e^3 = 1.3650028 \cdot 10^{-43}\ (\mathrm{m}^3)$$

Since $e = 270\ \mathbf{q_I}$, the relation between "filled and empty" space inside the sphere "occupied" by the electron would be:

$$R(e) = 270\ V(\mathbf{I}) / V(e) = 2.8879389 \cdot 10^{-58}$$

Following a similar way for nucleons, whose intervalic structure is, namely: $N = M_3 = 3\ L_3 = 9\ G_6 = 54\ D_{45} = 2430\ \mathbf{I} = 4860\ \gamma = 9720\ S$, we have got the relation:

$$R(N) = 2430\ V(\mathbf{I}) / V(N) = 1.206862 \cdot 10^{-53}$$

This means that subatomic particles are surprisingly much more empty than the own cosmic space, and fully demonstrates that subatomic particles are practically hollow. Summing the above results we have that the total "filled" space —"filled" with *photons*, which are the constituent particles of intervalino— inside a cubic metre of cosmic space containing one Hydrogen atom would only be:

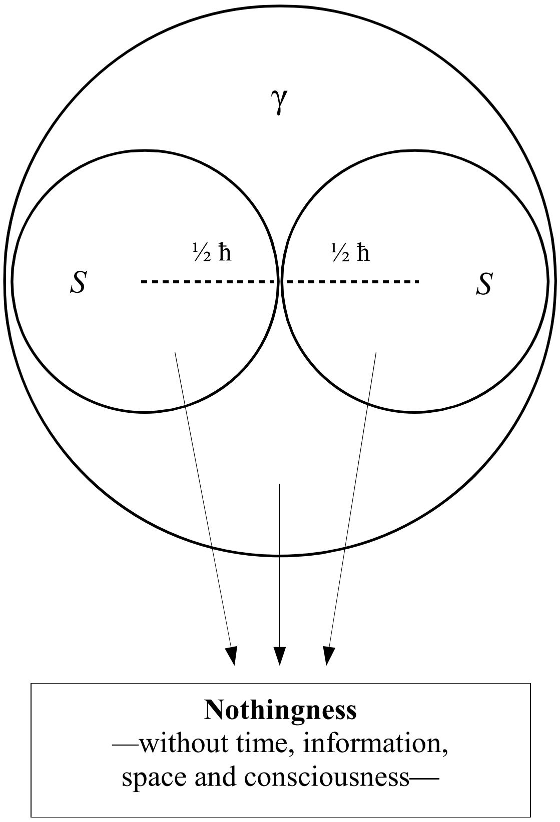
$$R(U) \cdot R(H) \cdot ½\, [R(e) + R(N)] = 4.789698 \cdot 10^{-98}$$

THE EMPTINESS OF LIGHT

We have seen that matter is absolutely empty. At last it is composed by *intervalinos,* which ultimately are made by two photons in antisymmetric state under interchange. So finally only photons appear to “fill” the space; but do they really fill it?

A *photon* is composed by two intervalic strings assembled in symmetric state under interchange. Although photon is moving at the speed of light forever, it is a particle whose intervalic structure fits entirely inside a *plane*, that is to say, photon has only two space dimensions: it is a bidimensional particle moving inside a tridimensional space.

Hereinafter we can easily calculate the volume “filled” by a photon: as it has got only two dimensions the volume of a photon is *zero*.



THE EMPTINESS OF THE INTERVALIC STRING

Finally let us try to calculate the surface “filled” by the volumeless *photon*, which will be the surface occupied by its constituent particles: the two intervalic strings. The intervalic structure of the intervalic string fits entirely inside a *line* since it is made only from unidimensional space: actually it is the *intervalic quantum of space*. Therefore the surface “filled” by it is once more *zero*.

Then, what kind of ultimate stuff, if any, fills the circular surface inside the *intervalic string*? The answer is what remains or exists where there is not time, information, space and consciousness: *nothingness*.

EXCHANGE VELOCITY OF ITS CONSTITUENT PARTICLES INSIDE

The maximum exchange velocity of its constituent particles —two photons in antisymmetric state under interchange— inside the intervalino will be:

$v(\gamma)_{\mathbf{I}} = 2\pi\, r_{\mathbf{I}}\, I(\mathbf{I}) / \hbar = 2\pi\, c^{-1} = 2.095845022 \cdot 10^{-8}$ (m s^{-1})

Please note that this slow exchange movement is perpendicular to the speed of light direction, that is to say, this movement is in the same plane of the closed string —which is the own photon—. On the contrary, the speed of light is perpendicular to that plane.

INTERVALINO AND DARK MATTER

IT postulates that the huge energy liberated in the primordial aggregation of intervalinos is the origin and the cause of the so named Big Bang. We suppose that all massive particles were created through the aggregation of intervalinos at the Big Bang. As we have explained in other site, the primordial aggregation of intervalinos stopped when a perfect balance was reached among all the structural energies involved in a subatomic particle: the intervalic energy, the electromagnetic energy and the spin energy:

$I - U - E(J) = 0$

This balance determines, among others, the magnitude of the so named *elementary charge*, which is now defined in IT as: $e = 270\ \mathbf{q}_{\mathbf{I}}$. Since this value is the same for all aggregations of intervalinos, it imposes a powerful symmetry constraint in further aggregation of aggregation, aggregations of aggregations of aggregations, etc., so only the value of the elementary charge and its divisor are allowed as constituent aggregations, and the number of constituent intervalinos of the final subatomic particles that we know only can be 270 or a multiple. Here we probably have the first emergency of spontaneous order in the Universe strongly based on well defined and measurable physical principles.

After this brief introduction to the problem the question that arises is the following: what is the *efficiency* in the primordial aggregation of intervalinos? Did stayed remaining *isolated* intervalinos without aggregating?

As we will explain later in the corresponding chapters, the primordial aggregation of intervalinos —for composing *dalinos*— was made exclusively through gravitational and intervalic interaction, being the own intervalino, which has spin 0, both the source and intermediate particle of the intervalic interaction. Therefore, the intervalinar interaction is an exchange frequorce. Since the intervalic interaction is *short ranged*, the intervalinos which could not assemble with others in primordial times, will not be able to aggregate *after* it. What is the destiny of these intervalinos which remain isolated?

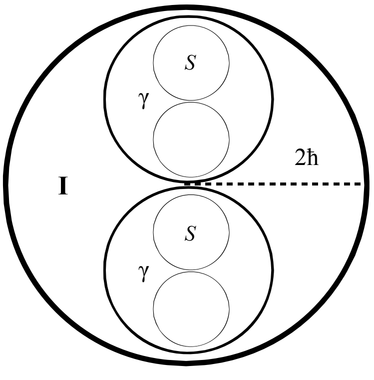
As we have seen, single intervalinos do not have electromagnetic energy and don't interact electromagnetically. The electromagnetic interaction only exist between *aggregations of intervalinos —dalinos—*, but an *isolated* intervalino do not have electromagnetic energy at all. On the other hand, although an intervalino could interact intervalically when shocking with a lepton or other particle, the symmetry constraint imposed by the elementary charge does not allow such aggregation, since it would destroy the electric balance of the particle in an Universe fully ordered according to a strong symmetry derived from the value of the elementary charge.

In resume, we have an isolated intervalino which does not interact electromagnetically, and which does not have a number of neighbour free intervalinos for aggregating with them through *short ranged* intervalic interaction. Therefore, our isolated intervalino only can interact with other particles via *gravitational* interaction. However, due to the symmetry constraint imposed by the elementary charge, already described, it will never be able to aggregate with other dalinos and will follow its lonely way indefinitely (unless it would meet with a lot of isolated intervalinos to make a dalino). As can be seen, the behaviour and features described for a single intervalino are just those that are intended for the *dark matter*. We will comment this exciting subject when describing the composition of dark matter according to IT, in the chapter on the Intervalic Dark Matter.

INTERVALINAR FUSION

The equations of the intervalic principles of equivalence represent a further step in fission and fusion processes. Whereas the intervalic binding energy liberated in a intervalinar fusion is several orders greater than the binding energy liberated in a nuclear fusion, we would have an almost unconceivable reserve of energy in the *intervalic charge* if its liberation could be controlled. Since the history of science has ever been like a series of impos-

INTERVALINO



Intervalic structure	$\mathbf{I} = 2^{-½} (\lvert\gamma\underline{\gamma}\rvert - \lvert\underline{\gamma}\gamma\rvert) = 2\ \gamma = 4\ S$
Intervalic energy, I	$I(\mathbf{I}) = c^{\pm 2}\ \hbar\ \mathbf{q_I}^{-2} = c^{-1} = 20{,}819.42423\ (MeV/c^2)$
Electromagnetic energy, U	$U(\mathbf{I}) = 0$
Spin energy, E_J	$E_J(\mathbf{I}) = I(\mathbf{I}) - U(\mathbf{I}) = c^{-1} = 20{,}819.42423\ (MeV/c^2)$
Structural energy balance	$[\ c^{\pm 2}\ \hbar\ \mathbf{q_I}^{-2}\ ] - m_\mathbf{I}\ \omega_\mathbf{I}^2\ r_\mathbf{I}^2 = 0$
Energy ratios	$I(\mathbf{I})/E(\mathbf{I})_{mass} = 1$ $U(\mathbf{I})/E(\mathbf{I})_{mass} = 0$ $E_J(\mathbf{I})/E(\mathbf{I})_{mass} = 1$
Radius, r	$r_\mathbf{I} = 2\ \hbar = 2.1112726 \cdot 10^{-34}\ (m)$
Angular velocity due to spin, ω_J	$\omega_J(\mathbf{I}) = c\ /\ r_\mathbf{I} = ½\ c\ \hbar^{-1} = 1.419960918 \cdot 10^{42}\ (s^{-1})$
Linear velocity due to spin on surface, v_J	$v_J(\mathbf{I}) = 2.99792458 \cdot 10^8\ (m\ s^{-1}) = c$

The intervalino is the first particle with *mass*, generated by the synthesis of two photons in antisymmetric state under interchange, whose threshold frequency *—coupling frequency of matter—* must be greater than: $\varphi_{cp} = 1\ /\ (4\pi\ c\ \hbar) = 2.51452013 \cdot 10^{24}\ (s^{-1})$ for the synthesis may occur, so that intervalinos could eventually be synthesized artificially in the laboratory.

The physical properties of intervalino are extraordinary, because it is the only particle with an electric charge that has no electromagnetic energy —which only particles *with structure* can have, being this a basic definition of the physical laws that has forgotten the standard model—, so it is logically necessary the existence of a fundamental particle, for the electromagnetic interaction, with these extraordinary physical features: an indivisible electric charge and, by this reason, without electromagnetic potential energy.

The electric charge of the intervalino is the *intervalic quantum of electrical charge*: $\mathbf{q_I} = \sqrt{}\text{-}(c^{-1}\,\hbar) = 1\ (i^{-1/2}\,L^{1/2}) = 5.93398995 \cdot 10^{-22}\,(C)$, which is the fundamental charge of Nature, whose geometric value is exactly 1/270 of the elementary charge, *e*.

Its mass energy, which comes exclusively from the equivalent energy of the previous intervalic quantum of electric charge, $I\ (\mathbf{I}) = c^{\pm 2}\ \hbar\ \mathbf{q_I}^{-2} = c^{-1} = 20{,}819.42423\ (MeV/c^2)$, is also the *intervalic quantum of mass*: $\mathbf{m_I} = 1\ (i) = c^{-1} = 20{,}819.42423\ (MeV/c^2)$, while its spin energy is equally c^{-1}.

Its radius is twice the photon radius, i.e., twice the *intervalic quantum of length*: $\mathbf{r_I} = 2\ \mathbf{l_I} = 2\ \hbar = 2.1112726 \cdot 10^{-34}\,(m)$.

The antisymmetric state of the two constituents photons of the intervalino can be visualized as two photons traveling in opposite directions which are coupled tangentially, so that opposite ends to the coupling point of each photon —which are situated in the centre of the intervalino— continue moving at the speed of light, c, as it can not be otherwise, since all non massive particle always moves at the speed of light in intervalic space-time, hence the linear velocity on the "surface" of the intervalino is precisely c.

sible task finally reached, there is no reason to think that the intervalinar fusion will not be able to be controlled in the future.

According to the intervalic principle of equivalence $E = c^{\pm 2} \hbar\ Q^{-2}$, the energy liberated in a intervalinar fusion of 270 intervalic charges to conform an elementary one would be:

$$E = (270^3\text{-}1)\ 270^{-2}\ c^{-1} = 9.0062301 \cdot 10^{-7}\ (J) = 5{,}621{,}244.4\ (MeV/c^2)$$

Of course, the problem for practice purposes is that all electric charges known in the actual Universe are already absolutely *degraded* to the state of minimal intervalic energy: the *elementary charge*. If there is really the mentioned ratio of single intervalinos floating across interstellar space, and a spatial navy moving through spacetime could join a number of them by some device up to make elementary charges, there would have an unlimited source of energy at our disposal for interstellar travels.

INTERVALINO AND STRING THEORY

The postulation of the *intervalino* can divide theoretical Physics research on two main fields: physics *before* the intervalino and Physics *after* it. The last can study the features of the successive aggregations of intervalinos to make subatomic particles, since all matter is made only from the assembly of intervalinos; this is the aim of IT in Particle Physics. The first one can study the mystery of the creation of the own intervalino, the last fundamental block of Nature; this will have to be likewise the aim of the String Intervalic Theory. Really it does not need to explain anything more since all particles can be explained starting from the intervalino and as simple assemblies of intervalinos in IT. Intervalino is really the unique primordial particle needed for yielding all subatomic particles in Physics. Henceforth, it might be the main area of research in String Theory. But to make this possible, it is unavoidable that a new Intervalic String Theory start to work from the very beginning, reformulating Physics in intervalic dimensions, with the intervalic quanta and limits, and expressing it in the intervalic system of units.

Finally, I regret to say that some parts of String Theory are lamentably *inconsistent* under intervalic units. This failure is, of course, due to the introduction of the so named “geometrized units” —$c = 1$ (1), $\hbar = 1$ (1)— which are absolutely geometryless and I have serious doubts about if such *non independent* system of measurement can be properly named “units”. It is not necessary to point out that starting from clearly inconsistent foundations, it is impossible to obtain any right result, unless it is yielded by chance. Anyone can read in a Physics textbook by Anthony Zee (***Quantum Field Theory in a Nutshell***), that being T some operator to be determined, time reversal verifies:

$$T^{-1}(-i)T = i$$

As Zee comments: “Speaking colloquially, we can say that in quantum physics time goes with an *i* and so flipping time means flipping *i* as well”. But this just coincides with the intervalic dimension of time: $T = iL$, which is in the foundations of the Intervalic Theory.

I am afraid that String Theory should reorient its research, forgetting the zoo of subatomic particles and focusing exclusively on the intervalino features, since all massive particles can be explained starting only from the intervalino. In other way, it is possible that String Theory does not be the mathematics of XXI century felt on the XX century, as someone have said, but only a fantastic mathematical crossword without any epistemological junction with Physics.

As we will see when describing the intervalic primordial aggregation of the Universe, all massive particles of nature can be fully explained as assemblies of intervalinos, this means that massless particles —photon, graviton— are not composed by intervalinos. This destroys the beauty of a faultless theory because the most simple assumption for such a theory is to find *one* fundamental particle from which are derived all the remaining ones, both massless and massful ones.

Richard Feynman says in his autobiography that his father asked him the following: how can be possible that an electron emits a lot of photons, have the electron a great store of photons inside? Feynman could not gave a satisfactory answer to his father. Our ignorance of a feature often lead us to accept blindly that feature without question it. The case is that the question of Feynman’s father is absolutely relevant, and it is similar to asking how can liquid water make vapour of water. Of course, it is only possible because liquid water have a number of molecules of H_2O. Similarly, we say that matter is like “solidified” energy, therefore matter should be composed by a number of “blocks” of energy. If we continue this reasoning up to the end, as ancient Greeks taught us, we will obtain an apparently absurd conclusion: intervalino must be composed by some kind of photons. Even worst, as electromagnetic waves have inertia, photons and gravitons must have a similar composition. In resume, intervalinos, photons and gravitons should have a similar composition.

There are several powerful reasons —which will be understood along this book— to postulate that intervalino is a spin 0 particle, photon a spin 1 particle, and graviton a spin 2. Supposing that photon is a closed string, it is clear that there is only one manner to relate those three particles with full symmetry under interchange: spin 0 intervalino would be an assembly of two closed strings in an antisymmetric state under interchange, and spin 2 graviton would be an assembly of two closed strings in a symmetric state under interchange. We will develop later the details of this picture in a wider context. By the moment, we can say that if this relation was consistent with the primordial aggregation of intervalinos, the fundamental interactions, the symmetry breakings, etc., we would have got a very simple and elegant faultless theory which could explain all fundamental particles of Nature starting from *one* particle: a *closed string* —later named *photon,* from the dalino synthesis and onwards, when acting as carrier of the electromagnetic interaction—. Moreover, the own closed string could still come from an open string —the intervalic string—, some of whose main physical features are intended to be the same ones as of vacuum.

INTERVALINO COUPLING FREQUORCE

We already know that the intervalino mass energy comes completely from the intervalic energy. If we equalize the intervalino intervalic energy with the *transversal energy* of a pair of massless closed strings, in an antisymmetric state under interchange, coupled at a distance of the intervalic length, $\hbar = 1\ (\mathrm{L}) = 1.0556363 \cdot 10^{-34}\ (\mathrm{m})$, we have:

$$E(\mathbf{I}) = c^{\pm 2}\ \hbar\ \mathbf{q_I}^{-2} = c^{\pm 2}\ \hbar\ [\surd\text{-}(c^{-1}\hbar)]^{-2} = c^{-1} = 3.335640952 \cdot 10^{-9}\ (\mathrm{J}) =$$
$$= 20{,}819.42423\ (\mathrm{MeV}/c^{2})$$
$$E(\gamma) + E(\underline{\gamma}) = 2 \cdot 2\pi J\varphi = 4\pi\hbar\varphi = E(\mathbf{I})$$

Therefore, the corresponding frequorce of the constituent photons is:

$$\varphi_{\mathrm{m}} = 1/(4\pi\ c\hbar) = 2.51452013 \cdot 10^{24}\ (\mathrm{s}^{-1})$$

This magnitude would be the intervalino coupling frequorce, which can be interpreted as the *coupling frequorce of matter*, since all intervalinos of the Universe are coupled at that frequorce. It is also clear that it will be the minimal allowed energy of the resultant pair photon-antiphoton in the theoretical electromagnetic decay of an intervalino (regardless the threshold energy). Therefore, we can affirm that the frequorce of the primordial isolated closed strings —ulterior photons— was necessarily *greater* that this one, since in other case the primordial aggregation of closed strings was not happened because it was not led to a state of lesser energy.

We can know the related *coupling temperature of matter*, Θ_m, which is the minimal temperature needed for the assembly of intervalinos. By means of the geometrical properties of the intervalic units, taking dimensionless intervalic light-units for the coupling frequorce and for the coupling temperature, being $\boldsymbol{\varphi}_\mathbf{I}$ and $\boldsymbol{\Theta}_\mathbf{I}$ respectively the *intervalic frequorce* and the *intervalic temperature* (namely, the geometric *intervalic limits* in the Intervalic Space), we have:

$$\varphi_c = \varphi_m / \boldsymbol{\varphi}_\mathbf{I} = 1/(4\pi\, c\hbar) / c\, \hbar^{-1} = 1/(4\pi\, c^2)$$
$$\Theta_c = \Theta_m / \boldsymbol{\Theta}_\mathbf{I} = \Theta_\gamma\, c^{-1}\, k_B$$
$$\Theta_m = 1/(4\pi\, c\, k_B) = 1.922575127 \cdot 10^{13}\ (K)$$

As we will see opportunely, the *threshold temperature* of annihilation-materialization of intervalinos in the primordial Universe, considered as a gas in thermodynamic equilibrium, is around 10 times greater than the above one.

INTERVALINO DECAY AND LIFETIME

The fact is that some matter decays electromagnetically. This means that we necessarily have some intervalic structure which decays into *photons*. But we know that all particles are composed finally by *intervalinos*. According to the principles of economy and simplicity in logical assumptions, this means that we should be compelled to investigate the possibility that the intervalino should be composed by some assembly of photons. It appears that the most simple possible decay of intervalino would be the separation of its constituent closed strings. In this case the genuine block of matter, namely the intervalino, which is the fundamental boson of the intervalic interaction with spin 0, would be at the same time a particle composed by two closed strings, that we can suppose with spin 1 and radius ħ. It appears that the most simple assumption is to identify these two closed strings with *photons*:

$$\mathbf{I} \rightarrow \gamma\underline{\gamma}$$

Since the lifetime of photon is intended to be infinite, we have no reason to suppose the lifetime of intervalino (and also of graviton) was not likewise infinite. Therefore we may suppose that the decay of intervalino into its two constituent closed strings (photons) only comes when reaching some geometric limit of temperature. That limit should be somehow related with the intervalic temperature, $\mathbf{\Theta_I} = c\ k_B^{-1} = 2.1713738 \cdot 10^{31}$ (K), a geometric magnitude which points the beginning of the Universe in traditional cosmologic models, or the interval between the Big Crunch and the next Big Bang in an oscillating Universe. By the way, the oscillating Universe is the unique model that satisfies the ancient wisdom about the deep parallelism existing between macro cosmos and micro cosmos. Since elegance and simplicity are indispensable features of a faultless theory of Nature, we believe that the inner geometry of Nature should involve the model of an oscillating Universe, as the two other possibilities —an open and a closed Universes— only can be really postulated by fragmented, inelegant and tasteless minds of bonkers, which surely can not understand the wonderful mind of Nature.

This is the way postulated by IT. However we still have another logical possibility inside the Intervalic Space that we are going to comment briefly. The intervalino lifetime could be related with the intervalic pseudo limit of time: $\mathbf{t_I}^{-1} = c\hbar^{-1} = 2.8399227 \cdot 10^{42}$ (s), which is supposed to be the greatest magnitude of time expected in the Universe. We say pseudo limit instead of limit because time is not geometrically *limited* in the Intervalic Geometry, but it is *quantized* by the intervalic time, $\mathbf{t_I}$. However $\mathbf{t_I}^{-1}$ is the inverse period of the intervalic frequency, namely, the largest oscillation allowed in the Intervalic Space, which may be supposed to be the oscillation of the own Universe from a Big Bang to a Big Crunch, being that magnitude $8.9991693 \cdot 10^{34}$ years. If this was the case, it is clear that the lifetime of proton postulated by SUSY could not be by no means greater than the intervalino lifetime.

To conclude we will consider the lifetime of intervalino as a *virtual* particle. According to well known physics principles it is:

$$T(\mathbf{I}) = c^{-1}\hbar / c\ m_{\mathbf{I}} = c\ \hbar = 3.1647180 \cdot 10^{-26}\ (s^{-1})$$

It can be noted that at the Big Bang, due to the, to say in an old style, intervalic Lorentz-Einstein transformation regarding *temperature*, the dilation of time could increase considerably such magnitude since the initial temperature of the Universe began with the *intervalic temperature*, $\mathbf{\Theta_I}$, being k_B the Boltzmann constant and $\boldsymbol{\varphi_I}$ the intervalic frequorce:

$$\mathbf{\Theta_I} = E / k_B = \hbar\ \boldsymbol{\varphi_I} / k_B = \hbar\ c\ \hbar^{-1} / k_B = c\ k_B^{-1} = 2.171374 \cdot 10^{31}\ (K)$$

This temperature is the intervalic geometrical limit which determines the highest one allowed in the Intervalic Space. Such temperature plays a role analogous to the speed of light with respect to the measurement of spacetime and physical quantities in Lorentz-Einstein transformations. The *c-temperature* is defined as:

$$\Theta_c = \Theta/\boldsymbol{\Theta_I}$$

And the gamma factor regarding temperature is:

$$\gamma(\Theta) = 1 / \sqrt{(1 - \Theta_c^2)}$$

Therefore, the intervalic Lorentz-Einstein transformations of space and time regarding temperature are, written in the classic mode of Relativity:

$$L = L_0 \, \gamma^{-1}(\Theta)$$
$$T = \gamma(\Theta) \, T_0$$

This means that if we suppose a primordial temperature $\Theta_c \approx 1$, the dilatation of intervalino's lifetime considered as *virtual* particle could be as large as the c-temperature was close to 1. This may have surprising consequences for the genesis of the Universe and clearly makes irrelevant the assumption of inflation which lead to the uneconomic existence of a lot of a lot of a lot of multiple Universes. That is neither the way of Art by no means, nor the way of Nature insofar as the unique art work made by Nature —the Universe— is necessarily still much more intelligent than the artificial art works —the musical compositions— made by human beings.

THE INTERVALIC STRUCTURE OF SPACE

THE TWO OLD CONCEPTIONS OF SPACE

There have been two different conceptions of *space* in the history of Physics:

- *Continuous*, completely full, made from an infinite number of infinitesimal space-time cells. This is the traditional paradigm of space in Physics, hold by both Classic and Quantum Mechanics.
- *Discrete, discontinuous*, granular, completely empty, made from the juxtaposition of a finite number of space blocks. It has been rigorously avoided by traditional Physics.

INTERVALIC STRUCTURE OF SPACE

According to the Intervalic Theory space is not continuous at quantum scale. Academic physics can not accept the concept of a granular space as it seems to involve that space is woven as a fixed net. However things are far to be that way. Tridimensional space is made by the cosmic composition of a finite number of intervalic quanta of length, ħ (L). As any surface is made by an infinite number of lines, this means that the sum of any *finite* number of intervalic lengths is neither enough to make any surface nor any volume. Therefore *the total volume of space of the Universe is zero*, and *the total surface of the Universe is equally zero*.

The spatial net which makes what we know as tridimensional space is composed exclusively by *lines* (ħ) at quantum scale. This means that the volume of space is absolutely *empty* at quantum scale and contains no other than *nothingness* between a tridimensional net of *lines of space* composed by a number of intervalic quanta of length.

Insofar as such quanta are the latest minimal blocks of *information*, which at once are the foundations of consciousness, *space* itself can be interpreted in some ways as equivalent and identical to *consciousness*. This means that 'space', as it is usually imagined, does not exist, but only a vast *cobweb of space-consciousness*, whose volume and surface is zero, which makes the illusion of a filled space. This involve that 'vacuum' is a misleading concept and that the quantum concept of vacuum is completely wrong.

Moreover, the space which makes that cobweb is just the stuff of which are made all subatomic particles —which are ultimately made from intervalic strings, that is to say, from space (L)—. Therefore we surprisingly find that *it does not exist any space in the Universe apart from the own one-dimensional space of which are made all subatomic particles*. This **one-dimensional physical** space is unfolded or curved in a **three-dimensional mathematical** space, making the great illusion of continuum we usually see with our senses.

If we could see a truthful image of the real stuff of the Universe during an interval of time, we would see but *a mess of straight lines of space crossing in all directions* (the track left by intervalinoless particles) and *a number of big cosmic nests* also made from *lines of space* (the track left by intervalinoful particles, gathered in vast bulks forming stars). By the way, the famous picture of the lead ball sinking on a rubber cloth used to explain the curvature of space in General Relativity has to be substituted by this one.

FINITENESS AND DISCRETENESS OF SPACE

By these reasons the total value in the Universe of everyone of those strongly related terms —space, consciousness and information— is necessarily *finite*.

The opposite is logically contradictory. If *space* was continuous —and therefore infinite— as it is intended by Classic Mechanics and Quantum Mechanics, it involves that *consciousness* and *information* would also be *infinite*. However, it goes against the higher principles of logical economy and in this way it seems to be a logical impossibility that consciousness was infinite. Moreover, since there is a definite geometric equation between *information* and *energy*, this involves that the total energy of the Universe would necessarily be infinite, what is absolutely impossible in an intervalic Universe which has got all its physical quantities geometrically limited by the intervalic quanta and limits, derived straightforwardly from the Intervalic System of Dimensions.

This means that the cosmic space in the Universe, although unlimited, it is however finite, which involves two things: the cosmic space is *finite* in size, and it is also *discrete* (as if it was *continuous* it would be anew *infinite*).

Chapter 7

INTERVALIC DALINO

INTERVALIC COMPOSITENESS

Intervalic compositeness —or structurefulness— is an obliged feature in IT since the fundamental geometry of the Intervalic Space quanta define logically the intervalic quantum of electric charge: $\mathbf{q_I} = \sqrt{}\text{-}(c^{-1}\hbar) = 1\ (i^{-1/2}L^{1/2}) = 5.9339900 \cdot 10^{-22}$ (C). Therefore, all charges of Nature must unavoidably be multiple of the intervalic charge, $\mathbf{q_I}$. Starting from here, when developing in a systematic way the infinite possibilities of the aggregation of that electric quantum of charge to create the particles of Nature, we arrive to the surprising conclusion that there is only *one* way to make such primordial aggregation of intervalic charges according to the intervalic geometry. We start postulating only the existence of the geometric relations derived from the existence of the two fundamental constants of Nature, c (i^{-1}) and ħ (L), which intervalic dimensions are, at once, just and precisely the unique two components of the *dimensional basis* of the Intervalic Theory. All those geometric relations are simply the *geometric equivalences* between all the 40 physical quantities existing in the Intervalic Space. Among such *geometric statements*, we find the intervalic principles of equivalence between electric charge, energy and matter:

$I = c^{\pm 2}\,\hbar\,Q^{-2}$
$E = c^{\pm 2}\,m$
$Q = c^{\pm 2}\,\sqrt{}(\hbar/m)$

These important formulas are fundamental equations in classic Physics, but in IT they have the epistemological rank of geometric statements —in a very different manner from the degenerate "geometrized units", which have not any geometric meaning, and hardly can be named independent units—.

Apart form this, we only need to postulate the validity of one theorem in order to develop logically the intervalic primordial aggregation of intervalinos: it is the *spin-statistics theorem*, which can be supposed to be valid before the apparition of the four supposed traditional interactions. Thus *spin* can be considered as the first degree of freedom existing in Nature, and therefore the first interaction between particles should be a spin dependent interaction. But this is just the *intervalic interaction*, which is a spin dependent exchange frequorce. Moreover, it relies and is defined starting from the *intervalic energy*, $I = c^{\pm 2} \hbar Q^{-2}$, which can be viewed as a geometric statement in the Intervalic Space.

In a remarkable show of simplicity, the existence of traditional interactions and other classic physical features is not necessary by no means to make such primordial aggregation. Moreover, the four supposed forces of Nature were born as a result of such primordial aggregation, appearing at successive steps and being related with corresponding *intervalic structures* and *symmetry breakings*, as we will opportunely see.

According to these simple and powerful constraints, the systematic aggregations of intervalinos led to the assembly of successive particles, all of them defined univocally by its *intervalic structure*. Thus, the intervalino based compositeness of Nature yields up to six intervalic structure levels, each one determined by an intervalic structure which name correspond to its related particle. They are, by order: *intervalino*, *dalino*, *gaudino*, *lisztino*, *monteverdino* and *palestrino* —these terms are taken from prominent artists of different epochs: Salvador Dalí, Antonio Gaudí, Franz Liszt, Claudio Monteverdi and Giovanni Pierluigi da Palestrina—.

STRUCTURE OF DALINOS

We define the *dalino* as an intervalic structure composed by the aggregation of a determine number of intervalinos. The term 'dalino' is taken in honour of the great Spanish surrealist artist Salvador Dalí (1904-1989).

Due to intervalic principles of symmetry, that number only can take 16 values, which are precisely the divisors of the elementary charge, since the magnitude of the elementary charge is the main state of lowest energy, reached through the accurate balance between the intervalic energy, electromagnetic and spin energies. These values are the 16 multiples of the intervalic charge, $\mathbf{q_I} = \surd\text{-}(c^{-1}\hbar)$:

1, 2, 3, 5, 6, 9, 10, 15, 18, 27, 30, 45, 54, 90, 135, 270.

Of course, the aggregations of intervalinos could take any other exotic values at the very beginning of the Big Bang, but none of them survived after the primordial synthesis of subatomic particles because its energy could not reach a balance imposing a different set of symmetrical constraints than those derived from the elementary charge, would could play like a strong and powerful attractor. Therefore, we are compelled to think that any particle which symmetries do not fit with the constraints imposed by the state of lowest energy of the elementary charge could not stay after primordial times.

According to the number of constituent intervalinos, we name the dalinos as, i.e., dalino 18, dalino 27, dalino 30, etc., including likewise this number behind its symbol as a subindex: D_{18}, D_{27}, D_{30}, etc. Need not to say that the dalino 270 (D_{270}) is the *electron*.

DALINOS INTERVALIC ENERGY

The intervalic energy of dalino constitutes its formerly named “intrinsic mass” of the particle. It has to be remarked that surprisingly the intervalic mass of dalinos do not rely on their radii, so it is a *geometric* magnitude which may have great importance to understand some physical features, as we will see along this book. Here are shown the intervalic masses of all dalinos with the magnitudes expressed in traditional units:

$I(D_{270}) = I(e) = c^{\pm 2}\, \hbar\, (270\, \mathbf{q_I})^{-2} = c^{\pm 2}\, \hbar\, [270\, \surd\text{-}(c^{-1}h)]^{-2} = 270^{-2}\, c^{-1} =$
$= 4.575639166 \cdot 10^{-14}\, (J) = 0.285588809\, (MeV/c^2)$
$I(D_{135}) = c^{\pm 2}\, \hbar\, (135\, \mathbf{q_I})^{-2} = c^{\pm 2}\, \hbar\, [135\, \surd\text{-}(c^{-1}h)]^{-2} = 135^{-2}\, c^{-1} =$
$= 1.8302557 \cdot 10^{-13}\, (J) = 1.1423553\, (MeV/c^2)$
$I(D_{90}) = c^{\pm 2}\, \hbar\, (90\, \mathbf{q_I})^{-2} = c^{\pm 2}\, \hbar\, [90\, \surd\text{-}(c^{-1}h)]^{-2} = 90^{-2}\, c^{-1} =$
$= 4.1180752 \cdot 10^{-13}\, (J) = 2.5702993\, (MeV/c^2)$
$I(D_{54}) = c^{\pm 2}\, \hbar\, (54\, \mathbf{q_I})^{-2} = c^{\pm 2}\, \hbar\, [54\, \surd\text{-}(c^{-1}h)]^{-2} = 54^{-2}\, c^{-1} =$
$= 1.1439098 \cdot 10^{-12}\, (J) = 7.1397203\, (MeV/c^2)$
$I(D_{45}) = c^{\pm 2}\, \hbar\, (45\, \mathbf{q_I})^{-2} = c^{\pm 2}\, \hbar\, [45\, \surd\text{-}(c^{-1}h)]^{-2} = 45^{-2}\, c^{-1} =$
$= 1.6472301 \cdot 10^{-12}\, (J) = 10.281197\, (MeV/c^2)$
$I(D_{30}) = c^{\pm 2}\, \hbar\, (30\, \mathbf{q_I})^{-2} = c^{\pm 2}\, \hbar\, [30\, \surd\text{-}(c^{-1}h)]^{-2} = 30^{-2}\, c^{-1} =$
$= 3.7062677 \cdot 10^{-12}\, (J) = 23.132694\, (MeV/c^2)$
$I(D_{27}) = c^{\pm 2}\, \hbar\, (27\, \mathbf{q_I})^{-2} = c^{\pm 2}\, \hbar\, [27\, \surd\text{-}(c^{-1}h)]^{-2} = 27^{-2}\, c^{-1} =$

<table>
<tr><th colspan="6">INTERVALIC STRUCTURE LEVELS</th></tr>
<tr><th>1st.</th><th>2nd.</th><th>3rd.</th><th>4th.</th><th>5th.</th><th>6th.</th></tr>
<tr><th><i>Intervalinar level</i></th><th><i>Dalinar level</i></th><th><i>Gaudinar level</i></th><th><i>Lisztinian level</i></th><th><i>Monteverdic level</i></th><th><i>Palestrinian level</i></th></tr>
<tr><td rowspan="6">INTER-
VALINO</td><td rowspan="5">Symmetric
aggregation
of intervalinos →
DALINO
(ELECTRON)</td><td rowspan="4">Symmetric
aggregation
of dalinos →
GAUDINO
(MUON, TAU,
CHARGED
MASSIVE
BOSONS)</td><td colspan="3">Symmetric aggregation of gaudinos →
LISZTINO
(ZERO CHARGED MASSIVE BOSONS)</td></tr>
<tr><td rowspan="3">Antisymmetric
aggregation
of gaudinos →
FRACTIONAL
CHARGED
LISZTINO
(QUARKS)</td><td colspan="2">Symmetric aggregation of lisztinos →
MONTEVERDINO
(MESONS)</td></tr>
<tr><td rowspan="2">Antisymmetric
aggregation
of lisztinos →
MONTE-
VERDINO
(BARYONS)</td><td>-</td></tr>
<tr><td>Antisymmetric
aggregation
of monteverdinos →
PALES-
TRINO</td></tr>
<tr><td colspan="4">Antisymmetric aggregation of dalinos → DARK MATTER</td></tr>
<tr><td colspan="5">Antisymmetric aggregation of intervalinos → DARK MATTER</td></tr>
</table>

$= 4.5756391 \cdot 10^{-12}$ (J) = 28.558881 (MeV/c^2)

$I(D_{18}) = c^{\pm 2}\, \hbar\, (18\, \mathbf{q_I})^{-2} = c^{\pm 2}\, \hbar\, [18\, \surd\text{-}(c^{-1}h)]^{-2} = 18^{-2}\, c^{-1} =$

$= 1.0295188 \cdot 10^{-11}$ (J) = 64.257483 (MeV/c^2)

$I(D_{15}) = c^{\pm 2}\, \hbar\, (15\, \mathbf{q_I})^{-2} = c^{\pm 2}\, \hbar\, [15\, \surd\text{-}(c^{-1}h)]^{-2} = 15^{-2}\, c^{-1} =$

$= 1.4825071 \cdot 10^{-11}$ (J) = 92.530775 (MeV/c^2)

$I(D_{10}) = c^{\pm 2}\, \hbar\, (10\, \mathbf{q_I})^{-2} = c^{\pm 2}\, \hbar\, [10\, \surd\text{-}(c^{-1}h)]^{-2} = 10^{-2}\, c^{-1} =$

$= 3.3356409 \cdot 10^{-11}$ (J) = 208.19424 (MeV/c^2)

$I(D_9) = c^{\pm 2}\, \hbar\, (9\, \mathbf{q_I})^{-2} = c^{\pm 2}\, \hbar\, [9\, \surd\text{-}(c^{-1}h)]^{-2} = 9^{-2}\, c^{-1} =$

$= 4.1180752 \cdot 10^{-11}$ (J) = 257.02993 (MeV/c^2)

$I(D_6) = c^{\pm 2}\, \hbar\, (6\, \mathbf{q_I})^{-2} = c^{\pm 2}\, \hbar\, [6\, \surd\text{-}(c^{-1}h)]^{-2} = 6^{-2}\, c^{-1} =$

$= 9.2656692 \cdot 10^{-11}$ (J) = 578.31735 (MeV/c^2)

$I(D_5) = c^{\pm 2}\, \hbar\, (5\, \mathbf{q_I})^{-2} = c^{\pm 2}\, \hbar\, [5\, \surd\text{-}(c^{-1}h)]^{-2} = 5^{-2}\, c^{-1} =$

$= 1.3342564 \cdot 10^{-10}$ (J) = 832.77698 (MeV/c^2)

$I(D_3) = c^{\pm 2}\, \hbar\, (3\, \mathbf{q_I})^{-2} = c^{\pm 2}\, \hbar\, [3\, \surd\text{-}(c^{-1}h)]^{-2} = 3^{-2}\, c^{-1} =$

$= 3.7062677 \cdot 10^{-10}$ (J) = 2,313.2694 (MeV/c^2)

$I(D_2) = c^{\pm 2}\, \hbar\, (2\, \mathbf{q_I})^{-2} = c^{\pm 2}\, \hbar\, [2\, \surd\text{-}(c^{-1}h)]^{-2} = 2^{-2}\, c^{-1} =$

$= 8.3391023 \cdot 10^{-10}$ (J) = 5,204.8561 (MeV/c^2)

$I(D_1) = I(\mathbf{I}) = c^{\pm 2}\, \hbar\, (1\, \mathbf{q_I})^{-2} = c^{\pm 2}\, \hbar\, [1\, \surd\text{-}(c^{-1}h)]^{-2} = 1^{-2}\, c^{-1} =$

$= 3.3356409 \cdot 10^{-9}$ (J) = 20,819.424 (MeV/c^2)

The total sum of the intervalic energy of the set of dalinos is $4.87763005 \cdot 10^{-9}$ (J) = 30,443.759 (MeV/c^2).

DALINOS RADIUS

We already know the radius of some dalinos: among others, those of the electronic dalino (D_{270}) and the muonic dalino (D_{45}). They are respectively:

$r(D_{270}) = r_e = 3.0257565 \cdot 10^{19}$ (L) $= 3.1940984 \cdot 10^{-15}$ (m)

$r(D_{45}) = 2.5850690 \cdot 10^{16}$ (L) $= 2.7288927 \cdot 10^{-18}$ (m)

which correspond to the following electromagnetic potential energies:

$U(D_{270}) = U(e) = \frac{1}{2}\, (1/4\pi\varepsilon_0)\, (270\, \mathbf{q_I})^2 / r_e =$

$= 3.6114723 \cdot 10^{-14}$ (J) = 0.22541028 (MeV/c^2)

$U(D_{45}) = \frac{1}{2}\, (1/4\pi\varepsilon_0)\, (45\, \mathbf{q_I})^2 / r(D_{45}) =$

$= 1.1742041 \cdot 10^{-12}$ (J) = 7.3288027 (MeV/c^2)

Instead to adjust a curve of interpolation, which is always inelegant, and since the radius is obviously proportional to the electric charge raised to the power 4, we will take intuitively as a first approximation the following formula with the electron radius ratio as reference: $r(D_n) \approx n^4 \cdot r(D_{270}) / 270^4$:

$r(D_{270}) = r_e = 3.0257565 \cdot 10^{19}$ (L) = $3.1940984 \cdot 10^{-15}$ (m)
$r(D_{135}) \approx 1.8910978 \cdot 10^{18}$ (L) = $1.9963115 \cdot 10^{-16}$ (m)
$r(D_{90}) \approx 3.7355018 \cdot 10^{17}$ (L) = $3.9433313 \cdot 10^{-17}$ (m)
$r(D_{54}) \approx 4.8412106 \cdot 10^{16}$ (L) = $5.1105576 \cdot 10^{-18}$ (m)
$r(D_{45}) \approx 2.3346887 \cdot 10^{16}$ (L) = $2.4645821 \cdot 10^{-18}$ (m)
$r(D_{30}) \approx 4.6117307 \cdot 10^{15}$ (L) = $4.8683104 \cdot 10^{-19}$ (m)
$r(D_{27}) \approx 3.0257565 \cdot 10^{15}$ (L) = $3.1940984 \cdot 10^{-19}$ (m)
$r(D_{18}) \approx 5.9768030 \cdot 10^{14}$ (L) = $6.3093302 \cdot 10^{-20}$ (m)
$r(D_{15}) \approx 2.8823317 \cdot 10^{14}$ (L) = $3.0426940 \cdot 10^{-20}$ (m)
$r(D_{10}) \approx 5.6934947 \cdot 10^{13}$ (L) = $6.0102597 \cdot 10^{-21}$ (m)
$r(D_9) \approx 3.7355018 \cdot 10^{13}$ (L) = $3.9433313 \cdot 10^{-21}$ (m)
$r(D_6) \approx 7.3787689 \cdot 10^{12}$ (L) = $7.7892963 \cdot 10^{-22}$ (m)
$r(D_5) \approx 3.5584341 \cdot 10^{12}$ (L) = $3.7564122 \cdot 10^{-22}$ (m)
$r(D_3) \approx 4.6117307 \cdot 10^{11}$ (L) = $4.8683104 \cdot 10^{-23}$ (m)
$r(D_2) \approx 9.1095914 \cdot 10^{10}$ (L) = $9.6164154 \cdot 10^{-24}$ (m)
$r(D_1) \approx 5.6934947 \cdot 10^{9}$ (L) = $6.0102597 \cdot 10^{-25}$ (m)

DALINOS EQUIVALENT ELECTROMAGNETIC ENERGY

Taking the preceding values of the radius, the equivalent electromagnetic energy of dalinos would be:

$U(D_{270}) = U(e) = 3.6114723 \cdot 10^{-14}$ (J) = 0.22541028 (MeV/c^2)
$U(D_{135}) = 1.4445889 \cdot 10^{-13}$ (J) = 0.90164111 (MeV/c^2)
$U(D_{90}) = 3.2503251 \cdot 10^{-13}$ (J) = 2.0286925 (MeV/c^2)
$U(D_{54}) = 9.0286804 \cdot 10^{-13}$ (J) = 5.6352567 (MeV/c^2)
$U(D_{45}) = 1.3001300 \cdot 10^{-12}$ (J) = 8.1147699 (MeV/c^2)
$U(D_{30}) = 2.9252925 \cdot 10^{-12}$ (J) = 18.258232 (MeV/c^2)
$U(D_{27}) = 3.6114723 \cdot 10^{-12}$ (J) = 22.541028 (MeV/c^2)
$U(D_{18}) = 8.1258126 \cdot 10^{-12}$ (J) = 50.717312 (MeV/c^2)
$U(D_{15}) = 1.1701170 \cdot 10^{-11}$ (J) = 73.032928 (MeV/c^2)
$U(D_{10}) = 2.6327633 \cdot 10^{-11}$ (J) = 164.32409 (MeV/c^2)
$U(D_9) = 3.2503251 \cdot 10^{-11}$ (J) = 202.86925 (MeV/c^2)
$U(D_6) = 7.3132316 \cdot 10^{-11}$ (J) = 456.45582 (MeV/c^2)
$U(D_5) = 1.0531053 \cdot 10^{-10}$ (J) = 657.29638 (MeV/c^2)
$U(D_3) = 2.9252925 \cdot 10^{-10}$ (J) = 1,825.8232 (MeV/c^2)
$U(D_2) = 6.5819083 \cdot 10^{-10}$ (J) = 4,108.1023 (MeV/c^2)

$U(D_1) = U(\mathbf{I}) = 0$

Please note that according to the right (and frequently forgotten) definition of electromagnetic potential energy, only can have potential energy the *composite* particles, that is to say, those which can be separated in fragments. Since the intervalino is a *single* particle —and the unique fundamental block of which are composed all subatomic particles—, it can not have electromagnetic potential energy. In the same way, the dalino 1 which is composed by *one* intervalino does not have either. In other case, its electromagnetic potential energy would be:

$U(D_1) = 5.26552606 \cdot 10^{-9}$ (J) = 32,864.8144 (MeV/c^2)

We will see with further detail this uncanny feature when describing the intervalic dark matter.

DALINOS TOTAL MASS

Since the total mass of a subatomic particle at rest is the sum of its intervalic and electromagnetic energies, $m(D_n) = c^{\pm 2}\,[I(D_n) + U(D_n)]$, we have from the below results:

$m(D_{270}) = 8.1871114 \cdot 10^{-14}$ (J) = 0.51099909 (MeV/c^2)
$m(D_{135}) = 3.2748446 \cdot 10^{-13}$ (J) = 2.0439964 (MeV/c^2)
$m(D_{90}) = 7.3684003 \cdot 10^{-13}$ (J) = 4.5989918 (MeV/c^2)
$m(D_{54}) = 2.0467778 \cdot 10^{-12}$ (J) = 12.774977 (MeV/c^2)
$m(D_{45}) = 2.9473601 \cdot 10^{-12}$ (J) = 18.395967 (MeV/c^2)
$m(D_{30}) = 6.6315602 \cdot 10^{-12}$ (J) = 41.390926 (MeV/c^2)
$m(D_{27}) = 8.1871114 \cdot 10^{-12}$ (J) = 51.099909 (MeV/c^2)
$m(D_{18}) = 1.8421001 \cdot 10^{-11}$ (J) = 114.97480 (MeV/c^2)
$m(D_{15}) = 2.6526240 \cdot 10^{-11}$ (J) = 165.56370 (MeV/c^2)
$m(D_{10}) = 5.9684041 \cdot 10^{-11}$ (J) = 372.51833 (MeV/c^2)
$m(D_{9}) = 7.3684003 \cdot 10^{-11}$ (J) = 459.89918 (MeV/c^2)
$m(D_{6}) = 1.6578901 \cdot 10^{-10}$ (J) = 1,034.7732 (MeV/c^2)
$m(D_{5}) = 2.3873618 \cdot 10^{-10}$ (J) = 1,490.0734 (MeV/c^2)
$m(D_{3}) = 6.6315602 \cdot 10^{-10}$ (J) = 4,139.0926 (MeV/c^2)
$m(D_{2}) = 1.4921011 \cdot 10^{-9}$ (J) = 9,312.9584 (MeV/c^2)
$m(D_{1}) = 3.3356409 \cdot 10^{-9}$ (J) = 20,819.424 (MeV/c^2)

The total mass of the set of dalinos is 38,040.09338 (MeV/c^2).

Of course, it has to be remembered that we have taken the ratio of energies of electron structure for all dalinos for yielding these calculations, but we totally know that the energy balance between intervalic, electromagnetic and spin energy in each particle has to be calculated individually, since there are slight deviations from this value in the energy ratios of all subatomic particles due to obvious reasons depending on the own intervalic structure of each particle. Nevertheless, it is a great pleasure to be able to write down a complete set with the approximate allowed values for all possible dalinos existing in Nature.

INTERVALIC PRINCIPLE OF ENERGY BALANCE FOR SUBATOMIC PARTICLES

The Lagrangian formalism usually deals with the difference between kinetic and potential energies, L = K - V. It leads to a law of conservation of energy: E = K + V, where E is interpreted as the *total energy* of the system. This total energy is not very useful because it is only the sum of other two amounts and does not have a formulation related with a single physical feature.

On the contrary, in IT this "total" energy —which is not total as we are going to see— is substituted by the *intervalic energy*, which is defined by means of the *intervalic principle of equivalence between electric charge and energy*: $I = c^{\pm 2}\ \hbar\ Q^{-2}$. The intervalic energy of any system is ever *invariant*, unless there is a change in the *structure* of the system. And it is invariant *a fortiori* because it states a *geometrical relation* among physical quantities in the Intervalic Space, which validity does not depend therefore on the system of reference chosen. This is one great difference between the intervalic energy and all the rest of physical quantities: the intervalic energy involves determine *levels of structure* in the system. It have to be applied in an *intervalic* way to anyone of those structures and can not be merged over different levels, as all the rest of physical quantities do. It can be noted that it is the first physical quantity that incorporates this feature in the last foundations of Physics.

Henceforth, the traditional balance in Lagrangian formalism has to be substituted by the *intervalic principle of energy balance* when calculating the total structural energy of subatomic particles: $I = U + E(J)$, where the last term is the intrinsic kinetic energy, namely, the spin energy. It is important to note that I and U are *manifested* as *mass energy*, while $E(J)$ is manifested as *kinetic energy*.

Moreover, the electromagnetic energy —as all the four supposed “forces” of Nature— is derived from the intervalic energy, being just its *inverse* in intervalic units: $U \equiv I^{-1} = c^{\pm 2} (n\hbar)^{-1} Q^2 = c^{\pm 2} Q^2 / r$. As we have seen, in SI units it has to be added to the equation the permeability of vacuum factor, which was conventionally set by definition as $\mu_0/4\pi = 10^{-7} (-1)$, instead of 1 (-1) as in intervalic units. Thus, subatomic particles are the final *balance* reached between two inverse equations, a relation of paramount elegance:

$$I - I^{-1} - E(J) = 0$$

This fundamental intervalic principle give us the basic relations existing among the *structural energies* —intervalic, electromagnetic and spin enegies— involved in any subatomic particle, and will be thoroughly used along this book.

In IT is defined the *energy interval* as the difference of energy between two states. That interval is the difference of energy between two *intervalic structures*, therefore, it is ever and *a fortiori* invariant, because it is like a geometrical interval. From the energy interval can be derived other classic physical quantities —force, field, potential, etc.— which dress the interaction. On the contrary, the Lagrangian way in quantum field theory tries to tell perhaps the same but in an old-fashioned overloaded mode, which is most limited since it is still involved in avoiding the “infinite paths” between those two states, which are irrelevant in IT because we have precisely avoid them in the definition: it has little sense to talk about the infinite paths between two structures since we are dealing with *geometrical relations*.

DALINO SPIN ENERGY

All stable subatomic particles must have a perfect *balance* in its involved structural energies conforming the particle. According to this principle of intervalic balance for subatomic particles, the intervalic energy must be always equal or greater than electromagnetic energy. In the second case, which is the more usual, the remaining energy up to balance the intervalic one is realized by the intrinsic angular momentum of the particle. The spin energy is manifested as *kinetic energy,* while the two other energies, the intervalic and the electromagnetic ones, are manifested as the *mass energy* of the particle:

$$I(D_n) - U(D_n) = E_J(D_n)$$

According to this important intervalic principle, the spin energy of all possible dalinos would be approximately, taken likewise the electron spin energy ratio as reference:

$E_J(D_{270}) = E_J(e) = 9.6416680 \cdot 10^{-15}$ (J) = 0.060178533 (MeV/c^2)
$E_J(D_{135}) = 3.8566680 \cdot 10^{-14}$ (J) = 0.24071418 (MeV/c^2)
$E_J(D_{90}) = 8.6775010 \cdot 10^{-14}$ (J) = 0.54160679 (MeV/c^2)
$E_J(D_{54}) = 2.4104176 \cdot 10^{-13}$ (J) = 1.5044637 (MeV/c^2)
$E_J(D_{45}) = 3.4710004 \cdot 10^{-13}$ (J) = 2.1664271 (MeV/c^2)
$E_J(D_{30}) = 7.8097525 \cdot 10^{-13}$ (J) = 4.874462 (MeV/c^2)
$E_J(D_{27}) = 9.6416677 \cdot 10^{-13}$ (J) = 6.017853 (MeV/c^2)
$E_J(D_{18}) = 2.1693755 \cdot 10^{-12}$ (J) = 13.540171 (MeV/c^2)
$E_J(D_{15}) = 3.1239008 \cdot 10^{-12}$ (J) = 19.497847 (MeV/c^2)
$E_J(D_{10}) = 7.0287760 \cdot 10^{-12}$ (J) = 43.87015 (MeV/c^2)
$E_J(D_9) = 8.6775014 \cdot 10^{-12}$ (J) = 54.16068 (MeV/c^2)
$E_J(D_6) = 1.9524378 \cdot 10^{-11}$ (J) = 121.8615 (MeV/c^2)
$E_J(D_5) = 2.8115104 \cdot 10^{-11}$ (J) = 175.4806 (MeV/c^2)
$E_J(D_3) = 7.8097525 \cdot 10^{-11}$ (J) = 487.4462 (MeV/c^2)
$E_J(D_2) = 1.7571941 \cdot 10^{-10}$ (J) = 1,096.7538 (MeV/c^2)
$E_J(D_1) = E_J(\mathbf{I}) = 3.3356409 \cdot 10^{-9}$ (J) = 20,819.424 (MeV/c^2)

The rotational kinetic energy due to the intrinsic angular momentum of dalino is: $K(D_n) = ½\, I_D\, \omega_D^2$, being I_D the dalino's moment of inertia and ω_D the angular velocity due to its spinning. But as a *composite* particle is like a micro galaxy at quantum scale —in this case the intervalinos would be like the stars and the dalino would play the role of the whole galaxy—, we can unexpectedly introduce a very beautiful application of a law from Cosmology, the Virial theorem, by means of which the potential energy due to dalino's spinning is: $U(D_n) = 2\, K(D_n)$. Therefore the spin energy of dalino, $E\ (D_n)_J$, will be:

$$E(D_n)_J = m_D\, r_D^2\, \omega_D^2$$

From here we will be able to deduce the linear velocity due to spin on dalino's surface, v_D:

$$v_D = \omega_D\, r_D = 1.028801396 \cdot 10^8 \text{ (m s}^{-2}\text{)} = 0.343171206\ c$$

And the acceleration on dalino's surface due to spin will be:

$$a_D = v_D^2 / r_D$$

Once more, needless to say that these are rough values because it has been taken the magnitude of the dalino radius according to the electron's ratio. Accurate values can be deduced when treating individually each particle, although it is expected that the deviation from electron's energy ratio will be very small, as we will see when studying the lepton-massive bosons, which energy ratios are very similar to the electron's one.

THE PRIMORDIAL AGGREGATION OF INTERVALINOS

The definition of the elementary charge in IT as exactly $e = 270\ \mathbf{q_I}$ is based on superbly solid basis: the intervalic system of dimensions, the intervalic quanta and the intervalic limits, and the intervalic system of units. All of them conform the foundations of the Intervalic Theory in Physics and it is hard —or perhaps impossible— to refuse any of them without challenging seriously the very last foundations of Mathematical Logic. Against all expected, the intervalic interaction states that the *electric charge is inversely proportional to energy* at quantum scale. This equivalence explains why the minimal state of energy of the 16 subatomic charges allowed by the Intervalic Theory (the divisors of the elementary charge: 1, 2, 3, 5, 6, 9, 10, 15, 18, 27, 30, 45, 54, 90, 135, 270, values that are very different than those presumed by String Theory) is that of the elementary charge —which is the greater single charge: 270 $\mathbf{q_I}$—, instead of the intervalic quantum of electric charge: $\mathbf{q_I}$ —the smaller one—. By the same reason we also can infer that there is no any *single* electric charge *greater* than the electron's, since it would exist, it would be the elementary one, because it would be then the main state of lesser energy.

Primordial intervalic charges will aggregate among them if, and only if, the aggregation lead to a state of lesser energy. This only is possible when the total *intervalic energy* of the aggregation of *n* intervalic charges is greater than its total *electromagnetic potential energy*, that is to say, when the intervalic energy is greater than its *inverse,* $\mathrm{I} > \mathrm{I}^{-1}$:

$$\mathrm{I}(n\mathbf{q_I}) > \mathrm{I}^{-1}(n\mathbf{q_I})$$

Since the subatomic particles are dynamical structures, the equality between I and I^{-1} can never be reached because there is a remaining structural energy shared by the intrinsic angular momentum of the particle, which is not manifested as *mass* energy but as *spin* energy. It is also clear that Nature balance for subatomic particles tries to maximize the magnitude of the dalino radius, since the electron radius is around 10^{10} orders greater than the maximum intervalino radius. It can be supposed that the magnitude of the radius can not increase indefinitely, but it has a limit determined, at least, by the short range of the intervalinar interaction: the distance among intervalinos inside the dalino must be comprised inside the effective range of the intervalic interaction. Those distances are different in all dalinos. For example, the intervalic distance between intervalinos inside dalino 45 gives smaller values than the analogous distance inside dalino 270. By the moment and at first sight, we can think that the possible biggest dalino radius could not be much more greater than the actual electron radius because it could be expected that according to a general law Nature usually tries to reach an energy equilibrium maximizing the volume of subatomic particles. (Of course these are still rough appreciations, but they are sufficient for our general introductory purpose at this moment; the intervalic interaction will be more thoroughly described later, in the two chapters devoted to that subject).

Henceforth, given supposedly an approximate magnitude of the biggest dalino radius the inequality $\mathrm{I}(n\mathbf{q_I}) > \mathrm{I}^{-1}(n\mathbf{q_I})$ would be valid until $n = 286$ inclusive. For the value $n = 287$ we already have: $\mathrm{I}(287\mathbf{q_I}) < \mathrm{U}(287\mathbf{q_I})$, and further aggregations will not happen anyway. Of course, if $n = 286$ there was not a remaining structural energy to be shared by the intrinsic angular momentum of the dalino, which maintains dynamically the quantum structure of the intervalic charges inside the dalino, so n must necessarily be lesser than 286. Moreover, it is hoped that it should be enough lesser, since in other case the intrinsic angular momentum of electron would be ridiculously small (compared with the speed of light). Actually, the linear velocity on electron's surface is $\mathrm{v}(e)_J = 1.028801396 \cdot 10^8$ (m s^{-2}) = 0.343171206 c.

On the other hand, due to symmetry principles it is expected that n should be divisible by the first integers because it ensures more rich symmetries, a very important constraint which is still difficult to quantify by human minds, but that Nature clearly knows and applies to. Well, the first number below 286 which is divisible by 2, 3, and 5 is 270. The next number is 240 which is too far from the expected values. And above the closed number would be 300. Therefore the maximum allowed aggregation of intervalinos, which at the same time is the state of minimal energy which tend all the aggregations of intervalinos, would be 240, 270 or 300. As we experimentally know by means of the magnitudes of the intervalic and elementary charges, it is just 270, and such dalino is called *electron*.

Since the state of minimal energy in the number of aggregation of intervalinos was fixed at 270, a lot of aggregations of intervalinos were made reaching just that number in the primordial Universe. The repetition and wide spreading of this physical fact along the Universe involves the emergency of an spontaneous order, or in other words, a new symmetry constraint based on that value, which now is named *elementary charge*, since all intervalic structures assembled after it will have to be exactly balanced with that value. In this way can be clearly understood the uniformity imposed by the elementary charge, which magnitude plays a role as an attractor to the main state of minimal energy in the primordial fabric of subatomic particles.

As we will explain opportunely when describing the intervalic primordial aggregation, the spin 0 dalino is an intervalic structure *defined* as the assembly of intervalinos *in symmetric state under interchange*. Therefore, it only can exist dalinos composed by intervalinos with like charges, because a “dalino” composed by intervalinos with unlike charges would be necessarily in an *antisymmetric* state, that is to say, it would not really be a ‘dalino’ but another primordial particle, which will be described at due course.

INTERVALIC CHAOS

Really, the complete understanding of the value of the attractor of the elementary charge is one of the most exciting problems in IT. Please note that at this precise point there is a confluence of meeting point of all the, say, main systems of thought in Physics, by chronological order: relativity, quantum mechanics, theory of chaos and intervalic geometry, and all of them must probably be satisfied here, inside IT.

Since there are non linear equations necessarily involved in the making of dalino, we must be aware of the developments of the theory of chaos. It can be proposed a lot of chaotic models for the primordial assembly of intervalinos which can match *ad hoc* with the dalino 270, and they may likely be interesting. However, only one model among all of them should be the unique entirely reliable one.

It is clear that there might be a trouble in the theory of chaos inasmuch as the vast majority of papers on chaos are infected by Bohr’s or Heisenberg’s philosophy in the sense that there try to prove —erroneously— the supposed “uncertainty” of Nature. On the contrary, the theory of chaos should be interpreted as a wide way of Nature to reach a state of minimal energy. Basically we can distinguish two principal features in any system to appraise its degree of chaotic behaviour: the difference between the energy of the initial and final states, and the number of physical variables involved in the system. When there is a great difference of energy or there are few variables, the involved physical quantities reach their corresponding state of minimal energy in a quick and straight way. We usually call this behaviour as ‘determined’. As the number of variables increases or the difference of energy is small, the paths to reach the state of minimal energy augment enormously and this final state is reached slower and the multiple existing paths become more evident than in the first case. In that case we usually hear that the behaviour of the system is ‘undetermined’.

However it is clear that there is no a net barrier between both behaviours, but a complete gradation between both behaviours of Nature. We can both say that a “determined” behaviour is like a very strong and narrow attractor; or we could also say that a “undetermined” behaviour is like a very long geodesic which has multiple paths to reach the final state of equilibrium. It is only the unlucky philosophy of the Standard Model which introduces unneeded troubles in the subject. We are accustomed to find the first “determined” behaviour in Physics and the second in Biology, and to make a fracture between both sides. Nevertheless this is not true: theory of chaos and IT have found “undetermined” behaviours in Physics, and the explanation of that query is very simple: the physical laws of Physics and of Biology are just the same and comes from the same source: Nature. Both are inside the Universe, and anything existing in the Universe has been created by Nature. Can it be really simpler?

To conclude, whatsoever it be the details of the process to reach the state of minimal energy represented by the elementary charge, the incontrovertible fact is that the dalino 270 is the first strongest state of minimal energy which was reached in the intervalic primordial aggregation, which imposed a powerful symmetry constraint to the next assemblies of intervalinos and further intervalic structures which made the subatomic particles of the actual Universe.

THE INTERVALIC UNIVERSE BEFORE THE BIG BANG

<table>
<tr><th>0</th><th>1</th><th>2</th><th>3</th><th>4</th></tr>
<tr>
<td rowspan="5">POINT
—quantum of being—
(Share = 1)</td>
<td rowspan="4">INTERVALIC STRING
—quantum of space—
(Share = 1)
An interval is, by definition, the distance between two points =
= Antisymmetric assembly of points

<i>Intervalic string state</i>
$S = \{\uparrow, \downarrow\}$
<i>Intervalic string radius</i>
$r_S = \frac{1}{2}\hbar$
<i>Intervalic string spin</i>
$J_S = \frac{1}{2}\hbar$
<i>Intervalic string length</i>
$l_S = \pi\,\mathbf{l_I} = \pi\,\hbar$

<i>Composition of the finite group of Physical Quantities from</i> (i, L^n).
No. of Ph.Q. for $n = 3$:
$4 + 12n = 40$</td>
<td rowspan="3">PHOTON
—quantum of light—
(Share = 1/2)
= Symmetric assembly of Intervalic Strings

<i>Photon state</i>
$\gamma = \{\, \vert\uparrow\uparrow\vert,$
$2^{-\frac{1}{2}}\,(\vert\uparrow\downarrow\vert + \vert\downarrow\uparrow\vert), \vert\downarrow\downarrow\vert \,\}$
<i>Photon radius</i>
$r_\gamma = \hbar =$
$= 1.0556363 \cdot 10^{-34}$ (m)
<i>Frequorce of primordial photon</i>
$\varphi_\gamma = \boldsymbol{\varphi}_\mathbf{I} = c\,\hbar^{-1} =$
$= 2.839921837 \cdot 10^{42}\ (s^{-1})$
<i>Temperature of primordial photon</i>
$\Theta_\gamma = \boldsymbol{\Theta}_\mathbf{I} = c\,k_B^{-1} =$
$= 2.17138589 \cdot 10^{31}$ (K)</td>
<td rowspan="2">INTERVALINO
—quantum of matter—
(Share = 1/4)
= Antisymmetric assembly of photons

<i>Intervalino state</i>
$\mathbf{I} = 2^{-\frac{1}{2}}\,(\vert\gamma\underline{\gamma}\vert - \vert\underline{\gamma}\gamma\vert)$
<i>Intervalino charge</i>
$\mathbf{q_I} = \surd\text{-}(c^{-1}\hbar) = 5.93398995 \cdot 10^{-22}$ (C)
<i>Intervalino intervalic energy</i>
$I(\mathbf{I}) = c^{\pm 2}\,\hbar\,\mathbf{q_I}^{-2} = c^{-1} =$
$= 20{,}819.42423\ (MeV/c^2)$
<i>Electromagnetic energy:</i> $U(\mathbf{I}) = 0$
<i>Intervalino mass:</i> $m(\mathbf{I}) = I(\mathbf{I})$
<i>Spin energy:</i> $E_J(\mathbf{I}) = I(\mathbf{I}) - U(\mathbf{I}) = c^{-1}$
<i>Intervalino radius</i>: $r_\mathbf{I} = c / \omega_\mathbf{I} = 2\,\hbar$</td>
<td>16 DALINOS
—quanta of electric charge—
(Share = 1/8)
$D^{(\pm 1/1,2,3,5,6,9,10,15,18,27,30,45,54,90,135,270)}$
= Symmetric assembly of Intervalinos
(Big Bang origin)
<i>Electron</i>
$e = G_1 = D_{270} = 270\,\mathbf{I}$
<i>Electron charge</i>
$e = 270\,\mathbf{q_I} = 270\,\surd\text{-}(c^{-1}\hbar)$</td>
</tr>
<tr>
<td>BINTERVALINO
(Share = 1/8)
= Antisymmetric assembly of intervalinos
Dark matter
$BI = 2^{-\frac{1}{2}}\,(\vert\mathbf{I}\,\underline{\mathbf{I}}\vert - \vert\underline{\mathbf{I}}\,\mathbf{I}\vert)$</td>
</tr>
<tr>
<td>GRAVITON
(Share = 1/4)
= Symmetric assembly of photons
Dark energy
$g = \vert\gamma\underline{\gamma}\vert_s = [\ \vert\gamma\gamma\vert, 2^{-\frac{1}{2}}\,(\vert\gamma\underline{\gamma}\vert + \vert\underline{\gamma}\gamma\vert), \vert\underline{\gamma}\underline{\gamma}\vert\ ]$</td>
<td>ELECTRIC CHARGE →
ELECTROMAGNETIC INTERACTION
Third symmetry breaking</td>
</tr>
<tr>
<td>CHI
(Share = 1/2)
= Antisymmetric assembly of i.s.
Dark energy
¢ $= 2^{-\frac{1}{2}}\,(\vert\uparrow\downarrow\vert - \vert\downarrow\uparrow\vert)$</td>
<td colspan="2">MASS → GRAVITATIONAL INTERACTION
DARK MATTER UNIVERSE
Second symmetry breaking</td>
</tr>
<tr>
<td>POINT
(Share = 0)
= Symmetric assembly of points</td>
<td colspan="3">SPIN → INTERVALIC CHANGELESS INTERACTION (formerly strong interaction)
LIGHT UNIVERSE (SPACETIME UNIVERSE). First symmetry breaking</td>
</tr>
<tr>
<td>NOTHINGNESS</td>
<td colspan="4">INFORMATION → INFORMATIONAL INTERACTION. INFORMATION (TIMELESS) UNIVERSE. Zero symmetry breaking</td>
</tr>
<tr>
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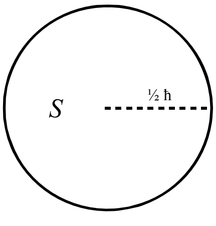
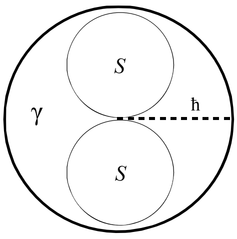
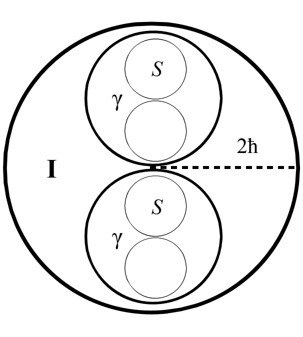
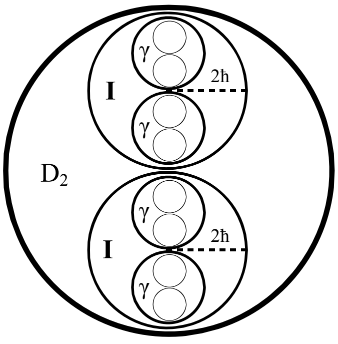
<td> </td>
<td> </td>
<td> </td>
<td> </td>
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Chapter 8

INTERVALIC ELECTRON

INTERVALIC ELECTRON

The intervalic structure of electron is:

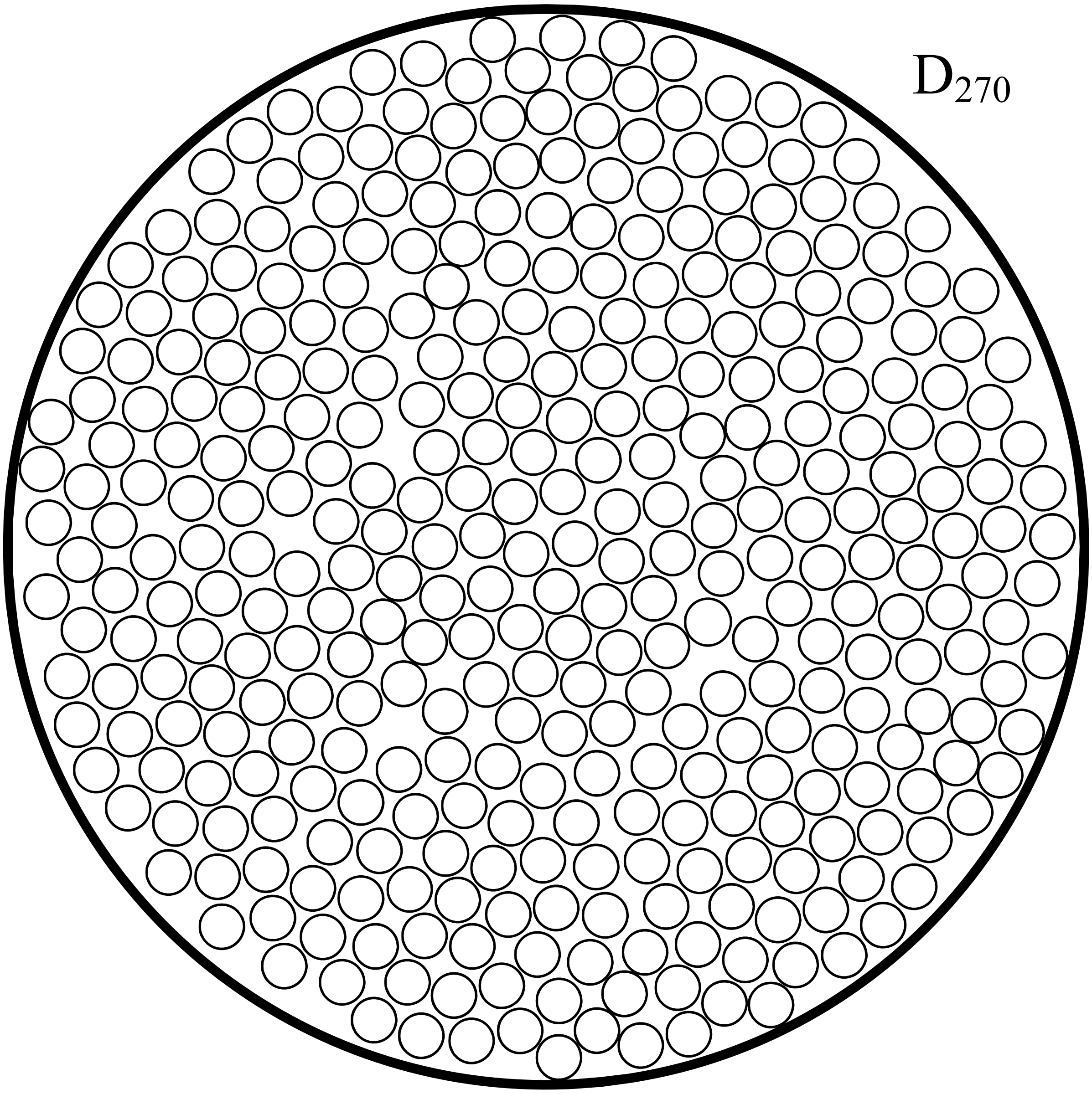
$G_1 = D_{270} = 270\ \mathbf{I}$

INTERVALIC ELECTRON MASS

According to IT, the magnitude of the elementary charge, *e*, is by definition —and univocally determined by the intervalic quanta and units—: $e = 270\ \mathbf{q_I}$, where the intervalic charge is $\mathbf{q_I} = \surd\text{-}(c^{-1}\hbar) = 5.9339900 \cdot 10^{-22}$ (C). Hence, the *intervalic energy* of the elementary charge is:

$$I(e) = c^{\pm 2}\ \hbar\ e^{-2} = c^{\pm 2}\ \hbar\ (270\ \mathbf{q_I})^{-2} = c^{\pm 2}\ \hbar\ [270\ \surd\text{-}(c^{-1}h)]^{-2} = 270^{-2}\ c^{-1} =$$
$$= 4.575639166 \cdot 10^{-14}\ (J) = 0.285588809\ (MeV/c^2)$$

Applied to the case of the electron it can be easily deduced the value of the *intervalic mass* —which is obviously the formerly named "*intrinsic mass*" attending to its unexplained origin—. The remaining mass will be



Figured intervalic structure of *electron*:
$L_1 = G_1 = D_{270} = 270$ **I**

named *material mass* and it has an electromagnetic origin. Remembering the *intervalic principle of energy balance* for subatomic particles, we can deduce that the *total mass* of electron must be the sum of its intervalic and material —electromagnetic— masses, since the other structural energy —the spin energy— does not contribute to the mass of the particle:

$$\mathrm{I}(e) = \mathrm{c}^{\pm 2}\, \hbar\, e^{-2} = 4.575639166 \cdot 10^{-14}\,(\mathrm{J}) = 0.28558881\ (\mathrm{MeV/c^2})$$
$$\mathrm{U}(e) = \mathrm{E}(e)_{mass} - \mathrm{I}(e) = 3.611471925 \cdot 10^{-14}\ (\mathrm{J}) = 0.22541025\ (\mathrm{MeV/c^2})$$

It must be pointed out that the intervalic mass of electron is a geometric magnitude which does not rely on any other physical feature but only on the symmetry of its intervalic structure.

As we will see immediately, this material mass has completely an *electromagnetic* origin. The ratios between their involved energies are:

$$\mathrm{I}(e)/\mathrm{U}(e) = 1.266973485 \approx 5/4$$
$$\mathrm{I}(e)/\mathrm{E}(e)_{\mathrm{mass}} = 0.558883239 \approx 5/9$$
$$\mathrm{U}(e)/\mathrm{E}(e)_{\mathrm{mass}} = 0.44111676 \approx 4/9$$

INTERVALIC ELECTRON RADIUS

IT postulates a right correspondence between the *material* energy of the electron and its *electromagnetic* potential energy —instead of its *total* energy, which is a great mistake, as it is postulated in the definition of the classic electron radius—. Actually, taking the doubtful magnitude of the classical electron radius the electromagnetic potential energy of electron would be slightly greater than its material mass:

$$\mathrm{U}(e) = \tfrac{1}{2}\,(1/4\pi\varepsilon_0)\, e^2 / r_{\mathrm{e}}(m_e) = 4.0935555 \cdot 10^{-14}\ (\mathrm{J})$$

This result clearly shows that the idea of the classical electron radius is absolutely wrong. The obvious reason is that it can’t be merged the *intervalic* and *electromagnetic* energies because these contributions are totally different (although both ones come from the same source: the electric charge). The magnitude of the intervalic electron radius does not depend directly on the contribution to mass of the *intervalic* energy, but only on the magnitude of the *electromagnetic* energy. And not to mention that if electron is postulated to be *structureless*, as SM holds, it can not have got any electromagnetic potential energy because this physical quantity is exclusively well defined as the energy derived from the assembly of two or more electric charges which make a composite particle. Therefore the classical electron radius would be erroneous twice.

In resume, the *intervalic electron radius* is:

$$r_e = ½ (1/4\pi\varepsilon_0)\, e^2 / \mathrm{U}(e) = 3.194098699 \cdot 10^{-15}\ \mathrm{(m)}$$

which is ~13.35% greater than the traditional magnitude of the classical electron radius, a result which ensures that no other appreciable energies are involved in the electron's energy mass.

ELECTRON MINIMAL RADIUS

The electromagnetic energy of a particle must ever be equal or lesser than its intervalic energy. In other case the particle could not be stable by no means. Therefore, any subatomic particle, X, has a minimal allowed radius determined by:

$$\mathrm{r}_{\mathrm{min}} = ½ (1/4\pi\varepsilon_0)\, \mathrm{X}^2 / \mathrm{I(X)} = 2.5210462 \cdot 10^{-15}\ \mathrm{(m)}$$

which would be the radius for the limit case: I(X) = U(X). In the case of electron we have:

$$r_e \geq ½ (1/4\pi\varepsilon_0)\, e^2 / \mathrm{I}(e) = 2.5210462 \cdot 10^{-15}\ \mathrm{(m)}$$

With a radius just equal to the minimal one, the electron could not have got any spin energy and therefore it would not have got intrinsic angular momentum. However, since according to IT *spin* is the very first and most fundamental *degree of freedom* existing in Nature —from which is derived the own *electric charge* as we will see a due course—, we can not postulate the existence of a fundamental particle without spin. Moreover, having got the intervalino a great spin energy, it would not be possible that any dalino was spinless. Therefore we can affirm that the intervalic electron radius must be greater (but not only equal) to the minimal one.

INTERVALIC ELECTRON SPIN ENERGY

Contrarily to what is spitefully intended by SM, electron is not a *single* particle but it is composed by 270 *intervalinos* —the primordial block of Nature which electric charge is the intervalic quantum of charge, $\mathbf{q}_{\mathbf{I}} = \surd\text{-}(c^{-1}\hbar)$—. As already commented, intervalic and electromagnetic energies of electron can not be equal, as it could perhaps have been expected if no other energies were involved. So, a part of the electron's structural energy will be consumed by its intrinsic angular momentum and will be manifested as kinetic energy. The electron spin energy, $E_J(e)$, is just the difference between intervalic and electromagnetic energies, which is not *manifested* as *mass* but as *spin*. This can be postulated because the electron is obviously a state of minimal energy, and therefore it must be the final result of a *perfect energetic balance* in all its involved structural energies:

$$E_J(e) = I(e) - U(e) = 9.64167241 \cdot 10^{-15}\ (J) = 0.060178559\ (MeV/c^2)$$

From here it can be easily deduced a lot of the dynamical features of electron, absolutely unknown up to date, as I have described with detail in other site. Likewise, the spin energy of leptons is the starting point to determine the neutrinos masses.

INTERVALIC ELECTRON STRUCTURAL ENERGY

The total intrinsic energy of electron is not only that due to mass, but it also has to include the energy due to the intrinsic angular momentum. As we already know all of them, the total structural energy of electron, $A(e)$, is:

$$A(e) = E(e)_{\text{mass}} + E_J(e) = I(e) + U(e) + E_J(e) = 2\ I(e) =$$
$$= 9.151277835 \cdot 10^{-14}\ (J) = 0.571177588\ (MeV/c^2)$$

As can be easily seen, the sum of all the intrinsic energies of electron is just equal to the double of the intervalic energy. Therefore, the total structural energy of electron is a geometric magnitude which does not rely on the share between the electromagnetic and spin energies. Whatever it be, the total structural energy will not be affected by such share of energy.

Thus we have got the total structural energy ratios:

$$E_J(e)/E(e)_{\text{mass}} = 0.117766476$$
$$E_J(e)/A(e) = 0.105358748$$
$$E(e)_{\text{mass}}/A(e) = 0.894641251$$

Chapter 9

INTERVALIC GAUDINO

INTERVALIC ENERGY OF THE INTERVALIC CHARGE

Let us remember the equation of the *intervalic principle of equivalence between energy and electric charge*: $I = c^{\pm 2}\ \hbar\ Q^{-2}$. Showing its intervalic dimensions between brackets:

$$I\ (i^{-1}) = c^{\pm 2}\ (-1)\ \hbar\ (L)\ Q^{-2}\ (iL^{-1})$$

In not-singular units, as the traditional ones, the half symmetry which is conserved is only the following: $I = c^{-2}\ \hbar\ Q^{-2}$, which is the expression of the same principle written in a non-singular system of units (those with $c \neq 1$).

Now we can know which is the intervalic energy of the intervalic quantum of electric charge, $\mathbf{q_I} = \sqrt{}-(c^{-1}\hbar)$:

$$I(\mathbf{q_I}) = c^{\pm 2}\ \hbar\ \mathbf{q_I}^{-2} = c^{\pm 2}\ \hbar\ [\sqrt{}-(c^{-1}\hbar)]^{-2} = c^{-1} = 3.335640952 \cdot 10^{-9}\ (J) =$$
$$= 20{,}819.42423\ (MeV/c^2)$$

INTERVALIC ENERGY OF THE ELEMENTARY CHARGE

According to IT, the magnitude of the elementary charge, *e*, is by definition —and univocally determined by the magnitudes of the intervalic quanta and units—: $e = 270\ \mathbf{q}_{\mathbf{I}}$, where the intervalic charge is $\mathbf{q}_{\mathbf{I}} = \sqrt{-(c^{-1}\hbar)} = 5.9339900 \cdot 10^{-22}$ (C). Hence, the intervalic energy of the elementary charge is:

$$\begin{aligned} I(e) &= c^{\pm 2}\, \hbar\, e^{-2} = c^{\pm 2}\, \hbar\, (270\ \mathbf{q}_{\mathbf{I}})^{-2} = c^{\pm 2}\, \hbar\, [270 \sqrt{-(c^{-1}h)}]^{-2} = 270^{-2}\, c^{-1} = \\ &= 4.575639166 \cdot 10^{-14}\ (\mathrm{J}) = 0.285588809\ (\mathrm{MeV}/c^{2}) \end{aligned}$$

ELECTROMAGNETIC POTENTIAL ENERGY OF SUBATOMIC PARTICLES

Although well known, sometimes it is forgotten that there has no physical sense to talk about the electromagnetic potential energy of a *single* structureless particle, but only of a *composite* particle. Now we can define the electromagnetic potential energy of electron because it is not a single particle yet, as in the mischievous SM, but it is composed by the aggregation of 270 intervalic charges.

In the calculation of that energy appears a coefficient that depends on the details of the geometric form of the particle, which is 3/5 in the case of a *rigid* sphere. Nevertheless, we will suppose that leptons are “quantum” spheres which have slightly less energy than a rigid sphere, since they are dynamical structures, as we will see later. In resume, we work on the assumption that the coefficient for a quantum sphere is ½, a simple detail that anyway does not affect the model.

INTERVALIC STRUCTURE OF LEPTON-CHARGED MASSIVE BOSON

> A physical theory can be satisfactory only if its structures are composed of elementary foundations.
>
> ALBERT EINSTEIN
> *To Arnold Sommerfeld, 14.01.1908*

The best which can be said about the Lagrangian formalism in SM is that it is so general that it can “explain” almost any particle observed by means of adjusting some rows of parameters, which number is always *greater* than the own number of particles which is trying to "explain" (!). The shoddy repair of Weinberg-Salam electroweak theory of leptons is a good example. We "only" have to adjust by hand more than three constants to the Higgs field for yielding the masses of the lepton family. In this formalism it can be easily predicted *infinite* number of particles by means of adjusting by hand a parameter for each particle observed. (I wonder if it was not more simple to adjust by hand directly the own masses instead of the same —and greater— number of meaningless parameters). It is sure that if, say, a leptonic flying pig was observed inside a collider, SM will be able to "predict" it simply by adjusting some constants and, surely, with an astonishing exactitude of more than nine digits (!). Being Nature constructed according to number, as Pythagoras said, it is not surprising that its symmetries can arise through any enough powerful mathematical formalism, say the unhappy Lagrangian as well as any other. But this is very different to have find by far the correct symmetries and the right underlying geometry of Nature. What we need is just the contrary: a theory that can't predict infinite particles, but only the few ones which really exist now or could exist at the Big Bang, that is to say, the only one *symmetries allowed by Nature*. And a faultless theory will have to reach those deductions without adjusting by hand *anyone* parameter. In other way, it can not be considered faultless, nor to a lesser extent aesthetically elegant.

Besides, the basic physical principles on which lies the fake Lagrangian formalism, although richly dressed with mathematical clothes, are no other than the same old-fashioned and classic —*macroscopic*— principles applied to quantum —*subatomic*— world, plus some naïve quantum numbers. Although that macroscopic principles can run at atomic scale, like in Quantum Mechanics, it is doubtful that they can be similarly applied at subatomic scale. Such a proposal hardly can be considered as fundamental, simple and elegant. Therefore it is almost sure that at least *a fundamental principle of Physics is still missing*, and it is clear that such a principle will do show an outstanding simplicity (as all fundamental physical principles do). In an ideal case, the very last foundations of Physics should rely in the system of dimensions, but till today it was almost unimaginable that a physical principle could be related with or derived from the dimensional system. If when starting from such a dimensional system, it could be logically and unavoidably deduced the magnitudes of subatomic particles, it is sure that this system of dimensions and units must be the *natural* one.

Since the structureful elementary charge, $e = 270\ \mathbf{q_I}$, is a state of lowest energy reached by Nature, the only allowed fractional values for the primordial aggregation of intervalinos would be, as I have explained in other site, those ones which sum could give 270 in a simple way, that is to say, the compositeness will be the set of divisors of the elementary charge:

1, 2, 3, 5, 6, 9, 10, 15, 18, 27, 30, 45, 54, 90, 135, 270

It is clear that once the value of the elementary charge has been reached through the balance between the intervalic energy and its inverse —the electromagnetic energy—, any other different values from the above 16 divisors would lead to an scenario with greater energy and lesser order. And we think that Nature ever choose the way of *lowest energy* and *spontaneous order*. The first is traditionally accepted. To understand the second it should be rightly understood as auto organization, which is the physical state that can be reached with the lowest amount of *information*. Therefore, Nature choose the maximum economy: lowest energy and information, two physical quantities deeply linked. To resume this picture in a word, we call it *symmetry*. The 16 allowed values for the aggregation of intervalic charges determine completely the *intervalic symmetries* of the electric charge.

Henceforth, the only allowed kinds of dalinos are just 16, corresponding to the 16 divisors of the elementary charge. Dalino can be view as the fundamental "cell" in nature since all subatomic particles are equally composed by simple aggregations of dalinos. These aggregations of dalinos are named *gaudinos* in honour of the great Spanish modernist artist Antonio Gaudí (1852-1926). Due to powerful symmetry constraints explained in other site, the principal gaudinos are those which have a number of constituent intervalinos multiple of 270 (the number of the elementary charge). Thus, there are only 16 kinds of such allowed gaudinos, G_n, where the subindex means the number of its constituent dalinos.

Gaudinos can aggregate likewise among them, being named the resultant subatomic particle *lisztino*, L_n, in honour of the great Hungarian musician Franz Liszt (1811-1886).

If it is supposed, in a roughly approximation, that the ratio intervalic energy/electromagnetic energy of dalinos is similar to that of the electron, ~5/4, the masses of the 16 possible gaudinos are as follows (in MeV/c^2):

$L_1 = G_1 = 1\ D_{270} = 270\ \mathbf{I} = 0.51099909$
$L_1 = G_2 = 2\ D_{135} = 270\ \mathbf{I} = 4.0879928$
$L_1 = G_3 = 3\ D_{90} = 270\ \mathbf{I} = 13.796975$
$L_1 = G_5 = 5\ D_{54} = 270\ \mathbf{I} = 63.874885$
$L_1 = G_6 = 6\ D_{45} = 270\ \mathbf{I} = 110.37580$
$L_1 = G_9 = 9\ D_{30} = 270\ \mathbf{I} = 372.51833$
$L_1 = G_{10} = 10\ D_{27} = 270\ \mathbf{I} = 510.99909$
$L_1 = G_{15} = 15\ D_{18} = 270\ \mathbf{I} = 1{,}724.6220$
$L_1 = G_{18} = 18\ D_{15} = 270\ \mathbf{I} = 2{,}980.1466$

$L_1 = G_{27} = 27\ D_{10} = 270\ \mathbf{I} = 10{,}057.995$
$L_1 = G_{30} = 30\ D_9 = 270\ \mathbf{I} = 13{,}796.975$
$L_1 = G_{45} = 45\ D_6 = 270\ \mathbf{I} = 46{,}564.794$
$L_1 = G_{54} = 54\ D_5 = 270\ \mathbf{I} = 80{,}463.964$
$L_1 = G_{90} = 90\ D_3 = 270\ \mathbf{I} = 372{,}518.33$
$L_1 = G_{135} = 135\ D_2 = 270\ \mathbf{I} = 1{,}257{,}249.4$
$L_1 = G_{270} = 270\ D_1 = 270\ \mathbf{I} = 5{,}621{,}244.5$

The total mass of the set of gaudinos is 7,407,675.889 (MeV/c^2), a value around 194 times greater than the total mass of the set of dalinos, which was, as we have seen, 38,040.09338 (MeV/c^2).

It can be pointed out that is wonder to see how the same set composed by just 270 intervalinos is transformed in all existing particles by means of a mere change in the internal structure, being the only difference among them the different intervalic symmetry in which the aggregation of intervalinos has been made, that is to say, its *intervalic structure*. The balance among its involved energies changes drastically according to the adopted intervalic structure, that is to say, according to the inner form of the particle. And all this play is being performed under almost one unique physical law, the intervalic energy: $I = c^{\pm 2}\ \hbar\ Q^{-2}$. The intervalic structures of the light *leptons-elementary charged massive bosons* that appear in the above table are described by the following intervalic symmetries:

$L_1 = G_1 = 1\ D_{270} = 0.51099909 \rightarrow e$, electron
$L_1 = G_6 = 6\ D_{45} = 110.37580 \rightarrow \mu$, muon
$L_1 = G_{15} = 15\ D_{18} = 1{,}724.6220 \rightarrow \tau$, tau

Please remember that these values are yielded taking the structural energy ratio of electron for all of them, then the slight deviation from experimental results.

Need not to say, likewise, that the above particles are *logical and directly yielded* starting from a mere change in the system of units and dimensions used —really the only reliable *natural* ones—, but not through an overloaded Lagrangian formalism. It is hard to believe that all (and more) results reached by SM through complex and sometimes doubtful mechanisms can be deduced *directly from the dimensional system* in a much more reliable way in IT, without using any formalism and only applying the new intervalic principles and symmetries. All systems of units and dimensions was supposed to be equivalent in Physics, but clearly they are not since they involve very different symmetries of Nature.

It appears that the intervalic symmetries existing in primordial times between G_1, G_6, G_{15} and G_{45} have not lasted up to present times of low energy.

On the other hand, the last five gaudinar structures correspond to the allowed heavy *elementary charged massive bosons* of changeful —weak— intervalic interaction, as it has been explained in other site:

$L_l = G_{45} = 45\ D_6 = 46{,}564.794 \rightarrow Z^{\pm}$ boson
$L_l = G_{54} = 54\ D_5 = 80{,}463.964 \rightarrow W^{\pm}$ boson
$L_l = G_{90} = 90\ D_3 = 372{,}518.33 \rightarrow Y^{\pm}$ boson
$L_l = G_{135} = 135\ D_2 = 1{,}257{,}249.4 \rightarrow X^{\pm}$ boson
$L_l = G_{270} = 270\ D_1 = 5{,}621{,}244.5 \rightarrow I^{\pm}$ boson

Thus, in a similar mode as SUSY postulates —although within a very different foundations— leptons and elementary charged massive bosons are members of the same intervalic family. It can be pointed that according to IT there are 16 allowed symmetries and it is not given beforehand the mystic number of 3 families of leptons and quarks, pathetically intended by SM in order to avoid some infinites in a poor and precarious formulation.

Finally, according to IT, neutrino must be *intervalinoless*, because such so small mass can not be obtained through any aggregation of intervalinos because the intervalic and electromagnetic energies are inversely proportional. Thus, as the number of intervalinos increases the intervalic energy becomes smaller but the electromagnetic energy becomes greater, and we have the vice versa as the number of intervalinos decreases. Moreover, after the fundamental intervalic balance between the I and I^{-1} energies was reached at primordial times (balance which is now named *elementary charge*) it is not possible to make any stable particle out of the intervalic symmetries. Therefore, the neutrino must be *intervalinoless*, coming its mass from the non linear contribution of the intervalic energy, as we will describe later in the chapter on the Intervalic Neutrino.

INTERVALIC SYMMETRIES OF ELEMENTARY CHARGED GAUDINOS

DALINAR SYMMETRY	INTERVALIC STRUCTURE	MASS (MeV/c^2)	PARTICLES WHICH STAY BELOW THE THRESHOLD TEMPERATURE: LEPTONS-CHARGED MASSIVE BOSONS
{D270}	$G1D270^{(\pm)}$	0.5	*e,* electron
{D135}	$G2D135^{(\pm)}$	4	
{D90}	$G3D90^{(\pm)}$	14	
{D54}	$G5D54^{(\pm)}$	64	
{D45}	$G6D45^{(\pm)}$	106	μ, muon
{D30}	$G9D30^{(\pm)}$	373	
{D27}	$G10D27^{(\pm)}$	511	
{D18}	$G15D18^{(\pm)}$	1,777	τ, tau
{D15}	$G18D15^{(\pm)}$	2,980	
{D10}	$G27D10^{(\pm)}$	10,058	
{D9}	$G30D9^{(\pm)}$	13,797	
{D6}	$G45D6^{(\pm)}$	46,565	
{D5}	$G54D5^{(\pm)}$	80,423	$W^{\pm}$ boson
{D3}	$G90D3^{(\pm)}$	372,518	$Y^{\pm}$ boson
{D2}	$G135D2^{(\pm)}$	1,257,249	$X^{\pm}$ boson
{D1}	$G270D1^{(\pm)}$	5,621,245	

Chapter 10

INTERVALIC LEPTON-CHARGED MASSIVE BOSON

INTERVALIC MUON

The intervalic structure of *muon* is:

$\mu \rightarrow L_1 = G_6 = 6\ D_{45} = 270\ \mathbf{I}$

INTERVALIC MUON MASS

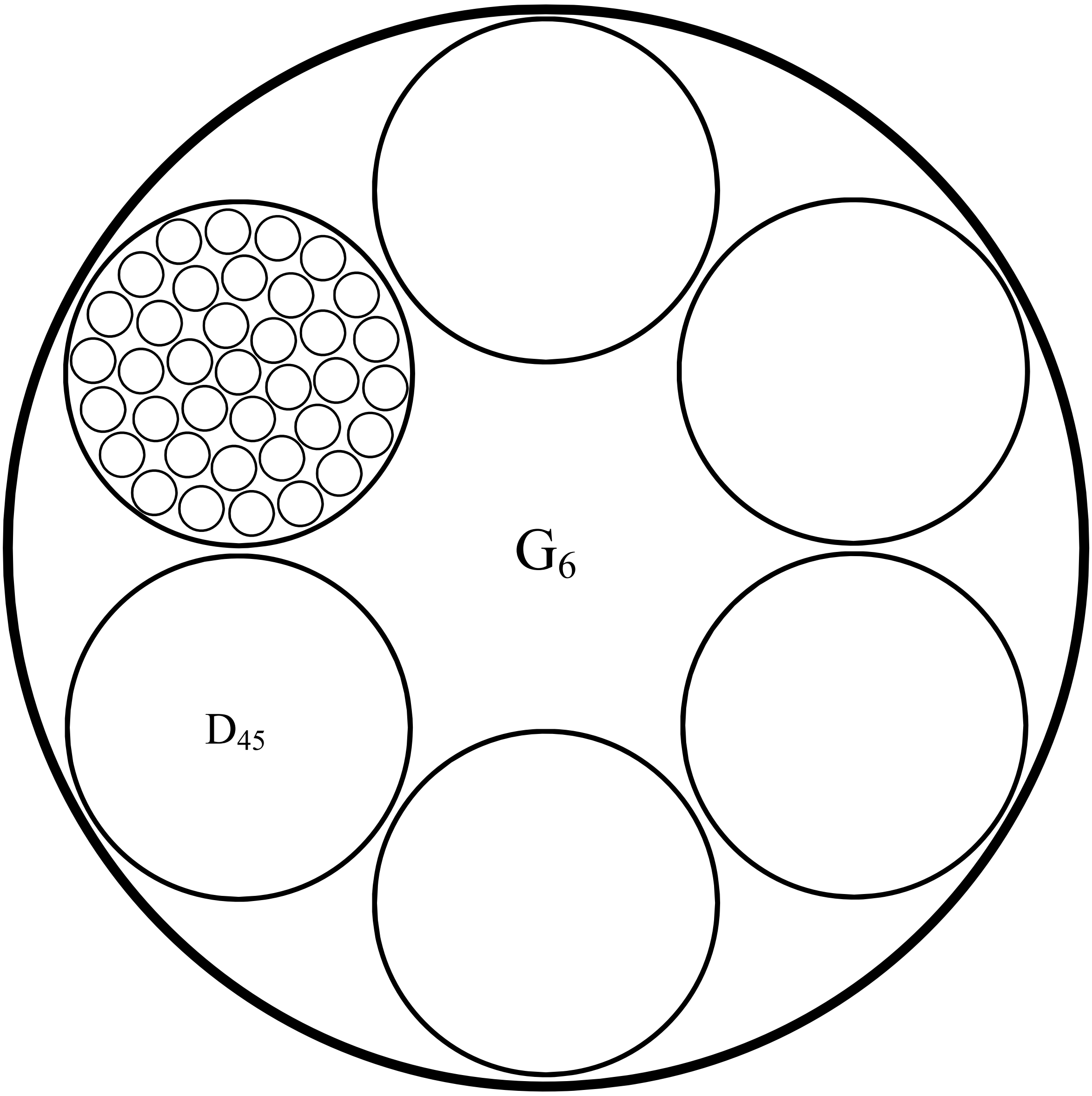
As any other subatomic particle, the intervalic muon mass is due to the contribution of the intervalic and electromagnetic energies. The first is:

$$I(\mu) = \sum(c^{\pm 2}\,\hbar Q^{-2}) = c^{\pm 2}\hbar\, e^{-2} + 6\ (c^{\pm 2}\hbar(45\mathbf{q_I})^{-2}) = (270^{-2}\ c^{-1}) + 6\ (45^{-2}\ c^{-1}) =$$
$$= 9.92913699 \cdot 10^{-12}\ (J) = 61.9727717\ (MeV/c^2)$$

It can be noted that this magnitude is a geometric one which relies exclusively on the symmetry of the intervalic structures involved.

The material mass of muon is, by definition, the difference between the total mass, 105.658389 (MeV/c^2), and the intervalic mass, as has likewise an electromagnetic origin:

$$U(\mu) = E(\mu)_{mass} - I(\mu) = 6.999210568 \cdot 10^{-12}\ (J) = 43.6856173\ (MeV/c^2)$$



Figured intervalic structure of *muon*:
$L_1 = G_6 = 6\ D_{45} = 270\ \mathbf{I}$

INTERVALIC MUON RADIUS

The magnitude of the *intervalic muon radius* can be deduced through the electromagnetic potential energy:

$$r_{\mu} = ½ (1/4\pi\varepsilon_0) (270\ \mathbf{q_I})^2 / \mathrm{U}(\mu) = 1.648099834 \cdot 10^{-17}\ \mathrm{(m)}$$

In a traditional view, the material energy of muon would be supposed to come from the 15 electromagnetic interactions existing between all dalinos 45. Due to the constituent hexagonal symmetry of muon, the distances between its constituent dalinos must be very similar, and therefore it makes sense to calculate the value of the average distance, $d_{\mathrm{D45}}(\mu)$, among its constituent dalinos 45:

$$d_{\mathrm{D45}}(\mu) = 15 \cdot (1/4\pi\varepsilon_0) (45\ \mathbf{q_I})^2 / \mathrm{E_q}(\mu) = 1.373416477 \cdot 10^{-17}\ \mathrm{(m)}$$

MUONIC DALINO 45 RADIUS

Since the value of the electromagnetic energy of intervalic muon is known, we can deduce the magnitude of the *muonic dalino 45 radius*, r_{D45}:

$$\mathrm{U}(\mu) = 6 \cdot ½ (1/4\pi\varepsilon_0) (45\ \mathbf{q_I})^2 / r_{\mathrm{D45}} = 7.0452248 \cdot 10^{-12}\ \mathrm{(J)}$$
$$r_{\mathrm{D45}} = 2.746832954 \cdot 10^{-18}\ \mathrm{(m)}$$

Curiously, we find the following perfect relations:

$$r_{\mathrm{D45}} / r_{\mu} = 1/6$$
$$r_{\mathrm{D45}} / d_{\mathrm{D45}}(\mu) = 1/5$$
$$r_{\mu} / d_{\mathrm{D45}}(\mu) = 6/5$$

INTERVALIC MUON SPIN ENERGY

As in electron, a part of muon's *structural energy* is manifested as intrinsic angular momentum. Thus, muon spin energy, $\mathrm{E}_J(\mu)$, is the difference between its intervalic and electromagnetic energies:

$E_J(\mu) = I(\mu) - U(\mu) = 2.929926422 \cdot 10^{-12}$ (J) = 18.28715441 (MeV/c^2)

INTERVALIC MUON STRUCTURAL ENERGY RATIOS

As in the case of intervalic electron, we find the energy ratios:

$I(\mu)/U(\mu) = 1.418608126$
$I(\mu)/E(\mu)_{\text{mass}} = 0.586539055$
$U(\mu)/E(\mu)_{\text{mass}} = 0.413460944$
$E_J(\mu)/E(\mu)_{\text{mass}} = 0.173078111$

INTERVALIC MUON STRUCTURAL ENERGY

The total intrinsic energy of muon is the sum of the energy due to mass plus the energy due to the intrinsic angular momentum. As we already know both, the total structural energy of muon, $A(\mu)$, will be:

$$A(\mu) = E(\mu)_{\text{mass}} + E_J(\mu) = I(\mu) + U(\mu) + E_J(\mu) = 2\ I(\mu) =$$
$$= 1.985827398 \cdot 10^{-11}\ \text{(J)} = 123.9455434\ (\text{MeV}/c^2)$$

Once more, it have to be remarked that sum of all the intrinsic energies of muon is just equal to the double of its intervalic energy. Therefore, the total structural energy of muon is a geometric magnitude which does not rely on the share between the electromagnetic and spin energies.

MUON INTERVALIC ARCHITECTURE

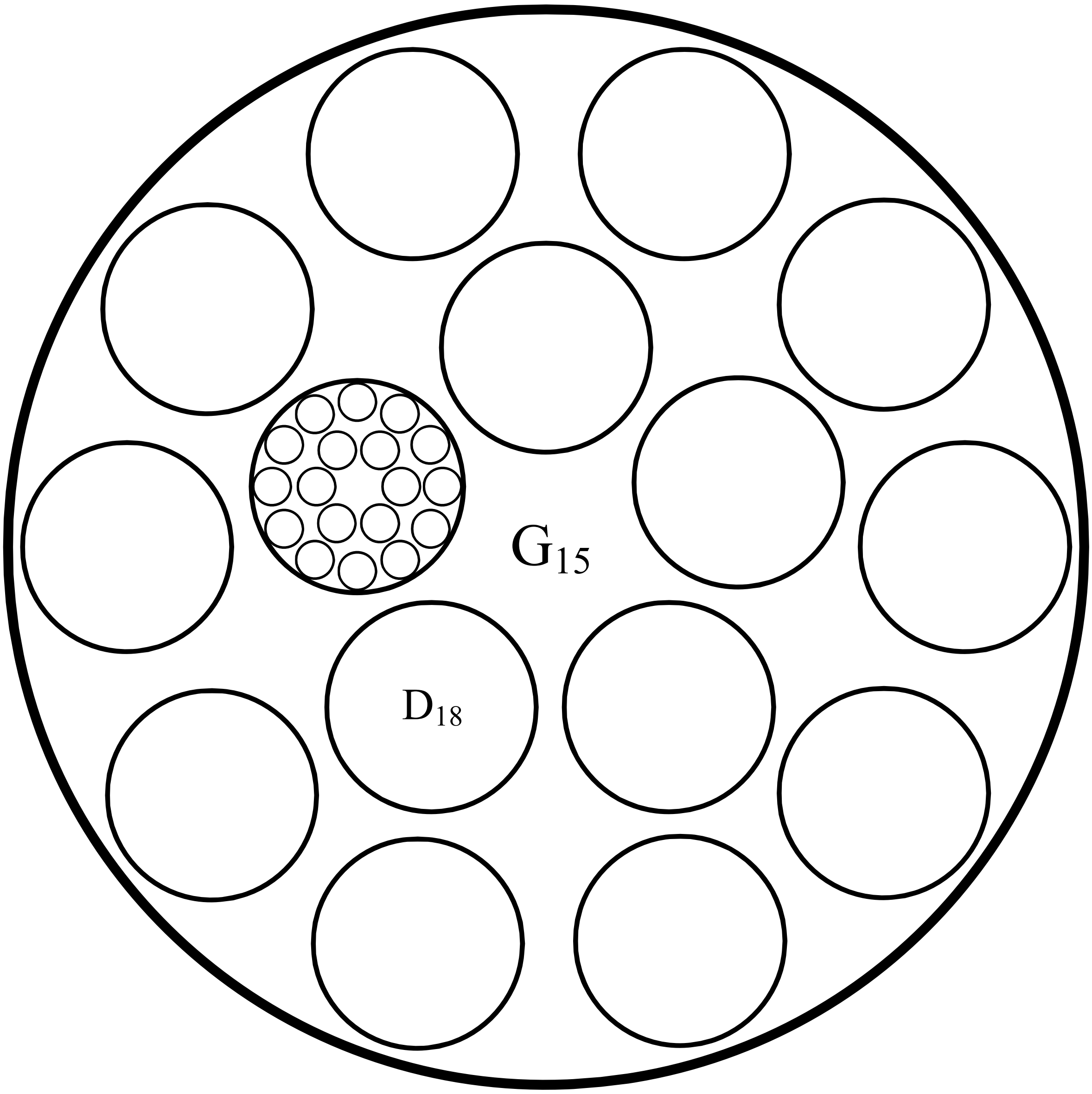
In a similar way as in electron we have got:

$A(\mu) = 2\ I(\mu)$
$A(\mu) = c^{\pm 2} m(\mu)_{\text{Schw}}$
$E(\mu)_{\text{mass}}\ /\ A(\mu) = m(\mu)\ /\ m(\mu)_{\text{Schw}} = 0.852458153$

INTERVALIC TAU

The intervalic structure of *tau* is:

$\tau \rightarrow L_1 = G_{15} = 15\ D_{18} = 270\ \mathbf{I}$



Figured intervalic structure of *tau*:
$L_1 = G_{15} = 15\ D_{18} = 270\ \mathbf{I}$

INTERVALIC TAU MASS

The intervalic tau mass is due to the contribution of intervalic and electromagnetic energies. The first is:

$$I(\tau) = \sum(c^{\pm2}\hbar Q^{-2}) = c^{\pm2}\hbar\, e^{-2} + 15\ (c^{\pm2}\hbar(18\mathbf{q_I})^{-2}) = (270^{-2}c^{-1}) + 15\ (18^{-2}c^{-1})$$
$$= 1.544735782 \cdot 10^{-10}\,(\mathrm{J}) = 964.1478215\ (\mathrm{MeV/c^2})$$

The electromagnetic mass of tau is the difference between the total mass, 1,777 ($\mathrm{MeV/c^2}$), and the intervalic mass:

$$U(\tau) = E(\tau)_{\mathrm{mass}} - I(\tau) = 1.302333333 \cdot 10^{-10}\,(\mathrm{J}) = 812.8521785\ (\mathrm{MeV/c^2})$$

INTERVALIC TAU RADIUS

The *intervalic tau radius* can be deduced from the electromagnetic potential energy:

$$r_\tau = ½\ (1/4\pi\varepsilon_0)\ (270\ \mathbf{q_I})^2 / U(\tau) = 8.857484858 \cdot 10^{-19}\,(\mathrm{m})$$

TAUONIC DALINO 18 RADIUS

Since the value of the electromagnetic energy of intervalic tau is known, we can deduce the tauonic dalino 18 radius, r_{D18}:

$$r_{\mathrm{D18}} = 15 \cdot ½\ (1/4\pi\varepsilon_0)\ (18\ \mathbf{q_I})^2 / U(\tau) = 5.904989684 \cdot 10^{-20}\,(\mathrm{m})$$

INTERVALIC TAU SPIN ENERGY

As in the other lepton-elementary charged massive bosons, tau spin energy, $E_J(\tau)$, is the difference between the intervalic and electromagnetic energies, which is *manifested* not as *mass* but as *spin*:

$$E_J(\tau) = I(\tau) - U(\tau) = 2.42402449 \cdot 10^{-11}\ (\mathrm{J}) = 151.2956428\ (\mathrm{MeV/c^2})$$

INTERVALIC TAU STRUCTURAL ENERGY RATIOS

As in the case of intervalic electron and muon, we find the ratios:

$I(\tau)/U(\tau) = 1.186129344$
$I(\tau)/E(\tau)_{mass} = 0.542570524$
$U(\tau)/E(\tau)_{mass} = 0.457429475$
$E_J(\tau)/E(\tau)_{mass} = 0.085141048$

INTERVALIC TAU STRUCTURAL ENERGY

The total intrinsic energy of tau is the sum of the energy due to mass plus the energy due to the intrinsic angular momentum:

$$A(\tau) = E(\tau)_{mass} + E_J(\tau) = I(\tau) + U(\tau) + E_J(\tau) = 2\ I(\tau) =$$
$$= 3.089471564 \cdot 10^{-10}\ (J) = 1{,}928.295643\ (MeV/c^2)$$

Once more, it have to be noted that the total structural energy of muon is just equal to the double of the intervalic energy. Therefore it is a geometric magnitude which does not rely on the share between the electromagnetic and spin energies. Whatever it be, the total structural energy will not be affected by such share of energy.

TAU INTERVALIC ARCHITECTURE

In a similar way as in electron and muon we have got:

$A(\tau) = 2\ I(\tau)$
$A(\tau) = c^{\pm 2} m(\tau)_{Schw}$
$E(\tau)_{mass} / A(\tau) = m(\tau) / m(\tau)_{Schw} = 0.921539187$

INTERVALIC $W^{\pm}$ BOSON

The intervalic structure of $W^{\pm}$ boson is:

$W^{\pm} \rightarrow L_1 = G_{54} = 54\ D_5 = 270\ \mathbf{I}$

INTERVALIC $W^{\pm}$ BOSON MASS

Remembering the *intervalic principle of energy balance* for subatomic particles, $I - I^{-1} - E(J) = 0$, the intervalic $W^{\pm}$ boson mass will be due to the contribution of intervalic and electromagnetic energies. The first is:

$$I(W^{\pm}) = \sum(c^{\pm 2}\hbar Q^{-2}) = c^{\pm 2}\hbar\ e^{-2} + 54\ (c^{\pm 2}\hbar\ (5\mathbf{q_I})^{-2}) = 270^{-2}c^{-1} + 54\ (5^{-2}c^{-1}) =$$
$$= 7.205030213 \cdot 10^{-9}\ (J) = 44{,}970.24192\ (MeV/c^2)$$

As we know, this magnitude is a geometric one which relies only on the symmetry of the intervalic structure.

The electromagnetic mass of $W^{\pm}$ boson is the difference between the total mass, 80,423.002 (MeV/c^2), and the intervalic mass:

$$U(W^{\pm}) = E(W^{\pm})_{tot} - I(W^{\pm}) = 5.6801605 \cdot 10^{-9}\ (J) = 35{,}452.76008\ (MeV/c^2)$$

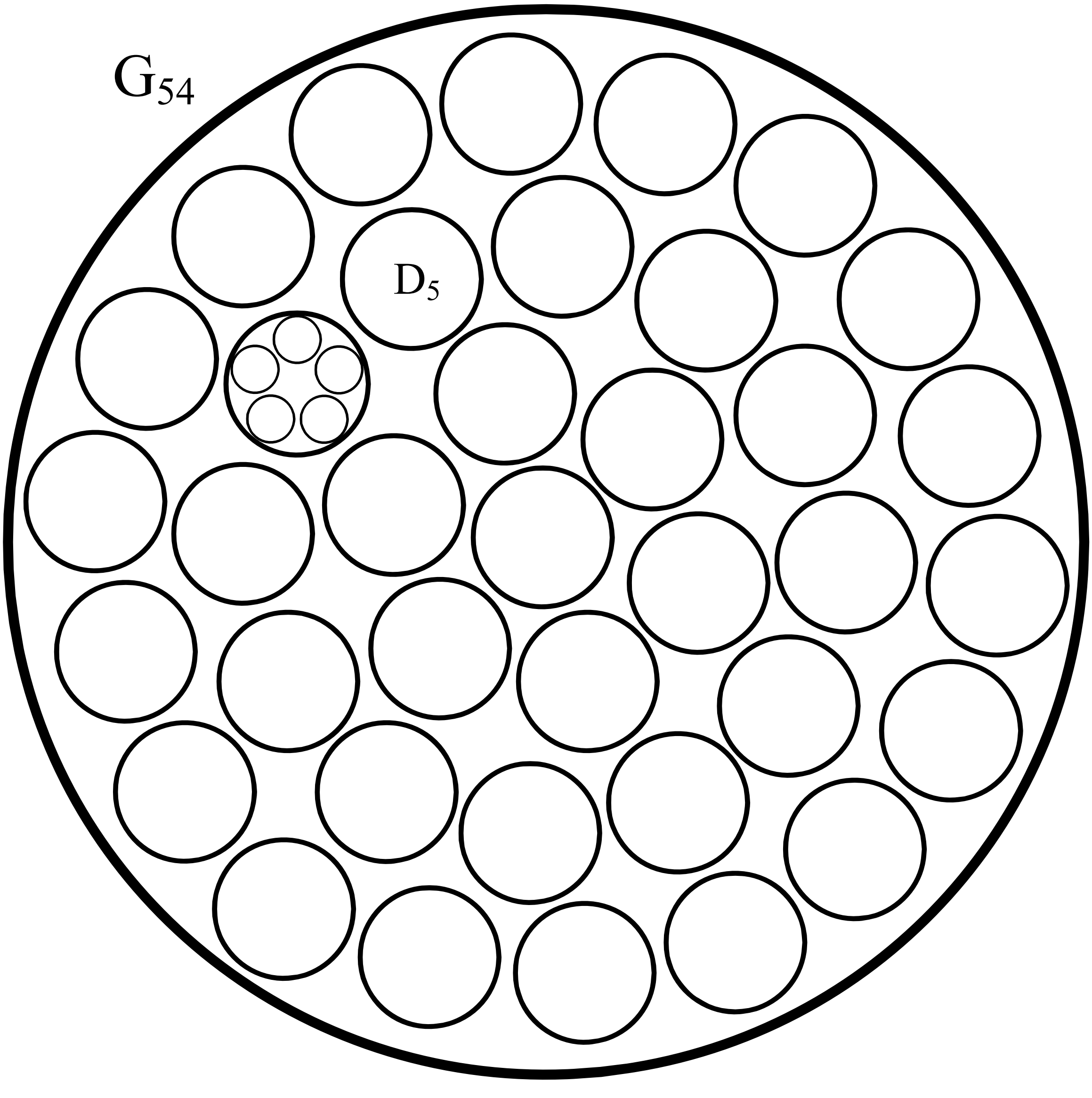
INTERVALIC $W^{\pm}$ BOSON RADIUS

Since the value of the electromagnetic potential energy of the $W^{\pm}$ boson is known, we can deduce the magnitude of the intervalic $W^{\pm}$ boson radius, r_W:

$$r_W = ½\ (1/4\pi\varepsilon_0)\ (270\ \mathbf{q_I})^2 / U(W^{\pm}) = 2.0308225 \cdot 10^{-20}\ (m)$$

BOSONIC DALINO 5 RADIUS

We can deduce likewise the magnitude of the constituent bosonic dalino 5 radius, r_{D5}:



Figured intervalic structure of $W^{\pm}$ boson :
$L_1 = G_{54} = 54\ D_5 = 270\ \mathbf{I}$

$r_{D5} = 54 \cdot ½ (1/4\pi\varepsilon_0) (5\ \mathbf{q_I})^2 / U(W^{\pm}) = 3.7607823 \cdot 10^{-22}$ (m)

A magnitude which is very close to the first approximation made through the electron's ratio: $r(D_5) \approx 3.7564122 \cdot 10^{-22}$ (m).

INTERVALIC W± BOSON SPIN ENERGY

The spin energy of W± boson is the unique structural energy of any subatomic particle which is not manifested as mass but as intrinsic angular momentum energy. Applying once more the intervalic structural balance for subatomic particles, we have for the W± boson:

$I(W^{\pm}) - U(W^{\pm}) - E_J(W^{\pm}) = 0$

Being known the magnitudes of the intervalic and electromagnetic energies of W± boson, its spin energy will be:

$E_J(W^{\pm}) = I(W^{\pm}) - U(W^{\pm}) = 1.524869713 \cdot 10^{-9}$ (J) = 9,517.484017 (MeV/c^2)

INTERVALIC W± BOSON STRUCTURAL ENERGY RATIOS

We find the following ratios between intervalic, electromagnetic and mass energies (ratios which surprisingly are almost identical to those ones of intervalic electron):

$I(W^{\pm})/U(W^{\pm}) = 1.268455314$
$I(W^{\pm})/E(W^{\pm})_{tot} = 0.559171391$
$U(W^{\pm})/E(W^{\pm})_{tot} = 0.440828608$
$E_J(W^{\pm}) /E(W^{\pm})_{tot} = 0.118342809$

INTERVALIC W± BOSON STRUCTURAL ENERGY

The total intrinsic energy of W± boson is the sum of the energy due to mass plus the energy due to the intrinsic angular momentum. As we already know both, the total structural energy of W± boson, $A(W^{\pm})$, will be:

$$A(W^{\pm}) = E(W^{\pm})_{mass} + E_{J}(W^{\pm}) = I(W^{\pm}) + U(W^{\pm}) + E_{J}(W^{\pm}) = 2\ I(W^{\pm}) =$$
$$= 1.441006043 \cdot 10^{-8}\ (J) = 89{,}940.48387\ (MeV/c^{2})$$

Once more, it have to be repeated that sum of all the intrinsic energies of $W^{\pm}$ boson is just equal to the double of its intervalic energy. Therefore, the total structural energy of $W^{\pm}$ boson is a geometric magnitude which does not rely on the share between the electromagnetic and spin energies.

$W^{\pm}$ BOSON INTERVALIC ARCHITECTURE

In a similar way we have got:

$A(W^{\pm}) = 2\ I(W^{\pm})$
$A(W^{\pm}) = c^{\pm 2} m(W^{\pm})_{Schw}$
$E(W^{\pm})_{mass}\ /\ A(W^{\pm}) = m(W^{\pm})\ /\ m(W^{\pm})_{Schw} = 0.894180223$

INTERVALIC $Y^{\pm}$ BOSON

The intervalic structure of $Y^{\pm}$ boson is:

$$Y^{\pm} \rightarrow L_1 = G_{90} = 90\ D_3 = 270\ \mathbf{I}$$

The features of $Y^{\pm}$ boson can be easily deduced in a similar way as in the previous leptons-charged massive bosons. Resuming results, we have obtained:

Intervalic energy:
$$I(Y^{\pm}) = \sum(c^{\pm 2}\hbar Q^{-2}) = c^{\pm 2}\hbar\ e^{-2} + 90\ (c^{\pm 2}\hbar\ (3\mathbf{q_I})^{-2}) = 270^{-2}c^{-1} + 90\ (3^{-2}c^{-1}) =$$
$$= 3.335645528 \cdot 10^{-8}\ (J) = 208{,}194.5279\ (MeV/c^{2})$$

Mass energy:
$$m(Y^{\pm}) = 5.968404233 \cdot 10^{-8}\ (J) = 372{,}518.33\ (MeV/c^{2})$$

Electromagnetic energy:
$$U(Y^{\pm}) = m(Y^{\pm}) - I(Y^{\pm}) = 2.632758703 \cdot 10^{-8}\ (J) = 164{,}323.802\ (MeV/c^{2})$$

Radius:
$r_Y = ½ (1/4\pi\varepsilon_0) (270 \mathbf{q_I})^2 / U(Y^{\pm}) = 4.381482156 \cdot 10^{-21}$ (m)

Spin energy:
$E_J(Y^{\pm}) = I(Y^{\pm}) - U(Y^{\pm}) = 7.02886825 \cdot 10^{-9}$ (J) = 43,870.726 (MeV/c^2)

INTERVALIC X± BOSON

The intervalic structure of $X^{\pm}$ boson is:

$X^{\pm} \rightarrow L_1 = G_{135} = 135\ D_2 = 270\ \mathbf{I}$

We have got likewise the following results:

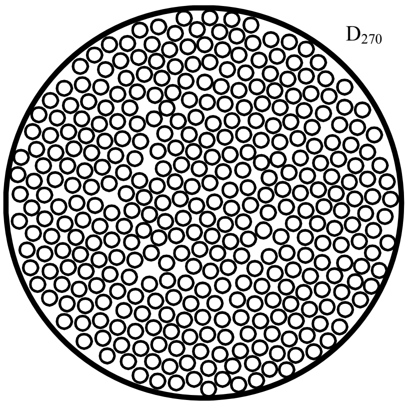
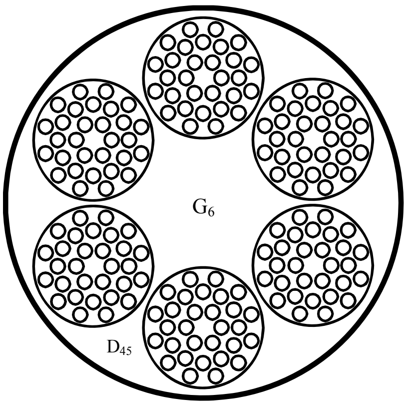
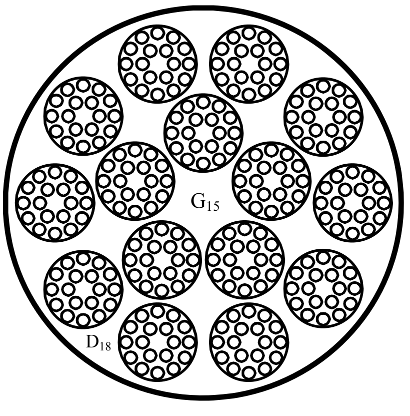
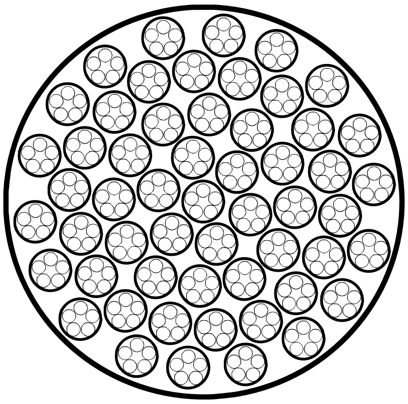
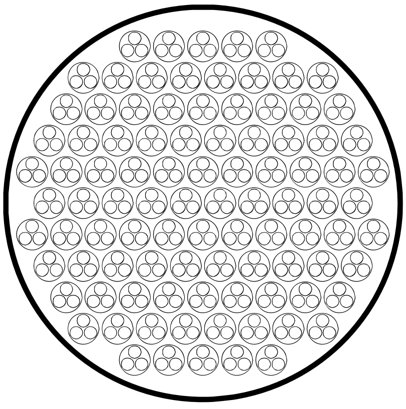
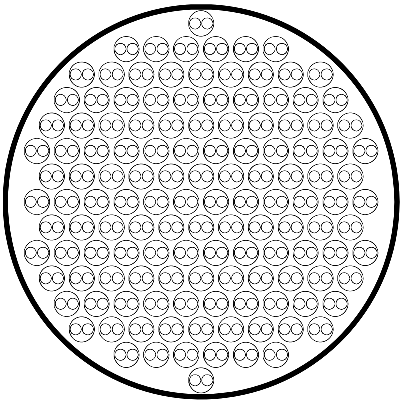
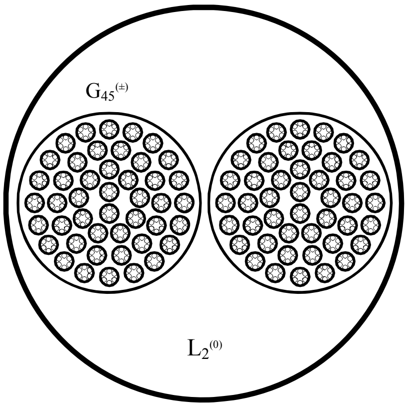
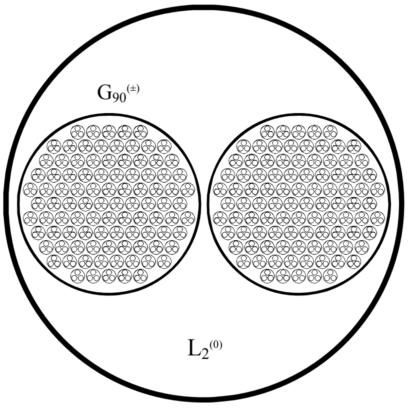
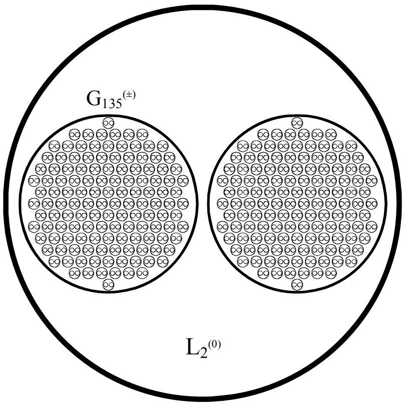
Intervalic energy:
$I(X^{\pm}) = \sum(c^{\pm 2}\hbar Q^{-2}) = c^{\pm 2}\hbar\, e^{-2} + 135\ (c^{\pm 2}\hbar\ (2\mathbf{q_I})^{-2}) = 270^{-2}c^{-1} + 135\ (2^{-2}c^{-1})$
$= 1.125779279 \cdot 10^{-7}$ (J) = 702,655.8532 (MeV/c^2)

Mass energy:
$m(X^{\pm}) = 2.014336487 \cdot 10^{-7}$ (J) = 1,257,249.4 (MeV/c^2)

Electromagnetic energy:
$U(X^{\pm}) = m(X^{\pm}) - I(X^{\pm}) = 8.88557208 \cdot 10^{-8}$ (J) = 554,593.547 (MeV/c^2)

Radius:
$r_X = ½ (1/4\pi\varepsilon_0) (270 \mathbf{q_I})^2 / U(X^{\pm}) = 1.298215261 \cdot 10^{-21}$ (m)

Spin energy:
$E_J(X^{\pm}) = I(X^{\pm}) - U(X^{\pm}) = 2.37222071 \cdot 10^{-8}$ (J) = 148,062.307 (MeV/c^2)

Dimensional Basis of the Intervalic System of Units: (L, *i*) dim (ħ) = L dim (c) = $\bar{i}^{-1}$	**INTERVALIC LEPTONS-CHARGED MASSIVE BOSONS**		
	ELECTRON (0.51099906 MeV/c^2)	**MUON (105.658389 MeV/c^2)**	**TAU (1,777 MeV/c^2)**
	$e = D_{270} = 270\,\mathbf{I} = 540\,\gamma = 1080\,S$	$\mu = G_6 = 6\,D_{45} = 270\,\mathbf{I} = 540\,\gamma = 1080\,S$	$\tau = G_{15} = 15\,D_{18} = 270\,\mathbf{I} = 540\,\gamma = 1080\,S$
Intervalic structure			
Intervalic energy, I	$I(e) = c^{\pm2}\,\hbar\,e^{-2} = 4.575639166 \cdot 10^{-14}\text{ (J)} =$ $= 0.285588809\text{ (MeV/}c^2\text{)}$	$I(\mu) = \sum(c^{\pm2}\,\hbar\,Q^{-2}) = c^{\pm2}\,\hbar\,e^{-2} +$ $+ 6\,(c^{\pm2}\hbar\,(45\,\mathbf{q_I})^{-2}) = 61.9727717\text{ (MeV/}c^2\text{)}$	$I(\tau) = \sum(c^{\pm2}\,\hbar\,Q^{-2}) = c^{\pm2}\,\hbar\,e^{-2} +$ $+ 15\,(c^{\pm2}\hbar\,(18\mathbf{q_I})^{-2}) = 964.1478215\text{ (MeV/}c^2\text{)}$
Electromagnetic energy, U	$U(e) = c^{\pm2}m(e) - I(e) = 3.611471925 \cdot 10^{-14}\text{ (J)} =$ $= 0.22541025\text{ (MeV/}c^2\text{)}$	$U(\mu) = c^{\pm2}m(\mu) - I(\mu) = 6.999210568 \cdot 10^{-12}\text{ (J)} =$ $= 43.6856173\text{ (MeV/}c^2\text{)}$	$U(\tau) = c^{\pm2}m(\tau) - I(\tau) = 1.302333333 \cdot 10^{-10}\text{ (J)} =$ $= 812.8521785\text{ (MeV/}c^2\text{)}$
Spin energy, E_J	$E_J(e) = I(e) - U(e) = 9.64167241 \cdot 10^{-15}\text{ (J)}$	$E_J(\mu) = I(\mu) - U(\mu) = 2.929926422 \cdot 10^{-12}\text{ (J)}$	$E_J(\tau) = I(\tau) - U(\tau) = 2.42402449 \cdot 10^{-11}\text{ (J)}$
Radius, r	$r_e = ½\,(1/4\pi\varepsilon_0)\,e^2 / U(e) = 3.194098699 \cdot 10^{-15}\text{ (m)}$	$r_\mu = ½\,(1/4\pi\varepsilon_0)\,(270\,\mathbf{q_I})^2 / U(\mu) = 1.648099834 \cdot 10^{-17}\text{ (m)}$	$r_\tau = ½\,(1/4\pi\varepsilon_0)\,(270\,\mathbf{q_I})^2 / U(\tau) = 8.857484858 \cdot 10^{-19}\text{ (m)}$
Angular velocity due to spin, ω_J	$\omega_J(e) = (\,E_J(e)\ /\ m_e\,r_e^{\,2}\,)^{½} = 3.220944289 \cdot 10^{22}\text{ (s}^{-1}\text{)}$	$\omega_J(\mu) = (\,E_J(\mu)\ /\ m_\mu\,r_\mu^{\,2}\,)^{½} = 7.567601581 \cdot 10^{24}\text{ (s}^{-1}\text{)}$	$\omega_J(\tau) = (\,E_J(\tau)\ /\ m_\tau\,r_\tau^{\,2}\,)^{½} = 9.87597042 \cdot 10^{25}\text{ (s}^{-1}\text{)}$
Linear velocity due to spin on surface, v_J	$v_J(e) = \omega_J(e)\,r_e = 1.028801396 \cdot 10^{8}\text{ (m s}^{-1}\text{)} =$ $= 0.343171206\text{ c}$	$v_J(\mu) = \omega_J(\mu)\,r_\mu = 1.247216291 \cdot 10^{8}\text{ (m s}^{-1}\text{)} =$ $= 0.416026573\text{ c}$	$v_J(\tau) = \omega_J(\tau)\,r_\tau = 8.747625846 \cdot 10^{7}\text{ (m s}^{-1}\text{)} =$ $= 0.29178939\text{ c}$
Intervalic quantum of charge $\mathbf{q_I} = \sqrt{-(c^{-1}\hbar)} = 1\ (\bar{i}^{-1/2}L^{1/2}) =$ $5.93398995 \cdot 10^{-22}$ (C)	**$W^{\pm}$ MASSIVE BOSON (80,423 MeV/c^2)**	**$Y^{\pm}$ MASSIVE BOSON (372,518 MeV/c^2)**	**$X^{\pm}$ MASSIVE BOSON (1,257,249 MeV/c^2)**
	$W^{\pm} = G_{54} = 54\,D_5 = 270\,\mathbf{I} = 540\,\gamma = 1080\,S$	$Y^{\pm} = G_{90} = 90\,D_3 = 270\,\mathbf{I} = 540\,\gamma = 1080\,S$	$X^{\pm} = G_{135} = 135\,D_2 = 270\,\mathbf{I} = 540\,\gamma = 1080\,S$
Intervalic structure			
Intervalic energy, I	$I(W^{\pm}) = \sum(c^{\pm2}\,\hbar\,Q^{-2}) = c^{\pm2}\,\hbar\,e^{-2} +$ $+ 54\,(c^{\pm2}\hbar\,(5\,\mathbf{q_I})^{-2}) = 44{,}970.24192\text{ (MeV/}c^2\text{)}$	$I(Y^{\pm}) = \sum(c^{\pm2}\hbar Q^{-2}) = c^{\pm2}\hbar\,e^{-2} + 90\,(c^{\pm2}\hbar\,(3\,\mathbf{q_I})^{-2}) =$ $3.335645528 \cdot 10^{-8}\text{ (J)} = 208{,}194.5279\text{ (MeV/}c^2\text{)}$	$I(X^{\pm}) = \sum(c^{\pm2}\hbar Q^{-2}) = c^{\pm2}\hbar\,e^{-2} + 135\,(c^{\pm2}\hbar\,(2\mathbf{q_I})^{-2}) =$ $= 1.125779279 \cdot 10^{-7}\text{ (J)} = 702{,}655.8532\text{ (MeV/}c^2\text{)}$
Electromagnetic energy, U	$U(W^{\pm}) = c^{\pm2}m(W^{\pm}) - I(W^{\pm}) = 5.6801605 \cdot 10^{-9}\text{ (J)} =$ $= 35{,}452.76\text{ (MeV/}c^2\text{)}$	$U(Y^{\pm}) = c^{\pm2}m(Y^{\pm}) - I(Y^{\pm}) = 2.632758703 \cdot 10^{-8}\text{ (J)} =$ $= 164{,}323.802\text{ (MeV/}c^2\text{)}$	$U(X^{\pm}) = m(X^{\pm}) - I(X^{\pm}) = 8.88557208 \cdot 10^{-8}\text{ (J)} =$ $= 554{,}593.547\text{ (MeV/}c^2\text{)}$
Spin energy, E_J	$E_J(W^{\pm}) = I(W^{\pm}) - U(W^{\pm}) = 1.524869713 \cdot 10^{-9}\text{ (J)} =$ $= 9{,}517.484017\text{ (MeV/}c^2\text{)}$	$E_J(Y^{\pm}) = I(Y^{\pm}) - U(Y^{\pm}) = 7.02886825 \cdot 10^{-9}\text{ (J)} =$ $= 43{,}870.726\text{ (MeV/}c^2\text{)}$	$E_J(X^{\pm}) = I(X^{\pm}) - U(X^{\pm}) = 2.37222071 \cdot 10^{-8}\text{ (J)} =$ $= 148{,}062.307\text{ (MeV/}c^2\text{)}$
Radius, r	$r_W = ½\,(1/4\pi\varepsilon_0)\,(270\,\mathbf{q_I})^2 / U(W^{\pm}) = 2.0308225 \cdot 10^{-20}\text{ (m)}$	$r_Y = ½\,(1/4\pi\varepsilon_0)\,(270\,\mathbf{q_I})^2 / U(Y^{\pm}) = 4.381482156 \cdot 10^{-21}\text{ (m)}$	$r_X = ½\,(1/4\pi\varepsilon_0)\,(270\,\mathbf{q_I})^2 / U(X^{\pm}) = 1.298215261 \cdot 10^{-21}\text{ (m)}$
Angular velocity due to spin, ω_J	$\omega_J(W^{\pm}) = (\,E_J(W^{\pm})\ /\ m_W\,r_W^{\,2}\,)^{½} = 5.0783155 \cdot 10^{27}\text{ (s}^{-1}\text{)}$	$\omega_J(Y^{\pm}) = (\,E_J(Y^{\pm})\ /\ m_Y\,r_Y^{\,2}\,)^{½} = 2.34808191 \cdot 10^{28}\text{ (s}^{-1}\text{)}$	$\omega_J(X^{\pm}) = (\,E_J(X^{\pm})\ /\ m_X\,r_X^{\,2}\,)^{½} = 7.92474925 \cdot 10^{28}\text{ (s}^{-1}\text{)}$
Linear velocity due to spin on surface, v_J	$v_J(W^{\pm}) = \omega_J(W^{\pm})\,r_W = 1.03131574 \cdot 10^{8}\text{ (m s}^{-1}\text{)} =$ $= 0.34400990\text{ c}$	$v_J(Y^{\pm}) = \omega_J(Y^{\pm})\,r_Y = 1.02880790 \cdot 10^{8}\text{ (m s}^{-1}\text{)} =$ $= 0.343173375\text{ c}$	$v_J(X^{\pm}) = \omega_J(X^{\pm})\,r_X = 1.02880304 \cdot 10^{8}\text{ (m s}^{-1}\text{)} =$ $= 0.343171755\text{ c}$
Structural energy balance for subatomic particles $I - I^{-1} - E_J = 0$ $c^{\pm2}\,\hbar\,Q^{-2} - [\,½(1/4\pi\varepsilon_0)Q^2 / r\,] - m\,r^2\omega_J^{\,2} = 0$	**INTERVALIC BILEPTONS-ZERO CHARGED MASSIVE BOSONS**		
	Z^0 MASSIVE BOSON (91,188 MeV/c^2)	**Y^0 MASSIVE BOSON (745,037 MeV/c^2)**	**X^0 MASSIVE BOSON (2,514,499 MeV/c^2)**
	$Z^0 = L_2 = 2\,G_{45} = 90\,D_6 = 540\,\mathbf{I} = 1080\,\gamma = 2160\,S$	$Y^0 = L_2 = 2\,G_{90} = 180\,D_3 = 540\,\mathbf{I} = 1080\,\gamma = 2160\,S$	$X^0 = L_2 = 2\,G_{135} = 270\,D_2 = 540\,\mathbf{I} = 1080\,\gamma = 2160\,S$
Intervalic structure			

Chapter 11

INTERVALIC DYNAMICS OF LEPTON-CHARGED MASSIVE BOSON

INTERVALIC ELECTRON

The intervalic structure of *electron* is:

$e \rightarrow G_1 = 1\ D_{270} = 270\ \mathbf{I}$

ELECTRON INTERVALIC AND ELECTROMAGNETIC ENERGY

The intervalic energy of electron is:

$$\mathrm{I}(e) = c^{\pm 2}\ \hbar\ e^{-2} = c^{\pm 2}\ \hbar\ (270\ \mathbf{q_I})^{-2} = c^{\pm 2}\ \hbar\ [270\ \sqrt{}\text{-}(c^{-1}h)]^{-2} = 270^{-2}\ c^{-1} =$$
$$= 4.575639166 \cdot 10^{-14}\ (\mathrm{J}) = 0.285588809\ (\mathrm{MeV/c^2})$$

And the electromagnetic energy is:

$$\mathrm{U}(e) = \mathrm{E}(e)_{tot} - \mathrm{I}(e) = 3.611471925 \cdot 10^{-14}\ (\mathrm{J}) = 0.22541025\ (\mathrm{MeV/c^2})$$

Thus, the *intervalic electron radius* is:

$r_e = \frac{1}{2}\,(1/4\pi\varepsilon_0)\,e^2 / \mathrm{U}(e) = 3.194098699 \cdot 10^{-15}$ (m)

ELECTRON INTERVALIC EXCHANGE FREQUORCE

The overall exchange frequorce due to intervalic interaction among intervalinos is proportional to the intervalic energy:

$\varphi(\mathbf{I})_e = \mathrm{I}(e) / \hbar = 4.334484487 \cdot 10^{20}$ (s^{-1})

The related maximum linear velocity of intervalinos inside electron will be:

$\mathrm{v}(\mathbf{I})_e = 2\pi\, r_\mathrm{e}\, \varphi(\mathbf{I})_e = 8.698926337 \cdot 10^6$ ($\mathrm{m\ s}^{-1}$) $= 0.029016494$ c

ELECTRON INTERVALIC POTENTIAL WELL

The relation between the intervalic energy and the intervalic structure make an astonishing simple formulation of the potential well corresponding to the intervalic interaction. The difference between the intervalic energy of electron and the intervalic energy of its *isolated* constituent intervalinos yields the magnitude of the intervalic interaction among intervalinos inside electron. This concept is similar to the definition of the electromagnetic potential energy of a composite particle, although in a new way. Lets us go to see it. The electromagnetic potential of electron is due to the difference between the electromagnetic energy of electron and the electromagnetic energy of its *isolated* constituent intervalinos. In our paper on the intervalino I have explained in detail a beautiful feature of IT, that the electromagnetic energy of an *isolated* intervalino is just zero (being its charge sign *not realized*, that is to say, neither + nor -, but ±). According to this we have:

$$\Delta\mathrm{U}(e) = \mathrm{U}(e) - 270\ \mathrm{U}(\mathbf{I}) = \mathrm{U}(270\mathbf{q}_\mathbf{I}) - 270\ \mathrm{U}(\mathbf{q}_\mathbf{I}) = \mathrm{U}(270\mathbf{q}_\mathbf{I}) - 0 =$$
$$= \mathrm{c}^{\pm 2}\mathrm{m}_e - \mathrm{I}(e) = 3.611471925 \cdot 10^{-14}\ (\mathrm{J}) = 0.22541025\ (\mathrm{MeV/c}^2)$$

And the electromagnetic potential is:

$\mathrm{V}(e) = \Delta\mathrm{U}(e) / \mathrm{m}_e = 3.964559695 \cdot 10^{16}$ ($\mathrm{m}^2\ \mathrm{s}^{-2}$)

In the case of electromagnetic energy (and *long ranged* interactions) ‘isolated’ means separate by an infinite length. However, in the case of intervalic interaction (and *short ranged* interactions) ‘isolated’ means *out* of the intervalic structure, an event which does not relies on the macroscopic distance of the separation as in the case of a long ranged interaction. Therefore, the electron intervalic potential is determined by the difference on the intervalic energy between electron and its constituent disassembled intervalinos:

$$\Delta I(e) = I(e) - 270\ I(\mathbf{I}) = I(270\mathbf{q_I}) - 270\ I(\mathbf{q_I}) =$$
$$= [c^{\pm 2}\hbar\ (270\ \mathbf{q_I})^{-2}] - [270\ c^{\pm 2}\hbar\ \mathbf{q_I}^{-2}] = 270^{-2}c^{-1} - 270c^{-1} =$$
$$= -9.006230113 \cdot 10^{-7}\ (J) = -5{,}621{,}244.256\ (MeV/c^2)$$

And the intervalic potential well is:

$$\Phi(e) = \Delta I(e) / m_e = -9.886754667 \cdot 10^{23}\ (m^2\ s^{-2})$$

ELECTRON DYNAMICAL FREQUORCE BALANCE

The magnitude of the corresponding electromagnetic frequorce on surface will be, supposing an overall frequorce:

$$\varphi(e)_{em} = U(e) / r_e = 11.30670109\ (N)$$

As the intervalic frequorce is short ranged it does not relies on the distance, unlike the long ranged one does. The intervalic interaction exists within its range of interaction, which is determined by the energy interval in each case, which is closely related with the masses of the intermediate bosons of the changeless intervalic interaction. In this case, the range of interaction between electron and an isolated intervalino will be between the following ranges:

$$d_e = c^{-1}\hbar / m_e = 3.865488017 \cdot 10^{-13}\ (m)$$
$$d_\mathbf{I} = c^{-1}\hbar / m_\mathbf{I} = 9.487585915 \cdot 10^{-18}\ (m)$$

Out of these ranges the magnitude of the intervalic interaction of electron is precisely *zero* since it is short ranged.

The corresponding intervalic frequorce at electron’s surface is determined by the intervalic energy of electron:

$$\varphi(e)_{in} = I(e) / r_e = 14.32529047\ (N)$$

Which is in the same order of the electromagnetic one, but there is a difference between the intervalic —attractive— and the electromagnetic —repulsive— frequorces just at the electron's surface of:

$\varphi(e)_{\mathrm{in}} - \varphi(e)_{\mathrm{em}} = 3.01858938$ (N)

This frequorce should be exactly compensated by another structural centrifugal frequorce in order to the stability of electron. There must be a perfect balance among all its involved structural energies. And the only one remaining structural energy of electron is the spin energy. Therefore, the corresponding dynamical frequorce due to spin, $\varphi(e)_J$, have to be ~3.01858938 (N):

$\varphi(e)_J = \mathrm{m}_e\, \omega_J^2\, \mathrm{r}_e = 3.01858938$ (N)

The intervalic energy of electron marks its *geodesic line of structural energy*. Inside this geodesic line in energy electron does not "feel" the intervalic field, as like as a planet does not "feel" acceleration due to gravity when following its geodesic line in spacetime. If electron deviates from this energy geodesic through a disassembly of its constituent intervalinos, it will be leaving the intervalic potential well, and the intervalic frequorce due to short ranged intervalic interaction will be in first approximation:

$\varphi(e)_{\mathrm{in}} = \Delta \mathrm{I}(e) / \mathrm{r}_e = 2.81964678 \cdot 10^8$ (N)

Thus, to make a metaphor, the geodesic of gravitational or electromagnetic interaction is like an infinite soft valley, whilst the geodesic of intervalic interaction is like a crack on the plane soil.

ELECTRON INTERVALIC KINEMATICS

From the dynamical frequorce due to spin, the angular velocity will be:

$\omega_J = (\ \varphi(e)_J\ /\ \mathrm{m}_e\, \mathrm{r}_e\ )^{½} = 3.220944289 \cdot 10^{22}\ (\mathrm{s}^{-1})$

The linear velocity due to spin on electron's surface is:

$\mathrm{v}_J = \omega_J\, \mathrm{r}_e = 1.028801396 \cdot 10^8\ (\mathrm{m\ s}^{-1}) = 0.343171206\ \mathrm{c}$

And the acceleration on electron's surface will be:

$a_J = v_J^2 / r_e = 3.313711982 \cdot 10^{30}$ (m s^{-2})

ELECTRON STRUCTURAL ENERGY BALANCE

Intervalic and electromagnetic energies of electron are not equal as could have been expected if no other energies were involved. Of course, this is due because electron is not a *single* particle but it is composed by 270 *intervalinos* —the primordial single particle which electric charge is the intervalic quantum of charge, $\mathbf{q_I} = \sqrt{-(c^{-1}\hbar)}$—. Therefore, a part of the electron's structural energy will be consumed by its intrinsic angular momentum and will be manifested as kinetic energy. The electron spin energy, $E(J_e)$, is just the difference between intervalic and electromagnetic energies, which is *manifested* not as *mass* but as *spin*. This can be postulated because the electron is obviously a state of minimal energy, and therefore it must be the final result of a *perfect energetic balance* in all its involved structural energies.

The rotational kinetic energy due to the intrinsic angular momentum of electron will be, according to traditional Mechanics: $K(J_e) = ½\ I_e\ \omega_J^2$, being I_e the electron's moment of inertia. By the Virial theorem —since from now on a *composite* particle can be considered like a micro galaxy at quantum scale— the potential energy due to spin is: $U(J_e) = 2\ K(J_e)$. Therefore we have (depicting the geometrical coefficient of the moment of inertia):

$U(J_e) = m_e\ r_e^2\ \omega_J^2 = 9.641672411 \cdot 10^{-15}$ (J)

The application of a physical law usually related with star systems or galaxies, as the Virial theorem, at microscopic scale, in a way that a subatomic particle can be compared with a complex star system, is a beautiful example of the legendary correspondence between macrocosmos and microcosmos, which now is materialized from the vagueness of Philosophy to the precision of Physics.

On the other hand the magnitude of the spin energy is under an immovable constraint based on the powerful *intervalic principle of energy balance* for subatomic particles, which establishes the fundamental equation:

$I(e) - U(e) - E(J_e) = 0$

And there should be verified the equality: $E(J_e) = U(J_e)$, that is to say:

$[\ c^{\pm 2}\ \hbar\ (270\ \mathbf{q_I})^{-2}\ ] - [\ ½\ (1/4\pi\varepsilon_0)\ e^2\ /\ r_e\ ] - m_e\ \omega_J^2\ r_e^2 = 0$

As may be expected, the value of the left member of the equation is, in stunning agreement with $U(J_e)$ up to the last digit:

$E(J_e) = m_e\ r_e^2\ \omega_J^2 = 9.64167241 \cdot 10^{-15}$ (J)
$\varphi(e)_J = E(J_e)\ /\ r_e = 3.01858938$ (N)

This is the delicate balance reached by all subatomic particles at every structure level. In the case of electron, as there is only a level —the dalinar one—, the balance is established between the number of intervalinos (which determine totally the intervalic energy and partially electromagnetic energy) and the magnitude of radius (which is the other variable of the electromagnetic energy) and the angular velocity (which involves the spin energy).

Finally, we can say in advance that the spin energy of leptons is the starting point to determine the neutrinos masses, as it has been explained in the chapter on the intervalic neutrino.

INTERVALIC SCHWARZSCHILD ELECTRON MASS AND RADIUS

Using the traditional concepts introduced in the formulation of the *gravitational* Schwarzschild radius, $r_{Schw} = 2Gm/c^2$, we can transform them substituting the gravitational energy by the intervalic energy —because the intervalic energy is the only attractive one inside electron (as the gravitational one is despicable) and therefore the intervalic energy plays just the role of the attractive energy inside electron—, so we will obtain an *intervalic* Schwarzschild radius for electron. The maximum linear velocity on electron's surface due to spin would now play the role as the escape velocity of the star —which now is converted into the electron or any other subatomic particle—, our electron's spin energy would play as the kinetic energy of the star, and the intervalic energy of electron, $I(e)$, would be analogous to the potential energy of the star. In this way, electron could be considered to be a black hole if its mass, $m_{Schw}(e)$, was slightly greater than the actual mass (substituting v_J by c):

$I(e) = K_{escape}(e)$
$c^{\pm 2}\ \hbar\ e^{-2} = ½\ m_{Schw}(e)\ v_J^2 = ½\ c^{\pm 2}\ m_{Schw}(e)$
$m_{Schw}(e) = 2\ c^{\pm 4}\ \hbar\ e^{-2} = 1.01821698 \cdot 10^{-30}$ (kg) $= 0.571177588$ (MeV/c^2)

Please note that the only constants involved in the calculus are just the two fundamental ones, c and ħ, plus the elementary charge, *e*. Therefore the magnitude of the intervalic Schwarzschild mass is a *geometric* result. Thus the ratio between the electron actual mass and this one might be meaningful:

$$m_e / m_{Schw}(e) = 0.894641299$$

Alternatively, electron could equally be an imaginary black hole if its radius was slightly smaller than the actual one:

$$r_{Schw}(e) = [\ m_e / m_{Schw}(e)\ ]\ r_e = 2.857572613 \cdot 10^{-15}\ (m)$$

This magnitude can be considered as an intervalic Schwarzschild electron radius, which is slightly smaller than the actual intervalic electron radius. Therefore, we can see that according to the old-fashioned value of the absolutely misleading Bohr's classical electron radius, $\alpha^2 a_0 = 2.81794092 \cdot 10^{-15}$ (m), the electron would be a black hole (!), a curious result which proves once more the gross mistake of Bohr's calculus.

Thus we reach a result which may help us to understand better the inner architecture of electron and the balance between the share of structural energies and the dynamical physical quantities of electron: the intervalic Schwarzschild mass (or radius) to actual electron mass (or radius) ratio is equal to the ratio between electron's mass energy —$I(e) + U(e) = c^{\pm 2} m_e$— and the total structural energy —$I(e) + U(e) + E(J_e) = 2\ I(e)$—:

$$m_e / m_{Schw}(e) \equiv r_{Schw}(e) / r_e = 0.894641299$$
$$c^{\pm 2} m_e /\ 2\ I(e) = 0.894641299$$

In other words, we could say that the actual mass (or radius) of electron is as greater than the Schwarzschild mass (or radius) as greater becomes the share of the spin energy with respect to the mass energy of electron, being this proportion roughly ~1/9. As the reader will be able to see quietly along this book, this share becomes greater as it is increased the number of constituent intervalic structure levels of subatomic particles.

This may imply that the mass (or radius) of a subatomic particle that would have zero spin energy would be the Schwarzschild's one. Since all subatomic particles without exception have got spin, we can expect that there are not black holes to be single subatomic particles.

ELECTRON INTERVALIC ARCHITECTURE

From here and in resume we have got the following meaningful results:

Electron mass to Schwarzschild mass ratio
$m(e) / m(e)_{\mathrm{Schw}} = 0.894641299$

Electron mass energy to structural energy ratio
$E(e)_{\mathrm{mass}} / A(e) = 0.894641299$

Electron Structural Energy
$A(e) = I(e) + U(e) + E_{J}(e) = E(e)_{\mathrm{mass}} + E_{J}(e) = 2\ I(e) =$
$= 0.571177588\ (\mathrm{MeV/c^2})$

Electron Schwarzschild Mass
$c^{\pm 2}\ \hbar\ e^{-2} = \frac{1}{2}\ m(e)_{\mathrm{Schw}}\ v_{\mathrm{esc}}{}^{\pm 2}$
$m(e)_{\mathrm{Schw}} = 0.571177588\ (\mathrm{MeV/c^2})$

Electron Intervalic Architecture
$A(e) = 2\ I(e)$
$A(e) = c^{\pm 2} m(e)_{\mathrm{Schw}}$
$E(e)_{\mathrm{mass}} / A(e) = m(e) / m(e)_{\mathrm{Schw}} = 0.894641299$

In plain English, the *structural energy* of electron coincides exactly with the *Schwarzschild mass* of electron. And both values are just equal to the double of the *intervalic energy* of electron. Here is the beautiful underlying *geometry* of the electron's structure. It must be noted that most balances of electron constituent energies have a *geometric* origin.

(The calculus is similar to all leptons-charged massive bosons. However it is a little more complex when the particle contains subparticles with both like and unlike charges, because in this case there have to be added to the attractive intervalic energy the electromagnetic energy between unlike subparticles for calculating the Schwarzschild mass of the particle).

MINIMAL ELECTRON RADII: GEOMETRIC RADIUS, SCHWARSCHILD RADIUS, BOSE-EINSTEIN RADIUS

To conclude this study on electron intervalic dynamics, we can make a miscellaneous comment on the minimal electron radius.

The electromagnetic energy of a particle must ever be equal or lesser than its intervalic energy. In other case the particle could not be stable by no means. Therefore, the electron radius has a low limit magnitude, the *minimal geometric radius*:

$r_e > ½\,(1/4\pi\varepsilon_0)\, e^2 / \mathrm{I}(e) = 2.5210462 \cdot 10^{-15}$ (m)

Besides, we can take the magnitude of the electron *Schwarschild radius*, which is another limit minimal radius:

$\mathrm{r}_{b.h.}(e) > [\ \mathrm{m}_e / \mathrm{m}_{b.h.}(e)\ ]\ r_e = 2.85756954 \cdot 10^{-15}$ (m)

And we still can calculate another minimal value which is greater than the two previous ones. Please note that the Bose-Einstein condensed state among electrons only could be possible —and it is— if the difference of the intervalic energy of a paired electrons was bigger than its corresponding electromagnetic energy:

$\mathrm{I}(e^-{+}e^-) - \mathrm{I}(2e^-) > \mathrm{U}(2e^-)$

From here it can be deduced another minimal magnitude allowed to the electron radius, r_e, which we will name *Bose-Einstein radius*. Depicting geometrical details:

$(7/4)\ \mathrm{c}^{\pm 2}\ \hbar\ e^{-2} > ½\,(1/4\pi\varepsilon_0)\,(2e)^2 / 2r_e$
$r_e > (4/7)\,(1/4\pi\varepsilon_0)\ \mathrm{c}^2\,\hbar^{-1} e^4 = 2.8811969 \cdot 10^{-15}$ (m)

The last two minimal magnitudes exceed clearly the misleading value of the bizarre classical electron radius, which is an obsolete approximation which should already be definitively discarded in Particle Physics.

INTERVALIC MUON

The intervalic structure of *muon* is:

$\mu \rightarrow L_1 = G_6 = 6\ D_{45} = 270\ \mathbf{I}$

From here and onwards we will find not only compositeness but *structurefulness*, that is to say, successive levels of compositeness.

MUON INTERVALIC AND ELECTROMAGNETIC ENERGY

As any other subatomic particle, the intervalic muon mass is due to the contribution of the intervalic and electromagnetic energies. The first is:

$$I(\mu) = \sum(c^{\pm 2}\hbar Q^{-2}) = c^{\pm 2}\hbar\, e^{-2} + 6\ (c^{\pm 2}\hbar(45\mathbf{q_I})^{-2}) = (270^{-2}\ c^{-1}) + 6\ (45^{-2}\ c^{-1}) = \\ = 9.92913699 \cdot 10^{-12}\ (J) = 61.9727717\ (MeV/c^2)$$

The material mass of muon is, by definition, the difference between the total mass and the intervalic mass, as has likewise an electromagnetic origin:

$$U(\mu) = E(\mu)_{tot} - I(\mu) = 6.999210568 \cdot 10^{-12}\ (J) = 43.6856173\ (MeV/c^2)$$

The magnitude of the *intervalic muon radius* can be deduced through the electromagnetic energy:

$$r_\mu = ½\ (1/4\pi\varepsilon_0)\ (270\ \mathbf{q_I})^2\ /\ U(\mu) = 1.648099834 \cdot 10^{-17}\ (m)$$

MUON INTERVALIC EXCHANGE FREQUORCE

The overall exchange frequorce due to intervalic interaction among intervalinos inside dalino 45 will be:

$$\varphi(\mathbf{I})_{D45} = I(D_{45})\ /\ \hbar = 1.560414415 \cdot 10^{22}\ (s^{-1})$$

The related maximum linear velocity of intervalinos inside dalino 45 will be, known the muonic dalino 45 radius, $r_{D45} = 2.746832954 \cdot 10^{-18}$ (m):

$$v(\mathbf{I})_{D45} = 2\pi r_{D45}\ \varphi(\mathbf{I})_{D45} = 2.693097464 \cdot 10^5\ (m\ s^{-1}) = 0.000898320619\ c$$

The overall exchange frequorce of dalinos 45 inside muon will be:

$\varphi(D_{45})_{\mu} = I(e) / \hbar = 4.334484487 \cdot 10^{20} (s^{-1})$

And the corresponding maximum linear velocity of dalinos 45 inside muon is, known the muon radius:

$v(D_{45})_{\mu} = 2\pi\, r_{\mu}\, \varphi(D_{45})_{\mu} = 44{,}884.95943 \text{ (m s}^{-1})$

MUON INTERVALIC POTENTIAL WELL

The electromagnetic potential energy of muon is due to the difference between the electromagnetic energy of muon and the electromagnetic energy of its *isolated* constituent dalinos 45, plus the difference between the electromagnetic energy of the dalino 45 and the electromagnetic energy of its *isolated* constituent intervalinos. According to this we have:

$$\Delta U(\mu) = [U(\mu) - 6\, U(D_{45})] + [6\, U(D_{45}) - 6\, (45\, U(\mathbf{I}))] = U(\mu) =$$
$$= c^{\pm 2} m_{\mu} - I(\mu) = 6.999210568 \cdot 10^{-12} \text{ (J)} = 43.6856173 \text{ (MeV/c}^{2})$$

And the electromagnetic potential is:

$V(\mu) = \Delta U(\mu) / m_{\mu} = 3.716001622 \cdot 10^{16} \text{ (m}^{2} \text{ s}^{-2})$

In the case of electromagnetic energy (and *long ranged* interactions) ‘isolated’ means separate by an infinite length. However, in the case of intervalic interaction (and *short ranged* interactions) ‘isolated’ means *out* of the intervalic structure, an event which does not relies on the macroscopic distance of the separation as in the case of a long ranged interaction. Therefore, the muon intervalic potential is determined by the difference on the intervalic energy between muon and its constituent disaggregated intervalinos:

$$\Delta I(\mu) = [I(\mu) - 6\, I(D_{45})] + [6\, I(D_{45}) - 6\, (45\, I(\mathbf{I}))] = [c^{\pm 2}\hbar\, (270\, \mathbf{q_I})^{-2}] -$$
$$- \{6\, [c^{\pm 2}\hbar\, (45\mathbf{q_I}^{-2})]\} + \{6\, [c^{\pm 2}\hbar\, (45\mathbf{q_I}^{-2})]\} - \{6\, [45\, (c^{\pm 2}\hbar\, \mathbf{q_I}^{-2})]\} =$$
$$= 270^{-2} c^{-1} - 270 c^{-1} = -9.006230113 \cdot 10^{-7} \text{ (J)} = -5{,}621{,}244.256 \text{ (MeV/c}^{2})$$

And the intervalic potential well is:

$\Phi(\mu) = \Delta I(\mu) / m_{\mu} = -4.781562918 \cdot 10^{21} \text{ (m}^{2} \text{ s}^{-2})$

MUON DYNAMICAL FREQUORCE BALANCE

The magnitudes of the intervalic and electromagnetic overall frequorces on surface will be:

$\varphi(\mu)_{\text{in}} = \text{I}(\mu) / \text{r}_\mu = 602{,}459.6802$ (N)

$\varphi(\mu)_{\text{em}} = \text{U}(\mu) / \text{r}_\mu = 424{,}683.6523$ (N)

As in electron, the dynamical frequorce due to spin, $\varphi(\mu)_J$, is:

$\varphi(\mu)_{\text{in}} - \varphi(\mu)_{\text{em}} = 177{,}776.0279$ (N)

MUON INTERVALIC KINEMATICS

From the dynamical frequorce due to spin, the angular velocity will be:

$\omega_J = (\ \varphi(\mu)_J\ /\ \text{m}_\mu\ \text{r}_\mu\ )^{½} = 7.567601581 \cdot 10^{24}\ (\text{s}^{-1})$

The linear velocity of spin on muon's surface is:

$\text{v}_J = \omega_J\ \text{r}_\mu = 1.247216291 \cdot 10^{8}\ (\text{m s}^{-1}) = 0.416026573$ c

And the acceleration on muon's surface due to spin will be:

$\text{a}_J = \text{v}_J^{2} / \text{r}_\mu = 9.438435974 \cdot 10^{32}\ (\text{m s}^{-2})$

MUON STRUCTURAL ENERGY BALANCE

The rotational kinetic energy due to the intrinsic angular momentum of muon is: $\text{K}(J_\mu) = ½\ \text{I}_\mu\ \omega_J^{2}$, being I_μ the muon's moment of inertia. By the Virial theorem, the potential energy due to spin is: $\text{U}(J_\mu) = 2\ \text{K}(J_\mu)$. As in electron we have:

$\text{U}(J_\mu) = \text{m}_\mu\ \text{r}_\mu^{2}\ \omega_J^{2} = 2.929926422 \cdot 10^{-12}$ (J)

By fundamental intervalic principle of energy balance for subatomic particles, the muon spin energy is:

$$I(\mu) - U(\mu) - E(J_{\mu}) = 0$$
$$E(J_{\mu}) = I(\mu) - U(\mu) = 2.929926422 \cdot 10^{-12}\ (J)$$

Therefore is verified the equality $E(J_{\mu}) = U(J_{\mu})$, that is to say:

$$[\ c^{\pm 2}\hbar\ (270\mathbf{q_I})^{-2} + 6\ (c^{\pm 2}\hbar\ (45\mathbf{q_I})^{-2})\ ] - [\ \tfrac{1}{2}\ (1/4\pi\varepsilon_0)\ e^2 / r_{\mu}\ ] - m_{\mu}\ \omega_J^2\ r_{\mu}^2 = 0$$

INTERVALIC TAU

The intervalic structure of *tau* is:

$\tau \rightarrow L_1 = G_{15} = 15\ D_{18} = 270\ \mathbf{I}$

TAU INTERVALIC AND ELECTROMAGNETIC ENERGY

In close analogy to electron and muon, the corresponding magnitudes of the intervalic and electromagnetic energies of tau are:

$I(\tau) = \sum(c^{\pm 2}\hbar Q^{-2}) = c^{\pm 2}\hbar\, e^{-2} + 15(c^{\pm 2}\hbar(18\mathbf{q_I})^{-2}) = (270^{-2}c^{-1}) + 15(18^{-2}c^{-1}) =$
$= 1.544735782 \cdot 10^{-10}\,(J) = 964.1478215\,(MeV/c^2)$

$U(\tau) = E(\tau)_{tot} - I(\tau) = 1.302333333 \cdot 10^{-10}\,(J) = 812.8521785\,(MeV/c^2)$

Intervalic tau radius:

$r_\tau = ½\,(1/4\pi\varepsilon_0)\,(270\,\mathbf{q_I})^2 / U(\tau) = 8.857484858 \cdot 10^{-19}\,(m)$

TAU INTERVALIC EXCHANGE FREQUORCE

Overall exchange frequorce due to intervalic interaction among intervalinos inside dalino 18:

$\varphi(\mathbf{I})_{D18} = I(D_{18}) / \hbar = 9.752590095 \cdot 10^{22}\,(s^{-1})$

Related maximum linear velocity of intervalinos inside dalino 18, known the tauonic dalino 18 radius, $r_{D18} = 5.904989684 \cdot 10^{-20}\,(m)$:

$v(\mathbf{I})_{D18} = 2\pi\, r_{D18}\, \varphi(\mathbf{I})_{D18} = 36{,}184.20062\,(m\ s^{-1}) = 0.0001206975014\ c$

Overall exchange frequorce of dalinos 18 inside tau:

$\varphi(D_{18})_\tau = I(e) / \hbar = 4.334484487 \cdot 10^{20}\,(s^{-1})$

Maximum linear velocity of dalinos 18 inside tau:

$v(D_{18})_\tau = 2\pi\, r_\tau\, \varphi(D_{18})_\tau = 2{,}412.280132\ (\mathrm{m\ s^{-1}})$

TAU INTERVALIC POTENTIAL WELL

Tau electromagnetic potential energy:

$\Delta U(\tau) = U(\tau) = 1.302333333 \cdot 10^{-10}\ (\mathrm{J}) = 812.8521785\ (\mathrm{MeV/c^2})$

Tau electromagnetic potential:

$V(\tau) = \Delta U(\tau)\ /\ m_\tau = 4.111171103 \cdot 10^{16}\ (\mathrm{m^2\ s^{-2}})$

Tau intervalic potential energy:

$\Delta I(\tau) = -9.006230113 \cdot 10^{-7}\ (\mathrm{J}) = -5{,}621{,}244.256\ (\mathrm{MeV/c^2})$

Intervalic potential well:

$\Phi(\tau) = \Delta I(\tau)\ /\ m_\tau = -2.843062682 \cdot 10^{20}\ (\mathrm{m^2\ s^{-2}})$

TAU DYNAMICAL FREQUORCE BALANCE

Intervalic and electromagnetic overall frequorces on tau's surface:

$\varphi(\tau)_{\mathrm{in}} = I(\tau)\ /\ r_\tau = 1.743989187 \cdot 10^{8}\ (\mathrm{N})$

$\varphi(\tau)_{\mathrm{em}} = U(\tau)\ /\ r_\tau = 1.47031957 \cdot 10^{8}\ (\mathrm{N})$

Dynamical frequorce due to spin, $\varphi(\tau)_J$:

$\varphi(\tau)_J = \varphi(\tau)_{\mathrm{in}} - \varphi(\tau)_{\mathrm{em}} = 2.736696167 \cdot 10^{7}\ (\mathrm{N})$

TAU INTERVALIC KINEMATICS

Tau angular velocity:

$\omega_J = (\varphi(\tau)_J \ / \ m_\tau \ r_\tau \ )^{½} = 9.87597042 \cdot 10^{25} \ (s^{-1})$

Linear velocity due to spin on tau's surface:

$v_J = \omega_J \ r_\tau = 8.747625846 \cdot 10^{7} \ (m \ s^{-1}) = 0.29178939 \ c$

Acceleration on muon's surface due to spin:

$a_J = v_J^{2} \ / \ r_\tau = 8.63912941 \cdot 10^{33} \ (m \ s^{-2})$

TAU STRUCTURAL ENERGY BALANCE

Tau rotational kinetic energy due to the intrinsic angular momentum:

$K(J_\tau) = ½ \ I_\tau \ \omega_J^{2}$
$U(J_\tau) = 2 \ K(J_\tau) = m_\tau \ r_\tau^{2} \ \omega_J^{2} = 2.42402449 \cdot 10^{-11} \ (J)$

Tau spin energy:

$E(J_\tau) = I(\tau) - U(\tau) = 2.42402449 \cdot 10^{-11} \ (J)$
$E(J_\tau) = U(J_\tau)$

Intervalic principle of energy balance for tau:

$[\ c^{\pm 2}\hbar \ (270\mathbf{q_I})^{-2} + 15 \ (c^{\pm 2}\hbar(18\mathbf{q_I})^{-2}) \ ] - [\ ½ \ (1/4\pi\varepsilon_0) \ e^{2} \ / \ r_\tau \ ] - m_\tau \ \omega_J^{2} \ r_\tau^{2} = 0$

INTERVALIC $W^{\pm}$ BOSON

$W^{\pm}$ BOSON INTERVALIC EXCHANGE FREQUORCE

The overall exchange frequorce due to intervalic interaction among intervalinos inside dalino 5 will be:

$\varphi(\mathbf{I})_{D5} = I(D_5) / \hbar = 1.263935676 \cdot 10^{24} (s^{-1})$

The related maximum linear velocity of intervalinos inside dalino 5 will be, known the bosonic dalino 5 radius:

$v(\mathbf{I})_{D5} = 2\pi\, r_{D5}\, \varphi(\mathbf{I})_{D5} = 2{,}986.6411$ (m s^{-1})

The overall exchange frequorce of dalinos 5 inside $W^{\pm}$ boson will be:

$\varphi(D_5)_W = I(e) / \hbar = 4.334484487 \cdot 10^{20} (s^{-1})$

And the corresponding maximum linear velocity of dalinos 5 inside $W^{\pm}$ boson is, known the $W^{\pm}$ boson radius:

$v(D_5)_W = 2\pi\, r_W\, \varphi(D_5)_W = 55.3081698$ (m s^{-1})

$W^{\pm}$ BOSON INTERVALIC POTENTIAL WELL

The electromagnetic potential energy of $W^{\pm}$ boson is due to the difference between the electromagnetic energy of $W^{\pm}$ boson and the electromagnetic energy of its *isolated* constituent dalinos 5, plus the difference between the electromagnetic energy of the dalino 5 and the electromagnetic energy of its *isolated* constituent intervalinos. According to this we have:

$$\Delta U(W^{\pm}) = [U(W^{\pm}) - 54\ U(D_5)] + [54\ U(D_5) - 54\ (5\ U(\mathbf{I}))] = U(W^{\pm}) - 0 =$$
$$= c^{\pm 2} m_W - I(W^{\pm}) = 5.6801605 \cdot 10^{-9}\ (J) = 35{,}452.76\ (MeV/c^2)$$

And the electromagnetic potential is:

$V(W^{\pm}) = \Delta U(W^{\pm}) / m_W = 3.9619698 \cdot 10^{16}$ ($m^2\ s^{-2}$)

In the case of electromagnetic energy (and *long ranged* interactions) ‘isolated’ means separate by an infinite length. However, in the case of intervalic interaction (and *short ranged* interactions) ‘isolated’ means *out* of the intervalic structure, an event which does not relies on the macroscopic distance of the separation as in the case of a long ranged interaction. Therefore, the $W^{\pm}$ boson intervalic potential is determined by the difference on the intervalic energy between $W^{\pm}$ boson and its constituent disaggregated intervalinos:

$$\Delta I(W^{\pm}) = [I(W^{\pm}) - 54\ I(D_5)] + [54\ I(D_5) - 54\ (5\ I(\mathbf{I}))] =$$
$$= [c^{\pm 2}\hbar\ (270\ \mathbf{q_I})^{-2}] - [54 \cdot 5\ (c^{\pm 2}\hbar\ \mathbf{q_I}^{-2})] = 270^{-2}c^{-1} - 270c^{-1} =$$
$$= -9.006230113 \cdot 10^{-7}\ (J) = -5{,}621{,}244.256\ (MeV/c^2)$$

And the intervalic potential well is:

$$\Phi(W^{\pm}) = \Delta I(W^{\pm}) / m_W = -6.28193724 \cdot 10^{18}\ (m^2\ s^{-2})$$

$W^{\pm}$ BOSON DYNAMICAL FREQUORCE BALANCE

The magnitudes of the intervalic and electromagnetic overall frequorces on surface will be:

$$\varphi(W^{\pm})_{in} = I(W^{\pm}) / r_W = 3.54783848 \cdot 10^{11}\ (N)$$

$$\varphi(W^{\pm})_{em} = U(W^{\pm}) / r_W = 2.79697536 \cdot 10^{11}\ (N)$$

As in other leptons, the dynamical frequorce due to spin, $\varphi(W^{\pm})_J$, is:

$$\varphi(W^{\pm})_{in} - \varphi(W^{\pm})_{em} = 7.50863117 \cdot 10^{10}\ (N)$$

$W^{\pm}$ BOSON INTERVALIC KINEMATICS

From the dynamical frequorce due to spin, the angular velocity will be:

$$\omega_J = (\ \varphi(W^{\pm})_J\ /\ m_W\ r_W\ )^{½} = 5.0783155 \cdot 10^{27}\ (s^{-1})$$

The linear velocity of spin on $W^{\pm}$ boson’s surface is:

$$v_J = \omega_J\ r_W = 1.03131574 \cdot 10^{8}\ (m\ s^{-1}) = 0.34400990\ c$$

And the acceleration on W± boson's surface due to spin will be:

$a_J = v_J^2 / r_W = 5.23734672 \cdot 10^{35}$ (m s^{-2})

W± BOSON STRUCTURAL ENERGY BALANCE

The rotational kinetic energy due to the intrinsic angular momentum of W± boson is: $K(J_W) = ½\, I_W\, \omega_J^2$, being I_W the W± boson's moment of inertia. By the Virial theorem —since a *composite* particle is like a micro galaxy at quantum scale—, the potential energy due to spin is: $U(J_W) = 2\, K(J_W)$. As in other leptons we have:

$U(J_W) = m_W\, r_W^2\, \omega_J^2 = 1.524869705 \cdot 10^{-9}$ (J)

By fundamental intervalic principle of energy balance for subatomic particles, the W± boson spin energy is:

$I(W^\pm) - U(W^\pm) - E(J_W) = 0$
$E(J_W) = I(W^\pm) - U(W^\pm) = 1.524869713 \cdot 10^{-9}$ (J)

Therefore is verified the equality $E(J_W) = U(J_W)$, that is to say:

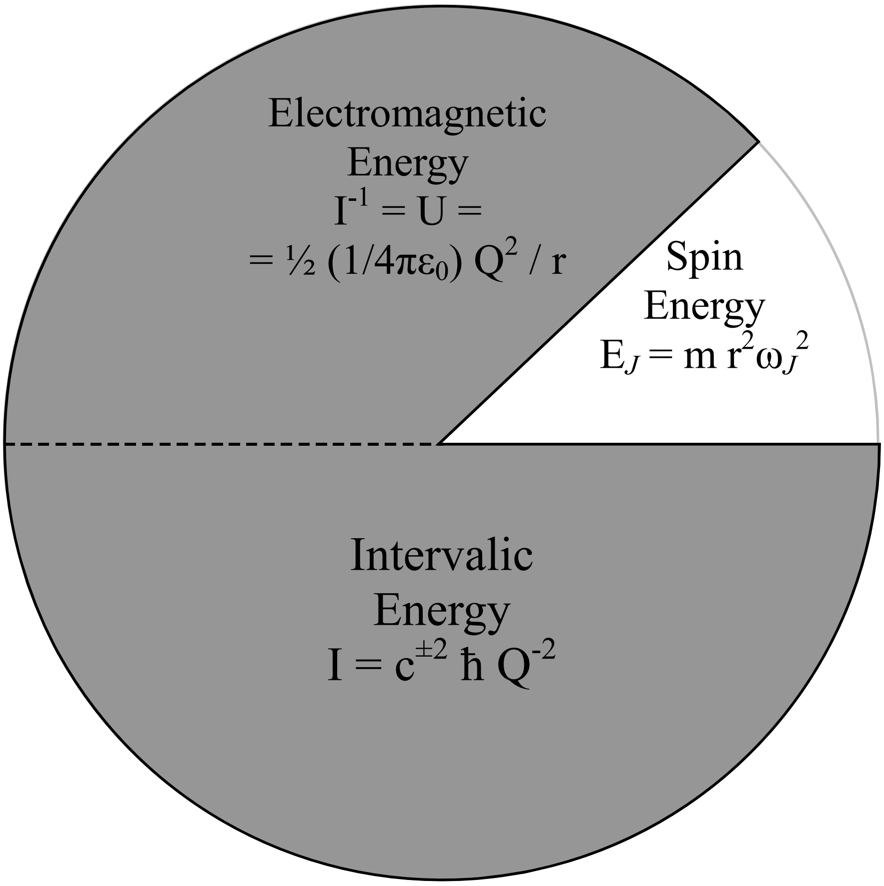
$$[c^{\pm 2}\hbar\, (270\mathbf{q_I})^{-2} + 54\, (c^{\pm 2}\hbar\, (5\mathbf{q_I})^{-2})] - [½\, (1/4\pi\varepsilon_0)\, e^2 / r_W] - m_W\, r_W^2\, \omega_J^2 = 0$$

ELEMENTARY DALINOS AND GAUDINOS: LEPTONS-CHARGED MASSIVE BOSONS

	ELECTRON	MUON	TAU	W$^{\pm}$ MASSIVE BOSON
Intervalic structure	$e = G_1 = D_{270} = 270\ \mathbf{I} = 540\ \gamma$	$\mu = L_1 = G_6 = 6\ D_{45} = 270\ \mathbf{I} = 540\ \gamma$	$\tau = L_1 = G_{15} = 15\ D_{18} = = 270\ \mathbf{I} = 540\ \gamma$	$W^{\pm} = L_1 = G_{54} = 54\ D_5 = = 270\ \mathbf{I} = 540\ \gamma$
Intervalic energy, I	$I(e) = c^{\pm 2}\ \hbar\ e^{-2} = 4.575639166 \cdot 10^{-14}\ (\text{J}) = 0.285588809\ (\text{MeV}/c^2)$	$I(\mu) = \sum(c^{\pm 2}\hbar Q^{-2}) = c^{\pm 2}\hbar\ e^{-2} + 6\ (c^{\pm 2}\hbar\ (45\mathbf{q_I})^{-2}) = 9.92913699 \cdot 10^{-12}\ (\text{J}) = 61.9727717\ (\text{MeV}/c^2)$	$I(\tau) = \sum(c^{\pm 2}\hbar Q^{-2}) = c^{\pm 2}\hbar\ e^{-2} + 15\ (c^{\pm 2}\hbar\ (18\mathbf{q_I})^{-2}) = 1.544735782 \cdot 10^{-10}\ (\text{J}) = 964.1478215\ (\text{MeV}/c^2)$	$I(W^{\pm}) = \sum(c^{\pm 2}\hbar Q^{-2}) = c^{\pm 2}\hbar\ e^{-2} + 54\ (c^{\pm 2}\hbar\ (5\mathbf{q_I})^{-2}) = 7.205030213 \cdot 10^{-9}\ (\text{J}) = 44{,}970.24192\ (\text{MeV}/c^2)$
Electromagnetic energy, U	$U(e) = E(e)_{\text{mass}} - I(e) = 3.611471925 \cdot 10^{-14}\ (\text{J}) = 0.22541025\ (\text{MeV}/c^2)$	$U(\mu) = E(\mu)_{\text{mass}} - I(\mu) = 6.999210568 \cdot 10^{-12}\ (\text{J}) = 43.6856173\ (\text{MeV}/c^2)$	$U(\tau) = E(\tau)_{\text{mass}} - I(\tau) = 1.302333333 \cdot 10^{-10}\ (\text{J}) = 812.8521785\ (\text{MeV}/c^2)$	$U(W^{\pm}) = E(W^{\pm})_{\text{mass}} - I(W^{\pm}) = 5.6801605 \cdot 10^{-9}\ (\text{J}) = 35{,}452.76\ (\text{MeV}/c^2)$
Spin energy E_J	$E_J(e) = I(e) - U(e) = 9.64167241 \cdot 10^{-15}\ (\text{J}) = 0.060178559\ (\text{MeV}/c^2)$	$E_J(\mu) = I(\mu) - U(\mu) = 2.929926422 \cdot 10^{-12}\ (\text{J})$	$E_J(\tau) = I(\tau) - U(\tau) = 2.42402449 \cdot 10^{-11}\ (\text{J})$	$E_J(W^{\pm}) = I(W^{\pm}) - U(W^{\pm}) = 1.524869713 \cdot 10^{-9}\ (\text{J})$
Energy ratios	$I(e)/U(e) = 1.266973485 \approx 5/4$ $I(e)/E(e)_{\text{mass}} = 0.558883239 \approx 5/9$ $U(e)/E(e)_{\text{mass}} = 0.44111676 \approx 4/9$	$I(\mu)/U(\mu) = 1.418608126 \approx 7/5$ $I(\mu)/E(\mu)_{\text{mass}} = 0.586539055 \approx 7/12$ $U(\mu)/E(\mu)_{\text{mass}} = 0.413460944 \approx 5/12$	$I(\tau)/U(\tau) = 1.186129344 \approx 6/5$ $I(\tau)/E(\tau)_{\text{mass}} = 0.542570524 \approx 6/11$ $U(\tau)/E(\tau)_{\text{mass}} = 0.457429475 \approx 5/11$	$I(W^{\pm})/U(W^{\pm}) = 1.268 \approx 5/4$ $I(W^{\pm})/E(W^{\pm})_{\text{mass}} = 0.559 \approx 5/9$ $U(W^{\pm})/E(W^{\pm})_{\text{mass}} = 0.441 \approx 4/9$
Radius r	$r_e = \tfrac{1}{2}\ (1/4\pi\varepsilon_0)\ e^2 / U(e) = = 3.194098699 \cdot 10^{-15}\ (\text{m})$	$r_\mu = \tfrac{1}{2}\ (1/4\pi\varepsilon_0)\ (270\ \mathbf{q_I})^2 / U(\mu) = = 1.648099834 \cdot 10^{-17}\ (\text{m})$	$r_\tau = \tfrac{1}{2}\ (1/4\pi\varepsilon_0)\ (270\ \mathbf{q_I})^2 / U(\tau) = = 8.857484858 \cdot 10^{-19}\ (\text{m})$	$r_W = \tfrac{1}{2}\ (1/4\pi\varepsilon_0)\ (270\ \mathbf{q_I})^2 / U(W^{\pm}) = = 2.0308225 \cdot 10^{-20}\ (\text{m})$
Angular velocity due to spin, ω_J	$\omega_J = (\ E_J(e)\ /\ m_e\ r_e^{\ 2}\ )^{1/2} = = 3.220944289 \cdot 10^{22}\ (\text{s}^{-1})$	$\omega_J = (\ E_J(\mu)\ /\ m_\mu\ r_\mu^{\ 2}\ )^{1/2} = = 7.567601581 \cdot 10^{24}\ (\text{s}^{-1})$	$\omega_J = (\ E_J(\tau)\ /\ m_\tau\ r_\tau^{\ 2}\ )^{1/2} = = 9.87597042 \cdot 10^{25}\ (\text{s}^{-1})$	$\omega_J = (\ E_J(W^{\pm})\ /\ m_W\ r_W^{\ 2}\ )^{1/2} = = 5.0783155 \cdot 10^{27}\ (\text{s}^{-1})$
Linear velocity due to spin on surface, v_J	$v_J = \omega_J\ r_e = 1.028801396 \cdot 10^{8}\ (\text{m s}^{-2}) = = 0.343171206\ c$	$v_J = \omega_J\ r_\mu = 1.247216291 \cdot 10^{8} = = 0.416026573\ (\text{m s}^{-2})$	$v_J = \omega_J\ r_\tau = 8.747625846 \cdot 10^{7} = = 0.29178939\ (\text{m s}^{-2})$	$v_J = \omega_J\ r_W = 1.03131574 \cdot 10^{8} = = 0.34400990\ (\text{m s}^{-2})$
Intervalic potential well, Φ	$\Phi(e) = \Delta I(e)\ /\ m_e = = -9.886754667 \cdot 10^{23}\ (\text{m}^2\ \text{s}^{-2})$	$\Phi(\mu) = \Delta I(\mu)\ /\ m_\mu = = -4.781562918 \cdot 10^{21}\ (\text{m}^2\ \text{s}^{-2})$	$\Phi(\tau) = \Delta I(\tau)\ /\ m_\tau = = -2.843062682 \cdot 10^{20}\ (\text{m}^2\ \text{s}^{-2})$	$\Phi(W^{\pm}) = \Delta I(W^{\pm})\ /\ m_W = = -6.28193724 \cdot 10^{18}\ (\text{m}^2\ \text{s}^{-2})$
Overall exchange frequorce of its constituent particles inside, φ	$\varphi(\mathbf{I})_e = I(e)\ /\ \hbar = = 4.334484487 \cdot 10^{20}\ (\text{s}^{-1})$	$\varphi(D_{45})_\mu = I(e)\ /\ \hbar = = 4.334484487 \cdot 10^{20}\ (\text{s}^{-1})$	$\varphi(D_{18})_\tau = I(e)\ /\ \hbar = = 4.334484487 \cdot 10^{20}\ (\text{s}^{-1})$	$\varphi(D_5)_W = I(e)\ /\ \hbar = = 4.334484487 \cdot 10^{20}\ (\text{s}^{-1})$
Maximum linear velocity of its constituent particles inside, v	$v(\mathbf{I})_e = 2\pi\ r_e\ \varphi(\mathbf{I})_e = = 8.698926337 \cdot 10^{6}\ (\text{m s}^{-1}) = 0.029016494\ c$	$v(D_{45})_\mu = 2\pi\ r_\mu\ \varphi(D_{45})_\mu = = 44{,}884.95943\ (\text{m s}^{-1})$	$v(D_{18})_\tau = 2\pi\ r_\tau\ \varphi(D_{18})_\tau = = 2{,}412.280132\ (\text{m s}^{-1})$	$v(D_{45})_W = 2\pi\ r_W\ \varphi(D_5)_W = = 55.3081698\ (\text{m s}^{-1})$
Structural energy balance	$[\ c^{\pm 2}\ \hbar\ (270\ \mathbf{q_I})^{-2}\ ] - - [\ \tfrac{1}{2}\ (1/4\pi\varepsilon_0)\ e^2 / r_e\ ] - m_e\ \omega_J^2\ r_e^2 = 0$	$[\ c^{\pm 2}\hbar\ (270\mathbf{q_I})^{-2} + 6\ (c^{\pm 2}\hbar\ (45\mathbf{q_I})^{-2})\ ] - - [\ \tfrac{1}{2}\ (1/4\pi\varepsilon_0)\ e^2 / r_\mu\ ] - m_\mu\ \omega_J^2\ r_\mu^2 = 0$	$[\ c^{\pm 2}\hbar\ (270\mathbf{q_I})^{-2} + 15\ (c^{\pm 2}\hbar(18\mathbf{q_I})^{-2})\ ] - - [\ \tfrac{1}{2}\ (1/4\pi\varepsilon_0)\ e^2 / r_\tau\ ] - m_\tau\ \omega_J^2\ r_\tau^2 = 0$	$[c^{\pm 2}\hbar\ (270\mathbf{q_I})^{-2} + 54\ (c^{\pm 2}\hbar\ (5\mathbf{q_I})^{-2})] - - [\tfrac{1}{2}\ (1/4\pi\varepsilon_0)\ e^2 / r_W] - m_W\ r_W^2\ \omega_J^2 = 0$

ARCHITECTURE OF THE STRUCTURAL ENERGY OF SUBATOMIC PARTICLES

STRUCTURAL ENERGY OF SUBATOMIC PARTICLES: $A = I + I^{-1} + E_J = c^{\pm 2}\, m_{\text{Schwarzschild}}$
Intervalic Principle of Energy Balance for Subatomic Particles: $I - I^{-1} - E_J = 0$



Electron Structural Energy Ratios

$I(e)/U(e) = 1.266973485$
$I(e)/E(e)_{\text{mass}} = 0.558883239$
$U(e)/E(e)_{\text{mass}} = 0.44111676$
$E_J(e)/E(e)_{\text{mass}} = 0.117766479$

Muon Structural Energy Ratios

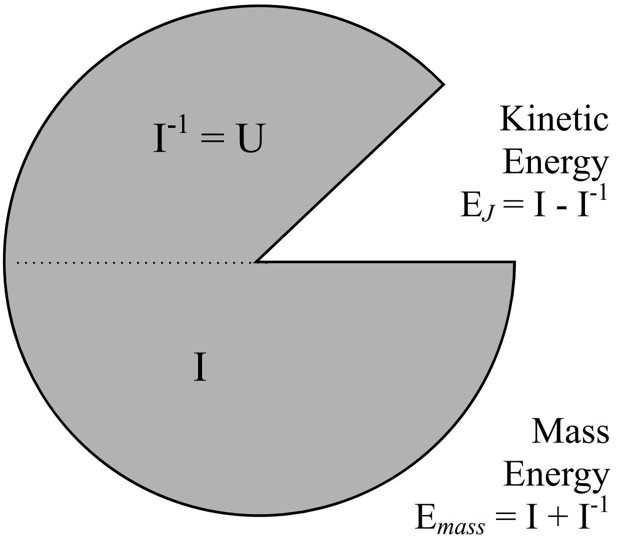
$I(\mu)/U(\mu) = 1.418608126$
$I(\mu)/E(\mu)_{\text{mass}} = 0.586539055$
$U(\mu)/E(\mu)_{\text{mass}} = 0.413460944$
$E_J(\mu)/E(\mu)_{\text{mass}} = 0.173078111$

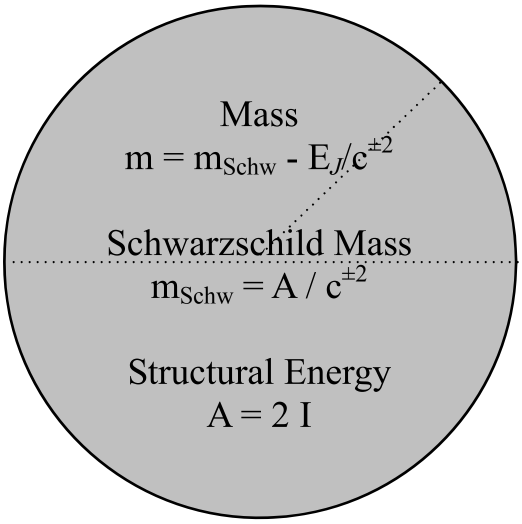
Tau Structural Energy Ratios

$I(\tau)/U(\tau) = 1.186129344$
$I(\tau)/E(\tau)_{\text{mass}} = 0.542570524$
$U(\tau)/E(\tau)_{\text{mass}} = 0.457429475$
$E_J(\tau)/E(\tau)_{\text{mass}} = 0.085141048$

$W^{\pm}$ boson Structural Energy Ratios

$I(W^{\pm})/U(W^{\pm}) = 1.268455314$
$I(W^{\pm})/E(W^{\pm})_{\text{mass}} = 0.559171391$
$U(W^{\pm})/E(W^{\pm})_{\text{mass}} = 0.440828608$
$E_J(W^{\pm})\ /E(W^{\pm})_{\text{mass}} = 0.118342809$





Intervalic Principle of Energy Balance for Lepton-CMB

$$I(l) - U(l) - E_J(l) = 0$$

Lepton-CMB Schwarzschild Mass

$$c^{\pm2}\ \hbar\ e^{-2} = \tfrac{1}{2}\ m(l)_{Schw}\ v_{esc}^{\pm2}$$

Lepton-CMB Structural Energy

$$A(l) = E(l)_{mass} + E_J(l) =$$
$$I(l) + U(l) + E_J(l)$$

Lepton-CMB Intervalic Architecture

$$A(l) = 2\ I(l)$$
$$A(l) = c^{\pm2} m(l)_{Schw}$$
$$R(l) = E(l)_{mass} / A(l)$$
$$R(l) = m(l) / m(l)_{Schw}$$
$$R(e) = 0.894641299$$
$$R(\mu) = 0.852458153$$
$$R(\tau) = 0.921539187$$
$$R(W^{\pm}) = 0.894180223$$

Chapter 12

INTERVALIC FRACTIONAL GAUDINO

STRUCTURE OF DALINOS

Recapitulating: we define the *dalino* as an intervalic particle composed by the assembly of a determine number of intervalinos. Due to intervalic principles of symmetry, such compositeness only can take 16 values, which are the divisors of the elementary charge, because the elementary charge is defined as the final state of the lowest energy, reached through the balance between intervalic energy, electromagnetic energy and spin energy. These values are the following multiples of the intervalic charge, $\mathbf{q}_{\mathbf{I}} = \sqrt{-(c^{-1}\hbar)}$:

1, 2, 3, 5, 6, 9, 10, 15, 18, 27, 30, 45, 54, 90, 135, 270.

Of course, the aggregations of intervalinos could take any other exotic values at the Big Bang, but any of them survived after the primordial synthesis of subatomic particles because its energy could not reach a balance imposing a different set of symmetrical constraints than those of the elementary charge. Therefore, we are compelled to think that any particle which symmetries do not fit with those imposed by the state of lowest energy of the elementary charge could stay after primordial times.

According to the number of constituent intervalinos, we name the dalinos as, i.e., dalino 18, dalino 27, dalino 30, etc., including likewise this number behind its symbol as a subindex: D_{18}, D_{27}, D_{30}, etc. Need not to say that the dalino 1 (D_1) is no other than the *intervalino*, and the dalino 270 (D_{270}) is the *electron*.

It has to be noted that the intervalic interaction has spin 0, as I have shown in other site. Therefore, like charges attract between them, and unlike charges repel, just the contrary to electromagnetic interaction. This fact fully explains why there are not dalinos with intervalic charges of different signs, since intervalic energy is ever much more greater than electromagnetic interaction at scale of subatomic particles.

STRUCTURE OF GAUDINO

We define the *gaudino,* G_n, as an intervalic particle composed by the assembly of a determine number of dalinos. The subindex *n* means the number of constituent dalinos. Insofar as dalinos are already composite particles, gaudinos involve compositeness of compositeness. Where there are successive levels of compositeness we may talk about *structurefulness*.

With the preceding data about dalinos the question that arises is how can dalinos aggregate in order to compose the subatomic particles that conform the actual Universe. It is clear that there must exist powerful constraints that avoid a great number of possible combinations. We have commented in other site that the magnitude of the elementary charge acts as an attractor of spontaneous order, since it is the state of minimal energy of the intervalic charge. This fact introduces a powerful symmetry constraint in the primordial aggregations of dalinos. Actually, the 16 allowed symmetries of dalinar aggregation can be viewed as a consequence of that constraint, valid for all primordial aggregations of intervalinos.

There are two basic kinds of gaudinos: the 16 *elementary* ones, each of them composed by 270 intervalinos, and the *fractional* ones, which are composed by a number of intervalinos which is a fraction of 270, and which number is postulated to be 12+12 = 24 as we are going to see immediately. In total there would be 16+24 = 40 kinds of gaudinos, regardless gaudinos with poor symmetries which can be discarded for practical purposes.

ELEMENTARY GAUDINOS: L_1

The most simple gaudinar structure is the aggregation of dalinos for constituting an elementary charge with 270 constituent intervalinos. Due to the symmetry constraints of the dalinar structure there are only 16 of such possible particles, which are composed by a determine number of dalinos. This set of 16 symmetries will be named L_1, where the subindex 1 means the number of constituent intervalinos of the elementary charge (270). The masses of all these elementary gaudinos are, taking the electron's ratio between intervalic and electromagnetic energy as reference, the following (in MeV/c^2):

$L_1 = G_1 = 1\ D_{270} = 270\ \mathbf{I} = 0.51099909$
$L_1 = G_2 = 2\ D_{135} = 270\ \mathbf{I} = 4.0879928$
$L_1 = G_3 = 3\ D_{90} = 270\ \mathbf{I} = 13.796975$
$L_1 = G_5 = 5\ D_{54} = 270\ \mathbf{I} = 63.874885$
$L_1 = G_6 = 6\ D_{45} = 270\ \mathbf{I} = 110.37580$
$L_1 = G_9 = 9\ D_{30} = 270\ \mathbf{I} = 372.51833$
$L_1 = G_{10} = 10\ D_{27} = 270\ \mathbf{I} = 510.99909$
$L_1 = G_{15} = 15\ D_{18} = 270\ \mathbf{I} = 1{,}724.6220$
$L_1 = G_{18} = 18\ D_{15} = 270\ \mathbf{I} = 2{,}980.1466$
$L_1 = G_{27} = 27\ D_{10} = 270\ \mathbf{I} = 10{,}057.995$
$L_1 = G_{30} = 30\ D_9 = 270\ \mathbf{I} = 13{,}796.975$
$L_1 = G_{45} = 45\ D_6 = 270\ \mathbf{I} = 46{,}564.794$
$L_1 = G_{54} = 54\ D_5 = 270\ \mathbf{I} = 80{,}463.964$
$L_1 = G_{90} = 90\ D_3 = 270\ \mathbf{I} = 372{,}518.33$
$L_1 = G_{135} = 135\ D_2 = 270\ \mathbf{I} = 1{,}257{,}249.4$
$L_1 = G_{270} = 270\ D_1 = 270\ \mathbf{I} = 5{,}621{,}244.5$

It can be pointed out that all these possible particles are equally composed by 270 intervalinos, being the only difference among them the different *symmetry* or *form* in which the aggregation of intervalinos has been made, that is to say, its *structure*. "God does not play dice". Here we have a clear example of the new importance of structure and form in Physics, importance that increases proportionally as it comes down more and more towards subatomic world.

Thus, all leptons are gaudinos focused on the symmetries 1 D_{270}, 6 D_{45} and 15 D_{18}:

$G_1 = 1\ D_{270} = 0.51099909 \rightarrow e$, electron
$G_6 = 6\ D_{45} = 110.37580 \rightarrow \mu$, muon
$G_{15} = 15\ D_{18} = 1{,}724.6220 \rightarrow \tau$, tauon

Meaningfully, the intermediate boson $W^{\pm}$ is a gaudino, while Z^0 is an aggregation of two gaudinos as we have described in detail in other sites:

$G_{54} = 54\ D_5 = 80{,}463.964 \rightarrow W^{\pm}$ intermediate boson

FRACTIONAL GAUDINOS: $L_{⅔}$ and $L_{⅓}$

As in all our papers, we will follow a systematic approach, applying rigorously logical processes up to its latest consequences, without regarding the meaning of the obtained results until theoretical deduction is finalized.

For obvious symmetry reasons, we have begun with the possible combinations of dalinos composed just by the number of intervalinos of the elementary charge. However, it could be proposed other kinds of gaudinos composed, for example, by fractional charge values: 180$\mathbf{q_I}$, 135$\mathbf{q_I}$ and 90$\mathbf{q_I}$ —or in other words ⅔*e*, ½*e*, ⅓*e*—. The states that Nature appears to chose are ever those that shows the *greatest symmetry* and the *lowest energy*. Precisely, the deep understanding and the right measurement about the Nature's preferences on symmetry in relation with energy, or vice versa, is an important pending chapter in our knowledge of Physics. Please note that the values ¼ *e* and ¾ *e* are not allowed anyway because ¼ *e* = 67.5 $\mathbf{q_I}$ and ¾ *e* = 202.5 $\mathbf{q_I}$, values that would imply a *partition* of the elementary charge and, *a fortiori*, a partition of the intervalino.

We can suppose that the fractional gaudinos chosen by Nature are those with the most rich symmetries. As we have seen, the elementary gaudino has 16 symmetries. It can be easily checked that the structures with the greatest number of symmetries among all possible fractional gaudinos are those which have ⅔ 270 = 180 and ⅓ 270 = 90 intervalinos. They are named respectively lisztinos $L_{⅔}$ and $L_{⅓}$. Both of them have 12 symmetries, while the next structure is ½ 270 = 135 intervalinos, which has only 8 symmetries, as can be seen right now (masses expressed in MeV/c^2). Therefore we will consider only the two first ones. Here is the whole set of lisztinos $L_{⅓}$:

$L_{⅓}$ = ⅓ G_1 = (1/3) D_{270} = 90 **I**, not allowed
$L_{⅓}$ = ⅓ G_2 = (2/3) D_{135} = 90 **I**, not allowed
$L_{⅓}$ = ⅓ G_3 = 1 D_{90} = 90 **I** = 4.5989918
$L_{⅓}$ = ⅓ G_5 = (5/3) D_{54} = 90 **I**, not allowed
$L_{⅓}$ = ⅓ G_6 = 2 D_{45} = 90 **I** = 36.791934
$L_{⅓}$ = ⅓ G_9 = 3 D_{30} = 90 **I** = 124.17278
$L_{⅓}$ = ⅓ G_{10} = (10/3) D_{27} = 90 **I**, not allowed
$L_{⅓}$ = ⅓ G_{15} = 5 D_{18} = 90 **I** = 574.87400
$L_{⅓}$ = ⅓ G_{18} = 6 D_{15} = 90 **I** = 993.38220
$L_{⅓}$ = ⅓ G_{27} = 9 D_{10} = 90 **I** = 3,352.6650
$L_{⅓}$ = ⅓ G_{30} = 10 D_9 = 90 **I** = 4,598.9918

$L_{⅓}$ = ⅓ G_{45} = 15 D_6 = 90 **I** = 15,521.598
$L_{⅓}$ = ⅓ G_{54} = 18 D_5 = 90 **I** = 26,821.321
$L_{⅓}$ = ⅓ G_{90} = 30 D_3 = 90 **I** = 124,172.78
$L_{⅓}$ = ⅓ G_{135} = 45 D_2 = 90 **I** = 419,083.13
$L_{⅓}$ = ⅓ G_{270} = 90 D_1 = 90 **I** = 1,873,748.2

The entire set of lisztinos $L_{⅔}$ is:

$L_{⅔}$ = ⅔ G_1 = (2/3) D_{270} = 180 **I**, not allowed
$L_{⅔}$ = ⅔ G_2 = (4/3) D_{135} = 180 **I**, not allowed
$L_{⅔}$ = ⅔ G_3 = 2 D_{90} = 180 **I** = 9.1979836
$L_{⅔}$ = ⅔ G_5 = (10/3) D_{54} = 180 **I**, not allowed
$L_{⅔}$ = ⅔ G_6 = 4 D_{45} = 180 **I** = 73.583868
$L_{⅔}$ = ⅔ G_9 = 6 D_{30} = 180 **I** = 248.34556
$L_{⅔}$ = ⅔ G_{10} = (20/3) D_{27} = 180 **I**, not allowed
$L_{⅔}$ = ⅔ G_{15} = 10 D_{18} = 180 **I** = 1,149.7480
$L_{⅔}$ = ⅔ G_{18} = 12 D_{15} = 180 **I** = 1,986.7644
$L_{⅔}$ = ⅔ G_{27} = 18 D_{10} = 180 **I** = 6,705.3299
$L_{⅔}$ = ⅔ G_{30} = 20 D_9 = 180 **I** = 9,197.9836
$L_{⅔}$ = ⅔ G_{45} = 30 D_6 = 180 **I** = 31,043.196
$L_{⅔}$ = ⅔ G_{54} = 36 D_5 = 180 **I** = 53,642.642
$L_{⅔}$ = ⅔ G_{90} = 60 D_3 = 180 **I** = 248,345.56
$L_{⅔}$ = ⅔ G_{135} = 90 D_2 = 180 **I** = 838,166.26
$L_{⅔}$ = ⅔ G_{270} = 180 D_1 = 180 **I** = 3,747,496.3

And only for curiosity in order to check its lesser symmetries with respect to the preceding sets, the whole set of lisztinos $L_{½}$ is:

$L_{½}$ = ½ G_1 = D_{270} = 135 **I**, not allowed
$L_{½}$ = ½ G_2 = 1 D_{135} = 135 **I** = 2.0439964
$L_{½}$ = ½ G_3 = (3/2) D_{90} = 135 **I**, not allowed
$L_{½}$ = ½ G_5 = (5/2) D_{54} = 135 **I**, not allowed
$L_{½}$ = ½ G_6 = 3 D_{45} = 135 **I** = 55.187901
$L_{½}$ = ½ G_9 = (9/2) D_{30} = 135 **I**, not allowed
$L_{½}$ = ½ G_{10} = 5 D_{27} = 135 **I** = 255.49955
$L_{½}$ = ½ G_{15} = (15/2) D_{18} = 135 **I**, not allowed
$L_{½}$ = ½ G_{18} = 9 D_{15} = 135 **I** = 1,490.0733
$L_{½}$ = ½ G_{27} = (27/2) D_{10} = 135 **I**, not allowed
$L_{½}$ = ½ G_{30} = 15 D_9 = 135 **I** = 6,898.4877
$L_{½}$ = ½ G_{45} = (45/2) D_6 = 135 **I**, not allowed
$L_{½}$ = ½ G_{54} = 27 D_5 = 135 **I** = 40,231.982
$L_{½}$ = ½ G_{90} = 45 D_3 = 135 **I** = 186,259.17

$L_{½}$ = ½ G_{135} = (135/2) D_2 = 135 **I**, not allowed
$L_{½}$ = ½ G_{270} = 135 D_1 = 135 **I** = 2,810,622.2

Since the elementary charge plays as an attractor for the aggregations of subatomic particles, these fractional gaudinos will not be able to exist in isolated state but only as constituents of other particles which total charge is the elementary one.

As we will see later with detail, among these symmetries we find the lightest intervalic structures of the allowed quark families:

$L_{⅓}$ = ⅓ G_6 = 2 D_{45} = 90 **I** = 36.791934
$L_{⅔}$ = ⅔ G_6 = 4 D_{45} = 180 **I** = 73.583868
$L_{⅓}$ = ⅓ G_9 = 3 D_{30} = 90 **I** = 124.17278
$L_{⅔}$ = ⅔ G_9 = 6 D_{30} = 180 **I** = 248.34556
$L_{⅓}$ = ⅓ G_{15} = 5 D_{18} = 90 **I** = 574.87400
$L_{⅔}$ = ⅔ G_{15} = 10 D_{18} = 180 **I** = 1,149.7480
$L_{⅓}$ = ⅓ G_{45} = 15 D_6 = 90 **I** = 15,521.598
$L_{⅔}$ = ⅔ G_{45} = 30 D_6 = 180 **I** = 31,043.196
$L_{⅓}$ = ⅓ G_{54} = 18 D_5 = 90 **I** = 26,821.321
$L_{⅔}$ = ⅔ G_{54} = 36 D_5 = 180 **I** = 53,642.642
$L_{⅓}$ = ⅓ G_{90} = 30 D_3 = 90 **I** = 124,172.78
$L_{⅔}$ = ⅔ G_{90} = 60 D_3 = 180 **I** = 248,345.56
$L_{⅓}$ = ⅓ G_{135} = 45 D_2 = 90 **I** = 419,083.13
$L_{⅔}$ = ⅔ G_{135} = 90 D_2 = 180 **I** = 838,166.26

NUCLEONIC GAUDINO 6 INTERVALIC STRUCTURE

It have to be noted that the principal structural difference between leptons and quarks is that the constituent dalinos of leptons have always like electric charge signs, while the nucleonic gaudinos 6 have constituent dalinos with unlike electric charge signs. This fact produces a delicate balance between the intervalic, electromagnetic and spin energies in the nucleonic gaudino 6. It can be also remembered that the electromagnetic energy is just the *inverse* of the intervalic energy, so subatomic particles reach a very elegant balance between a magnitude and its inverse. Due to its hexagonal symmetry, the dynamical electromagnetic interaction inside the gaudino 6 can be calculated as if it was composed by the sum of 15 equal dalino45-to-dalino45 interaction. Then, using the traditional notation of '-' for attractive interaction and '+' for repulsive interaction, and writing down the full set of symmetries, the following result is obtained:

$U [6 (D_{+45}) + 0 (D_{-45})] = +6 U(D_{45})$
$U [5 (D_{+45}) + 1 (D_{-45})] = [(10/15)-(5/15)] 6 U(D_{45}) = +(1/3) 6 U(D_{45})$
$U [4 (D_{+45}) + 2 (D_{-45})] = [(7/15)-(8/15)] 6 U(D_{45}) = -(1/15) 6 U(D_{45})$
$U [3 (D_{+45}) + 3 (D_{-45})] = [(6/15)-(9/15)] 6 U(D_{45}) = -(1/5) 6 U(D_{45})$
$U [2 (D_{+45}) + 4 (D_{-45})] = [(7/15)-(8/15)] 6 U(D_{45}) = -(1/15) 6 U(D_{45})$
$U [1 (D_{+45}) + 5 (D_{-45})] = [(10/15)-(5/15)] 6 U(D_{45}) = +(1/3) 6 U(D_{45})$
$U [0 (D_{+45}) + 6 (D_{-45})] = +6 U(D_{45})$

The primordial aggregation of intervalinos to make dalinos, and of dalinos to make gaudinos was symmetric under interchange and therefore follows Bose-Einstein statistics, as I have explained in other site. Intervalinos and dalinos are *bosons* with spin 0. On the contrary, the primordial aggregation of gaudinos made symmetric and antisymmetric states under interchange: the first is found in zero charged massive bosons, and the second is found in lisztinos with fractional charge, that is to say, in quarks.

Regarding stable quarks constituent of nucleons, due to powerful symmetry constraints there were only seven modes to make those aggregation of dalinos 45 to make gaudinos 6 at primordial times:

$6 (D_{+45}) + 0 (D_{-45}) = G_6^{+}$
$5 (D_{+45}) + 1 (D_{-45}) = G_6^{+\frac{2}{3}}$
$4 (D_{+45}) + 2 (D_{-45}) = G_6^{+\frac{1}{3}}$
$3 (D_{+45}) + 3 (D_{-45}) = G_6^{0}$
$2 (D_{+45}) + 4 (D_{-45}) = G_6^{-\frac{1}{3}}$
$1 (D_{+45}) + 5 (D_{-45}) = G_6^{-\frac{2}{3}}$
$0 (D_{+45}) + 6 (D_{-45}) = G_6^{-}$

All these gaudinos 6 have the same dalinar mass because the intervalic structure and absolute value of the charge of the constituent dalinos are identical. However the gaudinar masses are different according to their isocharge value, as can be seen in the next table on the isogaudino 6: structural balance between its intervalic and electromagnetic energies.

The last gaudino, 6 (D_{-45}), is no other than the *muon*, being 6 (D_{+45}) the *antimuon*. The intervalic structures of $G_6^{\pm}$ and G_6^{0} are unique. On the contrary, fractional charged gaudinos can have different intervalic structures relying on how the aggregation of dalinos is made. Writing only the charge sign of the constituent dalinos 45, we have that the gaudino $G_6^{\pm\frac{2}{3}}$ have only one intervalic structure (writing only, for example, $G_6^{+\frac{2}{3}}$):

(+++++-) = (++++-+) = (+++-++) = (++-+++) = (+-++++) = (-+++++)

but the gaudino $G_6^{\pm1/3}$ has got three different structures (writing only $G_6^{+1/3}$):

(++++--) = (+++--+) = (++--++) = (+--+++) = (--++++) = (-++++-) ≠
(+++-+-) = (++-+-+) = (+-+-++) = (-+-+++) = (+-+++-) = (-+++-+) ≠
(++-++-) = (+-++-+) = (-++-++) = (++-++-) = (+-++-+) = (-++-++)

GAUDINAR STRUCTURE OF NUCLEONIC QUARKS

As quarks have fractional charges, the only possible assemblies of isogaudinos (G_6) to compose a quark are the 15 following ones:

$q(+2/3) = G_6^{+} + G_6^{-} + G_6^{+2/3}$
$q(+2/3) = G_6^{+} + G_6^{-2/3} + G_6^{+1/3}$
$q(+2/3) = G_6^{+2/3} + G_6^{-2/3} + G_6^{+2/3}$
$q(+2/3) = G_6^{+} + G_6^{-1/3} + G_6^{0}$
$q(+2/3) = G_6^{+2/3} + G_6^{-1/3} + G_6^{+1/3}$
$q(+2/3) = G_6^{0} + G_6^{+2/3} + G_6^{0}$
$q(+2/3) = G_6^{+1/3} + G_6^{0} + G_6^{+1/3}$

$q(-1/3) = G_6^{+} + G_6^{-} + G_6^{-1/3}$
$q(-1/3) = G_6^{+} + G_6^{-2/3} + G_6^{-2/3}$
$q(-1/3) = G_6^{+2/3} + G_6^{-} + G_6^{0}$
$q(-1/3) = G_6^{+1/3} + G_6^{-} + G_6^{+1/3}$
$q(-1/3) = G_6^{+2/3} + G_6^{-2/3} + G_6^{-1/3}$
$q(-1/3) = G_6^{+1/3} + G_6^{-2/3} + G_6^{0}$
$q(-1/3) = G_6^{-1/3} + G_6^{+1/3} + G_6^{-1/3}$
$q(-1/3) = G_6^{0} + G_6^{-1/3} + G_6^{0}$

Now we could make some assumptions on the possible physical constraints to select the most stable states among this set. For example:

1) It can be supposed that the constituent charges of these isogaudinos would not be neither the elementary charge not zero charge but fractional charges. If this assumption was held the only remaining combinations would be these four ones:

$q(+2/3) = G_6^{+2/3} + G_6^{-2/3} + G_6^{+2/3}$
$q(+2/3) = G_6^{+2/3} + G_6^{-1/3} + G_6^{+1/3}$
$q(-1/3) = G_6^{+2/3} + G_6^{-2/3} + G_6^{-1/3}$
$q(-1/3) = G_6^{-1/3} + G_6^{+1/3} + G_6^{-1/3}$

ISOGAUDINO 6:
STRUCTURAL BALANCE BETWEEN INTERVALIC AND ELECTROMAGNETIC ENERGIES

Isogaudino	G_6^{+}	$G_6^{+2/3}$	$G_6^{+1/3}$	G_6^{0}	$G_6^{-1/3}$	$G_6^{-2/3}$	G_6^{-}
Intervalic energy	$I = -(1/36)\ I(D_{45})$	$I = -(1/16)\ I(D_{45})$	$I = -(1/4)\ I(D_{45})$	$I = 0$	$I = -(1/4)\ I(D_{45})$	$I = -(1/16)\ I(D_{45})$	$I = -(1/36)\ I(D_{45})$
Electromagnetic energy	$U = +6\ U(D_{45})$	$U = +2\ U(D_{45})$	$U = -(2/5)\ U(D_{45})$	$U = -(6/5)\ U(D_{45})$	$U = -(2/5)\ U(D_{45})$	$U = +2\ U(D_{45})$	$U = +6\ U(D_{45})$
Particle	Antimuon μ^{+}	Constituent gaudino of quarks	Constituent gaudino of quarks	Zero charge: it can't be a constituent of another particle	Constituent gaudino of quarks	Constituent gaudino of quarks	Muon μ^{-}

2) Since the intervalic energy decreases at each consecutive level of the intervalic structure in all known levels, from the first interior level (intervalinar) to the last exterior one (monteverdic), then it seems that the intervalic energy at the gaudinar structure level should be greater than the intervalic energy at the lisztinian level. This only can be possible if the electric charges of the constituent subparticles are lesser in the gaudinar level than in the lisztinian level. This constraint eliminates the first two intervalic structures of both quarks. Therefore the last two intervalic structures would be the basic states of the nucleonic quarks.

3) We have the partial balance —attraction-repulsion— of the dynamic electromagnetic interaction between the constituent dalinos due to their different charge signs. It is clear that the most stable isogaudinos will be those with the minimal energy. These are by order:

$G_6^{\pm\frac{1}{3}} = U[4(D_{\pm45}) + 2(D_{\pm45})] = [(7/15)-(8/15)]\ 6\ U(D_{45}) = -(6/15)\ U(D_{45})$
$G_6^{0} = U[3(D_{+45}) + 3(D_{-45})] = [(6/15)-(9/15)]\ 6\ U(D_{45}) = -(6/5)\ U(D_{45})$
$G_6^{\pm\frac{2}{3}} = U[1(D_{\pm45}) + 5(D_{\pm45})] = [(10/15)-(5/15)]\ 6\ U(D_{45}) = +2\ U(D_{45})$
$G_6^{\pm} = U[6(D_{\pm45}) + 0(D_{\pm45})] = +6\ U(D_{45})$

This constraint clearly eliminates the presence of isogaudinos with elementary charge in the intervalic structure of quarks. However the zero charged gaudino is the second state with lesser energy.

4) We have likewise the sum of this balance of the dynamic electromagnetic interaction between the constituent dalinos at the lisztinian level. The isoquarks with the minimal energy are by order:

$q(+\frac{2}{3}) = G_6^{0} + G_6^{+\frac{2}{3}} + G_6^{0} = -(2/5)\ U(D_{45})$
$q(-\frac{1}{3}) = G_6^{+\frac{1}{3}} + G_6^{-\frac{2}{3}} + G_6^{0} = +(2/5)\ U(D_{45})$
$q(+\frac{2}{3}) = G_6^{+\frac{2}{3}} + G_6^{-\frac{1}{3}} + G_6^{+\frac{1}{3}} = -(6/5)\ U(D_{45})$
$q(-\frac{1}{3}) = G_6^{-\frac{1}{3}} + G_6^{+\frac{1}{3}} + G_6^{-\frac{1}{3}} = +(6/5)\ U(D_{45})$
$q(+\frac{2}{3}) = G_6^{+\frac{1}{3}} + G_6^{0} + G_6^{+\frac{1}{3}} = -2\ U(D_{45})$
$q(-\frac{1}{3}) = G_6^{0} + G_6^{-\frac{1}{3}} + G_6^{0} = -(14/5)\ U(D_{45})$

5) Adding the intervalic energy of isogaudinos to the above dynamic electromagnetic interaction between dalinos will give us a wider and stronger constraint. The sum of those energies corresponding to the full set of nucleonic isoquarks can be seen in the next two tables. Its is clear that only the states written in the three last rows of each table can have got any chance to be chosen by Nature to compose nucleonic quarks because the re-

maining ones have much greater energies and can be discarded at first sight.

6) Since the structural ratio between the intervalic to the electromagnetic energy in nucleonic quarks is roughly: I/U = ⅔, we can weigh up the value of the electromagnetic energy in that way. Then the value of the sum of (I + ⅔U) for each isoquark will by roughly, with the magnitudes ordered by minimal energy:

$q(-\tfrac{1}{3}) = G_6^{+\tfrac{1}{3}} + G_6^{-\tfrac{2}{3}} + G_6^{0} = -0.04583$
$q(+\tfrac{2}{3}) = G_6^{+\tfrac{2}{3}} + G_6^{-\tfrac{1}{3}} + G_6^{+\tfrac{1}{3}} = +0.2375$
$q(+\tfrac{2}{3}) = G_6^{0} + G_6^{+\tfrac{2}{3}} + G_6^{0} = -0.3292$
$q(-\tfrac{1}{3}) = G_6^{-\tfrac{1}{3}} + G_6^{+\tfrac{1}{3}} + G_6^{-\tfrac{1}{3}} = -1.5500$
$q(+\tfrac{2}{3}) = G_6^{+\tfrac{1}{3}} + G_6^{0} + G_6^{+\tfrac{1}{3}} = -1.8333$
$q(-\tfrac{1}{3}) = G_6^{0} + G_6^{-\tfrac{1}{3}} + G_6^{0} = -2.1167$

7) It can be supposed that states containing a gaudino 6 with zero charge would make unstable structures because they do not have intervalic nor electromagnetic energy at the last structure level, and therefore these states would not be allowed. This powerful constraint eliminates four possible combinations from the above list and the two unique remaining ones would be:

$q(+\tfrac{2}{3}) = G_6^{+\tfrac{2}{3}} + G_6^{-\tfrac{1}{3}} + G_6^{+\tfrac{1}{3}}$
$q(-\tfrac{1}{3}) = G_6^{-\tfrac{1}{3}} + G_6^{+\tfrac{1}{3}} + G_6^{-\tfrac{1}{3}}$

These states can already be postulated to be those that compose the gaudinar structure of nucleonic quarks.

8) The preceding gaudinar structure has the remarkable feature that there is an equality in the values of the dynamical electromagnetic interaction between gaudinos inside the two nucleonic quarks:

$E_q(u)_G = E_q(G_6^{+\tfrac{2}{3}}G_6^{+\tfrac{1}{3}}G_6^{-\tfrac{1}{3}}) = [(\tfrac{2}{3}\cdot\tfrac{1}{3})-(\tfrac{2}{3}\cdot\tfrac{1}{3})-(\tfrac{1}{3})^2]\,(1/4\pi\varepsilon_0)\,e^2 / d_{G6} =$
$= -(1/9)\,(1/4\pi\varepsilon_0)\,e^2 / d_{G6} = -1.544278296 \cdot 10^{-13}$ (J) $= -0.96386228$ (MeV/c^2)

$E_q(d)_G = E_q(G_6^{-\tfrac{1}{3}}G_6^{+\tfrac{1}{3}}G_6^{-\tfrac{1}{3}}) = [-(\tfrac{1}{3})^2+(\tfrac{1}{3})^2-(\tfrac{1}{3})^2]\,(1/4\pi\varepsilon_0)\,e^2 / d_{G6} = \quad = -$
$(1/9)\,(1/4\pi\varepsilon_0)\,e^2 / d_{G6} = -1.544278296 \cdot 10^{-13}$ (J) $= -0.96386228$ (MeV/c^2)

The minus sign indicates, according to conventional use, that there is an attractive frequorce between the three gaudinos due to the electromagnetic interaction inside quarks up and down. From this chain of compelling results, we can postulate that the *intervalic structure of nucleonic quarks* is:

NUCLEONIC ISOQUARK L3D45$^{(+⅔)}$: STRUCTURAL BALANCE BETWEEN INTERVALIC AND ELECTROMAGNETIC ENERGIES

Constituent gaudinos / Attr./ repuls. energy	G_6^{+}	$G_6^{+⅔}$	$G_6^{+⅓}$	G_6^{0}	$G_6^{-⅓}$	$G_6^{-⅔}$	G_6^{-}
$-(17/144)\ I(D_{45})$ $+14\ U(D_{45})$	$-(1/36)\ I(D_{45})$ $+6\ U(D_{45})$	$-(1/16)\ I(D_{45})$ $+2\ U(D_{45})$					$-(1/36)\ I(D_{45})$ $+6\ U(D_{45})$
$-(49/144)\ I(D_{45})$ $+(38/5)\ U(D_{45})$	$-(1/36)\ I(D_{45})$ $+6\ U(D_{45})$		$-(1/4)\ I(D_{45})$ $-(2/5)\ U(D_{45})$			$-(1/16)\ I(D_{45})$ $+2\ U(D_{45})$	
$-(3/16)\ I(D_{45})$ $+6\ U(D_{45})$		$-(1/8)\ I(D_{45})$ $+4\ U(D_{45})$				$-(1/16)\ I(D_{45})$ $+2\ U(D_{45})$	
$-(5/18)\ I(D_{45})$ $+(22/5)\ U(D_{45})$	$-(1/36)\ I(D_{45})$ $+6\ U(D_{45})$			0 $-(6/5)\ U(D_{45})$	$-(1/4)\ I(D_{45})$ $-(2/5)\ U(D_{45})$		
$-(9/16)\ I(D_{45})$ $+(6/5)\ U(D_{45})$		$-(1/16)\ I(D_{45})$ $+2\ U(D_{45})$	$-(1/4)\ I(D_{45})$ $-(2/5)\ U(D_{45})$		$-(1/4)\ I(D_{45})$ $-(2/5)\ U(D_{45})$		
$-(1/16)\ I(D_{45})$ $-(2/5)\ U(D_{45})$		$-(1/16)\ I(D_{45})$ $+2\ U(D_{45})$		0 + 0 $-(12/5)\ U(D_{45})$			
$-(1/2)\ I(D_{45})$ $-2\ U(D_{45})$			$-(1/2)\ I(D_{45})$ $-(4/5)\ U(D_{45})$	0 $-(6/5)\ U(D_{45})$			

Constituent gaudinos / Attr./ repuls. energy	NUCLEONIC ISOQUARK $L3D45^{(-\frac{1}{3})}$: STRUCTURAL BALANCE BETWEEN INTERVALIC AND ELECTROMAGNETIC ENERGIES						
	G_6^{+}	$G_6^{+\frac{2}{3}}$	$G_6^{+\frac{1}{3}}$	G_6^{0}	$G_6^{-\frac{1}{3}}$	$G_6^{-\frac{2}{3}}$	G_6^{-}
-(11/36) $I(D_{45})$ +(58/5) $U(D_{45})$	-(1/36) $I(D_{45})$ +6 $U(D_{45})$				-(1/4) $I(D_{45})$ -(2/5) $U(D_{45})$		-(1/36) $I(D_{45})$ +6 $U(D_{45})$
-(11/72) $I(D_{45})$ +10 $U(D_{45})$	-(1/36) $I(D_{45})$ +6 $U(D_{45})$					-(1/8) $I(D_{45})$ +4 $U(D_{45})$	
-(13/144) $I(D_{45})$ +(34/5) $U(D_{45})$		-(1/16) $I(D_{45})$ +2 $U(D_{45})$		0 -(6/5) $U(D_{45})$			-(1/36) $I(D_{45})$ +6 $U(D_{45})$
-(19/36) $I(D_{45})$ +(26/5) $U(D_{45})$			-(1/2) $I(D_{45})$ -(4/5) $U(D_{45})$				-(1/36) $I(D_{45})$ +6 $U(D_{45})$
-(3/8) $I(D_{45})$ +(18/5) $U(D_{45})$		-(1/16) $I(D_{45})$ +2 $U(D_{45})$			-(1/4) $I(D_{45})$ -(2/5) $U(D_{45})$	-(1/16) $I(D_{45})$ +2 $U(D_{45})$	
-(5/16) $I(D_{45})$ +(2/5) $U(D_{45})$			-(1/4) $I(D_{45})$ -(2/5) $U(D_{45})$	0 -(6/5) $U(D_{45})$		-(1/16) $I(D_{45})$ +2 $U(D_{45})$	
-(3/4) $I(D_{45})$ -(6/5) $U(D_{45})$			-(1/4) $I(D_{45})$ -(2/5) $U(D_{45})$		-(1/2) $I(D_{45})$ -(4/5) $U(D_{45})$		
-(1/4) $I(D_{45})$ -(14/5) $U(D_{45})$				0 + 0 -(12/5) $U(D_{45})$	-(1/4) $I(D_{45})$ -(2/5) $U(D_{45})$		

$q \rightarrow L_3 = 3\ G_6 = 18\ D_{45} = 810\ \mathbf{I}$

$u^{+⅔} \rightarrow L_3 = (G_6^{+⅔}, G_6^{-⅓}, G_6^{+⅓}) = 18\ D_{45} = 810\ \mathbf{I}$
$d^{-⅓} \rightarrow L_3 = (G_6^{-⅓}, G_6^{+⅓}, G_6^{-⅓}) = 18\ D_{45} = 810\ \mathbf{I}$

This result will be reconfirmed later when describing the intervalic structure of nucleons and their constituent quarks.

Chapter 13

INTERVALIC LISZTINO

LISZTINO INTERVALIC STRUCTURE

Lisztino is defined as the intervalic structure corresponding to the 4th. intervalic level of compositeness or structurefulness, which is made from an assembly of gaudinos.

Lisztinos can be divided among two main sets with different symmetry under interchange of its constituents gaudinos: the symmetric state yield elementary lisztinos, and the antisymmetric state yield fractional charged lisztinos. The phenomenology of both states is represented principally by zero charged massive bosons and quarks respectively.

Recapitulating: we have defined the *gaudino,* G_n, as an intervalic particle composed by the aggregation of a determine number of dalinos. The subindex *n* means the number of constituent dalinos. As has been described in other site, there are two basic kinds of gaudinos: the *elementary* ones composed by 270 intervalinos, and the *fractional* ones, which are composed by a number of intervalinos which is a fraction of 270. We define likewise the *lisztino* as an assembly of gaudinos. The term lisztino has been taken in honour of the great Hungarian romantic musician Franz Liszt (1811-1886). Lisztinos can be divided among several kinds according to the number of constituent intervalinos:

- *Lisztinos ⅓*: $L_{⅓}$, composed by ⅓ gaudinos (90 intervalinos)
- *Lisztinos ⅔*: $L_{⅔}$, composed by ⅔ gaudinos (180 intervalinos)
- *Lisztinos 1*: L_1, composed by 1 gaudino (270 intervalinos)
- *Lisztinos 2*: L_2, composed by 2 gaudinos (540 intervalinos)
- *Lisztinos 3*: L_3, composed by 3 gaudinos (810 intervalinos)
- *Lisztinos 4*: L_4, composed by 4 gaudinos (1080 intervalinos)
- *Lisztinos 5*: L_5, composed by 5 gaudinos (1350 intervalinos)
- *Lisztinos n*: L_n, composed by n gaudinos

Lisztinos with resultant charge ⅔ or ⅓ of the elementary one are named *fractional lisztinos*, while lisztinos with charge 1 are named *elementary lisztinos*. The constituent gaudinos of fractional lisztinos are in an antisymmetric state under interchange and make the *quarks*, whilst the constituent gaudinos of elementary lisztinos are in a symmetric state under interchange and make the *zero charged massive bosons*.

The detailed intervalic structures of quarks will be described in the chapter devoted to the intervalic quark. Now we are going to give a general view on the lisztinian structures allowed by the intervalic symmetries of compositeness, as the lisztinian structure is perhaps the most complex level of the intervalic structure of subatomic particles. Thus, we are going to list in a systematic way the intervalic structures and masses yielded for all these sets of lisztinos without further commentary, taking the electron's ratio between the intervalic and electromagnetic constituent energies (I/U ≈ 5/4). Among lisztinos ⅓ and ⅔ there are some intervalic structures which are not allowed because they do not match with the number of constituent intervalinos of the corresponding dalinar structure, or because the gaudinar and dalinar structures are not commeasurable.

LISZTINOS ⅓

$L_{⅓}$ = ⅓ G_1 = (1/3) D_{270}, not allowed
$L_{⅓}$ = ⅓ G_2 = (2/3) D_{135}, not allowed
$L_{⅓}$ = ⅓ G_3 = 1 D_{90} = 4.5989918 (MeV/c^2)
$L_{⅓}$ = ⅓ G_5 = (5/3) D_{54}, not allowed
$L_{⅓}$ = ⅓ G_6 = 2 D_{45} = 36.791934 (MeV/c^2)
$L_{⅓}$ = ⅓ G_9 = 3 D_{30} = 124.17278 (MeV/c^2)
$L_{⅓}$ = ⅓ G_{10} = (10/3) D_{27}, not allowed
$L_{⅓}$ = ⅓ G_{15} = 5 D_{18} = 574.87400 (MeV/c^2)
$L_{⅓}$ = ⅓ G_{18} = 6 D_{15} = 993.38220 (MeV/c^2)
$L_{⅓}$ = ⅓ G_{27} = 9 D_{10} = 3,352.6650 (MeV/c^2)

$L_{⅓}$ = ⅓ G_{30} = 10 D_{9} = 4,598.9918 (MeV/c^2)
$L_{⅓}$ = ⅓ G_{45} = 15 D_{6} = 15,521.598 (MeV/c^2)
$L_{⅓}$ = ⅓ G_{54} = 18 D_{5} = 26,821.321 (MeV/c^2)
$L_{⅓}$ = ⅓ G_{90} = 30 D_{3} = 124,172.78 (MeV/c^2)
$L_{⅓}$ = ⅓ G_{135} = 45 D_{2} = 419,083.13 (MeV/c^2)
$L_{⅓}$ = ⅓ G_{270} = 90 D_{1} = 1,873,748.2 (MeV/c^2)

LISZTINOS ⅔

$L_{⅔}$ = ⅔ G_{1} = (2/3) D_{270}, not allowed
$L_{⅔}$ = ⅔ G_{2} = (4/3) D_{135}, not allowed
$L_{⅔}$ = ⅔ G_{3} = 2 D_{90} = 9.1979836 (MeV/c^2)
$L_{⅔}$ = ⅔ G_{5} = (10/3) D_{54}, not allowed
$L_{⅔}$ = ⅔ G_{6} = 4 D_{45} = 73.583868 (MeV/c^2)
$L_{⅔}$ = ⅔ G_{9} = 6 D_{30} = 248.34556 (MeV/c^2)
$L_{⅔}$ = ⅔ G_{10} = (20/3) D_{27}, not allowed
$L_{⅔}$ = ⅔ G_{15} = 10 D_{18} = 1,149.7480 (MeV/c^2)
$L_{⅔}$ = ⅔ G_{18} = 12 D_{15} = 1,986.7644 (MeV/c^2)
$L_{⅔}$ = ⅔ G_{27} = 18 D_{10} = 6,705.3299 (MeV/c^2)
$L_{⅔}$ = ⅔ G_{30} = 20 D_{9} = 9,197.9836 (MeV/c^2)
$L_{⅔}$ = ⅔ G_{45} = 30 D_{6} = 31,043.196 (MeV/c^2)
$L_{⅔}$ = ⅔ G_{54} = 36 D_{5} = 53,642.642 (MeV/c^2)
$L_{⅔}$ = ⅔ G_{90} = 60 D_{3} = 248,345.56 (MeV/c^2)
$L_{⅔}$ = ⅔ G_{135} = 90 D_{2} = 838,166.26 (MeV/c^2)
$L_{⅔}$ = ⅔ G_{270} = 180 D_{1} = 3,747,496.3 (MeV/c^2)

LISZTINOS 1

L_{1} = 1 G_{1} = 1 D_{270} = 0.51099909 (MeV/c^2)
L_{1} = 1 G_{2} = 2 D_{135} = 4.0879928 (MeV/c^2)
L_{1} = 1 G_{3} = 3 D_{90} = 13.796975 (MeV/c^2)
L_{1} = 1 G_{5} = 5 D_{54} = 63.874885 (MeV/c^2)
L_{1} = 1 G_{6} = 6 D_{45} = 110.37580 (MeV/c^2)
L_{1} = 1 G_{9} = 9 D_{30} = 372.51833 (MeV/c^2)
L_{1} = 1 G_{10} = 10 D_{27} = 510.99909 (MeV/c^2)
L_{1} = 1 G_{15} = 15 D_{18} = 1,724.6220 (MeV/c^2)
L_{1} = 1 G_{18} = 18 D_{15} = 2,980.1466 (MeV/c^2)
L_{1} = 1 G_{27} = 27 D_{10} = 10,057.995 (MeV/c^2)

$L_1 = 1\ G_{30} = 30\ D_9 = 13{,}796.975\ (MeV/c^2)$
$L_1 = 1\ G_{45} = 45\ D_6 = 46{,}564.794\ (MeV/c^2)$
$L_1 = 1\ G_{54} = 54\ D_5 = 80{,}463.964\ (MeV/c^2)$
$L_1 = 1\ G_{90} = 90\ D_3 = 372{,}518.33\ (MeV/c^2)$
$L_1 = 1\ G_{135} = 135\ D_2 = 1{,}257{,}249.4\ (MeV/c^2)$
$L_1 = 1\ G_{270} = 270\ D_1 = 5{,}621{,}244.5\ (MeV/c^2)$

LISZTINOS 2

$L_2 = 2\ G_1 = 2\ D_{270} = 1.0219982\ (MeV/c^2)$
$L_2 = 2\ G_2 = 4\ D_{135} = 8.1759856\ (MeV/c^2)$
$L_2 = 2\ G_3 = 6\ D_{90} = 27.593950\ (MeV/c^2)$
$L_2 = 2\ G_5 = 10\ D_{54} = 127.74977\ (MeV/c^2)$
$L_2 = 2\ G_6 = 12\ D_{45} = 220.75160\ (MeV/c^2)$
$L_2 = 2\ G_9 = 18\ D_{30} = 745.03666\ (MeV/c^2)$
$L_2 = 2\ G_{10} = 20\ D_{27} = 1{,}021.9982\ (MeV/c^2)$
$L_2 = 2\ G_{15} = 30\ D_{18} = 3{,}449.2440\ (MeV/c^2)$
$L_2 = 2\ G_{18} = 36\ D_{15} = 5{,}960.2932\ (MeV/c^2)$
$L_2 = 2\ G_{27} = 54\ D_{10} = 20{,}115.990\ (MeV/c^2)$
$L_2 = 2\ G_{30} = 60\ D_9 = 27{,}593.950\ (MeV/c^2)$
$L_2 = 2\ G_{45} = 90\ D_6 = 93{,}129.588\ (MeV/c^2)$
$L_2 = 2\ G_{54} = 108\ D_5 = 160{,}927.93\ (MeV/c^2)$
$L_2 = 2\ G_{90} = 180\ D_3 = 745{,}036.66\ (MeV/c^2)$
$L_2 = 2\ G_{135} = 270\ D_2 = 2{,}514{,}498.8\ (MeV/c^2)$
$L_2 = 2\ G_{270} = 540\ D_1 = 11{,}242{,}489.0\ (MeV/c^2)$

LISZTINOS 3

$L_3 = 3\ G_1 = 3\ D_{270} = 1.5329973\ (MeV/c^2)$
$L_3 = 3\ G_2 = 6\ D_{135} = 12.263978\ (MeV/c^2)$
$L_3 = 3\ G_3 = 9\ D_{90} = 41.390925\ (MeV/c^2)$
$L_3 = 3\ G_5 = 15\ D_{54} = 191.62466\ (MeV/c^2)$
$L_3 = 3\ G_6 = 18\ D_{45} = 331.12740\ (MeV/c^2)$
$L_3 = 3\ G_9 = 27\ D_{30} = 1{,}117.5550\ (MeV/c^2)$
$L_3 = 3\ G_{10} = 30\ D_{27} = 1{,}532.9973\ (MeV/c^2)$
$L_3 = 3\ G_{15} = 45\ D_{18} = 5{,}173.8660\ (MeV/c^2)$
$L_3 = 3\ G_{18} = 54\ D_{15} = 8{,}940.4398\ (MeV/c^2)$
$L_3 = 3\ G_{27} = 81\ D_{10} = 30{,}173.985\ (MeV/c^2)$

$L_3 = 3\ G_{30} = 90\ D_9 = 41{,}390.925\ (MeV/c^2)$
$L_3 = 3\ G_{45} = 135\ D_6 = 139{,}694.38\ (MeV/c^2)$
$L_3 = 3\ G_{54} = 162\ D_5 = 241{,}391.89\ (MeV/c^2)$
$L_3 = 3\ G_{90} = 270\ D_3 = 1{,}117{,}555.0\ (MeV/c^2)$
$L_3 = 3\ G_{135} = 405\ D_2 = 3{,}771{,}748.2\ (MeV/c^2)$
$L_3 = 3\ G_{270} = 810\ D_1 = 16{,}863.734\ (GeV/c^2)$

LISZTINOS 4

$L_4 = 4\ G_1 = 4\ D_{270} = 2.0439964\ (MeV/c^2)$
$L_4 = 4\ G_2 = 8\ D_{135} = 16.3519712\ (MeV/c^2)$
$L_4 = 4\ G_3 = 12\ D_{90} = 55.187900\ (MeV/c^2)$
$L_4 = 4\ G_5 = 20\ D_{54} = 255.49954\ (MeV/c^2)$
$L_4 = 4\ G_6 = 24\ D_{45} = 441.50320\ (MeV/c^2)$
$L_4 = 4\ G_9 = 36\ D_{30} = 1{,}490.0733\ (MeV/c^2)$
$L_4 = 4\ G_{10} = 40\ D_{27} = 2{,}043.9964\ (MeV/c^2)$
$L_4 = 4\ G_{15} = 60\ D_{18} = 6{,}898.4880\ (MeV/c^2)$
$L_4 = 4\ G_{18} = 72\ D_{15} = 11{,}920.5864\ (MeV/c^2)$
$L_4 = 4\ G_{27} = 108\ D_{10} = 40{,}231.980\ (MeV/c^2)$
$L_4 = 4\ G_{30} = 120\ D_9 = 55{,}187.90\ (MeV/c^2)$
$L_4 = 4\ G_{45} = 180\ D_6 = 186{,}259.17\ (MeV/c^2)$
$L_4 = 4\ G_{54} = 216\ D_5 = 321{,}855.85\ (MeV/c^2)$
$L_4 = 4\ G_{90} = 360\ D_3 = 1{,}490{,}073.32\ (MeV/c^2)$
$L_4 = 4\ G_{135} = 540\ D_2 = 5{,}028{,}997.6\ (MeV/c^2)$
$L_4 = 4\ G_{270} = 1080\ D_1 = 22{,}484.978\ (GeV/c^2)$

LISZTINOS 5

$L_5 = 5\ G_1 = 5\ D_{270} = 2.5549955\ (MeV/c^2)$
$L_5 = 5\ G_2 = 10\ D_{135} = 20.439964\ (MeV/c^2)$
$L_5 = 5\ G_3 = 15\ D_{90} = 68.984875\ (MeV/c^2)$
$L_5 = 5\ G_5 = 25\ D_{54} = 319.37442\ (MeV/c^2)$
$L_5 = 5\ G_6 = 30\ D_{45} = 551.87900\ (MeV/c^2)$
$L_5 = 5\ G_9 = 45\ D_{30} = 1{,}862.5916\ (MeV/c^2)$
$L_5 = 5\ G_{10} = 50\ D_{27} = 2{,}554.9954\ (MeV/c^2)$
$L_5 = 5\ G_{15} = 75\ D_{18} = 8623.1100\ (MeV/c^2)$
$L_5 = 5\ G_{18} = 90\ D_{15} = 14{,}900.733\ (MeV/c^2)$
$L_5 = 5\ G_{27} = 135\ D_{10} = 50{,}289.974\ (MeV/c^2)$

$L_5 = 5\ G_{30} = 150\ D_9 = 68{,}984.877\ (MeV/c^2)$
$L_5 = 5\ G_{45} = 225\ D_6 = 232{,}823.97\ (MeV/c^2)$
$L_5 = 5\ G_{54} = 270\ D_5 = 402{,}319.82\ (MeV/c^2)$
$L_5 = 5\ G_{90} = 450\ D_3 = 1{,}862{,}591.7\ (MeV/c^2)$
$L_5 = 5\ G_{135} = 675\ D_2 = 6{,}286{,}247\ (MeV/c^2)$
$L_5 = 5\ G_{270} = 1350\ D_1 = 28{,}106.222\ (GeV/c^2)$

LISZTINOS 6

$L_6 = 6\ G_1 = 6\ D_{270} = 3.0659946\ (MeV/c^2)$
$L_6 = 6\ G_2 = 12\ D_{135} = 24.527956\ (MeV/c^2)$
$L_6 = 6\ G_3 = 18\ D_{90} = 82.781850\ (MeV/c^2)$
$L_6 = 6\ G_5 = 30\ D_{54} = 383.24932\ (MeV/c^2)$
$L_6 = 6\ G_6 = 36\ D_{45} = 662.2548\ (MeV/c^2)$
$L_6 = 6\ G_9 = 54\ D_{30} = 2{,}235.1099\ (MeV/c^2)$
$L_6 = 6\ G_{10} = 60\ D_{27} = 3{,}065.9946\ (MeV/c^2)$
$L_6 = 6\ G_{15} = 90\ D_{18} = 10{,}347.732\ (MeV/c^2)$
$L_6 = 6\ G_{18} = 108\ D_{15} = 17{,}880.8796\ (MeV/c^2)$
$L_6 = 6\ G_{27} = 162\ D_{10} = 60{,}347.97\ (MeV/c^2)$
$L_6 = 6\ G_{30} = 180\ D_9 = 82{,}781.85\ (MeV/c^2)$
$L_6 = 6\ G_{45} = 270\ D_6 = 279{,}388.76\ (MeV/c^2)$
$L_6 = 6\ G_{54} = 324\ D_5 = 482{,}783.78\ (MeV/c^2)$
$L_6 = 6\ G_{90} = 540\ D_3 = 2{,}235{,}110.0\ (MeV/c^2)$
$L_6 = 6\ G_{135} = 810\ D_2 = 7{,}543{,}496.4\ (MeV/c^2)$
$L_6 = 6\ G_{270} = 1620\ D_1 = 33{,}727.468\ (GeV/c^2)$

SYMMETRIES OF NATURE

The vast majority of particles of Nature can be find among these set of intervalic symmetries. And only those ones showing the highest symmetries appear to have been chosen by Nature to make subatomic particles. Indeed, all stable particles pertains only to two families of symmetries: {D270} or {D45}. Quarks are mainly focused on the same families of symmetries as leptons-intermediate massive bosons. Therefore there is a noticeable parallelism among those families, as it has been *supposed or postulated by hand* in SM, but in a very different way since they are involved the intervalic structures of particles.

Till now Nature appears to chose only the symmetries derived from a select number chosen among the 16 divisors of the elementary charge, 270$\mathbf{q_I}$. It is remarkable that this is a fact realized among an *a priori* infinite number of possibilities. Moreover, among those 16 allowed symmetries there have lasted only a few of them at low energies: in first place $\{D_{270}\}$ and $\{D_{45}\}$; and in second place $\{D_{30}\}$, $\{D_{18}\}$, $\{D_6\}$ and $\{D_5\}$.

As can be seen in the table near this lines, all quarks are lisztinos with fractional charge. Leptons are lisztinos 1. Intermediate massive bosons of weak intervalic interaction are lisztinos 1 (those with elementary charge) or lisztinos 2 (those with zero charge). And finally, the vast majority of mesons have a paired lisztinian structure.

The last level of the intervalic structure is the aggregation of lisztinos which is named *monteverdino*, term chosen in honour of the great Italian musician Claudio Monteverdi (1567-1643).

INTERVALIC STRUCTURE OF ZERO CHARGED MASSIVE BOSONS

While the intervalic structure of all leptons-elementary charged massive bosons is the one of *lisztino 1* —that is to say, they are *gaudinos*—, all zero charged massive bosons have an intervalic structure of *lisztino 2* —they are composed by a gaudino and its corresponding antigaudino—. The full set of intervalic structures of lisztinos 2 allowed by the intervalic symmetries are just the 16 ones —{L2}— described above in this chapter. Please remember that those masses are yielded taking the electron intervalic to electromagnetic energy ratio for all of them, then the slight deviation from experimental results. On the contrary, it is surprising that this ratio does not vary considerably, since there are lot of very different intervalic structures involved in all leptons and massive bosons. In this set {L2} we find the zero charged massive bosons, which masses in MeV/c^2 are (taking the Z^0 boson's structural energy ratio):

$L_2 = 2\ G_{45} = 2 \cdot (45\ D_6) = 91{,}187.6 \rightarrow Z^0$ boson
$L_2 = 2\ G_{54} = 2 \cdot (54\ D_5) = 157{,}572.17 \rightarrow W^0$ boson
$L_2 = 2\ G_{90} = 2 \cdot (90\ D_3) = 729{,}500.76 \rightarrow Y^0$ boson
$L_2 = 2\ G_{135} = 2 \cdot (135\ D_2) = 2{,}462{,}065.12 \rightarrow X^0$ boson

Every zero charged massive bosons is composed by an elementary charged massive boson and its corresponding antiboson. Thus, theoretically we could also find here the possible particles composed by a lepton and its corresponding antilepton, which following the usual convention should be

CLASSIFICATION OF SUBATOMIC PARTICLES ACCORDING TO ITS LISZTINIAN STRUCTURE

	Elementary charge: e	*Fractional charge: ⅔ e, ⅓ e*	*Zero charge*
Lisztinos ⅓ (90 intervalinos)		Quarks	-
Lisztinos ⅔ (180 intervalinos)		Quarks	-
Lisztinos 1 (270 intervalinos)	Leptons-charged massive bosons	Quarks	-
Lisztinos 2 (540 intervalinos)	Mesons	Quarks	Mesons, Zero charged massive bosons
Lisztinos 3 (810 intervalinos)	-	Quarks *(principal sequence)*	-
Lisztinos 4 (1080 intervalinos)	-	Quarks *(principal sequence)*	-
Lisztinos 5 (1350 intervalinos)	-	Quarks	-

named *electronium*, *muonium* and *tauonium*:

$L_2 = 2\ G_1 = 2 \cdot (1\ D_{270}) = 1.0219982 \rightarrow e_2^0$ electronium
$L_2 = 2\ G_6 = 2 \cdot (6\ D_{45}) = 220.75160 \rightarrow \mu_2^0$ muonium
$L_2 = 2\ G_{15} = 2 \cdot (15\ D_{18}) = 3{,}449.2440 \rightarrow \tau_2^0$ tauonium

However, it seems that Nature does not allow the existence of a dalinar symmetry in both lisztino 1 and lisztino 2 phenomenology. So the leptons-charged massive bosons will not have got their corresponding lisztinos 2 as zero charged massive bosons, and in a similar way, the zero charged massive bosons will not have got their corresponding lisztinos 1 as leptons-charged massive bosons. Up to present we have not found experimentally any exception to this rule. Therefore, in this case the following allowed leptons-massive bosons will not be made at low energies:

$L_1 = 1\ G_{45} = 45\ D_6 = 46{,}564.794\ (MeV/c^2) \rightarrow Z^\pm$ boson
$L_2 = 2\ G_{54} = 2 \cdot (54\ D_5) = 157{,}572.17\ (MeV/c^2) \rightarrow W^0$ boson

And the heaviest ones will be made only as lisztino 1 or as lisztino 2, but not both states:

$L_1 = G_{90} = 90\ D_3 = 372{,}518.33 \rightarrow Y^\pm$ boson or
$L_2 = 2\ G_{90} = 2 \cdot (90\ D_3) = 729{,}500.76 \rightarrow Y^0$ boson, and

$L_1 = G_{135} = 135\ D_2 = 1{,}257{,}249.4 \rightarrow X^\pm$ boson or
$L_2 = 2\ G_{135} = 2 \cdot (135\ D_2) = 2{,}462{,}065.12 \rightarrow X^0$ boson

We will go on these heaviest massive bosons later when explaining the intervalic changeful —weak— interaction.

As can be seen, IT explains easily why Z^0 boson shows a composite lisztinian structure while $W^\pm$ boson have a single lisztinian structure. This result has been empirically deduced in SM from the experimental decay of Z^0 but in that mischievous model there is no a satisfactory theoretical explanation of that feature.

Moreover, SM does not have any basic link between leptons and massive bosons —unless a clumsy sum of Lagrangian densities is viewed as a basic link— although all of them are involved in the weak interaction. According to IT, massive bosons pertain to the same intervalic set and have the same intervalic structure than the family of leptons. This fact can be now easily explained not as a new and perhaps strange family of particles, as it is showed in SM, but as an intermediate state involved in a *change in the structure* of lepton (and other subatomic particles).

Needless to say that the above particles are *logical and directly yielded* starting from a mere change in the system of units and dimensions used — really the only reliable *natural* ones—, but not through a Lagrangian formalism. It is hard to believe that all (and more) results reached by SM through complex and sometimes doubtful mechanisms can be deduced in a much more reliable way by IT using a simple formalism and only starting from new fundamental physical principles. All systems of units and dimensions was supposed to be equivalent in Physics, but clearly they are not since they involves different symmetries of Nature.

AN INTRIGUING COINCIDENCE

As we will understand some chapters later, the most logical result which could be expected from the collision e^+e^- should be all pairs dalino-antidalino allowed by the intervalic structure, and it is sure that above some threshold temperature —which will be defined later— existing in the primordial Universe, this is roughly what happened:

$\leftrightarrow D_{+270}D_{-270} \leftrightarrow 2\ D_{+135}D_{-135} \leftrightarrow 3\ D_{+90}D_{-90} \leftrightarrow 5\ D_{+54}D_{-54} \leftrightarrow$
$\leftrightarrow 6\ D_{+45}D_{-45} \leftrightarrow 9\ D_{+30}D_{-30} \leftrightarrow 10\ D_{+27}D_{-27} \leftrightarrow 15\ D_{+18}D_{-18} \leftrightarrow$
$\leftrightarrow 18\ D_{+15}D_{-15} \leftrightarrow 27\ D_{+10}D_{-10} \leftrightarrow 30\ D_{+9}D_{-9} \leftrightarrow 45\ D_{+6}D_{-6} \leftrightarrow$
$\leftrightarrow 54\ D_{+5}D_{-5} \leftrightarrow 90\ D_{+3}D_{-3} \leftrightarrow 135\ D_{+2}D_{-2} \leftrightarrow 270\ D_{+1}D_{-1} \leftrightarrow$

Obviously here we have the pairs of leptons-massive bosons:

$D_{+270}D_{-270} = e^+e^-$
$6\ D_{+45}D_{-45} = \mu^+\mu^-$
$15\ D_{+18}D_{-18} = \tau^+\tau^-$
$45\ D_{+6}D_{-6} = Z^+Z^-\ (Z^0)$
$54\ D_{+5}D_{-5} = W^+W^-\ (W^0)$
$90\ D_{+3}D_{-3} = Y^+Y^-\ (Y^0)$
$135\ D_{+2}D_{-2} = X^+X^-\ (X^0)$

But in addition to the Z^0 bosons and the remaining heavy massive bosons, taking a look at the main peaks which appears in the well known graphic of the annihilation cross section ratio ($e^+e^- \rightarrow$ hadrons / $e^+e^- \rightarrow \mu^+\mu^-$) we find the extraordinary coincidences (with masses expressed according to electron's structural energy ratio):

$L_2 = 2\ G_5 = 2 \cdot (5\ D_{54}) = 127.74977 \rightarrow \pi^0$ meson (135)

$L_2 = 2\ G_9 = 2 \cdot (9\ D_{30}) = 745.03666 \rightarrow \rho, \omega$ mesons (770, 783)
$L_2 = 2\ G_{10} = 2 \cdot (10\ D_{27}) = 1{,}021.9982 \rightarrow \Phi$ meson (1,020)
$L_2 = 2\ G_{15} = 2 \cdot (15\ D_{18}) = 3{,}449.2440 \rightarrow X_0$ meson (3,415)

This means that the principal peaks of the graphic of the annihilation cross section ratio ($e^+e^- \rightarrow$ hadrons / $e^+e^- \rightarrow \mu^+\mu^-$) can be simply explained as assembled pairs of elementary gaudinos, having got the intervalic structure of lisztino 2. Such simplicity is quite disconcerting since the last four mesons are fully explained inside IT as having got a quarkic structure. Therefore, the existence of another alternative intervalic structure for these mesons which also fit reasonably well with the experimental data is an intriguing coincidence which is probably meaningless, but that could don't be so.

The challenge is: why should be made in an e^+e^- annihilation both pairs of leptons-massive bosons —which are *lisztinos 2*— and some determined pairs of quarks —just those which are *lisztinos 3 and 4* (as we will see when describing the intervalic principal sequence of quarks)—?

By now we will maintain the quarkic structure for these mesons, but keeping in mind the existence of that alternative structure which could become meaningful.

THE INTERMEDIATE MASSIVE BOSON FAMILY

It is clear that the intervalic structure allows to do a lot of predictions about unknown subatomic particles. We can reasonably think that the minimal threshold energy for the changeful —weak— intervalic interaction is that corresponding to usual massive bosons, since in other case, lesser massive bosons would have been detected in laboratory. On the other hand, there is no reason to believe that it does not exists more massive bosons beyond the actually known. In this way, if they exist, they will necessary be the next allowed lisztinos 1 and 2 starting from the last known. The first of them is the already viewed W^0 boson: $L_2 = 2\ G_{54} = 2 \cdot (54\ D_5) = 160{,}927.93$ (MeV/ c^2). The next is the gaudino: $L_1 = G_{90} = 90\ D_3$ and its corresponding lisztino 2: $L_2 = 2\ G_{90} = 2 \cdot (90\ D_3)$, say respectively $Y^{\pm}$ and Y^0 bosons. And the following allowed massive bosons are only the two remaining intervalic structures to the end, say $X^{\pm}$ and X^0, and $I^{\pm}$ and I^0 bosons. This last pair of possible bosons is named *intervalon*, which are the most massive bosons allowed, although their existence is really not postulated. These bosons should not be confounded with the infamous supersymmetric bosons postulated by SUSY: two charged Higgs scalars ($H^{\pm}$), two neutral scalars (H_1^0, H_2^0) and one neutral pseudoscalar (H_3^0), which are entirely wrong since there is no such a fantastic thing as a Higgs field —really another medieval *ether*— which gives just its mass to all subatomic particles. Recapitulating:

$L_1 = G_{45} = 45\ D_6 = 46{,}564.794 \rightarrow Z^{\pm}$ boson
$L_2 = 2\ G_{45} = 2 \cdot (45\ D_6) = 93{,}129.588 \rightarrow Z^0$ boson
$L_1 = G_{54} = 54\ D_5 = 80{,}463.964 \rightarrow W^{\pm}$ boson
$L_2 = 2\ G_{54} = 2 \cdot (54\ D_5) = 160{,}927.93 \rightarrow W^0$ boson
$L_1 = G_{90} = 90\ D_3 = 372{,}518.33 \rightarrow Y^{\pm}$ boson
$L_2 = 2\ G_{90} = 2 \cdot (90\ D_3) = 745{,}036.66 \rightarrow Y^0$ boson
$L_1 = G_{135} = 135\ D_2 = 1{,}257{,}249.4 \rightarrow X^{\pm}$ boson
$L_2 = 2\ G_{135} = 2 \cdot (135\ D_2) = 2{,}514{,}498.8 \rightarrow X^0$ boson
$L_1 = G_{270} = 270\ D_1 = 5{,}621{,}244.5 \rightarrow I^{\pm}$ boson
$L_2 = 2\ G_{270} = 2 \cdot (270\ D_1) = 11{,}242{,}489 \rightarrow I^0$ boson

When we will describe later the changeful —weak— intervalic interaction we will give a detailed prediction of the massive bosons whose existence is not only allowed at the Big Bang, but it is postulated to be detected in our cold Universe.

It may be pointed out that W^0 pertains to the {D5} symmetry, the same one as $W^{\pm}$. However, $Y^{\pm}$ boson and the two following heavier ones will be the first particles yielded by the intervalic symmetries {D3}, {D2} and {D1}, since no one particle is known in those symmetries, as all of them can yield only intervalic structures with very big masses.

These precise predictions, given by the theory at first sight and without any physical development yet, makes that IT in Particle Physics becomes easily falsable or verifiable, since no one boson is allowed out of this set. Moreover, the magnitudes postulated for leptons-massive bosons follows a fully determined and finite intervalic sequence of really disparate magnitudes which hardly can be reached or yielded by other means. This makes a remarkable contrast with SM, which is not falsable as it can incorporate practically infinite number of bosons and particles of any mass and condition by means of adjusting by hand —or by chance— their several corresponding parameters. It is wonder that such a non falsable model could be formally considered upon a time a scientific theory.

As can be seem, to obtain a little bit of phenomenology in quantum field theory is a highly exceptional case (and in String Theory —or String Lucubration— appears to be forbidden); on the contrary, to obtain a lot of phenomenology in IT is the norm and a starting point, as it was supposed to be in any *scientific theory*.

Need not to say that the above particles are logical and directly yielded starting from a mere change in the system of units and dimensions used —really the only reliable natural ones—, but not through a Lagrangian formalism. It is hard to believe that all (and much more) results reached by SM through complex and sometimes doubtful mechanisms can be deduced in a much more reliable way by IT using a simple formalism and only starting from the intervalic symmetries and applying a very few fundamental physical principles —mainly the spin-statistics theorem and the laws derived from the intervalic energy equation—, but this is an undeniable fact. All systems of units and dimensions was supposed to be equivalent in Physics, but clearly they are not since they involves different symmetries of Nature.

Chapter 14

INTERVALIC ZERO CHARGED MASSIVE BOSON

INTERVALIC Z^0 BOSON

The intervalic structure of Z^0 boson is:

$Z^0 \rightarrow L_2 = 2\ G_{45} = 90\ D_6 = 540\ \mathbf{I}$

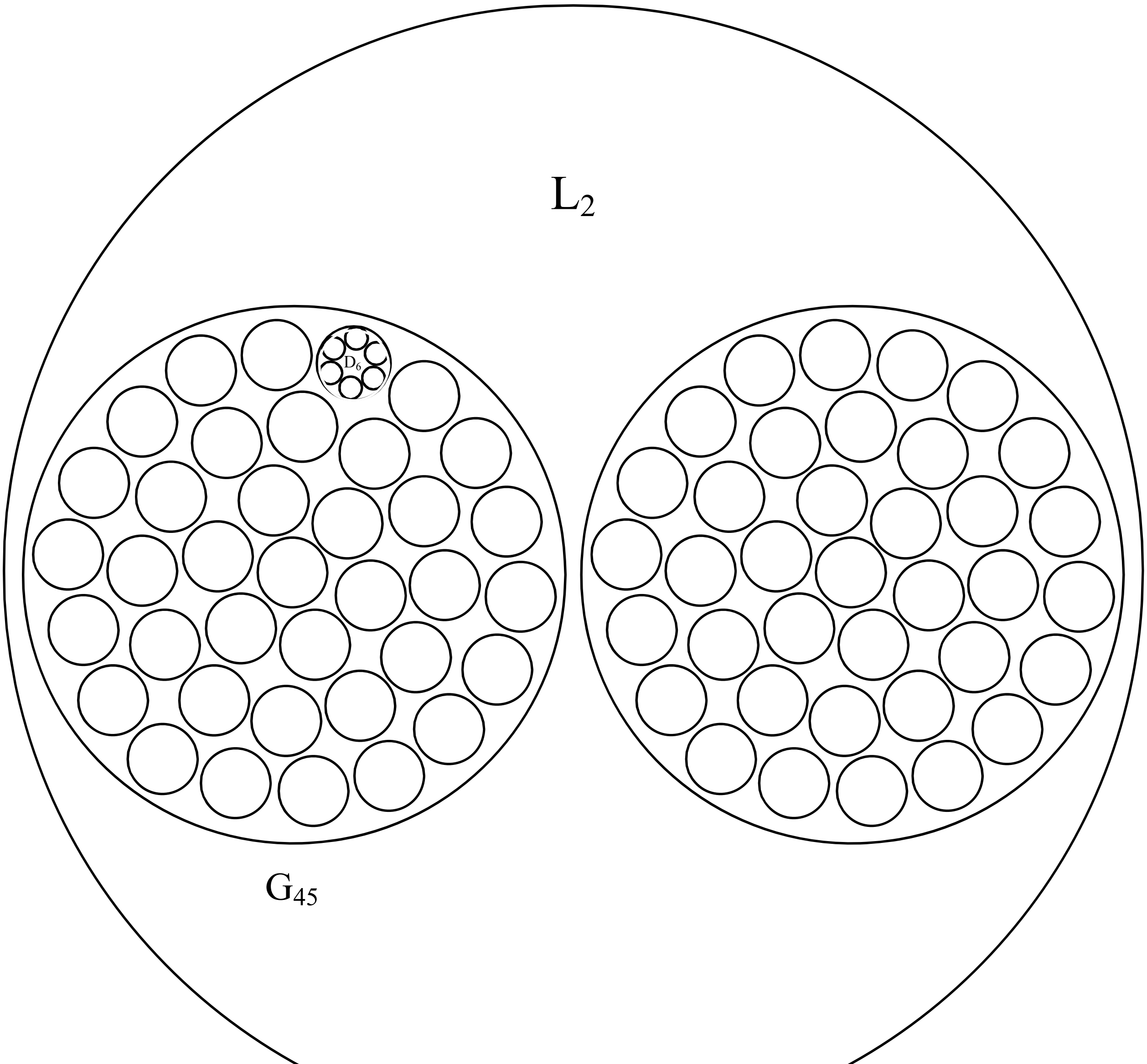
INTERVALIC ENERGY OF Z^0 BOSON

The intervalic Z^0 boson mass is due to the contribution of the intervalic and electromagnetic energies. The first is:

At lisztinian level: $I(Z^0)_{L2} = 0$
At gaudinar level: $I(Z^0)_{G45} = 2\ (c^{\pm 2}\hbar\ (270\mathbf{q_I})^{-2})$
At dalinar level: $I(Z^0)_{D6} = 90\ (c^{\pm 2}\hbar\ (6\mathbf{q_I})^{-2})$

Therefore the total intervalic energy of Z^0 boson will be:

$$I(Z^0) = \sum(c^{\pm 2}\hbar Q^{-2}) = 2\ c^{\pm 2}\hbar\ e^{-2} + 90\ (c^{\pm 2}\hbar\ (6\mathbf{q_I})^{-2}) =$$
$$= 2 \cdot 270^{-2}c^{-1} + 90 \cdot 6^{-2}c^{-1} = 8.339193892 \cdot 10^{-9}\ (J) =$$
$$= 52{,}049.13174\ (MeV/c^2)$$



Figured intervalic structure of Z^0 boson:
$L_2 = 2\ G_{45} = 90\ D_6 = 540\ \mathbf{I}$

ELECTROMAGNETIC ENERGY OF Z^0 BOSON

The electromagnetic mass of Z^0 boson is the difference between the total mass, $1.460987054 \cdot 10^{-8}$ (J) = 91,187.60016 (MeV/c^2), and the intervalic mass:

$U(Z^0) = E(Z^0)_{tot} - I(Z^0) = 6.270676648 \cdot 10^{-9}$ (J) = 39,138.4682 (MeV/c^2)

The electromagnetic mass of the Z^0 boson at the last level of its intervalic structure —the lisztinian level— is zero because the electromagnetic energy at this level is not manifested as *mass* but as *field*. This field is not outwards Z^0 boson because it is zero charged, but inwards, between its two constituent gaudinos 45.

At lisztinian level: $U(Z^0)_{L2} = 0$
At gaudinar level: $U(Z^0)_{G45} = 2\ (1/4\pi\varepsilon_0)\ (270\ \mathbf{q_I})^2\ /\ r_{G45}$
At dalinar level: $U(Z^0)_{D6} = 90\ (1/4\pi\varepsilon_0)\ (6\ \mathbf{q_I})^2\ /\ r_{D6}$

We find the following structural energy ratios between intervalic, electromagnetic and mass energies:

$I(Z^0)/U(Z^0) = 1.330 \approx 4/3$
$I(Z^0)/E(Z^0)_{tot} = 0.571 \approx 4/7$
$U(Z^0)/E(Z^0)_{tot} = 0.429 \approx 3/7$

BOSONIC GAUDINO 45 INTERVALIC, ELECTROMAGNETIC AND SPIN ENERGIES

Since the intervalic and electromagnetic mass energies of Z are just zero at the lisztinian level, we can calculate easily the features of its constituent gaudinos 45. The intervalic and electromagnetic mass of each one of the two constituent gaudinos 45 are necessarily half of the total intervalic and electromagnetic masses of Z^0 boson respectively:

$I(G_{45})_Z = ½\ I(Z^0) = 4.169596946 \cdot 10^{-9}$ (J) = 26,024.56587 (MeV/c^2)

$U(G_{45})_Z = ½\ U(Z^0) = 3.135338326 \cdot 10^{-9}$ (J) = 19,569.23411 (MeV/c^2)

Its spin energy will be:

$E_J(G_{45})_Z = I(G_{45})_Z - U(G_{45})_Z = 1.034258622 \cdot 10^{-9}$ (J) = 6,455.33177

BOSONIC GAUDINO 45 RADIUS

From the electromagnetic energy we can obtain the constituent gaudino 45 radius:

$r_{G45} = ½ (1/4\pi\varepsilon_0) (270\ \mathbf{q_I})^2 / U(G_{45})_Z = 7.358311087 \cdot 10^{-20}$ (m)

BOSONIC GAUDINO 45 SPIN ENERGY

Since the intervalic and electromagnetic mass energies of Z are just zero at the lisztinian level, we can calculate easily the features of its constituent gaudinos 45. Its spin energy will be:

$E_J(G_{45}) = ½\ I(Z^0) - ½U(Z^0) =$

BOSONIC DALINO 6 RADIUS

We can deduce likewise the magnitude of the constituent bosonic dalino 6 radius, r_{D6}:

$r_{D6} = 90 \cdot ½ (1/4\pi\varepsilon_0) (6\ \mathbf{q_I})^2 / U(Z^0) = 8.175901202 \cdot 10^{-22}$ (m)

This magnitude is in a similar way near the first approximation obtained via electron’s ratio: $r(D_6) \approx 7.7892963 \cdot 10^{-22}$ (m).

Z^0 BOSON INTERVALIC EXCHANGE FREQUORCE

The overall exchange frequorce due to intervalic interaction among intervalinos inside dalino 6 will be:

$\varphi(\mathbf{I})_{D6} = I(D_6) / \hbar = 8.777331086 \cdot 10^{23} (s^{-1})$

The related maximum linear velocity of intervalinos inside dalino 6 will be, known the bosonic dalino 6 radius:

$v(\mathbf{I})_{D6} = 2\pi\, r_{D6}\, \varphi(\mathbf{I})_{D6} = 4{,}508.976622\ (m\ s^{-1})$

The overall exchange frequorce of dalinos 6 inside each one of the two constituent gaudinos G_{45} of the Z^0 boson will be:

$\varphi(D_6)_{G45} = I(e) / \hbar = 4.334484487 \cdot 10^{20} (s^{-1})$

And the corresponding maximum linear velocity of dalinos 6 inside each gaudino G_{45} of the Z^0 boson is, known the G_{45} radius:

$v(D_6)_{G45} = 2\pi\, r_{G45}\, \varphi(D_6)_{G45} = 200.3989611\ (m\ s^{-1})$

Z^0 BOSON SPIN ENERGY

The Z^0 boson spin energy, $E_J(Z^0)$, is the difference between intervalic and electromagnetic energies, which is *manifested* not as *mass* but as *spin*:

$E_J(Z^0)_{GD} = I(Z^0)_{GD} - U(Z^0)_{GD} = 2.0684257 \cdot 10^{-9}$ (J) = 12,910.09279 (MeV/c^2)

However this result does not include the Z^0 boson spin energy at the exterior level, but only at the gaudinar and dalinar levels. As we have seen the contribution to *mass* of the intervalic and electromagnetic energies of Z^0 boson at lisztinian level is zero. Therefore the dynamic energies at the exterior level of Z^0 boson can not be calculated through the potential energy at lisztinian level because of the constituent unlike charges, but through the dynamic electromagnetic interaction between gaudinos 45, where the minus or plus sign of the magnitude only indicates the way —attraction or repulsion— of the related frequorce according to conventional use. The simplest assumption on the distance between the two constituent gaudinos 45 is $d_{G45} = 2\ r_{G45}$. Following this way we have got:

$$E_q(Z^0)_L = E_q(G_{45}{}^{(+)}G_{45}{}^{(-)})_G = [(+1)\cdot(-1)]\ (1/4\pi\varepsilon_0)\ e^2 / d_{G45} =$$
$$= -1.567669217 \cdot 10^{-9}\ (J) = -9{,}784.617392\ (MeV/c^2)$$

Therefore the balance dynamical equation of Z^0 boson at lisztinian level becomes:

$E_J(Z^0)_L + E_q(Z^0)_L = 0$

And the total spin energy of Z^0 boson is:

$\Sigma E_J(Z^0)_{LGD} = E_J(Z^0)_{GD} + E_J(Z^0)_L = 3.636095016 \cdot 10^{-9}$ (J) = 22,694.71018 (MeV/c^2)

Z^0 BOSON INTERVALIC KINEMATICS

From here it can be deduced some dynamic features of Z^0 boson by means of the already well known equation $E(J) = m\ r^2\omega_J^2$, deduced previously from the Virial theorem, where ω_J is the angular velocity due to spin. Supposing likewise that $r_Z = d_{G45} = 1.471662217 \cdot 10^{-19}$ (m) we have:

$\omega_J(Z^0) = (\ E_J(Z^0)_L / m_Z\, r_Z^2\ )^{½} = 6.672930386 \cdot 10^{26}$ (s^{-1})

The linear velocity on surface due to spin is:

$v_J(Z^0) = \omega_J(Z^0)\ r_Z = 9.820299526 \cdot 10^7$ (m s^{-1}) = 0.327569932 c

And the acceleration on Z^0 boson's surface due to spin will be:

$a_J(Z^0) = v_J(Z^0)^2 / r_Z = 6.553017511 \cdot 10^{34}$ (m s^{-2})

STRUCTURAL ENERGY OF Z^0 BOSON

The structural energy of Z^0 boson is the sum of the energy due to mass plus the energy due to the intrinsic angular momentum which balances mass energy. The structural energy is always just the double of the intervalic energy, so the concept of structural energy does not include the field energy which is not manifested as mass nor its correlated spin energy.

$A(Z^0) = 2I(Z^0) = E(Z^0)_{mass} + E_J(Z^0)_{GD} = 1.667838778 \cdot 10^{-8}$ (J) = 104,098.2635 (MeV/c^2)

Z^0 BOSON INTERVALIC POTENTIAL WELL

The electromagnetic potential energy of Z^0 boson is due to the difference between the electromagnetic energy of Z^0 boson and the electromagnetic energy of its *isolated* constituent dalinos 6, plus the difference between the electromagnetic energy of the dalino 6 and the electromagnetic energy of its *isolated* constituent intervalinos. According to this we have:

$\Delta U(Z^0) = [U(Z^0)_L - 2U(G_{45})] + 2[U(G_{45}) - 45\ U(D_6)] + 2[45\ U(D_6) - 45\ (6\ U(\mathbf{I}))] = [U(Z^0)_L - 0 = 6.270676648 \cdot 10^{-9}$ (J) $= 39{,}138.4682$ (MeV/c^2)

And the electromagnetic potential is:

$V(Z^0) = \Delta U(Z^0) / m_Z = -3.857531178 \cdot 10^{16}$ ($m^2\ s^{-2}$)

In the case of electromagnetic energy (and *long ranged* interactions) ‘isolated’ means separate by an infinite length. However, in the case of intervalic interaction (and *short ranged* interactions) ‘isolated’ means *out* of the intervalic structure, an event which does not relies on the macroscopic distance of the separation as in the case of a long ranged interaction. Therefore, the Z^0 boson intervalic potential is determined by the difference on the intervalic energy between Z^0 boson and its constituent disaggregated intervalinos:

$\Delta I(Z^0) = [I(Z^0)_L - 2I(G_{45})] + 2[I(G_{45}) - 45\ I(D_6)] + 2[45\ I(D_6) - 45\ (6\ I\ (\mathbf{I}))] = 0 - 540\ (c^{\pm 2}\hbar\ \mathbf{q_I}^{-2}) = -540\ c^{-1} = -1.801246114 \cdot 10^{-6}$ (J) $= -11{,}242{,}489.08$ (MeV/c^2)

And the intervalic potential well is:

$\Phi(Z^0) = \Delta I(Z^0) / m_Z = -2.844390857 \cdot 10^{19}$ ($m^2\ s^{-2}$)

INTERVALIC SYMMETRIES OF ZERO CHARGED LISZTINOS

DALINAR SYMMETRY	INTERVALIC STRUCTURE	MASS (MeV/c^2)	PARTICLES WHICH STAY BELOW THE THRESHOLD TEMPERATURE: ZERO CHARGED MASSIVE BOSONS
{D270}	$L2G1D270^{(0)}$	1	
{D135}	$L2G2D135^{(0)}$	8	
{D90}	$L2G3D90^{(0)}$	28	
{D54}	$L2G5D54^{(0)}$	128	
{D45}	$L2G6D45^{(0)}$	221	
{D30}	$L2G9D30^{(0)}$	745	
{D27}	$L2G10D27^{(0)}$	1,022	
{D18}	$L2G15D18^{(0)}$	3,449	
{D15}	$L2G18D15^{(0)}$	5,960	
{D10}	$L2G27D10^{(0)}$	20,116	
{D9}	$L2G30D9^{(0)}$	27,594	
{D6}	$L2G45D6^{(0)}$	91,188	Z^0 boson
{D5}	$L2G54D5^{(0)}$	157,572	W^0 boson
{D3}	$L2G90D3^{(0)}$	729,501	Y^0 boson
{D2}	$L2G135D2^{(0)}$	2,462,065	X^0 boson
{D1}	$L2G270D1^{(0)}$	11,008,055	

Chapter 15

INTERVALIC FRACTIONAL LISZTINO: QUARKS

We are going to describe the *origin of quarks masses*, the *intervalic structures of quarks* and its corresponding intervalic families from a general point of view, and finally the *structural energies of nucleonic quarks* at all levels of its intervalic structure.

As in the description of intervalic leptons and massive bosons, the introduction of the intervalic structure of quarks makes still much more dramatic changes in the number and families of quarks traditionally supposed. It must be noted that the infamous *six+four parameters* of the Standard Model corresponding to quarks masses and the KM matrix, are now irrelevant. Moreover, IT makes useless quantum chromodynamics.

It can be said that the Standard Model *finishes* lamentably without explaining masses, structures and features of fundamental particles and interactions through an overloaded formalism which relies on ~18 or more arbitrary parameters; whilst on the contrary, the Intervalic Theory *begins* describing with astonishing exactness the masses, intervalic structures and features of all fundamental particles, subparticles and interactions, *deduced directly from the intervalic system of dimensions and units*, without using any mathematical formalism, but only applying the new intervalic physics principles and symmetries, and relying on *no one* parameter, with insulting simplicity… This fact involves a powerful logical relation between IT and the very last foundations of Physics, since the intervalic symmetries only can be logically derived under intervalic units and dimensions.

INTERVALIC STRUCTURE OF QUARKS AT THE LISZTINIAN LEVEL

We define a *quark* as a lisztino with fractional charge ⅓ or ⅔ of the elementary charge. As we have seen, Nature choose ever the sets with lowest energy and higher number of symmetries, which a little surprisingly is not (*n*/2)*e* but (*n*/3)*e*. This have been easily explained because ½ *e* has only 8 symmetries while ⅔ *e* and ⅓ *e* has each one 12 symmetries. Even worst, ¾ *e* and ¼ *e* are not allowed states because they involve a partition of the intervalino, which is clearly forbidden: ¾ *e* = 202.5 $\mathbf{q_I}$ and ¼ *e* = 67.5 $\mathbf{q_I}$.

It must be noted that lisztinos based on dalinar structures 270, 135, 54 and 27 cannot yield quarks by no means because those symmetries of compositeness can’t make the fractional charges of quarks in any combination.

Now we can list all possible lisztinian structures of quarks in IT. We are going to suppose that we only know the intervalic / electromagnetic energies ratio of the nucleonic quarks, which is greater than the lepton’s ratio (roughly 3/2 > 5/4). Although it is sure that the ratio of most of the remaining quarks will not be smaller than the lepton’s ratio, we are going to list the predicted masses of quarks between both ratios. It is expected that quarks masses will be very close to the nucleonic quarks’ ratio, listed in first place.

There is a difficult related with the nomenclature of quarks because we have seven quarks by each allowed dalinar symmetry. In total 7 x 7 = 49 intervalic structures of quarks. However, only a few of them have till now got a proper name —the six supposed flavoured quarks—. Since the traditional names of quarks are some eccentric and bizarre, we propose to name them according its intervalic structure, as we are going to see. Describing systematically quarks according to the constituent dalinar structure, we have the following possible sets, by order (masses are always in MeV/c^2).

On the contrary, it is necessary to advise that the three families of quarks deplorably intended by SM do not go anyway and the supposed naïve parallelism postulated *ad hoc* between leptons and quarks is doubtful because there are much more than six quarks. Indeed, the observed quarks are only the low energy quarks, but all the 16 intervalic symmetries could exist at the Big Bang, allowing dozens of quarks, although obviously they decayed immediately to yield the presently known particles. There are a lot of intervalic symmetries among all particles, but they are totally different from the ridiculous ones supposed by SM. Of course, there are quarks families focused on the same dalinar symmetries than every lepton-massive boson, but this is due to the features of the own constituent intervalic symmetries, and not to a mystic “trinity” of particles as lamentably prays SM in order to neutralize two errors of infiniteness between themselves.

QUARKS BASED ON {D270} INTERVALIC SYMMETRY (EXISTENCE NOT POSTULATED)

The {D270} symmetry can not make quarks by no means because it can yield any intervalic structure whose electric charge was a fraction of the elementary one.

QUARKS BASED ON {D135} INTERVALIC SYMMETRY (EXISTENCE NOT POSTULATED)

In a similar way, the dalinar symmetry {D135} only can make particles with electric charge *e*, ½ *e* or 0. Therefore, it neither can yield quarks.

QUARKS BASED ON {D90} INTERVALIC SYMMETRY (EXISTENCE NOT POSTULATED)

The intervalic symmetry {D90} appears to do not exist in Nature at low energies due to its poor possibilities to produce fractional charges. An even number of dalinos 90 only can make a particle with resultant charge ±⅔ *e*, and an odd number a particle charged ±⅓ *e*:

$L_{1/3} = \frac{1}{3} G_3 = 1 D_{90} = 4.3171932$—$4.5989918$ → quark L⅓D90$^{(1/3)}$
$L_{2/3} = \frac{2}{3} G_3 = 2 D_{90} = 8.6343864$—$9.1979836$ → quark L⅔D90$^{(2/3)}$
$L_1 = 1 G_3 = 3 D_{90} = 12.951579$—$13.796975$ → quark L1D90$^{(1/3)}$
$L_2 = 2 G_3 = 6 D_{90} = 25.903158$—$27.593950$ → quark L2D90$^{(2/3)}$
$L_3 = 3 G_3 = 9 D_{90} = 38.854737$—$41.390925$ → quark L3D90$^{(1/3)}$
$L_4 = 4 G_3 = 12 D_{90} = 51.806316$—$55.187900$ → quark L4D90$^{(2/3)}$
$L_5 = 5 G_3 = 15 D_{90} = 64.757896$—$68.984875$ → quark L5D90$^{(1/3)}$
$L_6 = 6 G_3 = 18 D_{90} = 77.709475$—$82.781850$

Nevertheless it have to be noted the close relation in the mass of the quark L4-D90$^{(2/3)}$ of this set —pertaining to the *principal intervalic sequence of quarks* (see below)— with the mass of the stable quark in the fundamental set {D45}, which is just the double:

$L_4 = 4\ G_3 = 12\ D_{90}$ = 51.806316—55.187900 → quark L4D90$^{(\frac{2}{3})}$
$L_1 = 1\ G_6 = 6\ D_{45}$ = 103.61263—110.37580 → quark L1D45$^{(\frac{1}{3},\ \frac{2}{3})}$

By this reason we can't discard at first sight that some of these exotic structures could exist in some excited states of quarks, although we personally do not postulate them.

QUARKS BASED ON {D54} INTERVALIC SYMMETRY (EXISTENCE NOT POSTULATED)

The exotic {D54} symmetry can not make quarks by no means, as it is clear that 180/54 and 90/54 do not give integer numbers.

QUARKS BASED ON {D45} INTERVALIC SYMMETRY

In this symmetry set we already find the formerly named quarks *u*, *d*, *s* and a lot of its supposed free masses which, obviously, are not free. As can be seen, the vast majority of quarks with different masses have different intervalic structures and are, therefore, totally different particles, as the intervalic structures of the several supposed quarks up and down dramatically show. The exponent between brackets in the quarks means its fractional electric charges *allowed* by the intervalic structure. As can be seen, most of quarks can have both charges ±⅔ and ±⅓.

$L_{\frac{1}{3}} = \frac{1}{3}\ G_6 = 2\ D_{45}$ = 34.537545—36.791934 → quark L⅓D45$^{(\frac{1}{3})}$
$L_{\frac{2}{3}} = \frac{2}{3}\ G_6 = 4\ D_{45}$ = 69.075090—73.583868 → quark L⅔D45$^{(\frac{1}{3},\ \frac{2}{3})}$
$L_1 = 1\ G_6 = 6\ D_{45}$ = 103.61263—110.37580 → quark L1D45$^{(\frac{1}{3},\ \frac{2}{3})}$
$L_2 = 2\ G_6 = 12\ D_{45}$ = 207.22526—220.75160 → quark L2D45$^{(\frac{1}{3},\ \frac{2}{3})}$
$L_3 = 3\ G_6 = 18\ D_{45}$ = 310.83790—331.12740 → quark L3D45$^{(\frac{1}{3},\ \frac{2}{3})}$
$L_4 = 4\ G_6 = 24\ D_{45}$ = 414.45053—441.50320 → quark L4D45$^{(\frac{1}{3},\ \frac{2}{3})}$
$L_5 = 5\ G_6 = 30\ D_{45}$ = 518.06316—551.87900 → quark L5D45$^{(\frac{1}{3},\ \frac{2}{3})}$
$L_6 = 6\ G_6 = 36\ D_{45}$ = 621.67579—662.25480

Quarks with two allowed electric charges are named *isoquarks*. For example, quarks L3D45$^{(\frac{2}{3})}$ and L3D45$^{(\frac{1}{3})}$ —former quarks *up* and *down*— are isoquarks. This degree of freedom of quarks will be named *isocharge*. As we are going to see, the only symmetries which have an isocharge doublet are {D45}, {D5}, {D3}, {D2} and {D1}.

Remarkable particles in this set are the two *nucleonic quarks*: 3D45$^{(⅓, ⅔)}$; the two constituent quarks of the *π meson*, which can be any pair adequately chosen between ⅓D45$^{(⅓)}$, ⅔D45$^{(⅓, ⅔)}$ and 1D45$^{(⅓, ⅔)}$; and a intervalic structure of the formerly named quark *strange*: 5D45$^{(⅓, ⅔)}$. The *even* lisztinos can be “fatter” states of all these quarks. It must be noted that quarks up and down have *identical* intervalic structures, that is to say, they are the same quark (with can have different charge) in IT, whilst on the contrary, they are different quarks —with different flavour— in SM. We can also remember that the intervalic structure of *muon* is L1D45$^{(1)} \rightarrow \mu$.

The total mass energy of the intervalic symmetry {D45} is the sum of all its constituent quarks: 16 L$_1$ = 1,657.8020—1,766.0128 (MeV/c^2).

QUARKS BASED ON {D30} INTERVALIC SYMMETRY

Due to obvious reason the quarks of this set only can show one fractional charge: ±⅓ *or* ±⅔, but not both. This maybe the reason why although {D30} seems to be a very powerful symmetry, it is really less rich than {D45}. This fact also could explain why this is the only dalinar structure of quarks which is not shared with leptons and intermediate massive bosons of weak intervalic interaction.

L$_{⅓}$ = ⅓ G$_9$ = 3 D$_{30}$ = 116.56421—124.17278 → quark L⅓D30$^{(⅓)}$
L$_{⅔}$ = ⅔ G$_9$ = 6 D$_{30}$ = 233.12843—248.34556 → quark L⅔D30$^{(⅔)}$
L$_1$ = 1 G$_9$ = 9 D$_{30}$ = 349.69264—372.51833 → quark L1D30$^{(⅓)}$
L$_2$ = 2 G$_9$ = 18 D$_{30}$ = 699.38528—745.03666 → quark L2D30$^{(⅔)}$
L$_3$ = 3 G$_9$ = 27 D$_{30}$ = 1,049.0779—1,117.5550 → quark L3D30$^{(⅓)}$
L$_4$ = 4 G$_9$ = 36 D$_{30}$ = 1,398.7705—1,490.0733 → quark L4D30$^{(⅔)}$
L$_5$ = 5 G$_9$ = 45 D$_{30}$ = 1,748.4631—1,862.5916 → quark L5D30$^{(⅓)}$
L$_6$ = 6 G$_9$ = 54 D$_{30}$ = 2,098.1557—2,235.1099

Remarkable particles in this set are the former quark *charm*: L4D30$^{(⅔)}$ as well as one of its possible “fatter” states: L5D30$^{(⅓)}$. The last one would involve a mutual interchange in the constituent quarks charges of some hadrons. The first three structures of the set can be seen as excited states of the corresponding intervalic structures of {D45}, as well as the possible quark L3D30$^{(⅓)}$.

The total mass energy of the intervalic symmetry {D30} is the sum of all its constituent quarks: 16 L$_1$ = 5,595.0822—5,960.2938 (MeV/c^2).

QUARKS BASED ON {D27} INTERVALIC SYMMETRY (EXISTENCE NOT POSTULATED)

As like as {D54}, the exotic {D27} symmetry can not make quarks inasmuch as 180/54 and 90/54 do not give integer numbers.

QUARKS BASED ON {D18} INTERVALIC SYMMETRY

In the following set find mainly quarks with fractional charge ±⅓ since to yield the ±⅔ charge it is necessary to get a number *even* of constituent dalinos.

$L_{⅓}$ = ⅓ G_{15} = 5 D_{18} = 539.64917—574.87400 → quark L⅓D18$^{(⅓)}$
$L_{⅔}$ = ⅔ G_{15} = 10 D_{18} = 1,079.2983—1,149.7480 → quark L⅔D18$^{(⅔)}$
L_1 = 1 G_{15} = 15 D_{18} = 1,618.9475—1,724.6220 → quark L1D18$^{(⅓)}$
L_2 = 2 G_{15} = 30 D_{18} = 3,237.8950—3,449.2440 → quark L2D18$^{(⅔)}$
L_3 = 3 G_{15} = 45 D_{18} = 4,856.8425—5,173.8660 → quark L3D18$^{(⅓)}$
L_4 = 4 G_{15} = 60 D_{18} = 6,475.7900—6,898.4880 → quark L4D18$^{(⅔)}$
L_5 = 5 G_{15} = 75 D_{18} = 8,094.7375—8,623.1100 → quark L5D18$^{(⅓)}$
L_6 = 6 G_{15} = 90 D_{18} = 9,713.6850—10,347.732

Up to date, quarks of this symmetry with charge ⅓ are well established: we find the former quark *strange*: L⅓D18$^{(⅓)}$ and the quark *bottom*: L3D18$^{(⅓)}$. And once more we find another possible structure for the interchanged quark *charm*: L1D18$^{(⅓)}$. At first sight it appears to exist lesser evidence for the other quarks with charge ⅔, but this is not the case as we will see later, since all deductions for the existence of quarks *inside* SM are doubtfully based on indirect evidences and setting by hand the masses of quarks; even worst, setting by hand the number of quarks through choosing by hand the number of flavours.

Finally, we can remember that the intervalic structure of *tau* is L1D18$^{(1)}$ → τ.

The total mass energy of the intervalic symmetry {D18} is the sum of all its constituent quarks: 16 L_1 = 25,903.160—27,593.954 (MeV/c^2).

THE INTERVALIC QUARK LISZTINIAN SEQUENCE

Till now we have developed systematically the intervalic structures at the lisztinian level yielded unavoidably by the symmetries {D45}, {D30} and {D18}. It must be noted that this development of the intervalic compositeness —which makes a rich structurefulness— follows strictly and exclusively the logical rules imposed by the constraint derived from the intervalic units. There is neither any human or subjective *choosing* through all the process, nor has been set by hand any *parameter* or *constant* —really, there is *no one* parameter or constant to be set by hand in all IT—. The only intervention along the process has been to stop at any place the lisztinian sequence in all sets of symmetries: $L_{\frac{1}{3}}$, $L_{\frac{2}{3}}$, L_1, L_2, L_3, L_4, L_5, L_6,… since it is not a *finite* sequence, as in previous set of symmetries, but it can continue indefinitely. Therefore, we have looked at phenomenology and have seen that there appear to do not exist evidence of particles from lisztino 6 and onwards. Since it is clear that an *infinite* sequence of intervalic structures cannot be postulated, we will therefore stop at lisztino 5 and will check whether such sequence, yielded by Nature in a logical and systematic way, does match or not with the experimental data. Really it may seem strange that lisztino 6 was not made since the hexagonal symmetry is clearly favoured by Nature among any others. On the contrary, the symmetry chosen by Nature at this step to make the most stable particles is the {L3}, which is the highest symmetry which stay necessarily into a bidimensional plane. We will name the systematic sequence $L_{\frac{1}{3}}$, $L_{\frac{2}{3}}$, L_1, L_2, L_3, L_4, L_5 as the *intervalic quark lisztinian sequence*, and will prove that it is the way in which Nature works. But our partial or incomplete knowledge of any aspect of Nature does not means that God plays dice, as it is sure that *She-He* —or better, *IT*— does not play dice.

QUARKS BASED ON {D15} INTERVALIC SYMMETRY (EXISTENCE NOT POSTULATED)

$L_{\frac{1}{3}} = \frac{1}{3}\, G_{18} = 6\, D_{15} = 932.51359$—993.38220 → quark L⅓D15$^{(\frac{1}{3})}$
$L_{\frac{2}{3}} = \frac{2}{3}\, G_{18} = 12\, D_{15} = 1{,}865.0271$—1,986.7644 → quark L⅔D15$^{(\frac{1}{3},\, \frac{2}{3})}$
$L_1 = 1\, G_{18} = 18\, D_{15} = 2{,}797.5407$—2,980.1466 → quark L1D15$^{(\frac{1}{3},\, \frac{2}{3})}$
$L_2 = 2\, G_{18} = 36\, D_{15} = 5{,}595.0815$—5,960.2932 → quark L2D15$^{(\frac{1}{3},\, \frac{2}{3})}$
$L_3 = 3\, G_{18} = 54\, D_{15} = 8{,}392.6223$—8,940.4398 → quark L3D15$^{(\frac{1}{3},\, \frac{2}{3})}$
$L_4 = 4\, G_{18} = 72\, D_{15} = 11{,}190.162$—11,920.586 → quark L4D15$^{(\frac{1}{3},\, \frac{2}{3})}$
$L_5 = 5\, G_{18} = 90\, D_{15} = 13{,}987.703$—14,900.733 → quark L5D15$^{(\frac{1}{3},\, \frac{2}{3})}$
$L_6 = 6\, G_{18} = 108\, D_{15} = 16{,}785.244$—17,880.879 →

QUARKS BASED ON {D10} INTERVALIC SYMMETRY (EXISTENCE NOT POSTULATED)

$L_{1/3}$ = ⅓ G_{27} = 9 D_{10} = 3,147.2334—3,352.6650 → quark L⅓D10$^{(1/3)}$
$L_{2/3}$ = ⅔ G_{27} = 18 D_{10} = 6,294.4668—6,705.3299 → quark L⅔D10$^{(2/3)}$
L_1 = 1 G_{27} = 27 D_{10} = 9,441.7704—10,057.995 → quark L1D10$^{(1/3)}$
L_2 = 2 G_{27} = 54 D_{10} = 18,883.40—20,115.990 → quark L2D10$^{(2/3)}$
L_3 = 3 G_{27} = 81 D_{10} = 28,325.101—30,173.985 → quark L3D10$^{(1/3)}$
L_4 = 4 G_{27} = 108 D_{10} = 37,766.801—40,231.98 → quark L4D10$^{(2/3)}$
L_5 = 5 G_{27} = 135 D_{10} = 47,490.119—50,589.975 → quark L5D10$^{(1/3)}$
L_6 = 6 G_{27} = 162 D_{10} = 56,650.202—60,347.97

QUARKS BASED ON {D9} INTERVALIC SYMMETRY (EXISTENCE NOT POSTULATED)

$L_{1/3}$ = ⅓ G_{30} = 10 D_9 = 4,317.1927—4,598.9918 → quark L⅓D9$^{(1/3)}$
$L_{2/3}$ = ⅔ G_{30} = 20 D_9 = 8,634.3854—9,197.9836 → quark L⅔D9$^{(1/3,\ 2/3)}$
L_1 = 1 G_{30} = 30 D_9 = 12,951.577—13,796.975 → quark L1D9$^{(1/3,\ 2/3)}$
L_2 = 2 G_{30} = 60 D_9 = 25,903.155—27,593.950 → quark L2D9$^{(1/3,\ 2/3)}$
L_3 = 3 G_{30} = 90 D_9 = 38,854.733—41,390.925 → quark L3D9$^{(1/3,\ 2/3)}$
L_4 = 4 G_{30} = 120 D_9 = 51,806.311—55,187.90 → quark L4D9$^{(1/3,\ 2/3)}$
L_5 = 5 G_{30} = 150 D_9 = 64,757.888—68,984.875 → quark L5D9$^{(1/3,\ 2/3)}$
L_6 = 6 G_{30} = 180 D_9 = 77,709.466—82,781.85

QUARKS BASED ON {D6} INTERVALIC SYMMETRY

From now on we find the heaviest particles, since as smaller is the dalinar structure greater is the related intervalic energy.

$L_{1/3}$ = ⅓ G_{45} = 15 D_6 = 14,570.527—15,521.598 → quark L⅓D6$^{(1/3)}$
$L_{2/3}$ = ⅔ G_{45} = 30 D_6 = 29,141.055—31,043.196 → quark L⅔D6$^{(2/3)}$
L_1 = 1 G_{45} = 45 D_6 = 43,711.582—46,564.794 → quark L1D6$^{(1/3)}$
L_2 = 2 G_{45} = 90 D_6 = 87,423.165—93,129.588 → quark L2D6$^{(2/3)}$
L_3 = 3 G_{45} = 135 D_6 = 131,134.74—139,694.38 → quark L3D6$^{(1/3)}$
L_4 = 4 G_{45} = 180 D_6 = 174,846.32—186,259.17 → quark L4D6$^{(2/3)}$

$L_5 = 5\ G_{45} = 225\ D_6 =$ 218,557.91—232,823.97 → quark L5D6$^{(\frac{1}{3})}$
$L_6 = 6\ G_{45} = 270\ D_6 =$ 262,269.49—279,388.76

The most remarkable quark in this set is the formerly named quark *top*: L4D6$^{(\frac{2}{3})}$, and it can be also remembered that the intervalic structure of the *Z^0 massive boson* is: L2D6$^{(0)}$ → Z^0. It can be expected that the remaining quarks of this set will be detected as constituents of heavy baryons with {D6} symmetry when higher energies become available, since it appears to be clear that Nature does not merge quarks pertaining to different symmetries when assembling baryons or mesons. Therefore the threshold energy to make such baryons is much greater that the masses of the lightest quarks of the set, which explains why they have not been detected yet.

The total mass energy of the intervalic symmetry {D6} is the sum of all its constituent quarks: $16\ L_1 =$ 699,385.31—745,036.76 (MeV/c^2).

QUARKS BASED ON {D5} INTERVALIC SYMMETRY

This set is the last one —following by order the sequence imposed by the dalinar structure— where any subatomic particle had been detected experimentally (the $W^\pm$ massive boson).

$L_{\frac{1}{3}} = \frac{1}{3}\ G_{54} = 18\ D_5 =$ 25,177.871—26,821.321 → quark L⅓D5$^{(\frac{1}{3})}$
$L_{\frac{2}{3}} = \frac{2}{3}\ G_{54} = 36\ D_5 =$ 50,355.742—53,642.642 → quark L⅔D5$^{(\frac{1}{3},\ \frac{2}{3})}$
$L_1 = 1\ G_{54} = 54\ D_5 =$ 75,533.615—80,463.964 → quark L1D5$^{(\frac{1}{3},\ \frac{2}{3})}$
$L_2 = 2\ G_{54} = 108\ D_5 =$ 151,067.23—160,927.93 → quark L2D5$^{(\frac{1}{3},\ \frac{2}{3})}$
$L_3 = 3\ G_{54} = 162\ D_5 =$ 226,600.84—241,391.89 → quark L3D5$^{(\frac{1}{3},\ \frac{2}{3})}$
$L_4 = 4\ G_{54} = 216\ D_5 =$ 302,134.45—321,855.85 → quark L4D5$^{(\frac{1}{3},\ \frac{2}{3})}$
$L_5 = 5\ G_{54} = 270\ D_5 =$ 377,668.07—402,319.82 → quark L5D5$^{(\frac{1}{3},\ \frac{2}{3})}$
$L_6 = 6\ G_{54} = 324\ D_5 =$ 453,201.68—482,783.78

In this set we predict a new heavy quark: L3D5$^{(\frac{1}{3},\ \frac{2}{3})}$ with mass 226,600.84—241,391.89 (MeV/c^2), based on the principal intervalic sequence of quarks. It can be remembered that the intervalic structure of *$W^\pm$ massive boson* also pertain to this set: L1D5$^{(1)}$ → $W^\pm$. As in the preceding symmetry set, {D6}, there is no reason to expect that the allowed quarks of this symmetry will not be detected when higher energies become available.

The total mass energy of the intervalic symmetry {D5} is the sum of all its constituent quarks: $16\ L_1 =$ 1,208,537.8—1,287,423.5 (MeV/c^2).

PRINCIPAL INTERVALIC SEQUENCE OF QUARKS

It can be seen that exists a naïve recurrent formula which alternates lisztinos 3 and 4 at each consecutive dalinar level of structure, and which coincides approximately with the principal peaks that appear in the graphic of the annihilation cross section ratio (e^+e^- → hadrons / e^+e^- → $\mu^+\mu^-$):

ρ, ω mesons (770, 783)
Φ meson (1,020)
J/ψ meson (3,097)
Y meson (9,460)
Z^0 boson (91,187.6)

Historically, this set of particles was the most important "evidence" to intend the existence of the next quarks above the nucleonic ones. As we have pointed out, the most simple assumption would be to assign to all these mesons an intervalic structure of lisztino 2, just like for the Z^0 boson, since the original interacting particles are equally two lisztinos 1 —e^+e^-—. However, according to the usual view of SM it would correspond to have got intervalic structures of alternating lisztinos 3 and lisztinos 4:

- quark L3D45$^{(⅓,\ ⅔)}$ → former quark up, down
- quark L4D30$^{(⅔)}$ → former quark charm
- quark L3D18$^{(⅓)}$ → former quark bottom
- quark L4D6$^{(⅔)}$ → former quark top
- quark L3D5$^{(⅓,\ ⅔)}$ → predicted new heavy quark
- quark L4D3$^{(⅓,\ ⅔)}$ → predicted new heavy quark
- quark L3D2$^{(⅓,\ ⅔)}$ → predicted new heavy quark

This sequence seems likely to be, compared for example with the stars, as a *principal intervalic sequence* of quarks.

The quark *strange*, to honour its name, is the only one among traditional quarks that does not fit in the recurrent formula.

It is curious that the quarks pertaining to this principal intervalic sequence correspond just with the supposed flavours postulated by SM. This also could mean that such intervalic structures are more stable that the others, although it could also be a pure coincidence. Other possible explanation is that such quarks may be related with the *threshold energy* of each symmetry. It appears to be experimentally clear that no one quark of a determine symmetry is made until there have been made all the quarks of the preceding symmetry, until the preceding symmetry is completed. Therefore the threshold energy of the intervalic symmetries will be equal or greater than the total mass energy of its preceding symmetry. Supposed that the exotic symmetries do not intervene, they would be:

E_{th} {D45} ≥
E_{th} {D30} ≥ 1,657.8020—1,766.0128
E_{th} {D18} ≥ 5,595.0822—5,960.2938
E_{th} {D6} ≥ 25,903.160—27,593.954
E_{th} {D5} ≥ 699,385.31—745,036.76
E_{th} {D3} ≥ 1,208,537.8—1,287,423.5
E_{th} {D2} ≥ 5,595,082.2—5,960,293.8

But if the exotic symmetries which can made quarks do intervene — namely {D90}, {D15}, {D10} and {D9}, since {D270}, {D135}, {D54} and {D27} can not made fractional charges by no means—, they would be the following:

E_{th} {D45} ≥ 207.22526—220.75160
E_{th} {D30} ≥ 1,657.8020—1,766.0128
E_{th} {D18} ≥ 5,595.0822—5,960.2938
E_{th} {D6} ≥ 207,225.26—220,751.60
E_{th} {D5} ≥ 699,385.31—745,036.76
E_{th} {D3} ≥ 1,208,537.8—1,287,423.5
E_{th} {D2} ≥ 5,595,082.2—5,960,293.8

Of course, at first sight the most simple assumption would be to postulate the *universality* principle in the synthesis of quarks (and disregarding exotic symmetries), so any quark is not made until there is enough energy to make all the 7 quarks of its family. In this case the threshold energy would be the sum of the mass energy of each family of quarks:

E_{th} {D45} = $\Sigma(L_nD_{45})$ = 1,657.8020—1,766.0128
E_{th} {D30} = $\Sigma(L_nD_{30})$ = 5,595.0822—5,960.2938
E_{th} {D18} = $\Sigma(L_nD_{18})$ = 25,903.160—27,593.954
E_{th} {D6} = $\Sigma(L_nD_{6})$ = 699,385.31—745,036.76
E_{th} {D5} = $\Sigma(L_nD_{5})$ = 1,208,537.8—1,287,423.5
E_{th} {D3} = $\Sigma(L_nD_{3})$ = 5,595,082.2—5,960,293.8
E_{th} {D2} = $\Sigma(L_nD_{2})$ = 18,883,403—20,115,992

Whatever will be the threshold energy, what would appear to be most simple is that the skipping from one dalinar symmetry to the next in order to make quarks was not made until the preceding symmetry is not completed.

However, as we will explain when studying the *intervalic decay* of subatomic particles, the rule is to be leaded by the *masses* of the intervalic structures involved, disregarding the dalinar symmetry to which they pertain.

This behaviour can be easily explained because it happens *below* the threshold temperature and there is a limited energy available. On the contrary, *above* the threshold temperature the constraint of the mass becomes useless and inoperative if the availability of energy is endless, as it is the case between the Big Crunch and the next Big Bang. This beautiful state, never seen by human eyes, is leaded completely by the intervalic structures derived from the intervalic symmetries of Nature, and will be described at due course.

QUARKS BASED ON {D3} INTERVALIC SYMMETRY

Although their energies are not available yet, we give the intervalic structures and masses allowed for the heavier quarks.

$L_{⅓}$ = ⅓ G_{90} = 30 D_3 = 116,564.21—124,172.78 → quark L⅓D3$^{(⅓)}$
$L_{⅔}$ = ⅔ G_{90} = 60 D_3 = 233,128.43—248,345.56 → quark L⅔D3$^{(⅓,\ ⅔)}$
L_1 = 1 G_{90} = 90 D_3 = 349,692.64—372,518.33 → quark L1D3$^{(⅓,\ ⅔)}$
L_2 = 2 G_{90} = 180 D_3 = 699,385.28—745,036.66 → quark L2D3$^{(⅓,\ ⅔)}$
L_3 = 3 G_{90} = 270 D_3 = 1,049,077.9—1,117,555.0 → quark L3D3$^{(⅓,\ ⅔)}$
L_4 = 4 G_{90} = 360 D_3 = 1,398,770.5—1,490,073.3 → quark L4D3$^{(⅓,\ ⅔)}$
L_5 = 5 G_{90} = 450 D_3 = 1,748,463.2—1,862,591.7 → quark L5D3$^{(⅓,\ ⅔)}$
L_6 = 6 G_{90} = 540 D_3 = 2,098,155.9—2,235,110.0

The quark L4D3$^{(⅓,\ ⅔)}$ would be the next one of the *principal sequence*.

The total mass energy of the intervalic symmetry {D3} is the sum of all its constituent quarks: 16 L_1 = 5,595,082.2—5,960,293.8 (MeV/c^2).

QUARKS BASED ON {D2} INTERVALIC SYMMETRY

And this is the last symmetry which is intended to make quarks, as it is supposed that the symmetry {D1} does not yield any quarks since its energy balance is totally different from the energy balance usually shown by quarks and leptons-massive bosons.

$L_{⅓}$ = ⅓ G_{135} = 45 D_2 = 393,404.23—419,083.13 → quark L⅓D2$^{(⅓)}$

QUARKS AND ISOCHARGES ALLOWED BY THE INTERVALIC SYMMETRIES

DALINAR SYMMETRY	ALLOWED NUMBER OF QUARKIC INTERVALIC STRUCTURES	ISOCHARGE ALLOWED
{D270}	0	-
{D135}	0	-
{D90}	7	no
{D54}	0	-
{D45}	7	yes
{D30}	7	no
{D27}	0	-
{D18}	7	no
{D15}	7	yes
{D10}	7	no
{D9}	7	yes
{D6}	7	no
{D5}	7	yes
{D3}	7	yes
{D2}	7	yes
{D1}	-	-

TABLE
OF
INTERVALIC QUARKS

—Fractional lisztinos—

According to its dalinar symmetry and electric charge:
25 **uniquarks**
(quarks with one allowed charge: ⅓ *or* ⅔)
and 24 **isoquarks**
(quarks with two allowed charges: ⅓ *and* ⅔).

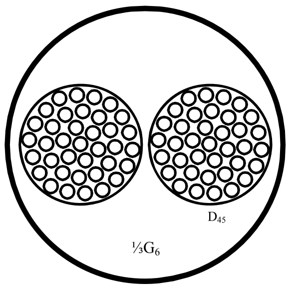
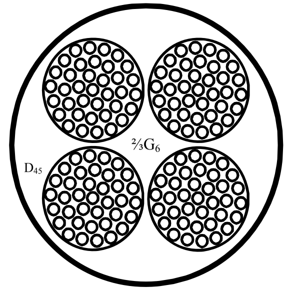
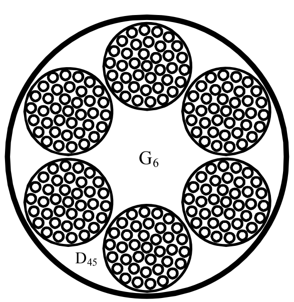
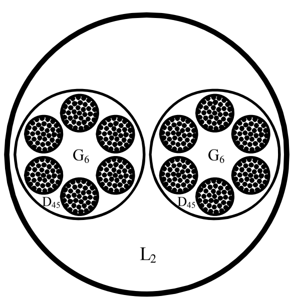
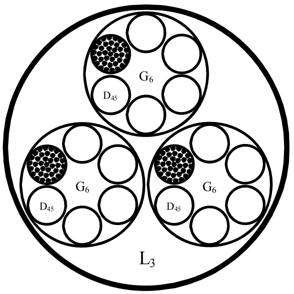
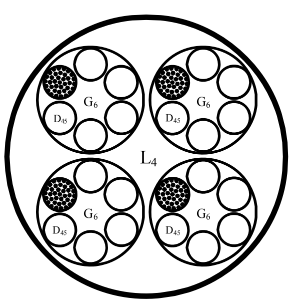
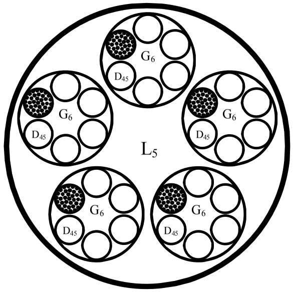
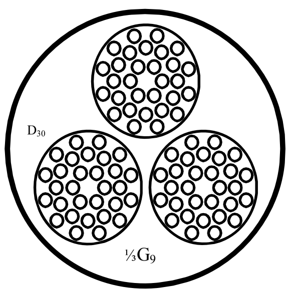
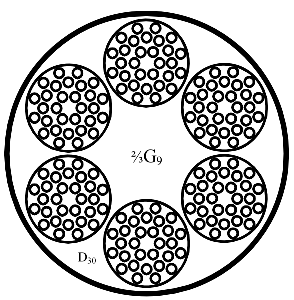
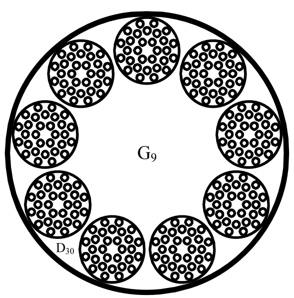
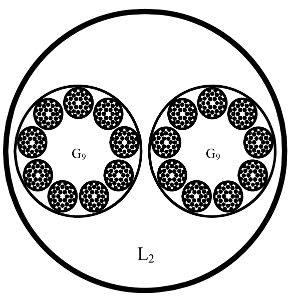
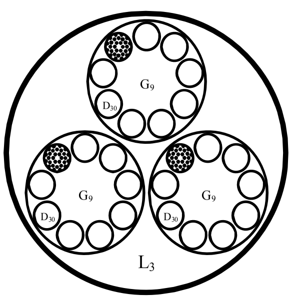
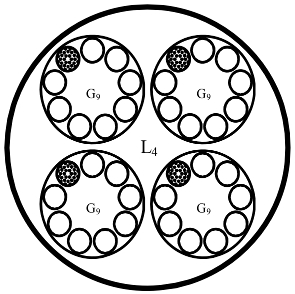
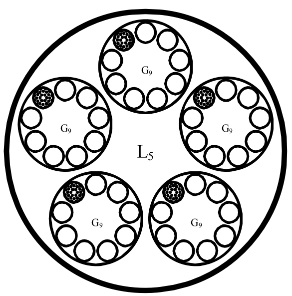
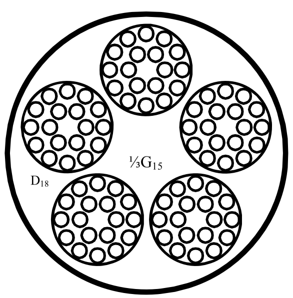
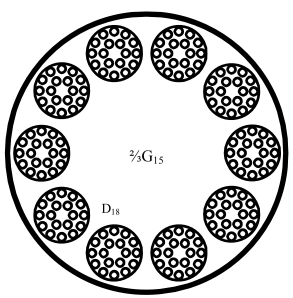
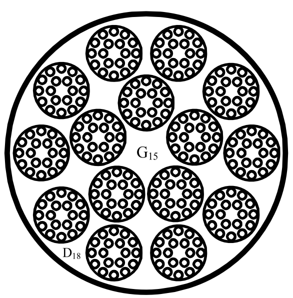
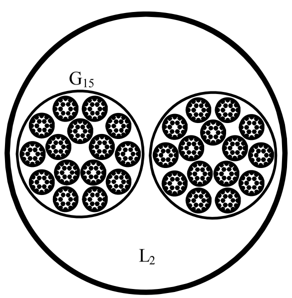
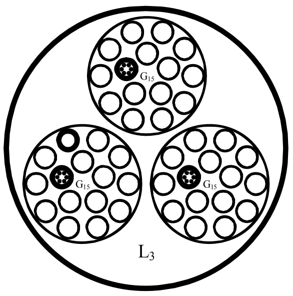
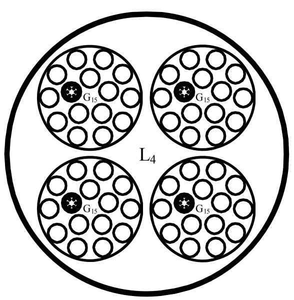
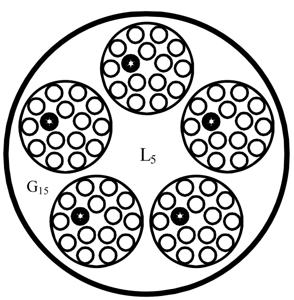
Mass in (MeV/c^2)

Dalinar symmetry		{D270}	{D135}	{D90}	{D54}	{D45}	{D30}	{D27}	{D18}	{D15}	{D10}
UNIQUARKS	Charge ⅓					Quark $L_{⅓}⅓G_{6}2D_{45}^{(⅓)}$ (35) *last radiant decaying quark*	Quark $L_{⅓}⅓G_{9}3D_{30}^{(⅓)}$ (117) Quark $L_{1}1G_{9}9D_{30}^{(⅓)}$ (350) Quark $L_{3}3G_{9}27D_{30}^{(⅓)}$ (1,049) Quark $L_{5}5G_{9}45D_{30}^{(⅓)}$ (1,748)		Quark $L_{⅓}⅓G_{15}5D_{18}^{(⅓)}$ (540) Quark $L_{1}1G_{15}15D_{18}^{(⅓)}$ (1,619) Quark $L_{3}3G_{15}45D_{18}^{(⅓)}$ (4,857) *former quark bottom* Quark $L_{5}5G_{15}75D_{18}^{(⅓)}$ (8,095)		
	Charge ⅔						Quark $L_{⅔}⅔G_{9}6D_{30}^{(⅔)}$ (233) Quark $L_{2}2G_{9}18D_{30}^{(⅔)}$ (699) Quark $L_{4}4G_{9}36D_{30}^{(⅔)}$ (1,399) *former quark charm*		Quark $L_{⅔}⅔G_{15}10D_{18}^{(⅔)}$ (1,079) Quark $L_{2}2G_{15}30D_{18}^{(⅔)}$ (3,238) Quark $L_{4}4G_{15}60D_{18}^{(⅔)}$ (6,476)		
ISOQUARKS	Charge ⅓ *and* ⅔					Quark $L_{⅔}⅔G_{6}4D_{45}^{(⅓,\,⅔)}$ (69) *constituent quark of π meson* Quark $L_{1}1G_{6}6D_{45}^{(⅓,\,⅔)}$ (104) Quark $L_{2}2G_{6}12D_{45}^{(⅓,\,⅔)}$ (207) Quark $L_{3}3G_{6}18D_{45}^{(⅓,\,⅔)}$ (311) *former quarks up, down* Quark $L_{4}4G_{6}24D_{45}^{(⅓,\,⅔)}$ (414) Quark $L_{5}5G_{6}30D_{45}^{(⅓,\,⅔)}$ (518) *former quark strange*					

Dalinar symmetry		{D9}	{D6}	{D5}	{D3}	{D2}	{D1}
UNIQUARKS	Charge ⅓		Quark $L_{⅓}⅓G_{45}15D_{6}^{(⅓)}$ (14,571) Quark $L_{1}1G_{45}45D_{6}^{(⅓)}$ (43,712) Quark $L_{3}3G_{45}135D_{6}^{(⅓)}$ (131,135) Quark $L_{5}5G_{45}225D_{6}^{(⅓)}$ (218,558)	Quark $L_{⅓}⅓G_{54}18D_{5}^{(⅓)}$ (25,178)	Quark $L_{⅓}⅓G_{90}30D_{3}^{(⅓)}$ (116,564)	Quark $L_{⅓}⅓G_{135}45D_{2}^{(⅓)}$ (393,404)	
	Charge ⅔		Quark $L_{⅔}⅔G_{45}30D_{6}^{(⅔)}$ (29,141) Quark $L_{2}2G_{45}90D_{6}^{(⅔)}$ (87,426) Quark $L_{4}4G_{45}180D_{6}^{(⅔)}$ (174,846) *former quark top*				
ISOQUARKS	Charge ⅓ *and* ⅔			Quark $L_{⅔}⅔G_{54}36D_{5}^{(⅓,\,⅔)}$ (50,356) Quark $L_{1}1G_{54}54D_{5}^{(⅓,\,⅔)}$ (75,534) Quark $L_{2}2G_{54}108D_{5}^{(⅓,\,⅔)}$ (151,068) Quark $L_{3}3G_{54}162D_{5}^{(⅓,\,⅔)}$ (226,601) Quark $L_{4}4G_{54}216D_{5}^{(⅓,\,⅔)}$ (302,134) Quark $L_{5}5G_{54}270D_{5}^{(⅓,\,⅔)}$ (377,668)	Quark $L_{⅔}⅔G_{90}60D_{3}^{(⅓,\,⅔)}$ (233,128) Quark $L_{1}1G_{90}90D_{3}^{(⅓,\,⅔)}$ (349,693) Quark $L_{2}2G_{90}180D_{3}^{(⅓,\,⅔)}$ (699,384) Quark $L_{3}3G_{90}270D_{3}^{(⅓,\,⅔)}$ (1,049,078) Quark $L_{4}4G_{90}360D_{3}^{(⅓,\,⅔)}$ (1,398,771) Quark $L_{5}5G_{90}450D_{3}^{(⅓,\,⅔)}$ (1,748,463)	Quark $L_{⅔}⅔G_{135}90D_{2}^{(⅓,\,⅔)}$ (786,808) Quark $L_{1}1G_{135}135D_{2}^{(⅓,\,⅔)}$ (1,180,213) Quark $L_{2}2G_{135}270D_{2}^{(⅓,\,⅔)}$ (2,360,424) Quark $L_{3}3G_{135}405D_{2}^{(⅓,\,⅔)}$ (3,540,638) Quark $L_{4}4G_{135}540D_{2}^{(⅓,\,⅔)}$ (4,720,850) Quark $L_{5}5G_{135}675D_{2}^{(⅓,\,⅔)}$ (5,901,063)	

INTERVALIC STRUCTURE OF THE COMPLETE FAMILY OF INTERVALIC QUARKS

Intervalic structure levels: 1 Intervalic String (S), 2 Photon (γ), 3 Intervalino (**I**), 4 Dalino (D), 5 Gaudino (G), 6 Lisztino(L), 7 Monteverdino (M), 8 Palestrino (P).
Dalinar symmetries: {270, 135, 90, 54, 45, 30, 27, 18, 15, 10, 9, 6, 5, 3, 2, 1}, of which only {45, 30, 18, 6, 5, 3, 2} are allowed for lisztinos. (Mass in MeV/c^2)

Dal. Sym.	**Lisztinian structure $L_{1/3}$** (quarks composed by 90 intervalinos)	**Lisztinian structure $L_{2/3}$** (quarks composed by 180 intervalinos)	**Lisztinian structure L_1** (quarks composed by 270 intervalinos)	**Lisztinian structure L_2** (quarks composed by 540 intervalinos)	**Lisztinian structure L_3** (quarks composed by 810 intervalinos)	**Lisztinian structure L_4** (quarks composed by 1080 intervalinos)	**Lisztinian structure L_5** (quarks composed by 1350 intervalinos)
{D45}	 *Last radiant decay quark*	 *Constituent quark of π meson*			 *Former quarks up, down*		 *Former quark strange*
	(35) Quark $L_{1/3}\tfrac{1}{3}G_6 2D_{45}^{(1/3)}$ = 90 **I** = 180 γ = 360 S	(69) Quark $L_{2/3}\tfrac{2}{3}G_6 4D_{45}^{(1/3,\,2/3)}$ = 180 **I** = 360 γ = 720 S	(104) Quark $L_1 1G_6 6D_{45}^{(1/3,\,2/3)}$ = 270 **I** = 540 γ = 1080 S	(207) Quark $L_2 2G_6 12D_{45}^{(1/3,\,2/3)}$ = 540 **I** = 1080 γ = 2160 S	**(311) Quark $\mathbf{L_3 3G_6 18D_{45}}^{(1/3,\,2/3)}$** = 810 **I** = 1620 γ = 3240 S	(414) Quark $L_4 4G_6 24D_{45}^{(1/3,\,2/3)}$ = 1080 **I** = 2160 γ = 4320 S	(518) Quark $L_5 5G_6 30D_{45}^{(1/3,\,2/3)}$ = 1350 **I** = 2700 γ = 5400 S
{D30}						 *Former quark charm*	
	(117) Quark $L_{1/3}\tfrac{1}{3}G_9 3D_{30}^{(1/3)}$ = 90 **I** = 180 γ = 360 S	(233) Quark $L_{2/3}\tfrac{2}{3}G_9 6D_{30}^{(2/3)}$ = 180 **I** = 360 γ = 720 S	(350) Quark $L_1 1G_9 9D_{30}^{(1/3)}$ = 270 **I** = 540 γ = 1080 S	(699) Quark $L_2 2G_9 18D_{30}^{(2/3)}$ = 540 **I** = 1080 γ = 2160 S	(1,049) Quark $L_3 3G_9 27D_{30}^{(1/3)}$ = 810 **I** = 1620 γ = 3240 S	**(1,399) Quark $\mathbf{L_4 4G_9 36D_{30}}^{(2/3)}$** = 1080 **I** = 2160 γ = 4320 S	(1,748) Quark $L_5 5G_9 45D_{30}^{(1/3)}$ = 1350 **I** = 2700 γ = 5400 S
{D18}					 *Former quark bottom*		
	(540) Quark $L_{1/3}\tfrac{1}{3}G_{15} 5D_{18}^{(1/3)}$ = 90 **I** = 180 γ = 360 S	(1,079) Quark $L_{2/3}\tfrac{2}{3}G_{15} 10D_{18}^{(2/3)}$ = 180 **I** = 360 γ = 720 S	(1,619) Quark $L_1 1G_{15} 15D_{18}^{(1/3)}$ = 270 **I** = 540 γ = 1080 S	(3,238) Quark $L_2 2G_{15} 30D_{18}^{(2/3)}$ = 540 **I** = 1080 γ = 2160 S	**(4,857) Quark $\mathbf{L_3 3G_{15} 45D_{18}}^{(1/3)}$** = 810 **I** = 1620 γ = 3240 S	(6,476) Quark $L_4 4G_{15} 60D_{18}^{(2/3)}$ = 1080 **I** = 2160 γ = 4320 S	(8,095) Quark $L_5 5G_{15} 75D_{18}^{(1/3)}$ = 1350 **I** = 2700 γ = 5400 S

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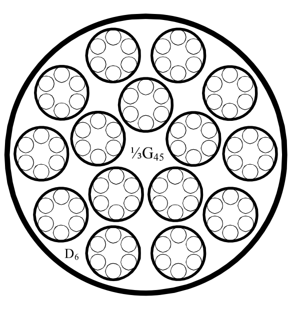
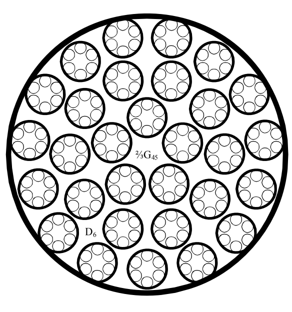
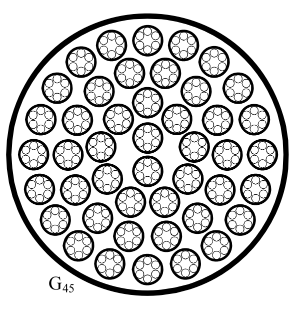
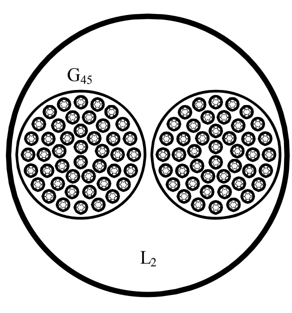
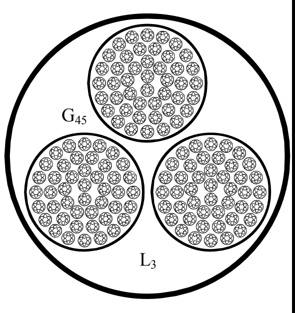
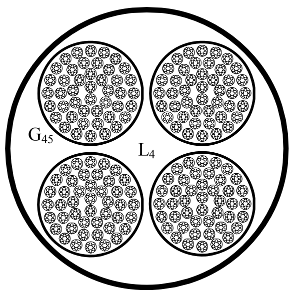
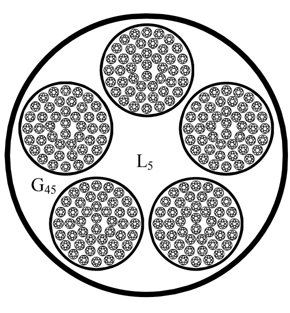
<td> </td>
<td> </td>
<td> </td>
<td> </td>
<td> </td>
<td>
Former quark top</td>
<td> </td>
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<td>(14,571) Quark $L_{\frac{1}{3}}\frac{1}{3}G_{45}15D_6^{(\frac{1}{3})}$
= 90 I = 180 γ = 360 S</td>
<td>(29,141) Quark $L_{\frac{2}{3}}\frac{2}{3}G_{45}30D_6^{(\frac{2}{3})}$
= 180 I = 360 γ = 720 S</td>
<td>(43,712) Quark $L_1 1G_{45}45D_6^{(\frac{1}{3})}$
= 270 I = 540 γ = 1080 S</td>
<td>(87,426) Quark $L_2 2G_{45}90D_6^{(\frac{2}{3})}$
= 540 I = 1080 γ = 2160 S</td>
<td>(131,135) Quark $L_3 3G_{45}135D_6^{(\frac{1}{3})}$
= 810 I = 1620 γ = 3240 S</td>
<td>(174,846) Quark $L_4 4G_{45}180D_6^{(\frac{2}{3})}$
= 1080 I = 2160 γ = 4320 S</td>
<td>(218,558) Quark $L_5 5G_{45}225D_6^{(\frac{1}{3})}$
= 1350 I = 2700 γ = 5400 S</td>
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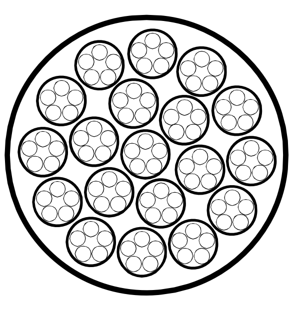
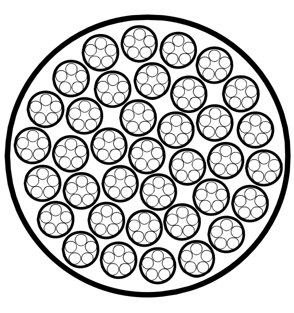
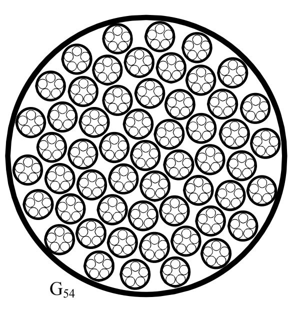
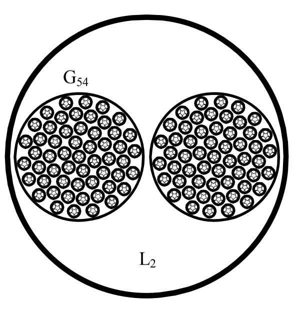
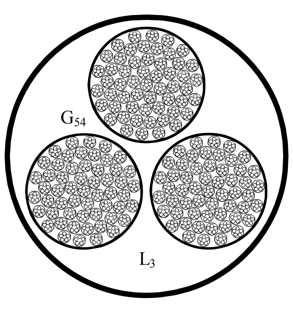
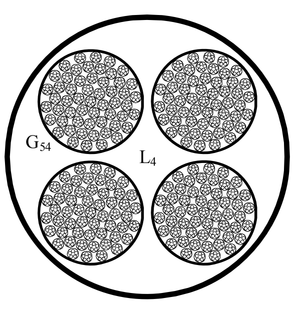
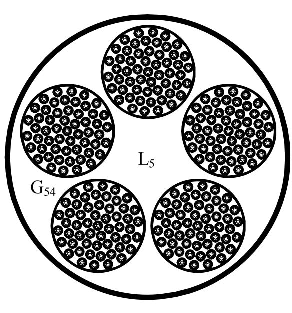
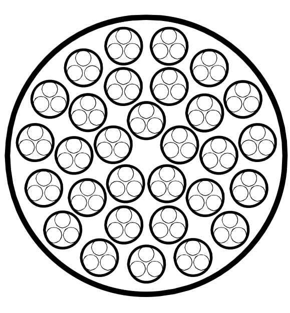
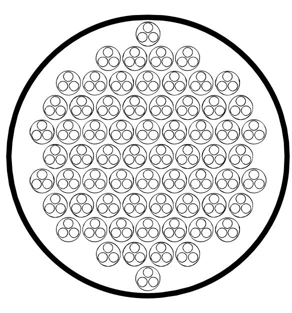
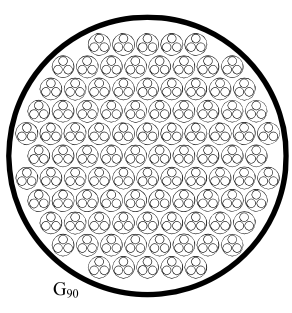
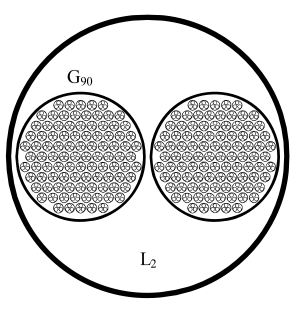
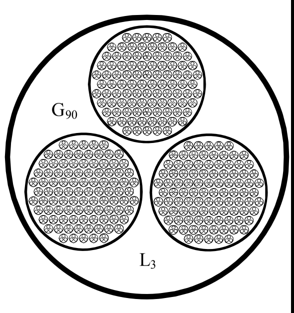
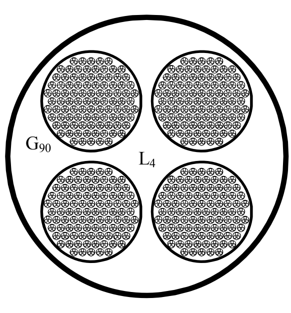
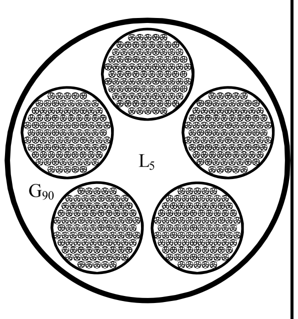
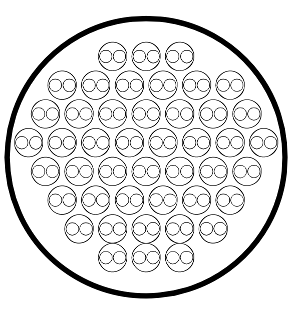
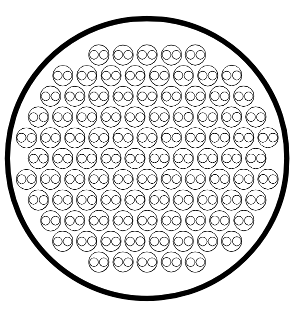
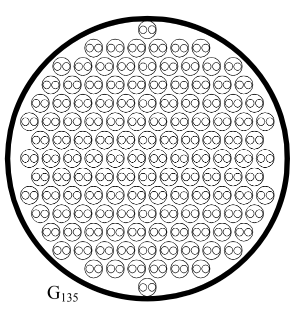
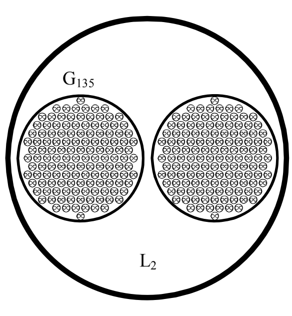
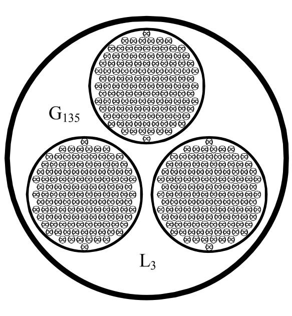
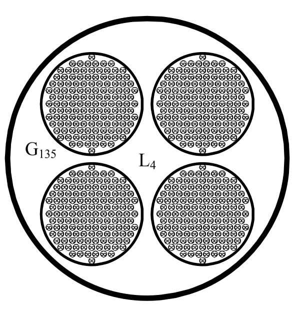
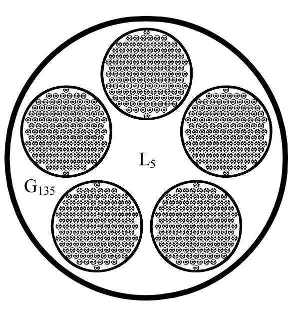
<td></td>
<td></td>
<td> </td>
<td> </td>
<td> </td>
<td> </td>
<td> </td>
</tr>
<tr>
<td>(25,178) Quark $L_{\frac{1}{3}}\frac{1}{3}G_{54}18D_5^{(\frac{1}{3})}$
= 90 I = 180 γ = 360 S</td>
<td>(50,356) Quark $L_{\frac{2}{3}}\frac{2}{3}G_{54}36D_5^{(\frac{1}{3}, \frac{2}{3})}$
= 180 I = 360 γ = 720 S</td>
<td>(75,534) Quark $L_1 1G_{54}54D_5^{(\frac{1}{3}, \frac{2}{3})}$
= 270 I = 540 γ = 1080 S</td>
<td>(151,068) Quark $L_2 2G_{54}108D_5^{(\frac{1}{3}, \frac{2}{3})}$
= 540 I = 1080 γ = 2160 S</td>
<td>(226,601) Quark $L_3 3G_{54}162D_5^{(\frac{1}{3}, \frac{2}{3})}$
= 810 I = 1620 γ = 3240 S</td>
<td>(302,134) Quark $L_4 4G_{54}216D_5^{(\frac{1}{3}, \frac{2}{3})}$
= 1080 I = 2160 γ = 4320 S</td>
<td>(377,668) Quark $L_5 5G_{54}270D_5^{(\frac{1}{3}, \frac{2}{3})}$
= 1350 I = 2700 γ = 5400 S</td>
</tr>
<tr>
<td rowspan="2">{D3}</td>
<td></td>
<td></td>
<td> </td>
<td> </td>
<td> </td>
<td> </td>
<td> </td>
</tr>
<tr>
<td>(116,564) Quark $L_{\frac{1}{3}}\frac{1}{3}G_{90}30D_3^{(\frac{1}{3})}$
= 90 I = 180 γ = 360 S</td>
<td>(233,128) Quark $L_{\frac{2}{3}}\frac{2}{3}G_{90}60D_3^{(\frac{1}{3}, \frac{2}{3})}$
= 180 I = 360 γ = 720 S</td>
<td>(349,693) Quark $L_1 1G_{90}90D_3^{(\frac{1}{3}, \frac{2}{3})}$
= 270 I = 540 γ = 1080 S</td>
<td>(699,384) Quark $L_2 2G_{90}180D_3^{(\frac{1}{3}, \frac{2}{3})}$
= 540 I = 1080 γ = 2160 S</td>
<td>(1,049,078) Quark $L_3 3G_{90}270D_3^{(\frac{1}{3}, \frac{2}{3})}$
= 810 I = 1620 γ = 3240 S</td>
<td>(1,398,771) Quark $L_4 4G_{90}360D_3^{(\frac{1}{3}, \frac{2}{3})}$
= 1080 I = 2160 γ = 4320 S</td>
<td>(1,748,463) Quark $L_5 5G_{90}450D_3^{(\frac{1}{3}, \frac{2}{3})}$
= 1350 I = 2700 γ = 5400 S</td>
</tr>
<tr>
<td rowspan="2">{D2}</td>
<td></td>
<td></td>
<td> </td>
<td> </td>
<td> </td>
<td> </td>
<td> </td>
</tr>
<tr>
<td>(393,404) Quark $L_{\frac{1}{3}}\frac{1}{3}G_{135}45D_2^{(\frac{1}{3})}$
= 90 I = 180 γ = 360 S</td>
<td>(786,808) Quark $L_{\frac{2}{3}}\frac{2}{3}G_{135}90D_2^{(\frac{1}{3}, \frac{2}{3})}$
= 180 I = 360 γ = 720 S</td>
<td>(1,180,213) Quark $L_1 1G_{135}135D_2^{(\frac{1}{3}, \frac{2}{3})}$
= 270 I = 540 γ = 1080 S</td>
<td>(2,360,424) Quark $L_2 2G_{135}270D_2^{(\frac{1}{3}, \frac{2}{3})}$
= 540 I = 1080 γ = 2160 S</td>
<td>(3,540,638) Quark $L_3 3G_{135}405D_2^{(\frac{1}{3}, \frac{2}{3})}$
= 810 I = 1620 γ = 3240 S</td>
<td>(4,720,850) Quark $L_4 4G_{135}540D_2^{(\frac{1}{3}, \frac{2}{3})}$
= 1080 I = 2160 γ = 4320 S</td>
<td>(5,901,063) Quark $L_5 5G_{135}675D_2^{(\frac{1}{3}, \frac{2}{3})}$
= 1350 I = 2700 γ = 5400 S</td>
</tr>
</table>

$L_{\frac{2}{3}} = \frac{2}{3}\ G_{135} = 90\ D_2$ = 786,808.46—838,166.26 → quark L⅔D2$^{(\frac{1}{3},\ \frac{2}{3})}$
$L_1 = 1\ G_{135} = 135\ D_2$ = 1,180,212.7—1,257,249.4 → quark L1D2$^{(\frac{1}{3},\ \frac{2}{3})}$
$L_2 = 2\ G_{135} = 270\ D_2$ = 2,360,425.4—2,514,498.8 → quark L2D2$^{(\frac{1}{3},\ \frac{2}{3})}$
$L_3 = 3\ G_{135} = 405\ D_2$ = 3,540,638.1—3,771,748.2 → quark L3D2$^{(\frac{1}{3},\ \frac{2}{3})}$
$L_4 = 4\ G_{135} = 540\ D_2$ = 4,720,850.8—5,028,997.6 → quark L4D2$^{(\frac{1}{3},\ \frac{2}{3})}$
$L_5 = 5\ G_{135} = 675\ D_2$ = 5,901,063.5—6,286,247.0 → quark L5D2$^{(\frac{1}{3},\ \frac{2}{3})}$
$L_6 = 6\ G_{135} = 810\ D_2$ = 7,081,276.2—7,543,496.4

The quark L3D2$^{(\frac{1}{3},\ \frac{2}{3})}$ would be the last quark pertaining to the principal intervalic sequence.

The total mass energy of the intervalic symmetry {D2} is the sum of all its constituent quarks: 16 L_1 = 18,883,403—20,115,992 (MeV/c^2).

QUARKS BASED ON {D1} INTERVALIC SYMMETRY

As {D1} is a limit symmetry since the dalino 1 is the subatomic particle closest to the intervalino, it only can make particles above the threshold temperature. Therefore this symmetry has not importance at low energies, but only at the intervalic primordial aggregation.

QUARKS FLAVOURS AND INTERVALIC SYMMETRIES

It is really difficult to understand how have been possible that it have been generally accepted some obviously wrong affirmations of SM. For example, regarding the constituent quarks of, say, the SU(3) nonet of mesons with spin 0, it is clear the constituent light quarks of the π meson can't be, by no means, the same quarks *up* and *down* of nucleons… unless it was stupidly postulated that sometimes some quarks can have "free masses", which however they are not really "free" because the mass of the π meson is precisely always the same (!). The intervalic structure of quarks involves dramatic charges in quantum chromodynamics because colour and gluon fields become unnecessary and superfluous assumptions in IT, as I have explained in other sites. The existence of colour and gluons is based on some features and results, like those of the e^-e^+ annihilation, the electromagnetic decay of π^0 meson, the hadronic decay of $W^\pm$ and Z^0, the *jets* events in e^-e^+ annihilations, the symmetry of the baryon states, the strong interaction, etc., but all of them can be explained in a much more fundamental way through the intervalic symmetries in spite of the fantastic absurdity about the 3 colours and the 8 gluon fields postulated by SM.

In a similar way as colour, *flavour* becomes irrelevant since it is substituted by the *intervalic structure* of quarks. It is clear that the traditional model of quarks is, at least, incomplete because it does no explain the hundreds of particles detected experimentally, but only a few of them. This model does not lead to any place. Moreover, its naïve combinations of quarks, *mixing flavours* of all kinds and conditions, is absolutely misleading although Lie groups may look mathematically pretty to somebody, since it is not based on any reliable fundamental feature, but only in the trust of the existence of underlying symmetries in Nature —which of course ever can be *partially* found through very different ways, inclusive through wrong means, as is the case of SM—. Nevertheless, we are not satisfied with some *partial* symmetries yet, but we wish to find the whole reliable underlying symmetries of Nature. And it is sure that they are not those ones derived miserably from the flavours, colours, arbitrary mixing angles and other disastrous features postulated by SM.

The most economic assumption in IT regarding the aggregation of quarks (and also any other particles) postulates a homogeneity of symmetries, which states that there is *no mixing of intervalic symmetries* in the assembly of quarks. It can be shown that all the detected baryons and meson can be fully explained as aggregations of quarks pertaining to the same family of intervalic symmetries.

Therefore, the assembly of hadrons, postulated by SM to be composed by any mixture containing several of the supposed strange, charm, beauty or top quarks, is absolutely false. Such hadrons are monteverdinos composed by *lisztinos pertaining exclusively to a unique family of intervalic symmetries*, for example:

- Hadrons with up, down, strange → Monteverdino of {D45} symmetry
- Hadrons with charm → Monteverdino of {D30} intervalic symmetry
- Hadrons with beauty → Monteverdino of {D18} intervalic symmetry
- Hadrons with top → Monteverdino of {D6} intervalic symmetry

The logical economy and elegance of the intervalic postulate on the homogeneity of the intervalic symmetries in the assembly of subatomic particles speaks by itself. Needless to say that according to IT the three traditional quarks families and their half a dozen of flavours postulated by SM, or in other words, the full QCD and the traditional model of flavoured quarks become irrelevant. Fortunately, all experimental data remain, and only need to be interpreted in a radical new way, according to the new intervalic symmetries. As the concepts which handles SM are likely to be a bag of mistakes, it is sometimes awkward to establish a meaningful correspondence between those erroneous concepts and the right ones introduced by IT. From now on we are not going to try it unless it can help to clarify some physical feature. SM can not be repaired by no means because it is wrong from the most superficial up to the very last foundations. Therefore it sinks noisily anyway, and can only be discarded completely, quickly and at once, before to suffer a resounding defeat. In resume, right after the postulation of IT, the Standard Model is perhaps not yet a whimsical discipline of *Science*, but of *History*.

LISTING THE INTERVALIC STRUCTURES OF QUARKS

Ordering in a list all these symmetries which have been logical and systematically yielded from the intervalic units, we have got an impressive set of intervalic structurefulness, a total of 49 allowed intervalic structures of quarks which fit superbly with experimental data in an astonishing way and can make a lot of predictions of all kinds, easily falsable or verifiable. And most important, all this have been reached without having introduced any constant or parameter at every step, in the whole theory.

$L_{⅓}$ = ⅓ G_6 = 2 D_{45} = 34.537545—36.791934 → quark L⅓D45$^{(⅓)}$
$L_{⅔}$ = ⅔ G_6 = 4 D_{45} = 69.075090—73.583868 → quark L⅔D45$^{(⅓,\, ⅔)}$
L_1 = 1 G_6 = 6 D_{45} = 103.61263—110.37580 → quark L1D45$^{(⅓,\, ⅔)}$
L_2 = 2 G_6 = 12 D_{45} = 207.22526—220.75160 → quark L2D45$^{(⅓,\, ⅔)}$
L_3 = 3 G_6 = 18 D_{45} = 310.83790—331.12740 → quark L3D45$^{(⅓,\, ⅔)}$
L_4 = 4 G_6 = 24 D_{45} = 414.45053—441.50320 → quark L4D45$^{(⅓,\, ⅔)}$
L_5 = 5 G_6 = 30 D_{45} = 518.06316—551.87900 → quark L5D45$^{(⅓,\, ⅔)}$

$L_{⅓}$ = ⅓ G_9 = 3 D_{30} = 116.56421—124.17278 → quark L⅓D30$^{(⅓)}$
$L_{⅔}$ = ⅔ G_9 = 6 D_{30} = 233.12843—248.34556 → quark L⅔D30$^{(⅔)}$
L_1 = 1 G_9 = 9 D_{30} = 349.69264—372.51833 → quark L1D30$^{(⅓)}$
L_2 = 2 G_9 = 18 D_{30} = 699.38520—745.03666 → quark L2D30$^{(⅔)}$
L_3 = 3 G_9 = 27 D_{30} = 1,049.0779—1,117.5550 → quark L3D30$^{(⅓)}$
L_4 = 4 G_9 = 36 D_{30} = 1,398.7705—1,490.0733 → quark L4D30$^{(⅔)}$
L_5 = 5 G_9 = 45 D_{30} = 1,748.4631—1,862.5916 → quark L5D30$^{(⅓)}$

$L_{⅓}$ = ⅓ G_{15} = 5 D_{18} = 539.64917—574.87400 → quark L⅓D18$^{(⅓)}$
$L_{⅔}$ = ⅔ G_{15} = 10 D_{18} = 1,079.2982—1,149.7480 → quark L⅔D18$^{(⅔)}$
L_1 = 1 G_{15} = 15 D_{18} = 1,618.9475—1,724.6220 → quark L1D18$^{(⅓)}$
L_2 = 2 G_{15} = 30 D_{18} = 3,237.8950—3,449.2443 → quark L2D18$^{(⅔)}$
L_3 = 3 G_{15} = 45 D_{18} = 4,856.8425—5,173.8660 → quark L3D18$^{(⅓)}$
L_4 = 4 G_{15} = 60 D_{18} = 6,475.7900—6,898.4886 → quark L4D18$^{(⅔)}$

L_5 = 5 G_{15} = 75 D_{18} = 8,094.7375—8,623.1100 → quark L5D18$^{(\frac{1}{3})}$

$L_{\frac{1}{3}}$ = ⅓ G_{45} = 15 D_6 = 14,570.527—15,521.598 → quark L⅓D6$^{(\frac{1}{3})}$
$L_{\frac{2}{3}}$ = ⅔ G_{45} = 30 D_6 = 29,141.055—31,043.196 → quark L⅔D6$^{(\frac{2}{3})}$
L_1 = 1 G_{45} = 45 D_6 = 43,711.582—46,564.794 → quark L1D6$^{(\frac{1}{3})}$
L_2 = 2 G_{45} = 90 D_6 = 87,423.165—93,129.588 → quark L2D6$^{(\frac{2}{3})}$
L_3 = 3 G_{45} = 135 D_6 = 131,134.74—139,694.38 → quark L3D6$^{(\frac{1}{3})}$
L_4 = 4 G_{45} = 180 D_6 = 174,846.32—186,259.17 → quark L4D6$^{(\frac{2}{3})}$
L_5 = 5 G_{45} = 225 D_6 = 218,557.91—232,823.97 → quark L5D6$^{(\frac{1}{3})}$

$L_{\frac{1}{3}}$ = ⅓ G_{54} = 18 D_5 = 25,177.871—26,821.321 → quark L⅓D5$^{(\frac{1}{3})}$
$L_{\frac{2}{3}}$ = ⅔ G_{54} = 36 D_5 = 50,355.742—53,642.642 → quark L⅔D5$^{(\frac{1}{3}, \frac{2}{3})}$
L_1 = 1 G_{54} = 54 D_5 = 75,533.615—80,463.964 → quark L1D5$^{(\frac{1}{3}, \frac{2}{3})}$
L_2 = 2 G_{54} = 108 D_5 = 151,067.23—160,927.93 → quark L2D5$^{(\frac{1}{3}, \frac{2}{3})}$
L_3 = 3 G_{54} = 162 D_5 = 226,600.84—241,391.89 → quark L3D5$^{(\frac{1}{3}, \frac{2}{3})}$
L_4 = 4 G_{54} = 216 D_5 = 302,134.45—321,855.85 → quark L4D5$^{(\frac{1}{3}, \frac{2}{3})}$
L_5 = 5 G_{54} = 270 D_5 = 377,668.07—402,319.82 → quark L5D5$^{(\frac{1}{3}, \frac{2}{3})}$

$L_{\frac{1}{3}}$ = ⅓ G_{90} = 30 D_3 = 116,564.21—124,172.78 → quark L⅓D3$^{(\frac{1}{3})}$
$L_{\frac{2}{3}}$ = ⅔ G_{90} = 60 D_3 = 233,128.43—248,345.56 → quark L⅔D3$^{(\frac{1}{3}, \frac{2}{3})}$
L_1 = 1 G_{90} = 90 D_3 = 349,692.64—372,518.33 → quark L1D3$^{(\frac{1}{3}, \frac{2}{3})}$
L_2 = 2 G_{90} = 180 D_3 = 699,385.28—745,036.66 → quark L2D3$^{(\frac{1}{3}, \frac{2}{3})}$
L_3 = 3 G_{90} = 270 D_3 = 1,049,077.9—1,117,555.0 → quark L3D3$^{(\frac{1}{3}, \frac{2}{3})}$
L_4 = 4 G_{90} = 360 D_3 = 1,398,770.5—1,490,073.3 → quark L4D3$^{(\frac{1}{3}, \frac{2}{3})}$
L_5 = 5 G_{90} = 450 D_3 = 1,748,463.2—1,862,591.7 → quark L5D3$^{(\frac{1}{3}, \frac{2}{3})}$

$L_{\frac{1}{3}}$ = ⅓ G_{135} = 45 D_2 = 393,404.23—419,083.13 → quark L⅓D2$^{(\frac{1}{3})}$
$L_{\frac{2}{3}}$ = ⅔ G_{135} = 90 D_2 = 786,808.46—838,166.26 → quark L⅔D2$^{(\frac{1}{3}, \frac{2}{3})}$
L_1 = 1 G_{135} = 135 D_2 = 1,180,212.7—1,257,249.4 → quark L1D2$^{(\frac{1}{3}, \frac{2}{3})}$
L_2 = 2 G_{135} = 270 D_2 = 2,360,425.4—2,514,498.8 → quark L2D2$^{(\frac{1}{3}, \frac{2}{3})}$
L_3 = 3 G_{135} = 405 D_2 = 3,540,638.1—3,771,748.2 → quark L3D2$^{(\frac{1}{3}, \frac{2}{3})}$
L_4 = 4 G_{135} = 540 D_2 = 4,720,850.8—5,028,997.6 → quark L4D2$^{(\frac{1}{3}, \frac{2}{3})}$
L_5 = 5 G_{135} = 675 D_2 = 5,901,063.5—6,286,247.0 → quark L5D2$^{(\frac{1}{3}, \frac{2}{3})}$

INTERVALIC STRUCTURES OF FUNDAMENTAL PARTICLES ALLOWED BY THE INTERVALIC SYMMETRIES BELOW THE THRESHOLD TEMPERATURE ACCORDING TO THE 16 DALINAR SYMMETRIES

DALINAR SYMMETRY	LEPTONS-MASSIVE BOSONS	QUARKS
{D270}	G1D270$^{\pm}$ lepton (0.5) = e	
{D135}		
{D90}		
{D54}		
{D45}	G6D45$^{\pm}$ lepton (106) = μ	L⅓D45$^{(⅓)}$ (35) L⅔D45$^{(⅓,\ ⅔)}$ (69) L1D45$^{(⅓,\ ⅔)}$ (104) L2D45$^{(⅓,\ ⅔)}$ (207) L3D45$^{(⅓,\ ⅔)}$ (311) L4D45$^{(⅓,\ ⅔)}$ (414) L5D45$^{(⅓,\ ⅔)}$ (518)
{D30}	G9D30$^{\pm}$ lepton (373)	L⅓D30$^{(⅓)}$ (117) L⅔D30$^{(⅔)}$ (233) L1D30$^{(⅓)}$ (350) L2D30$^{(⅔)}$ (699) L3D30$^{(⅓)}$ (1,049) L4D30$^{(⅔)}$ (1,399) L5D30$^{(⅓)}$ (1,748)
{D27}		
{D18}	G15D18$^{\pm}$ lepton (1,777) = τ	L⅓D18$^{(⅓)}$ (540) L⅔D18$^{(⅔)}$ (1,079) L1D18$^{(⅓)}$ (1,619) L2D18$^{(⅔)}$ (3,238) L3D18$^{(⅓)}$ (4,857) L4D18$^{(⅔)}$ (6,476) L5D18$^{(⅓)}$ (8,095)

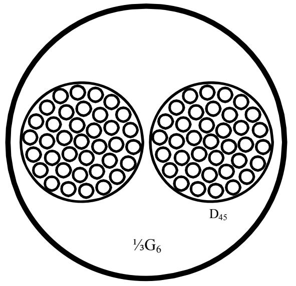
INTERVALIC STRUCTURES
OF FUNDAMENTAL PARTICLES
ALLOWED BY THE 16 DALINAR SYMMETRIES
BELOW THE THRESHOLD TEMPERATURE
ACCORDING TO THE 16 DALINAR SYMMETRIES

DALINAR SYMMETRY	LEPTONS-MASSIVE BOSONS	QUARKS
{D15}		
{D10}		
{D9}		
{D6}	G45D6$^{\pm}$ (46,565) = Z$^{\pm}$ L2G45D6^{0} (91,188) = Z^{0}	L⅓D6$^{(⅓)}$ (14,571) L⅔D6$^{(⅔)}$ (29,141) L1D6$^{(⅓)}$ (43,712) L2D6$^{(⅔)}$ (87,426) L3D6$^{(⅓)}$ (131,135) L4D6$^{(⅔)}$ (174,846) L5D6$^{(⅓)}$ (218,558)
{D5}	G54D5$^{\pm}$ (80,423) = W$^{\pm}$ L2G54D5^{0} (160,928) = W^{0}	L⅓D5$^{(⅓)}$ (25,178) L⅔D5$^{(⅓,\ ⅔)}$ (50,356) L1D5$^{(⅓,\ ⅔)}$ (75,534) L2D5$^{(⅓,\ ⅔)}$ (151,068) L3D5$^{(⅓,\ ⅔)}$ (226,601) L4D5$^{(⅓,\ ⅔)}$ (302,134) L5D5$^{(⅓,\ ⅔)}$ (377,668)
{D3}	G90D3$^{\pm}$ (372,518) = Y$^{\pm}$ L2G90D3^{0} (745,037) = Y^{0}	L⅓D3$^{(⅓)}$ (116,564) L⅔D3$^{(⅓,\ ⅔)}$ (233,128) L1D3$^{(⅓,\ ⅔)}$ (349,693) L2D3$^{(⅓,\ ⅔)}$ (699,384) L3D3$^{(⅓,\ ⅔)}$ (1,049,078) L4D3$^{(⅓,\ ⅔)}$ (1,398,771) L5D3$^{(⅓,\ ⅔)}$ (1,748,463)
{D2}	G135D2$^{\pm}$ (1,257,249) = X$^{\pm}$ L2G135D2^{0} (2,514,499) = X^{0}	L⅓D2$^{(⅓)}$ (393,404) L⅔D2$^{(⅓,\ ⅔)}$ (786,808) L1D2$^{(⅓,\ ⅔)}$ (1,180,213) L2D2$^{(⅓,\ ⅔)}$ (2,360,424) L3D2$^{(⅓,\ ⅔)}$ (3,540,638) L4D2$^{(⅓,\ ⅔)}$ (4,720,850) L5D2$^{(⅓,\ ⅔)}$ (5,901,063)
{D1}		

INTERVALIC STRUCTURES
OF SUBATOMIC PARTICLES
ALLOWED BY THE INTERVALIC SYMMETRIES
(mass in MeV)

SIMETRÍA DALINAR	LEPTONES-BOSONES MASIVOS Y NEUTRINOS	QUARKS (LISZTINOS FRACCIONARIOS)
{D270}	$G_1D_{270}^{(\pm)}$ (0.5) = $e^{\pm}$ *electron* $v_{D270} = v_e$ *neutrino* (1.1833119 · 10^{-14})	-
{D135}	-	-
{D90}	-	-
{D54}	-	-
{D45}	$G_6D_{45}^{(\pm)}$ (106) = $\mu^{\pm}$ *muon* $v_{D45} = v_{\mu}$ *neutrino* (2.0005108 · 10^{-7})	$L_{1/3}\tfrac{1}{3}G_6 2D_{45}^{(1/3)}$ (35) *last radiant decay quark* $L_{2/3}\tfrac{2}{3}G_6 4D_{45}^{(1/3,\,2/3)}$ (69) *constituent quark of π meson* $L_1 1G_6 6D_{45}^{(1/3,\,2/3)}$ (104) $L_2 2G_6 12D_{45}^{(1/3,\,2/3)}$ (207) $\mathbf{L_3 3G_6 18D_{45}^{(1/3,\,2/3)}}$ **(311)** *former quarks up, down* $L_4 4G_6 24D_{45}^{(1/3,\,2/3)}$ (414) $L_5 5G_6 30D_{45}^{(1/3,\,2/3)}$ (518) *former quark strange*
{D30}	$G_9D_{30}^{(\pm)}$ (373) - v_{D30} -	$L_{1/3}\tfrac{1}{3}G_9 3D_{30}^{(1/3)}$ (117) $L_{2/3}\tfrac{2}{3}G_9 6D_{30}^{(2/3)}$ (233) $L_1 1G_9 9D_{30}^{(1/3)}$ (350) $L_2 2G_9 18D_{30}^{(2/3)}$ (699) $L_3 3G_9 27D_{30}^{(1/3)}$ (1,049) $\mathbf{L_4 4G_9 36D_{30}^{(2/3)}}$ **(1,399)** *former quark charm* $L_5 5G_9 45D_{30}^{(1/3)}$ (1,748)
{D27}	-	-
{D18}	$G_{15}D_{18}^{(\pm)}$ (1,777) = $\tau^{\pm}$ *tau* $v_{D18} = v_{\tau}$ *neutrino* (2.6777745 ·10^{-4})	$L_{1/3}\tfrac{1}{3}G_{15} 5D_{18}^{(1/3)}$ (540) $L_{2/3}\tfrac{2}{3}G_{15} 10D_{18}^{(2/3)}$ (1,079) $L_1 1G_{15} 15D_{18}^{(1/3)}$ (1,619) $L_2 2G_{15} 30D_{18}^{(2/3)}$ (3,238) $\mathbf{L_3 3G_{15} 45D_{18}^{(1/3)}}$ **(4,857)** *former quark bottom* $L_4 4G_{15} 60D_{18}^{(2/3)}$ (6,476) $L_5 5G_{15} 75D_{18}^{(1/3)}$ (8,095)
{D15}	-	-
{D10}	-	-
{D9}	-	-
{D6}	$G_{45}45D_6^{(\pm)}$ (46,565) $Z^{\pm}$ *massive boson* $L_2 2G_{45}90D_6^{(0)}$ (91,188) **Z^0 massive boson** v_{D6} *neutrino*	$L_{1/3}\tfrac{1}{3}G_{45} 15D_6^{(1/3)}$ (14,571) $L_{2/3}\tfrac{2}{3}G_{45} 30D_6^{(2/3)}$ (29,141) $L_1 1G_{45} 45D_6^{(1/3)}$ (43,712) $L_2 2G_{45} 90D_6^{(2/3)}$ (87,426) $L_3 3G_{45} 135D_6^{(1/3)}$ (131,135) $\mathbf{L_4 4G_{45} 180D_6^{(2/3)}}$ **(174,846)** *former quark top* $L_5 5G_{45} 225D_6^{(1/3)}$ (218,558)
{D5}	$G_{54}54D_5^{(\pm)}$ (80,423) **$W^{\pm}$ massive boson** $L_2 2G_{54}108D_5^{(0)}$(160,928) W^0 *massive boson* v_{D5} *neutrino*	$L_{1/3}\tfrac{1}{3}G_{54} 18D_5^{(1/3)}$ (25,178) $L_{2/3}\tfrac{2}{3}G_{54} 36D_5^{(1/3,\,2/3)}$ (50,356) $L_1 1G_{54} 54D_5^{(1/3,\,2/3)}$ (75,534) $L_2 2G_{54} 108D_5^{(1/3,\,2/3)}$ (151,068) $\mathbf{L_3 3G_{54} 162D_5^{(1/3,\,2/3)}}$ **(226,601)** $L_4 4G_{54} 216D_5^{(1/3,\,2/3)}$ (302,134) $L_5 5G_{54} 270D_5^{(1/3,\,2/3)}$ (377,668)
{D3}	$G_{90}90D_3^{(\pm)}$ (372,518) $Y^{\pm}$ *massive boson* $L_2 2G_{90}180D_3^{(0)}$ (745,037) **Y^0 massive boson** v_{D3} *neutrino*	$L_{1/3}\tfrac{1}{3}G_{90} 30D_3^{(1/3)}$ (116,564) $L_{2/3}\tfrac{2}{3}G_{90} 60D_3^{(1/3,\,2/3)}$ (233,128) $L_1 1G_{90} 90D_3^{(1/3,\,2/3)}$ (349,693) $L_2 2G_{90} 180D_3^{(1/3,\,2/3)}$ (699,384) $L_3 3G_{90} 270D_3^{(1/3,\,2/3)}$ (1,049,078) $\mathbf{L_4 4G_{90} 360D_3^{(1/3,\,2/3)}}$ **(1,398,771)** $L_5 5G_{90} 450D_3^{(1/3,\,2/3)}$ (1,748,463)
{D2}	$G_{135}135D_2^{(\pm)}$ (1,257,249) **$X^{\pm}$ massive boson** $L_2 2G_{135}270D_2^{(0)}$ (2,514,499) X^0 *massive boson* v_{D2} *neutrino*	$L_{1/3}\tfrac{1}{3}G_{135} 45D_2^{(1/3)}$ (393,404) $L_{2/3}\tfrac{2}{3}G_{135} 90D_2^{(1/3,\,2/3)}$ (786,808) $L_1 1G_{135} 135D_2^{(1/3,\,2/3)}$ (1,180,213) $L_2 2G_{135} 270D_2^{(1/3,\,2/3)}$ (2,360,424) $L_3 3G_{135} 405D_2^{(1/3,\,2/3)}$ (3,540,638) $L_4 4G_{135} 540D_2^{(1/3,\,2/3)}$ (4,720,850) $L_5 5G_{135} 675D_2^{(1/3,\,2/3)}$ (5,901,063)
{D1}	-	-

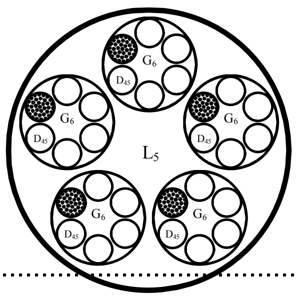
Lisztinian structure $L_{1/3}$
(quarks composed by 90 intervalinos)



Constituent quark of π meson.
Last radiant decay quark

(35) Quark $L_{1/3}\tfrac{1}{3}G_6 2D_{45}^{(1/3)}$
= 90 **I** = 180 γ = 360 S

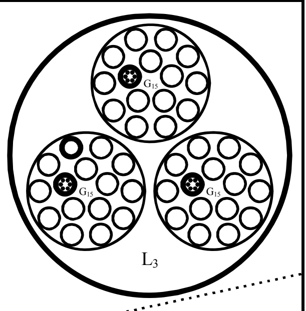
Lisztinian structure L_5
(quarks composed by 1350 intervalinos)



Former quark strange

(518) Quark $L_5 5G_6 30D_{45}^{(1/3,\,2/3)}$
= 1350 **I** = 2700 γ = 5400 S

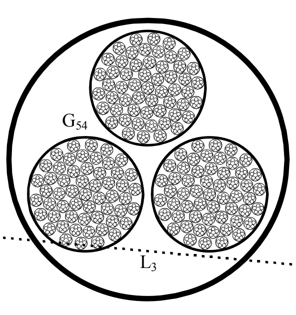
Lisztinian structure L_3
(quarks composed by 810 intervalinos)



Former quark bottom

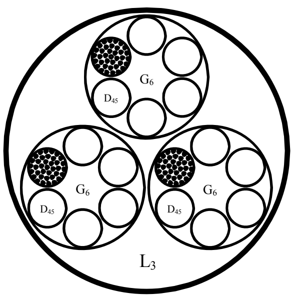
(4,857) Quark $L_3 3G_{15} 45D_{18}^{(1/3)}$
= 810 **I** = 1620 γ = 3240 S

Lisztinian structure L_3
(quarks composed by 810 intervalinos)



(226,601) Quark $L_3 3G_{54} 162D_5^{(1/3,\,2/3)}$
= 810 **I** = 1620 γ = 3240 S

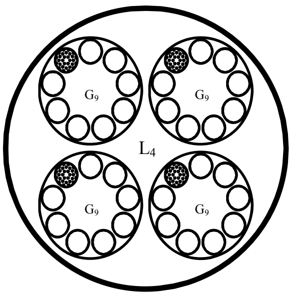
Lisztinian structure L_3
(quarks composed by 810 intervalinos)



Former quarks up, down

(311) Quark $L_3 3G_6 18D_{45}^{(1/3,\,2/3)}$
= 810 **I** = 1620 γ = 3240 S

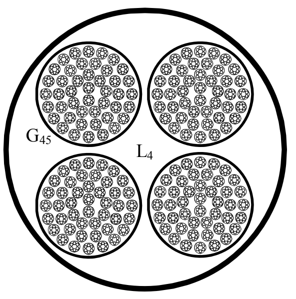
Lisztinian structure L_4
(quarks composed by 1080 intervalinos)



Former quark charm

(1,399) Quark $L_4 4G_9 36D_{30}^{(2/3)}$
= 1080 **I** = 2160 γ = 4320 S

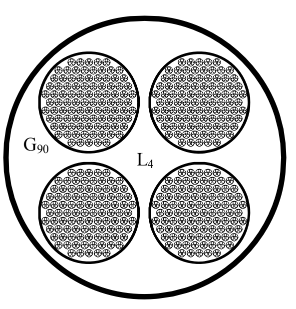
Lisztinian structure L_4
(quarks composed by 1080 intervalinos)



Former quark top

(174,846) Quark $L_4 4G_{45} 180D_6^{(2/3)}$
= 1080 **I** = 2160 γ = 4320 S

Lisztinian structure L_4
(quarks composed by 1080 intervalinos)



(1,398,771) Quark $L_4 4G_{90} 360D_3^{(1/3,\,2/3)}$
= 1080 **I** = 2160 γ = 4320 S

Chapter 16

INTERVALIC QUARKS UP AND DOWN

NUCLEONIC QUARKS: GAUDINAR STRUCTURE

Let us recapitulate the gaudinar structure of nucleonic quarks. The primordial aggregation of intervalinos to make dalinos, and of dalinos to make gaudinos was symmetric under interchange and therefore follows Bose-Einstein statistics. On the contrary, the primordial aggregation of gaudinos made symmetric and antisymmetric states under interchange: the first is found in zero charge massive bosons and the second is found in lisztinos with fractional charge, that is to say, in *quarks*.

Regarding stable quarks constituent of nucleons, there are only seven modes to make those aggregation of dalinos 45 to make gaudinos 6:

$6 (D_{+45}) + 0 (D_{-45}) = G_6^{+}$
$5 (D_{+45}) + 1 (D_{-45}) = G_6^{+2/3}$
$4 (D_{+45}) + 2 (D_{-45}) = G_6^{+1/3}$
$3 (D_{+45}) + 3 (D_{-45}) = G_6^{0}$
$2 (D_{+45}) + 4 (D_{-45}) = G_6^{-1/3}$
$1 (D_{+45}) + 5 (D_{-45}) = G_6^{-2/3}$
$0 (D_{+45}) + 6 (D_{-45}) = G_6^{-}$

Since quarks have fractional charges, the only possible aggregations of gaudinos (G_6) to compose a quark are:

$q(+⅔) = G_6^{+} + G_6^{-} + G_6^{+⅔}$
$q(+⅔) = G_6^{+} + G_6^{-⅔} + G_6^{+⅓}$
$q(+⅔) = G_6^{+⅔} + G_6^{-⅔} + G_6^{+⅔}$
$q(+⅔) = G_6^{+} + G_6^{-⅓} + G_6^{0}$
$q(+⅔) = G_6^{+⅔} + G_6^{-⅓} + G_6^{+⅓}$
$q(+⅔) = G_6^{+⅔} + G_6^{0} + G_6^{0}$
$q(+⅔) = G_6^{+⅓} + G_6^{0} + G_6^{+⅓}$

$q(-⅓) = G_6^{+} + G_6^{-} + G_6^{-⅓}$
$q(-⅓) = G_6^{+} + G_6^{-⅔} + G_6^{-⅔}$
$q(-⅓) = G_6^{+⅔} + G_6^{-} + G_6^{0}$
$q(-⅓) = G_6^{+⅓} + G_6^{-} + G_6^{+⅓}$
$q(-⅓) = G_6^{+⅔} + G_6^{-⅔} + G_6^{-⅓}$
$q(-⅓) = G_6^{+⅓} + G_6^{-⅔} + G_6^{0}$
$q(-⅓) = G_6^{+⅓} + G_6^{-⅓} + G_6^{-⅓}$
$q(-⅓) = G_6^{-⅓} + G_6^{0} + G_6^{0}$

It can be supposed that states containing a gaudino 6 with zero charge would make unstable structures because they do not have intervalic nor electromagnetic energy at the last structure level, and therefore these states are not allowed. This clear constraint eliminates six possible combinations among gaudinos from the above lists.

On the other hand, it can be supposed that the constituent charges of these gaudinos will not be the elementary charge but fractional charges. If this assumption was held the only remaining combinations would be:

$q(+⅔) = G_6^{+⅔} + G_6^{-⅔} + G_6^{+⅔}$
$q(+⅔) = G_6^{+⅔} + G_6^{-⅓} + G_6^{+⅓}$

$q(-⅓) = G_6^{+⅔} + G_6^{-⅔} + G_6^{-⅓}$
$q(-⅓) = G_6^{+⅓} + G_6^{-⅓} + G_6^{-⅓}$

Since the intervalic energy at the gaudinar structure level should be greater than the intervalic energy at the lisztinian level, the first two intervalic structures of both quarks must be eliminated. Therefore, the intervalic structure of nucleonic quarks will be:

$q \rightarrow L_3 = 3\ G_6 = 18\ D_{45} = 810\ \mathbf{I}$

$u^{+2/3} \rightarrow \mathrm{L}_3 = \mathrm{G}_6^{+2/3} + \mathrm{G}_6^{-1/3} + \mathrm{G}_6^{+1/3} = 18\ \mathrm{D}_{45} = 810\ \mathbf{I}$
$d^{-1/3} \rightarrow \mathrm{L}_3 = \mathrm{G}_6^{+1/3} + \mathrm{G}_6^{-1/3} + \mathrm{G}_6^{-1/3} = 18\ \mathrm{D}_{45} = 810\ \mathbf{I}$

We will make use in advance the astonishing results obtained in the deduction of the nucleons masses (cfr. Intervalic Nucleon) with null error made in our study of the intervalic nucleon. There were obtained the following nucleons and quarks masses:

$\mathrm{m}(p) = 2\ \mathrm{m}(u) + \mathrm{m}(d) + \mathrm{c}^{\pm 2}\ \mathrm{I}(e) = 938.2723027\ (\mathrm{MeV/c}^2)$
$\mathrm{m}(n) = \mathrm{m}(u) + 2\ \mathrm{m}(d) = 939.5656372\ (\mathrm{MeV/c}^2)$

$\mathrm{m}(u) = \mathrm{m}(u)_{\mathrm{com}} + \mathrm{c}^{\pm 2}\ \mathrm{I}(u) + \mathrm{c}^{\pm 2}\ \mathrm{U}(u) = 312.1359302\ (\mathrm{MeV/c}^2)$
$\mathrm{m}(d) = \mathrm{m}(d)_{\mathrm{com}} + \mathrm{c}^{\pm 2}\ \mathrm{I}(d) + \mathrm{c}^{\pm 2}\ \mathrm{U}(d) = 313.7148535\ (\mathrm{MeV/c}^2)$

Needless to say that some fantastic assumptions introduced in SM, like the acrobatic “free masses” of quarks, the elusive creation of mass through an unexplained spin-spin interaction —however single nucleus do not loose dramatically its mass—, and the mysterious Higgs mechanism (which looks like a certain medieval ether) are, from the point of view of IT, naïve and clumsy assumptions which have become to be unnecessary and irrelevant, as we have discussed in other sites.

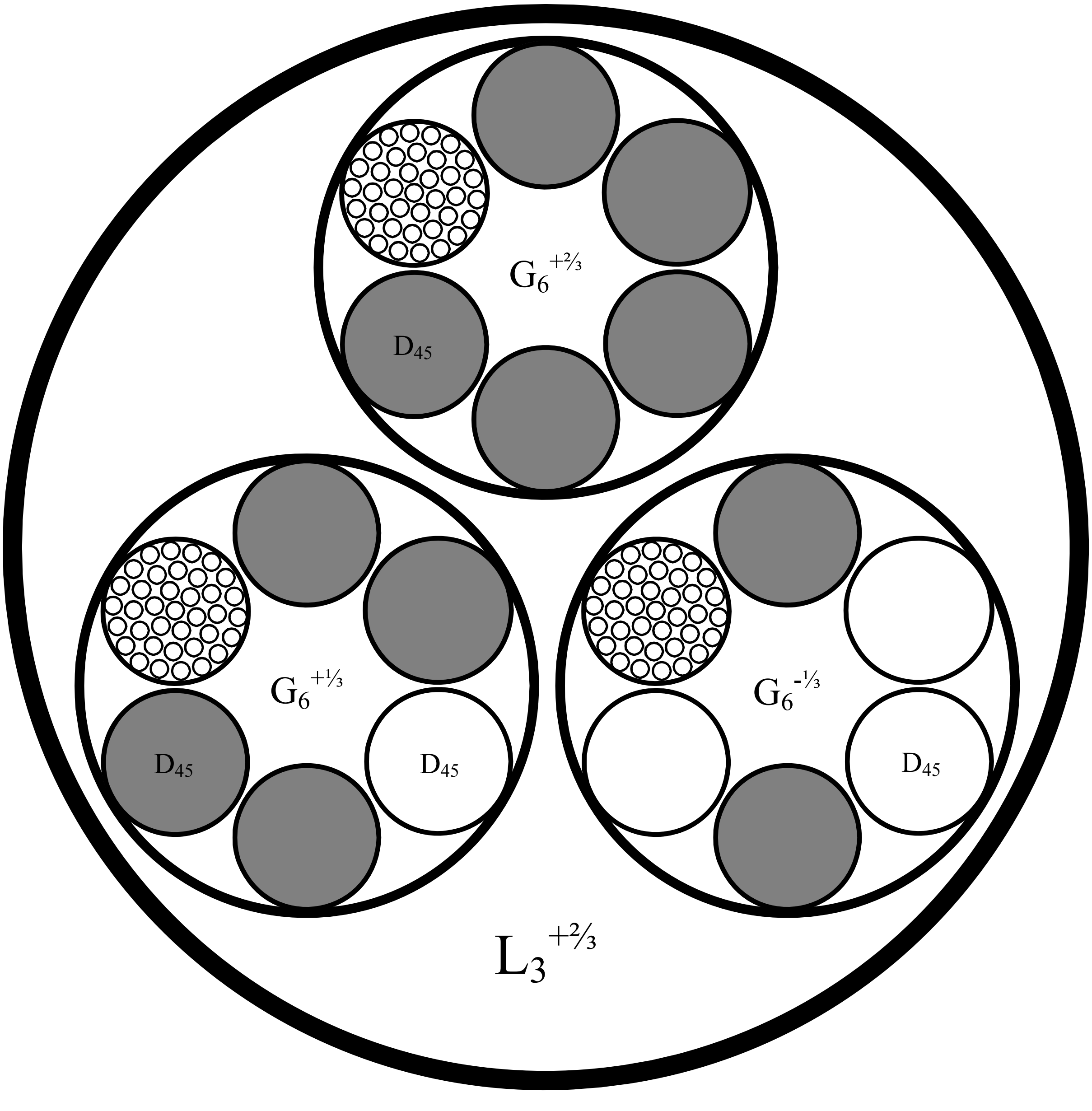
NUCLEONIC QUARKS INTERVALIC ENERGY

INTERVALIC ENERGY AT LISZTINIAN STRUCTURE LEVEL: L_3

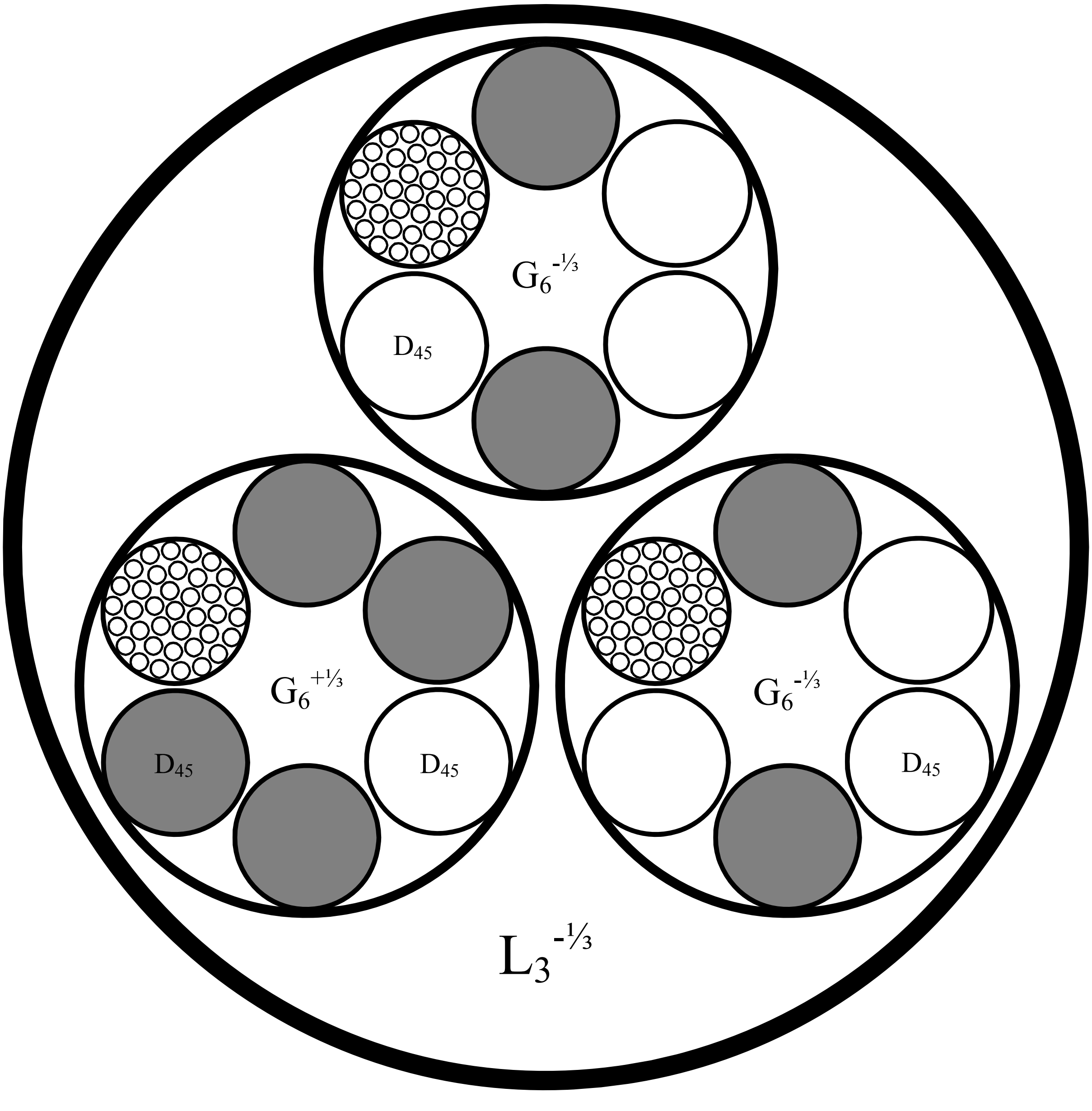
The intervalic energy of quarks at the last structure level is simply the intervalic energy of its overall charge. According to the intervalic principle of equivalence between electric charge and energy, $\mathrm{I} = \mathrm{c}^{\pm 2}\,\hbar\ \mathrm{Q}^{-2}$, the intervalic energy of nucleonic quarks at this level is:

$\mathrm{I}(u)_{\mathrm{L}} = \mathrm{c}^{\pm 2}\,\hbar\ (180\ \mathbf{q_I})^{-2} = \mathrm{c}^{-1}\ 180^{-2} = 1.0295188 \cdot 10^{-13}\ (\mathrm{J}) =$
$= 0.64257482\ (\mathrm{MeV/c}^2)$

$\mathrm{I}(d)_{\mathrm{L}} = \mathrm{c}^{\pm 2}\,\hbar\ (90\ \mathbf{q_I})^{-2} = \mathrm{c}^{-1}\ 90^{-2} = 4.1180752 \cdot 10^{-13}\ (\mathrm{J}) =$
$= 2.5702993\ (\mathrm{MeV/c}^2)$



Figured intervalic structure of *nucleonic isoquark +⅔ (up)*:
$L_3^{+\frac{2}{3}} = 3\ G_6\ (G_6^{+\frac{2}{3}}, G_6^{-\frac{1}{3}}, G_6^{+\frac{1}{3}}) = 18\ D_{45}\ (11\ D_{+45}, 7\ D_{-45}) = 810\ \mathbf{I}$



Figured intervalic structure of *nucleonic isoquark -⅓ (down)*:
$L_3^{+2/3}$ = 3 G_6 ($G_6^{-1/3}$, $G_6^{+1/3}$, $G_6^{-1/3}$) = 18 D_{45} (8 D_{+45}, 10 D_{-45}) = 810 **I**

INTERVALIC ENERGY AT GAUDINAR STRUCTURE LEVEL: 3 G_6

Each quark —lisztino 3— is composed by three fractional charged gaudinos 6, each of them has its proper intervalic energy according to its overall electric charge. The electric charge of gaudinos 6 can take in general the values: 0, ±90$\mathbf{q_I}$, ±180$\mathbf{q_I}$ and ±270$\mathbf{q_I}$. Its corresponding gaudinar intervalic energy will be respectively:

$$I(G_6^{0}) = 0$$
$$I(G_6^{\pm⅓}) = c^{\pm2}\, ħ\, (⅓\, e)^{-2} = 90^{-2}\, c^{-1} = 2.5702993\ (\mathrm{MeV/c^2})$$
$$I(G_6^{\pm⅔}) = c^{\pm2}\, ħ\, (⅔\, e)^{-2} = 180^{-2}\, c^{-1} = 0.64257482\ (\mathrm{MeV/c^2})$$
$$I(G_6^{\pm1}) = c^{\pm2}\, ħ\, e^{-2} = 270^{-2}\, c^{-1} = 0.28558881\ (\mathrm{MeV/c^2})$$

The total intervalic energy of the quark at the gaudinar structure level is the sum of the intervalic energy of each one of its three constituent gaudinos.

$$I(u)_G = I(G_6^{+⅔}) + 2\, I(G_6^{\pm⅓}) = 5.78317342\ (\mathrm{MeV/c^2})$$
$$I(d)_G = I(G_6^{-⅓}) + 2\, I(G_6^{\pm⅓}) = 7.71089790\ (\mathrm{MeV/c^2})$$

INTERVALIC ENERGY AT DALINAR STRUCTURE LEVEL: 18 D_{45}

Each gaudino 6 is composed by six dalinos 45. The intervalic energy of one dalino 45 is:

$$I(D_{45}) = c^{\pm2}\, ħ\, (45\, \mathbf{q_I})^{-2} = c^{\pm2}\, ħ\, [45\, \sqrt{}\text{-}(c^{-1}h)]^{-2} = 45^{-2}\, c^{-1} =$$
$$= 1.64723010 \cdot 10^{-12}\, (\mathrm{J}) = 10.28119715\ (\mathrm{MeV/c^2})$$

Therefore the dalinar intervalic energy of the gaudino 6 is:

$$I(G_6)_D = 6 \cdot I(D_{45}) = 9.8833806 \cdot 10^{-12}\, (\mathrm{J}) = 61.687184\ (\mathrm{MeV/c^2})$$

And the dalinar intervalic energy of the lisztino 3 —quark— is:

$$I(L_3)_D = 3 \cdot I(G_6) = 2.9650142 \cdot 10^{-11}\, (\mathrm{J}) = 185.06155\ (\mathrm{MeV/c^2})$$

Or in other words: $I(L_3)_{D45} = 18 \cdot I(D_{45})$.

NUCLEONIC QUARKS TOTAL INTERVALIC ENERGY

The total intervalic energy of nucleonic quarks is the sum of the intervalic energy at all levels of its intervalic structure:

$$I(u)_t = I(L_3^{+⅔}) + I(G_6^{+⅔}) + 2I(G_6^{\pm⅓}) + 18I(D_{45}) = 191.4872982\ (\mathrm{MeV/c^2})$$
$$I(d)_t = I(L_3^{-⅓}) + I(G_6^{-⅓}) + 2I(G_6^{\pm⅓}) + 18I(D_{45}) = 195.3427472\ (\mathrm{MeV/c^2})$$

NUCLEONIC QUARKS ELECTROMAGNETIC ENERGY

NUCLEONIC QUARKS MATERIAL ENERGY

From the nucleonic quark mass we can deduce the *material* energy of quarks —of electromagnetic origin—, which is *by definition* the difference between the total and the intervalic energies:

$$U(u)_t = c^{\pm2}m(u) - I(u)_t = 1.93300503 \cdot 10^{-11}\ (\mathrm{J}) = 120.6486320\ (\mathrm{MeV/c^2})$$
$$U(d)_t = c^{\pm2}m(d) - I(d)_t = 1.89653105 \cdot 10^{-11}\ (\mathrm{J}) = 118.3721063\ (\mathrm{MeV/c^2})$$

Now we have got the total intervalic / electromagnetic energy ratios of nucleonic quarks:

$I(u)/U(u) = 1.587148524$
$I(u)/E(u)_t = 0.613474065$
$U(u)/E(u)_t = 0.386525934$

$I(d)/U(d) = 1.650243062$
$I(d)/E(d)_t = 0.622676118$
$U(d)/E(d)_t = 0.377323881$

ELECTROMAGNETIC ENERGY AT LISZTINIAN STRUCTURE LEVEL: L_3

Using the already known magnitude in IT of the intervalic nucleonic quark radius $r_q = 6.88054386 \cdot 10^{-16}$ (m), the electromagnetic energy in the last structure level of nucleonic quarks is:

$$U(u)_L = U(L_3^{+⅔}) = ½\,(1/4\pi\varepsilon_0)\,(180\,\mathbf{q_I})^2/\,r_q = 7.451218056 \cdot 10^{-14}\ (\mathrm{J}) =$$
$$= 0.465068249\ (\mathrm{MeV/c^2})$$

$U(d)_L = U(L_3^{-⅓}) = ½ (1/4\pi\varepsilon_0) (90\ \mathbf{q_I})^2 / r_q = 1.862804514 \cdot 10^{-14}$ (J) =
= 0.116267062 (MeV/c^2)

DISTANCE BETWEEN GAUDINOS 6

The electromagnetic energy at the gaudinar level is the sum of the energies of the three constituent gaudinos 6:

$U(u)_G = U(G_6^{+⅔}) + 2\ U(G_6^{\pm⅓})$
$U(d)_G = U(G_6^{-⅓}) + 2\ U(G_6^{\pm⅓})$

In a traditional view we can suppose that the difference in the material mass of quarks is due to the electromagnetic interaction between constituent gaudinos 6 at gaudinar level. To make this calculus we have to eliminate the other involved energy levels: the lisztinian and the dalinar electromagnetic contributions to mass:

$U(u)_G = U(u)_t - U(u)_L - U(u)_D = 120.1835638 - U(u)_D$
$U(d)_G = U(d)_t - U(d)_L - U(d)_D = 118.2558392 - U(d)_D$

Combining the preceding expressions we have:

$U(u)_G - U(d)_G = 1.927724562\ (MeV/c^2) = 3.088556592 \cdot 10^{-13}$ (J) =
$= E_q(G_6^{+⅔}G_6^{+⅓}G_6^{-⅓}) - E_q(G_6^{-⅓}G_6^{+⅓}G_6^{-⅓}) = \{[(⅔ \cdot ⅓) + (⅔ \cdot ⅓) + (⅓)^2] -$
$- [(⅓)^2 + (⅓)^2 + (⅓)^2]\}\ (1/4\pi\varepsilon_0)\ e^2 / d_{G6} = (2/9)\ (1/4\pi\varepsilon_0)\ e^2 / d_{G6}$

From here we can deduce the distance between gaudinos 6 inside quark:

$d_{G6} = 1.659948039 \cdot 10^{-16}$ (m)

QUARKIC GAUDINO 6 RADIUS

Immediately we can deduce a magnitude of the quarkic gaudino 6 radius suited for the calculation of the electromagnetic energy:

$r_{G6} = d_{G6} / 2 = 8.299740193 \cdot 10^{-17}$ (m)

ELECTROMAGNETIC ENERGY AT GAUDINAR STRUCTURE LEVEL: 3 G_6

Henceforth, the electromagnetic energy of quarkic gaudinos 6 is:

$U(G_6^{⅔}) = ½\ (1/4\pi\varepsilon_0)\ (180\ \mathbf{q_I})^2 / r_{G6} = 6.177112952 \cdot 10^{-13}$ (J) =
= 3.85544898 (MeV/c^2)

$U(G_6^{⅓}) = ½\ (1/4\pi\varepsilon_0)\ (90\ \mathbf{q_I})^2 / r_{G6} = 1.544278238 \cdot 10^{-13}$ (J) =
= 0.963862244 (MeV/c^2)

And the total electromagnetic energy of quarks at gaudinar level is:

$U(u)_G = U(G_6^{⅔}) + 2\ U(G_6^{⅓}) = 5.783173468$ (MeV/c^2)
$U(d)_G = 3\ U(G_6^{⅓}) = 2.891586735$ (MeV/c^2)

ELECTROMAGNETIC ENERGY AT DALINAR STRUCTURE LEVEL: 18 D_{45}

Since we know the electromagnetic energy at all the preceding energy levels of the intervalic structure we have immediately:

$U(u)_D = U(u)_t - U(u)_L - U(u)_G = 114.4003903$ (MeV/c^2)
$U(d)_D = U(d)_t - U(d)_L - U(d)_G = 115.3642525$ (MeV/c^2)

Therefore the electromagnetic energy of the constituent gaudinos 6 at the dalinar level is:

$U(G_6^{\pm⅓})_D = ⅓\ U(d)_D = 38.45475083$ (MeV/c^2)
$U(G_6^{\pm⅔})_D = U(u)_D - 2\ U(G_6^{\pm⅓})_D = 37.49088864$ (MeV/c^2)

And the electromagnetic energy of each one of the six constituent dalinos 45 at the dalinar level of the intervalic structure is:

$U_{G6\pm⅓}(D_{45}) = (1/6)\ U(G_6^{\pm⅓})_D = 6.409125138$ (MeV/c^2)
$U_{G6\pm⅔}(D_{45}) = (1/6)\ U(G_6^{\pm⅔})_D = 6.24848144$ (MeV/c^2)

QUARKIC DALINO 45 RADIUS

Since the value of the electromagnetic energy of the quarkic dalino 45 is known, we can calculate the magnitude of the *quarkic dalino 45 radius*, r_{D45}:

$U_{G6\pm\frac{2}{3}}(D_{45}) = \frac{1}{2}\, (1/4\pi\varepsilon_0)\, (45\ \mathbf{q_I})^2 / r_{G6\pm\frac{2}{3}}(D_{45}) = 1.001117531 \cdot 10^{-12}$ (J)
$r_{G6\pm\frac{2}{3}}(D_{45}) = 3.200696811 \cdot 10^{-18}$ (m)

$U_{G6\pm\frac{1}{3}}(D_{45}) = \frac{1}{2}\, (1/4\pi\varepsilon_0)\, (45\ \mathbf{q_I})^2 / r_{G6\pm\frac{1}{3}}(D_{45}) = 1.02685550 \cdot 10^{-12}$ (J)
$r_{G6\pm\frac{1}{3}}(D_{45}) = 3.12047512 \cdot 10^{-18}$ (m)

These magnitudes are slightly greater than the muonic dalino 45 radius, $r_{D45}(\mu) = 2.746832954 \cdot 10^{-18}$ (m), as expected.

Due to the hexagonal symmetry of gaudino 6, the distance among dalinos 45 will be approximately:

$d_{G6\pm\frac{1}{3}}(D_{45}) \approx 15\, (1/4\pi\varepsilon_0)\, (45\ \mathbf{q_I})^2 / U(G_6^{\pm\frac{1}{3}})_D = 1.560235928 \cdot 10^{-17}$ (m)
$d_{G6\pm\frac{2}{3}}(D_{45}) \approx 15\, (1/4\pi\varepsilon_0)\, (45\ \mathbf{q_I})^2 / U(G_6^{\pm\frac{2}{3}})_D = 1.600348405 \cdot 10^{-17}$ (m)

This magnitude are likewise slightly greater than the distance among muonic dalinos 45, $d_{D45}(\mu) = 1.373416477 \cdot 10^{-17}$ (m), as expected.

NUCLEONIC QUARKS ENERGY RATIOS

Now we can write the energy ratios of nucleonic quarks at every level of the intervalic structure with such astonishing precision which can never be imagined by SM at its best.

The data of the constituent dalinos 45 are:

$I(D_{45}) = 1.6472301 \cdot 10^{-12}$ (J) $= 10.28119715$ (MeV/c^2)
$U_{G6\pm\frac{1}{3}}(D_{45}) = (1/6)\ U(G_6^{\pm\frac{1}{3}})_D = 6.409125138$ (MeV/c^2)
$U_{G6\pm\frac{2}{3}}(D_{45}) = (1/6)\ U(G_6^{\pm\frac{2}{3}})_D = 6.24848144$ (MeV/c^2)
$m_{G6\pm\frac{1}{3}}(D_{45}) = 2.67408560 \cdot 10^{-12}$ (J) $= 16.69032229$ (MeV/c^2)
$m_{G6\pm\frac{2}{3}}(D_{45}) = 2.648347631 \cdot 10^{-12}$ (J) $= 16.52967859$ (MeV/c^2)

And their corresponding energy ratios:

$I(D_{45})/U_{G6\pm\frac{2}{3}}(D_{45}) = 1.645381324$
$I(D_{45})/E_{G6\pm\frac{2}{3}}(D_{45})_{tot} = 0.621984093$
$U_{G6\pm\frac{2}{3}}(D_{45})/E_{G6\pm\frac{2}{3}}(D_{45})_{tot} = 0.378015906$

$I(D_{45})/U_{G6\pm\frac{1}{3}}(D_{45}) = 1.604149853$
$I(D_{45})/E_{G6\pm\frac{1}{3}}(D_{45})_{tot} = 0.61599752$
$U_{G6\pm\frac{1}{3}}(D_{45})/E_{G6\pm\frac{1}{3}}(D_{45})_{tot} = 0.384002479$

The data of the constituent gaudinos 6 are:

$I(G_6^{\pm\frac{1}{3}})_{tot} = 1.029518813 \cdot 10^{-11}$ (J) = 64.2574822 (MeV/c^2)
$I(G_6^{\pm\frac{2}{3}})_{tot} = 9.98633248 \cdot 10^{-12}$ (J) = 62.32975772 (MeV/c^2)
$U(G_6^{\pm\frac{1}{3}})_{tot} = 6.624416481 \cdot 10^{-12}$ (J) = 41.34633762 (MeV/c^2)

$U(G_6^{\pm\frac{2}{3}})_{tot} = 6.315560825 \cdot 10^{-12}$ (J) = 39.41861307 (MeV/c^2)
$m(G_6^{\pm\frac{1}{3}}) = 1.69196046 \cdot 10^{-11}$ (J) = 105.6038198 (MeV/c^2)
$m(G_6^{\pm\frac{2}{3}}) = 1.63018933 \cdot 10^{-11}$ (J) = 101.7483708 (MeV/c^2)

And their corresponding energy ratios:

$I(G_6^{\pm\frac{1}{3}})/U(G_6^{\pm\frac{1}{3}}) = 1.554127545$
$I(G_6^{\pm\frac{1}{3}})/E(G_6^{\pm\frac{1}{3}})_{tot} = 0.608476874$
$U(G_6^{\pm\frac{1}{3}})/E(G_6^{\pm\frac{1}{3}})_{tot} = 0.391523125$

$I(G_6^{\pm\frac{2}{3}})/U(G_6^{\pm\frac{2}{3}}) = 1.581226554$
$I(G_6^{\pm\frac{2}{3}})/E(G_6^{\pm\frac{2}{3}})_{tot} = 0.61258728$
$U(G_6^{\pm\frac{2}{3}})/E(G_6^{\pm\frac{2}{3}})_{tot} = 0.387412719$

The data of the constituent lisztinos 3 are:

$I(L_3^{+\frac{2}{3}})_{tot} \equiv I(u)_{tot} = 3.067966082 \cdot 10^{-11}$ (J) = 191.4872982 (MeV/c^2)
$I(L_3^{-\frac{1}{3}})_{tot} \equiv I(d)_{tot} = 3.129737211 \cdot 10^{-11}$ (J) = 195.3427472 (MeV/c^2)
$U(L_3^{+\frac{2}{3}})_{tot} \equiv U(u)_{tot} = 1.93300503 \cdot 10^{-11}$ (J) = 120.6486320 (MeV/c^2)
$U(L_3^{-\frac{1}{3}})_{tot} \equiv U(d)_{tot} = 1.89653105 \cdot 10^{-11}$ (J) = 118.3721063 (MeV/c^2)
$m(L_3^{+\frac{2}{3}}) \equiv m(u) = 5.000971112 \cdot 10^{-11}$ (J) = 312.1359302 (MeV/c^2)
$m(L_3^{-\frac{1}{3}}) \equiv m(d) = 5.026268264 \cdot 10^{-11}$ (J) = 313.7148535 (MeV/c^2)

And their corresponding energy ratios:

$I(u)/U(u) = 1.587148524$
$I(u)/E(u)_{tot} = 0.613474065$

$U(u)/E(u)_{tot} = 0.386525934$

$I(d)/U(d) = 1.650243062$
$I(d)/E(d)_{tot} = 0.622676118$
$U(d)/E(d)_{tot} = 0.377323881$

The average ratios between both quarks is:

$\langle I(d)/U(d)\rangle = 1.618695793 \sim \Phi$
$\langle I(d)/E(d)_{tot}\rangle = 0.618075091 \sim \Phi^{-1}$
$\langle U(d)/E(d)_{tot}\rangle = 0.381924907 \sim 1\text{-}\Phi^{-1}$

The deviation of these ratios from the golden mean, $\Phi = 1.61803398875$, is:

$\Delta[\langle I(d)/U(d)\rangle] = +0.0409018\%$
$\Delta[\langle I(d)/E(d)_{tot}\rangle] = +0.0066505\%$
$\Delta[\langle U(d)/E(d)_{tot}\rangle] = -0.0107624\%$

As we will see when describing the intervalic nucleon, there is a simple and elegant relation between the intervalic and electromagnetic energies of nucleons at the lisztinian —quarks— level:

$I(n)_L / I(p)_L = 1.500000000$
$U(p)_L / U(n)_L = 1.500000000$

Chapter 17

INTERVALIC NUCLEON

INTERVALIC NUCLEON

INTERVALIC, MATERIAL, ELECTROMAGNETIC, AND MASS ENERGIES

The total mass of a particle at rest is the sum of its constituent structural energies which are due: first, to electric charge, which is named *intervalic* energy, $I = c^{\pm 2} \hbar Q^{-2}$; and second, the remaining energy, which is named *material* energy, which, and usually has an *electromagnetic* origin. Thus, we have in the following equation two of the three intervalic principles of equivalence —between electric charge, energy and matter— already described in other site:

$$E = c^{\pm 2} \hbar Q^{-2} + c^{\pm 2} m$$

In not-singular units —that is to say, units with $c \neq 1$ (although the inconsistent and trivial "geometrized units" are naively singular, they are clearly geometryless and do not have any intervalic symmetry)— the equation *looses* a half of its dimensional symmetries and have to be written as:

$$E = c^{-2} \hbar Q^{-2} + c^{2} m$$

Therefore, the constituent masses of a subatomic particle can be separated according to its different origin. Mass due to the electric charge is named *intervalic* mass, m_{in} (this is the formerly named "intrinsic" mass, a term that described its unknown origin); and the remaining mass is named *material* mass, m_{mat} —and *electromagnetic* mass, m_{em}, if it comes from electromagnetic sources—.

As I have explained in other site, the electromagnetic energy —as all the four supposed "forces" of Nature— is derived from the intervalic energy, being just its *inverse* in intervalic units: $U \equiv I^{-1} = c^{\pm 2} (n\hbar)^{-1} Q^{2} = c^{\pm 2} Q^{2} / r$. In SI units it has to be added to the equation the permeability of vacuum factor, which was conventionally set by definition as $\mu_0/4\pi = 10^{-7} (-1)$, instead of 1 (-1) as in intervalic units. Thus, the total energy manifested as mass, that is to say, the *mass energy* of subatomic particles is due to a sum between two inverse factors, a relation of paramount elegance:

$$E_{mass} = I + I^{-1} = c^{\pm 2} \hbar\, Q^{-2} + c^{\pm 2} (n\hbar)^{-1} Q^{2}$$

NUCLEON INTERVALIC STRUCTURE

The difference between nucleons masses —treated here, as well as the supposed binding energy of nucleons in the nucleus—, is principally due to the involved structural energies in the last monteverdic level of the intervalic structure.

According to Intervalic Theory in Particle Physics nucleons are composed by an assembly of three lisztinos or quarks $L3D45^{(1/3,\, 2/3)}$. Its full intervalic structure, showing its compositeness and structurefulness, is:

$$M_3 = 3\ L_3 = 9\ G_6 = 54\ D_{45} = 2430\ \mathbf{I}$$

Although this paper is not devoted to the complex intervalic structure of nucleons, which have been explained by separate and with detail in other sites, it means that nucleon is a *monteverdino* 3 composed by the intervalic aggregation of three *lisztinos* 3, each one of them is composed by three *gaudinos* 6, each one of them is formed by six *dalinos* 45, and each of them is composed by forty five *intervalinos*, making a total of 2430 intervalinos. These terms have been taken in honour of the great artists Claudio Monteverdi (1567-1643), Franz Liszt (1811-1886), Antonio Gaudí (1852-1926) and Salvador Dalí (1904-1989) respectively. All these particles are the unavoidable result of the primordial aggregation of intervalinos which made the Big Bang through *intervalic interaction* and according to the *intervalic symmetries* of the electric charge and the fundamental *intervalic principle of energy* *balance for subatomic particles*, which establish the perfect balance reached by the involved energies in all subatomic particles, which are named *structural energies*. Being E(*J*) the spin energy:

$$\mathrm{I} - \mathrm{I}^{-1} - \mathrm{E}(J) = 0$$

The first ones, intervalic energy and its inverse the electromagnetic energies, are manifested as *mass*, while the last structural energy is not manifested as mass but as *spin*.

NUCLEON INTERVALIC ENERGY

The magnitudes of the intervalic energy of nucleon at every step of its intervalic structure can be known with remarkable accuracy and with all desired precision. This full knowledge, which is a great achievement of IT, is due mainly to the fact that the intervalic interaction is a short ranged one which does not varies progressively according to the distance of the involved particles, as long ranged interactions do, but only relies on spin and its derived physical quantity: the electric charge. The physical features of the intervalic interaction are completely determined by the intervalic structure and vice versa. They are very different from the electromagnetic features, and will be seen in the suitable chapter later.

INTERVALIC ENERGY AT MONTEVERDIC STRUCTURE LEVEL: M_3

At the last level of its intervalic structure the monteverdic intervalic energy of nucleons is simply the energy of its total overall electric charge. Thus, for proton it is the intervalic energy of the elementary charge, and for neutron is zero:

$$\mathrm{I}(\mathrm{M}_3{}^{+}) = \mathrm{I}(p)_{\mathrm{M3}} = \mathrm{c}^{\pm 2}\,\hbar\, e^{-2} = \mathrm{c}^{\pm 2}\,\hbar\,(270\ \mathbf{q}_{\mathbf{I}})^{-2} = \mathrm{c}^{\pm 2}\,\hbar\,[270\ \sqrt{}\text{-}(\mathrm{c}^{-1}\mathrm{h})]^{-2} =$$
$$= 270^{-2}\,\mathrm{c}^{-1} = 4.57563917 \cdot 10^{-14}\,(\mathrm{J}) = 0.28558881\ (\mathrm{MeV/c}^{2})$$

$$\mathrm{I}(\mathrm{M}_3{}^{0}) = \mathrm{I}(n)_{\mathrm{M3}} = 0$$

INTERVALIC ENERGY AT LISZTINIAN STRUCTURE LEVEL: 3 L3

The next level of the intervalic structure of nucleons is the lisztinian one where we find three lisztinos, namely, quarks. Since the electric charge of nucleons is composed by the electric charges of its constituent quarks, the proton and neutron intervalic energies are different between them.

According to the intervalic principle of equivalence between electric charge and energy, $I = c^{\pm 2} \hbar Q^{-2}$, the lisztinian intervalic energy of quarks *up* and *down,* $I(u)$ and $I(d)$, are respectively 9/4 and 9 times the energy of the elementary charge:

$$I(L_3^{+2/3}) = I(u)_{L3} = c^{\pm 2} \hbar (2/3\, e)^{-2} = (9/4)\, I(e) = c^{\pm 2} \hbar\, (180\, \mathbf{q_I})^{-2} =$$
$$= c^{-1}\, 180^{-2} = 1.0295188 \cdot 10^{-13}\ (\text{J}) = 0.64257483\ (\text{MeV/c}^2)$$

$$I(L_3^{-1/3}) = I(d)_{L3} = c^{\pm 2} \hbar (1/3\, e)^{-2} = 9\, I(e) = c^{\pm 2} \hbar\, (90\, \mathbf{q_I})^{-2} =$$
$$= c^{-1}\, 90^{-2} = 4.1180752 \cdot 10^{-13}\ (\text{J}) = 2.5702993\ (\text{MeV/c}^2)$$

When joining three quarks in a proton (as in primordial times), there is liberated a considerable amount of intervalic energy in different processes by means of the aggregation of subatomic intervalic electric charges, up to reaching the value of the elementary charge —the state of minimal intervalic energy—. The lisztinian intervalic energy of the three quarks in the proton is 54/4 times the energy of the elementary charge:

$$I(p)_{L3} = I(u{+}u{+}d)_{L3} = ((9/4) + (9/4) + 9)\, c^{-2} \hbar\, e^{-2} =$$
$$= (27/2)\, 270^{-2} c^{-1} = 6.1771128 \cdot 10^{-13}\ (\text{J}) = 3.8554490\ (\text{MeV/c}^2)$$

In a similar way, we have that the lisztinian intervalic energy of the three quarks that conform the neutron is 81/4 times greater:

$$I(n)_{L3} = I(u{+}d{+}d)_{L3} = ((9/4) + 9 + 9)\, c^{-2} \hbar\, e^{-2} =$$
$$= (81/4)\, 270^{-2} c^{-1} = 9.2656692 \cdot 10^{-13}\ (\text{J}) = 5.7831734\ (\text{MeV/c}^2)$$

At the lisztinian level of intervalic structure, the proton/electron, neutron/electron and neutron/proton intervalic energy ratios are:

$I(p) / I(e) = 27/2 = 13.500000$
$I(n) / I(e) = 81/4 = 20.250000$
$I(p) / I(n) = (27/2)/(81/4) = 0.66666667$
$I(n) / I(p) = (81/4)/(27/2) = 1.50000000$

INTERVALIC ENERGY AT GAUDINAR STRUCTURE LEVEL: 9 G_6

Each quark —lisztino 3— is composed by three gaudinos 6, each of them has its proper intervalic energy according to its overall electric charge. Due to powerful intervalic symmetries constraints explained in other site the electric charge of gaudinos 6 can only take the values: 0, ±90$\mathbf{q_I}$, ±180$\mathbf{q_I}$ and ±270$\mathbf{q_I}$. Therefore its corresponding gaudinar intervalic energy will be respectively:

$I(G_6^{0}) = 0$

$I(G_6^{\pm 1/3}) = c^{\pm 2}\, \hbar\, (1/3\, e)^{-2} = 90^{-2}\, c^{-1} = 2.570299287\ (MeV/c^2)$

$I(G_6^{\pm 2/3}) = c^{\pm 2}\, \hbar\, (2/3\, e)^{-2} = 180^{-2}\, c^{-1} = 0.642574821\ (MeV/c^2)$

$I(G_6^{\pm 1}) = c^{\pm 2}\, \hbar\, e^{-2} = 270^{-2}\, c^{-1} = 0.285588809\ (MeV/c^2)$

The total intervalic energy of the nucleon at the gaudinar structure level is the sum of the intervalic energy of each one of its nine constituent gaudinos. Since we postulated that the gaudinar structure of nucleonic quarks is:

$u^{+2/3} \rightarrow L_3 = G_6^{+2/3} + G_6^{-1/3} + G_6^{+1/3}$

$d^{-1/3} \rightarrow L_3 = G_6^{+1/3} + G_6^{-1/3} + G_6^{-1/3}$

The intervalic energy of quarks at the gaudinar structure level will be:

$I(u)_G = I(G_6^{\pm 2/3}) + 2\, I(G_6^{\pm 1/3}) = 5.783173396\ (MeV/c^2)$

$I(d)_G = 3\, I(G_6^{\pm 1/3}) = 7.710897861\ (MeV/c^2)$

And the intervalic energy of nucleons at this level will be:

$I(p)_G = I\, [2(G_6^{\pm 2/3})+7(G_6^{\pm 1/3})]_G = 19.27724465\ (MeV/c^2)$

$I(n)_G = I\, [(G_6^{\pm 2/3})+8(G_6^{\pm 1/3})]_G = 21.20496912\ (MeV/c^2)$

INTERVALIC ENERGY AT DALINAR STRUCTURE LEVEL: 54 D_{45}

Each G_6 is composed by six D_{45}. The intervalic energy of one D_{45} is:

$$I(D_{45}) = c^{\pm 2}\, \hbar\, (45\, \mathbf{q_I})^{-2} = c^{\pm 2}\, \hbar\, [45\, \sqrt{}\text{-}(c^{-1}h)]^{-2} = 45^{-2}\, c^{-1} =$$
$$= 1.6472301 \cdot 10^{-12}\, (J) = 10.281197\ (MeV/c^2)$$

Therefore the dalinar intervalic energy of the gaudino 6 is:

$$I(G_6)_D = 6 \cdot I(D_{45}) = 9.8833806 \cdot 10^{-12}\,(J) = 61.687184\ (MeV/c^2)$$

And the dalinar intervalic energy of the lisztino 3 —quark— is:

$$I(L_3)_D = 3 \cdot I(G_6) = 2.9650142 \cdot 10^{-11}\,(J) = 185.06155\ (MeV/c^2)$$

And finally the total dalinar intervalic energy of the nucleon is:

$$I(M_3)_D = 3 \cdot I(G_6) = 8.8950426 \cdot 10^{-11}\,(J) = 555.184650\ (MeV/c^2)$$

Or in other words: $I(M_3)_D = 54 \cdot I(D_{45})$.

NUCLEON TOTAL INTERVALIC ENERGY

The total intervalic energy of nucleons is simply the sum of its constituent intervalic energies at all levels of its intervalic structure:

$$I(p)_{tot} = I(M_3^{+}) + 2\ I(L_3^{+2/3}) + I(L_3^{-1/3}) + 2\ I(u)_G + I(d)_G + 54\ I(D_{45}) =$$
$$= 9.270245023 \cdot 10^{-11}\,(J) = 578.602933\ (MeV/c^2)$$

$$I(n)_{tot} = I(M_3^{0}) + I(L_3^{+2/3}) + 2\ I(L_3^{-1/3}) + I(u)_G + 2\ I(d)_G + 54\ I(D_{45}) =$$
$$= 9.327440495 \cdot 10^{-11}\,(J) = 582.172792\ (MeV/c^2)$$

NUCLEON ELECTROMAGNETIC ENERGY

Contrarily to the short ranged intervalic energy, the electromagnetic energy relies on the distance of the involved particles, or on its radius if it is expressed as potential energy. This means that the electromagnetic mass of an intervalic structure may be different when existing in *isolated state* as when forming part of a further intervalic structure, that is to say, in a *binding state*. The difference of mass between both states is named *binding energy,* although sometimes this might be a misleading concept as we will see when describing the intervalic nuclei. All magnitudes of the electromagnetic energy of nucleon in this chapter are the masses of the intervalic structures as ‘binding states’ inside nucleon, as we only have got direct experimental data on nucleon mass as a whole. Although it seems to be absolutely impossible to know even approximately the electromagnetic mass of the intervalic structures of nucleon as 'isolated states' —which would lead us to the knowledge of their corresponding binding energies—, we will see opportunely how the magic of IT inclusive reaches that unexpected achievement.

NUCLEON TOTAL ELECTROMAGNETIC ENERGY

Since we already know the magnitude of the total intervalic energy of nucleon, we can deduce immediately its total electromagnetic energy:

$$U(p)_t = c^{\pm 2}m(p) - I(p)_t = 5.762528048 \cdot 10^{-11} \text{ (J)} = 359.6685548 \text{ (MeV/c}^2\text{)}$$

$$U(n)_t = c^{\pm 2}m(n) - I(n)_t = 5.726054096 \cdot 10^{-11} \text{ (J)} = 357.3920307 \text{ (MeV/c}^2\text{)}$$

Then, the ratios between the intervalic, electromagnetic and total mass energies of nucleon will be:

$I(p)/U(p) = 1.60871148$
$I(p)/E(p)_{mass} = 0.616668452$
$U(p)/E(p)_{mass} = 0.383330671$

$I(n)/U(n) = 1.628947324$
$I(n)/E(n)_{mass} = 0.61961908$
$U(n)/E(n)_{mass} = 0.38038006$

NUCLEON MATERIAL ENERGY

According to the definition of *material* energy of a particle as the difference between its *mass* energy and its *intervalic* energy, it can be easily calculated the nucleons material energy. Of course, this definition of material energy does not affirm anything about its origin. In the present case, since nucleons have a complex intervalic structure with several levels, the concept of material energy in nucleons have to be carefully handled because it is only valid at its own level of structure. It can not be used to deduce nothing about the magnitudes and physical quantities involved in deeper levels of structure. Taking into consideration these precisions, it can be however useful. For example, we may wish to calculate the electromagnetic energy and other physical features of nucleon at the last structure levels as if we did not know its intervalic structure at the gaudinar level and inwards. Really, we are going to do it right now. In that case, we begin calculating the material energy up to the gaudinar level inclusive. It will be, supposed that our knowledge of the structure of nucleon finishes on the traditional model of quarks:

$$\sum^{9\cdot G6} E(p)_{\mathrm{mat}} = \mathrm{m}(p) - \mathrm{I}(\mathrm{M}_3^{+}) - \mathrm{I}(u{+}u{+}d) = 934.13131\ (\mathrm{MeV/c^2})$$
$$\sum^{9\cdot G6} E(n)_{\mathrm{mat}} = \mathrm{m}(n) - \mathrm{I}(\mathrm{M}_3^{0}) - \mathrm{I}(u{+}d{+}d) = 933.78251\ (\mathrm{MeV/c^2})$$

As it can be seen, the *material* mass of proton at this structure level is slightly *greater* than neutron's one.

DISTANCE BETWEEN QUARKS IN NUCLEONS

If it is supposed that the difference between proton and neutron masses is due to only to the constituent electric charges of quarks, as it is usually assumed, their *material* masses must be exactly the same after subtracting the different intervalic and electromagnetic energies among quarks in both nucleons. Besides, since *material* masses of proton and neutron has been deduced by means of the intervalic principles of equivalence, we can *define* that subatomic electromagnetic energy as the *difference* between nucleons material masses. Following that definition, we can calculate with full precision the electromagnetic interaction between quarks although the distance between quarks, d_q, was not known. Moreover, from this *difference of material energy* between nucleons, previously deduced by intervalic geometrical means, it can be deduced the *distance* between quarks inside nucleon, d_q:

$$\mathrm{m}(p)_{\mathrm{mat}} - \mathrm{m}(n)_{\mathrm{mat}} = 0.3488012\ (\mathrm{MeV/c^2}) = 5.58841375 \cdot 10^{-14}\ (\mathrm{J}) =$$
$$= \mathrm{E_q}(uud) - \mathrm{E_q}(udd) = \{[(⅔)^2 + (⅔ \cdot ⅓) + (⅔ \cdot ⅓)] -$$
$$- [(⅓)^2 + (⅔ \cdot ⅓) + (⅔ \cdot ⅓)]\}\ (1/4\pi\varepsilon_0)\ e^2 / d_q = ⅓\ (1/4\pi\varepsilon_0)\ e^2 / d_q$$

$$d_q = 1.37610877 \cdot 10^{-15}\ (\mathrm{m})$$

This is a meaningful result, as I have explained in other site, because it shows that there is a changeless —strong— intervalic interaction among *quarks* instead of *nucleons,* as usually supposed, since the distance reached by the π meson as intermediate state is: $c^{-1}\hbar / m_\pi = 1.4152474 \cdot 10^{-15}$ (m).

INTERVALIC NUCLEONIC QUARK RADIUS

Immediately, the intervalic nucleonic quark radius, r_q, is, if it is supposed that the three quarks are tangent among themselves in nucleon:

$r_q = d_q / 2 = 6.88054386 \cdot 10^{-16}$ (m)

We can use this value in order to express the electromagnetic mass energy of quarks inside nucleon as a potential energy.

ELECTROMAGNETIC ENERGY AT MONTEVERDIC STRUCTURE LEVEL: M$_3$

We are tempted to write for the proton:

$\mathrm{U}(\mathrm{M}_3^{+}) = \mathrm{U}(p)_\mathrm{M} = \frac{1}{2}\,(1/4\pi\varepsilon_0)\,(270\,\mathbf{q_I})^2 / r_N = 0.58535170\ (\mathrm{MeV/c^2})$

However this electromagnetic energy is just the energy of the electromagnetic *field*, and therefore it is not manifested as *mass* energy. On the contrary, the intervalic energy at this level is the “equivalent energy” of the total charge which is ever manifested as mass energy.

ELECTROMAGNETIC ENERGY AT LISZTINIAN STRUCTURE LEVEL: L$_3$

The electromagnetic energy of quarks at the lisztinian structure level is:

$\mathrm{U}(\mathrm{L}_3^{+2/3}) = \mathrm{U}(u)_\mathrm{L} = \frac{1}{2}\,(1/4\pi\varepsilon_0)\,(180\,\mathbf{q_I})^2 / r_q = 0.46506825\ (\mathrm{MeV/c^2})$

$\mathrm{U}(\mathrm{L}_3^{-1/3}) = \mathrm{U}(d)_\mathrm{L} = \frac{1}{2}\,(1/4\pi\varepsilon_0)\,(90\,\mathbf{q_I})^2 / r_q = 0.116267062\ (\mathrm{MeV/c^2})$

The electromagnetic energy of nucleon at this structure level is:

$\mathrm{U}(p)_\mathrm{L} = \mathrm{U}(u{+}u{+}d)_\mathrm{L} = (180^2{+}180^2{+}90^2)\ \frac{1}{2}\,(1/4\pi\varepsilon_0)\,\mathbf{q_I}^2 / r_q =$
$= 1.67652406 \cdot 10^{-13}\ (\mathrm{J}) = 1.04640356\ (\mathrm{MeV/c^2})$

$\mathrm{U}(n)_\mathrm{L} = \mathrm{U}(u{+}d{+}d)_\mathrm{L} = (180^2{+}90^2{+}90^2)\ \frac{1}{2}\,(1/4\pi\varepsilon_0)\,\mathbf{q_I}^2 / r_q =$
$= 1.11768271 \cdot 10^{-13}\ (\mathrm{J}) = 0.697602374\ (\mathrm{MeV/c^2})$

Remembering that the *electromagnetic* energy of electron is the difference between its *total* and *intervalic* energies: $U(e) = E(e)_{tot} - I(e) = 3.6114722 \cdot 10^{-14}$ (J) = 0.2254103 (MeV/c^2), the corresponding electromagnetic energy ratios at the lisztinian level of the intervalic structure are:

$U(p)_L / U(e) = 4.64221715$
$U(n)_L / U(e) = 3.09481144$
$U(p)_L / U(n)_L = 1.50000000$
$U(n)_L / U(p)_L = 0.66666667$

As can be seen, there is a very simple and elegant relation between the intervalic and electromagnetic energies of nucleons at this level:

$I(n)_L / I(p)_L = 1.50000000$
$U(p)_L / U(n)_L = 1.50000000$

For our purpose in this chapter we don't need to consider now the electromagnetic energy of nucleon at the complex gaudinar and dalinar structure levels, which have been described in their corresponding sites dedicated to these intervalic structures.

THE DIFFERENCE OF MASSES BETWEEN PROTON AND NEUTRON ACCORDING TO THE INTERVALIC THEORY

Experimentally, $m(n) - m(p) = 1.29332 \pm 0.00028$ (MeV/c^2).

If it is postulated a structural similitude between nucleons, this difference of mass must be due to the *difference between its involved intervalic and electromagnetic energies at the last structure level* —monteverdic level for nucleons and lisztinian level for quarks—. Applying the above results on the intervalic and electromagnetic energies of constituent quarks, we have (in MeV/c^2):

$$m(n) - m(p) = {}_{M3}\sum^{3 \cdot L3} [I(n) + U(n)] - [I(p) + U(p)] =$$
$$= [(I(M_3^0)+I(u)+2I(d)) + (U(M_3^0)+U(u)+2U(d))] -$$
$$- [(I(M_3^+)+2I(u)+I(d)) + (U(M_3^+)+2U(u)+U(d))] =$$
$$= [(0+0.64257483+5.14059860) + (0+0.465068250+0.232534124)] -$$
$$- [(0.28558880+1.2851497+2.5702993)+(0+0.9301365+0.116267062)]$$
$$= 5.78317343+0.697602374-4.1410378-1.046403562 = 1.293334442$$

Therefore, the difference between proton and neutron masses is, according to intervalic principles of equivalence, exactly 1.293334442 (MeV/c^2). It means a theoretical exactitude up to a thousandth of electron volt, 0.001 eV (!), while the best present experimental values have an error of around 280 eV. (Actually, the result is yielded theoretically with *null error*, since the pointed one of 0.001 eV is due only to the limitation represented by the number of digits that we have chosen to make the calculus from the values of the fundamental constants, c and ħ).

In concrete, according to IT the present experimental value about the difference of mass between proton and neutron has a very little deviation with respect to the theoretical intervalic value of only 14.44 eV (our experimental physicists have done a really good measurement!). This simple deduction is completely based on intervalic physical principles, which lies only on the intervalic system of units and dimensions. It appears to be the first truthful and largely exact explanation about the difference of masses between proton and neutron.

INTERVALIC NUCLEON COMMON MASS

It can be supposed that the dalinar structure level is equal for both nucleons, and their dalinar masses will be identical, $m_p(54\ D_{45}) \equiv m_n(54\ D_{45})$. At the next gaudinar structure level the constituent electric charges of gaudinos are different in quarks up and down, hence their different masses. Nevertheless, if we subtract the contribution to mass of the monteverdic and lisztinian structure levels of proton and neutron, it will remain a magnitude that we are going to name *intervalic nucleon common mass, m(N)$_{com}$*:

$$m(N)_{com} = m(p) - [I(p)_{M3+L3} + U(p)_{M3+L3}] = 933.0848686\ (MeV/c^2) \approx$$
$$m(N)_{com} = m(n) - [I(n)_{M3+L3} + U(n)_{M3+L3}] = 933.0848542\ (MeV/c^2)$$

The difference of 14.44 eV between both results is due to the deviation in the experimental data already viewed. We will take the middle value between both ones as the intervalic nucleon common mass: 933.0848614 (MeV/c^2).

NUCLEONIC QUARK COMMON MASS

If the deeper levels of intervalic structure would not have influence on the masses of the nucleonic quarks, we could define a nucleonic quark common mass as:

$$m(u)_{com} \approx m(d)_{com} = ⅓\ m(N)_{com} = 311.0282871\ (\mathrm{MeV/c^2})$$

Nevertheless, as the different constituent electric charges at the gaudinar level has influence on quarks masses, this magnitude will have to be interpreted as the average nucleonic quark common mass.

INTERVALIC QUARKS UP AND DOWN MASSES

Following the preceding results it can be deduced the nucleonic quarks up and down total masses:

$$m(u) = m(u)_{com} + I(u)_{L3} + U(u)_{L3} = 312.1359302\ (\mathrm{MeV/c^2})$$
$$m(d) = m(d)_{com} + I(d)_{L3} + U(d)_{L3} = 313.7148535\ (\mathrm{MeV/c^2})$$

As can be seen, the contribution of the *intervalic energy* explain at last why the mass of quark *d* is *greater* than the mass of quark *u*, which fully explains the difference of masses between nucleons:

$$I(u)_L = c^{\pm 2}\,\hbar\,(180\,\mathbf{q_I})^{-2} = c^{-1}\,180^{-2} = 1.0295188 \cdot 10^{-13}\ (\mathrm{J}) =$$
$$= 0.64257482\ (\mathrm{MeV/c^2})$$

$$I(d)_L = c^{\pm 2}\,\hbar\,(90\,\mathbf{q_I})^{-2} = c^{-1}\,90^{-2} = 4.1180752 \cdot 10^{-13}\ (\mathrm{J}) =$$
$$= 2.5702993\ (\mathrm{MeV/c^2})$$

$$U(u)_L = U(L_3^{+⅔}) = ½\,(1/4\pi\varepsilon_0)\,(180\,\mathbf{q_I})^2/\,r_q = 7.451218056 \cdot 10^{-14}\ (\mathrm{J}) =$$
$$= 0.465068249\ (\mathrm{MeV/c^2})$$

$$U(d)_L = U(L_3^{-⅓}) = ½\,(1/4\pi\varepsilon_0)\,(90\,\mathbf{q_I})^2/\,r_q = 1.862804514 \cdot 10^{-14}\ (\mathrm{J}) =$$
$$= 0.116267062\ (\mathrm{MeV/c^2})$$

Thus, to the value of the common mass of quarks displayed in our tables of intervalic quarks, it have to be added the contribution to mass of the last lisztinian level of quarks, which is roughly ~2.7 and ~1.1 ($\mathrm{MeV/c^2}$) to quarks with charge ±⅓ and ±⅔ respectively, in order to obtain the actual masses of all existing 49 quarks.

INTERVALIC NUCLEONS MASSES

In a similar way, we have immediately the intervalic proton and neutron masses, with *null error*, by means of the simple sum of its constituent intervalic quarks total masses, a result made without adjusting any constant, and directly deduced from the intervalic system of units and dimensions:

$\mathrm{m}(p) = 2\ \mathrm{m}(u) + \mathrm{m}(d) + \mathrm{I}(e) = 938.2723027\ (\mathrm{MeV/c^2})$
$\mathrm{m}(n) = \mathrm{m}(u) + 2\ \mathrm{m}(d) = 939.5656372\ (\mathrm{MeV/c^2})$

Needless to say that some fantastic assumptions introduced by SM, like the acrobatic “free masses” of quarks, the elusive creation of mass through a supposed spin-spin interaction, and the mysterious Higgs mechanism (which looks like a certain medieval ether) are, from the point of view of IT, naïve and clumsy assumptions which have become unnecessary and irrelevant.

NUCLEONIC COMMON QUARK ELECTROMAGNETIC ENERGY

From the nucleonic quark common mass we can deduce the common dalinar electromagnetic energy of the three constituent gaudinos of the lisztino 3:

$\mathrm{U}(\mathrm{L}_3) = \mathrm{E}(\mathrm{L}_3)_{\mathrm{com}} - \mathrm{I}(\mathrm{L}_3) = 2.0182105 \cdot 10^{-11}\ (\mathrm{J}) = 125.9667371\ (\mathrm{MeV/c^2})$

The nucleonic common quark ratios of the involved energies are, as expected:

$\mathrm{I}(\mathrm{L}_3)/\mathrm{U}(\mathrm{L}_3) = 1.469130298$
$\mathrm{I}(\mathrm{L}_3)/\mathrm{E}(\mathrm{L}_3)_{\mathrm{com}} = 0.594999097$
$\mathrm{U}(\mathrm{L}_3)/\mathrm{E}(\mathrm{L}_3)_{\mathrm{com}} = 0.405000902$

Compared with the electron energy ratio, $\mathrm{I}(e)/\mathrm{U}(e) = 1.266973485$, the electromagnetic energy of quarks is considerably smaller.

INTERVALIC NUCLEON RADIUS

To better understand the nucleon radius we could define two extreme magnitudes for that value, and it is expected that the nucleon radius will be between both values: an interior and an exterior radius.

To determine the first one, based on volume means, we have that the total volume of the three quarks according to the magnitude of the intervalic quark radius is:

$$3\ \mathrm{V}(q) = 3 \cdot (4/3)\ \pi\ \mathrm{r_q}^3 = 4.093343275 \cdot 10^{-45}\ (\mathrm{m}^3)$$

This volume would correspond to the interior radius:

$$\mathrm{r_{int}} = [(3/4)\mathrm{V}(q) / \pi]^{1/3} = 9.923461426 \cdot 10^{-16}\ (\mathrm{m})$$

To determine the second one, based on geometric means, we will define an exterior radius tangent to the constituent quarks in nucleon. We can deduce it from the magnitude of the intervalic quark radius after some straightforward algebra:

$$\mathrm{r_{ext}} = [1 + (4/3)\sqrt{(3/4)}]\ r_q = 2.1547005\ r_q = 1.48255113 \cdot 10^{-15}\ (\mathrm{m})$$

Curiously, $\mathrm{r_{int}} \approx ⅔\ \mathrm{r_{ext}}$. The experimental magnitude of the nucleon radius, $\mathrm{r_N} \sim 1.23 \cdot 10^{-15}$ (m), is between both values, as expected. Moreover, it is just in the middle between the interior and exterior radius: $½\ (\mathrm{r_{int}} + \mathrm{r_{ext}}) = 1.237448636 \cdot 10^{-15}\ (\mathrm{m}) \approx \mathrm{r_N}$.

NUCLEON ENERGY MASS ORGANIZED BY INTERVALIC STRUCTURAL LEVELS

We can organize the preceding results in order to show the mass of nucleons which is added as we go into deeper levels of the intervalic structure. So we have that the nucleon energy mass at the most exterior level, the monteverdic one, is:

$\mathrm{I}(p)_\mathrm{M} = 4.575639155 \cdot 10^{-14}\ (\mathrm{J}) = 0.285588809\ (\mathrm{MeV/c^2})$
$\mathrm{I}(n)_\mathrm{M} = 0$

$\mathrm{U}(p)_\mathrm{M} = 0$
$\mathrm{U}(n)_\mathrm{M} = 0$

At the monteverdic and lisztinian level the involved energies are:

$$\mathrm{I}(p)_{\mathrm{ML}} = \mathrm{I}(p)_{\mathrm{M}} + \mathrm{I}(u+u+d)_{\mathrm{L}} =$$
$$= 6.63467679 \cdot 10^{-13}\ (\mathrm{J}) = 4.14103774\ (\mathrm{MeV/c^2})$$
$$\mathrm{I}(n)_{\mathrm{ML}} = \mathrm{I}(n)_{\mathrm{M}} + \mathrm{I}(u+d+d)_{\mathrm{L}} =$$
$$= 9.265669311 \cdot 10^{-13}\ (\mathrm{J}) = 5.783173396\ (\mathrm{MeV/c^2})$$

$$\mathrm{U}(p)_{\mathrm{ML}} = \mathrm{U}(p)_{\mathrm{M}} + \mathrm{U}(u+u+d)_{\mathrm{L}} =$$
$$= 1.67652406 \cdot 10^{-13}\ (\mathrm{J}) = 1.04640356\ (\mathrm{MeV/c^2})$$
$$\mathrm{U}(n)_{\mathrm{ML}} = \mathrm{U}(n)_{\mathrm{M}} + \mathrm{U}(u+d+d)_{\mathrm{L}} =$$
$$= 1.11768271 \cdot 10^{-13}\ (\mathrm{J}) = 0.697602374\ (\mathrm{MeV/c^2})$$

At the three most exterior levels of nucleon —monteverdic, lisztinian and gaudinar— the mass energies are:

$$\mathrm{I}(p)_{\mathrm{MLG}} = \mathrm{I}(p)_{\mathrm{M}} + \mathrm{I}(u+u+d)_{\mathrm{L}} + \mathrm{I}[2(\mathrm{G}_6^{\pm 2/3})+7(\mathrm{G}_6^{\pm 1/3})]_{\mathrm{G}} =$$
$$= 3.752024115 \cdot 10^{-12}\ (\mathrm{J}) = 23.41828239\ (\mathrm{MeV/c^2})$$
$$\mathrm{I}(n)_{\mathrm{MLG}} = \mathrm{I}(n)_{\mathrm{M}} + \mathrm{I}(u+d+d)_{\mathrm{L}} + \mathrm{I}[(\mathrm{G}_6^{\pm 2/3})+8(\mathrm{G}_6^{\pm 1/3})]_{\mathrm{G}} =$$
$$= 4.323979011 \cdot 10^{-12}\ (\mathrm{J}) = 26.98814251\ (\mathrm{MeV/c^2})$$

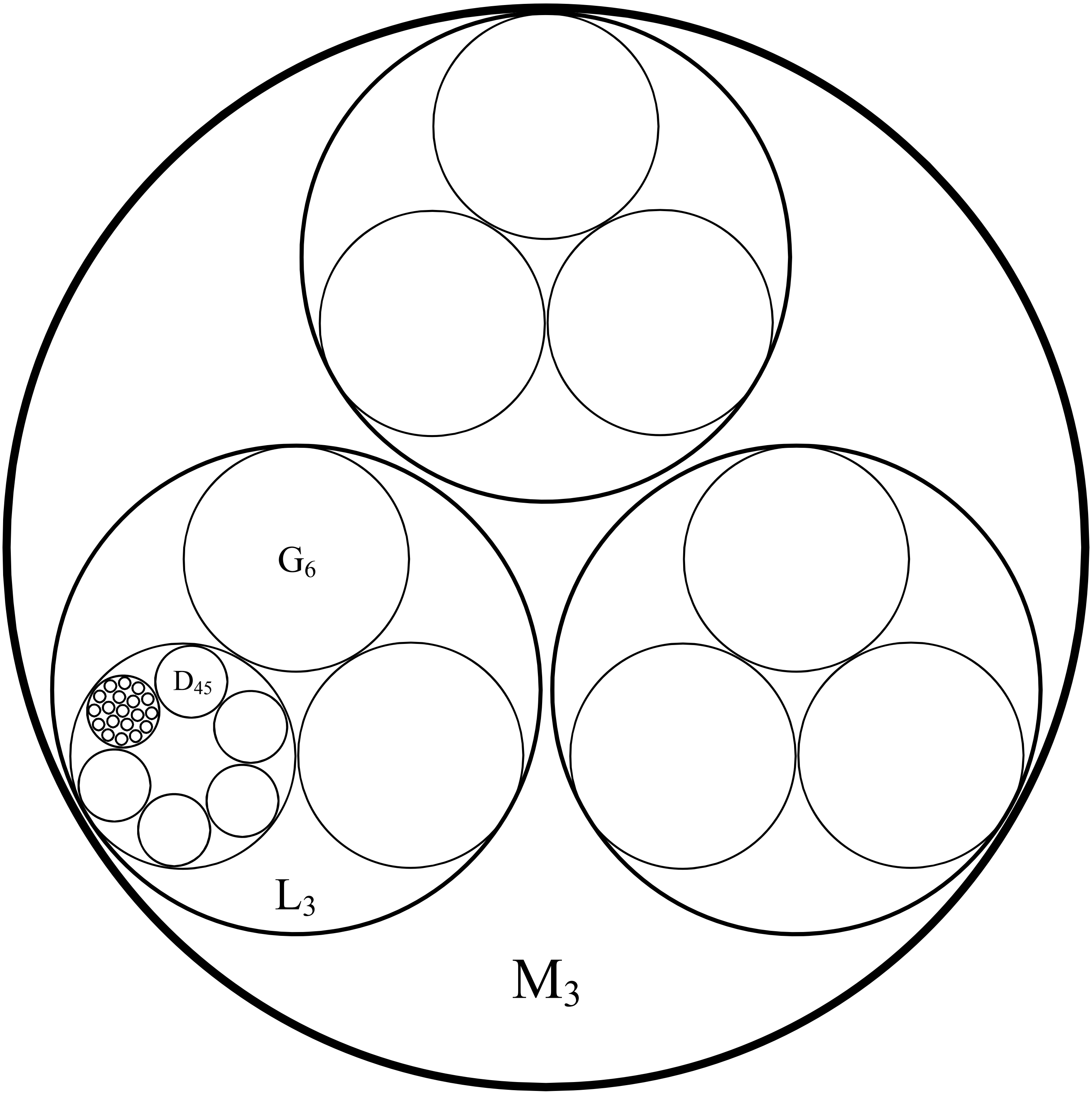
$$\mathrm{U}(p)_{\mathrm{MLG}} = \mathrm{U}(p)_{\mathrm{M}} + \mathrm{U}(u+u+d)_{\mathrm{L}} + \mathrm{U}[2(\mathrm{G}_6^{\pm 2/3})+7(\mathrm{G}_6^{\pm 1/3})]_{\mathrm{G}} =$$
$$= 2.484069763 \cdot 10^{-12}\ (\mathrm{J}) = 15.50433723\ (\mathrm{MeV/c^2})$$
$$\mathrm{U}(n)_{\mathrm{MLG}} = \mathrm{U}(n)_{\mathrm{M}} + \mathrm{U}(u+d+d)_{\mathrm{L}} + \mathrm{U}[(\mathrm{G}_6^{\pm 2/3})+8(\mathrm{G}_6^{\pm 1/3})]_{\mathrm{G}} =$$
$$= 1.964902156 \cdot 10^{-12}\ (\mathrm{J}) = 12.26394931\ (\mathrm{MeV/c^2})$$

And finally, we have the intervalic and electromagnetic energies from the monteverdic up to the dalinar levels of the intervalic structure, whose sums yield the total intervalic and electromagnetic masses of nucleon:

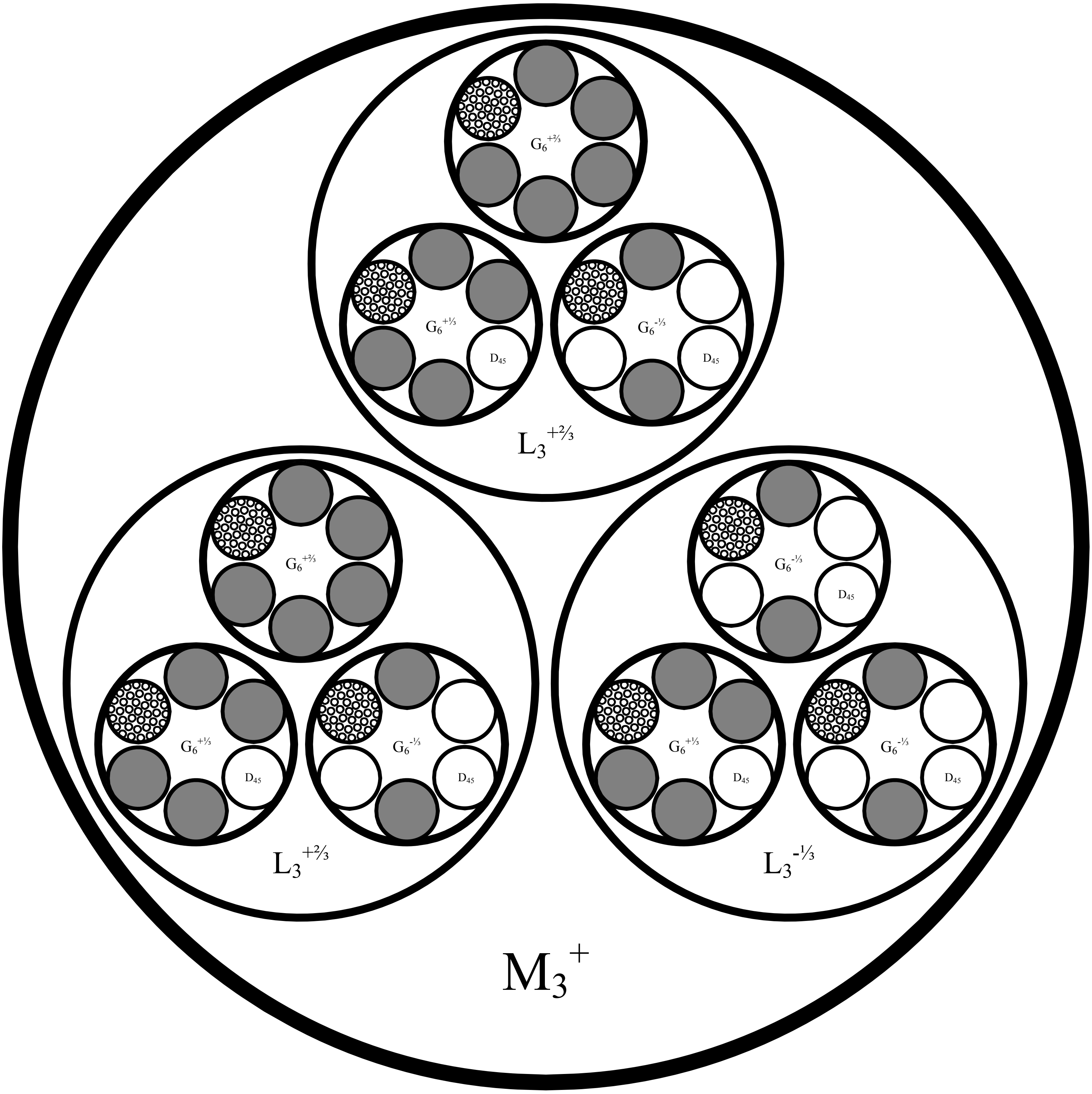
$$\mathrm{I}(p)_{\mathrm{MLGD}} = \mathrm{I}(p)_{\mathrm{M}} + \mathrm{I}(u+u+d)_{\mathrm{L}} + \mathrm{I}[2(\mathrm{G}_6^{\pm 2/3})+7(\mathrm{G}_6^{\pm 1/3})]_{\mathrm{G}} + 54\mathrm{I}(\mathrm{D}_{45})_{\mathrm{D}} =$$
$$= 9.270245014 \cdot 10^{-11}\ (\mathrm{J}) = 578.6029324\ (\mathrm{MeV/c^2})$$
$$\mathrm{I}(n)_{\mathrm{MLGD}} = \mathrm{I}(n)_{\mathrm{M}} + \mathrm{I}(u+d+d)_{\mathrm{L}} + \mathrm{I}[(\mathrm{G}_6^{\pm 2/3})+8(\mathrm{G}_6^{\pm 1/3})]_{\mathrm{G}} + 54\mathrm{I}(\mathrm{D}_{45})_{\mathrm{D}} = =$$
$$= 9.327440504 \cdot 10^{-11}\ (\mathrm{J}) = 582.1727926\ (\mathrm{MeV/c^2})$$

$$\mathrm{U}(p)_{\mathrm{MLGD}} = \mathrm{U}(p)_{\mathrm{M}} + \mathrm{U}(u+u+d)_{\mathrm{L}} + \mathrm{U}[2(\mathrm{G}_6^{\pm 2/3})+7(\mathrm{G}_6^{\pm 1/3})]_{\mathrm{G}} + 54\mathrm{U}(\mathrm{D}_{45})_{\mathrm{D}} =$$
$$= 5.762541114 \cdot 10^{-11}\ (\mathrm{J}) = 359.6693703\ (\mathrm{MeV/c^2})$$
$$\mathrm{U}(n)_{\mathrm{MLGD}} = \mathrm{U}(n)_{\mathrm{M}} + \mathrm{U}(u+d+d)_{\mathrm{L}} + \mathrm{U}[(\mathrm{G}_6^{\pm 2/3})+8(\mathrm{G}_6^{\pm 1/3})]_{\mathrm{G}} + 54\mathrm{U}(\mathrm{D}_{45})_{\mathrm{D}} =$$
$$= 5.72606702 \cdot 10^{-11}\ (\mathrm{J}) = 357.3928374\ (\mathrm{MeV/c^2})$$

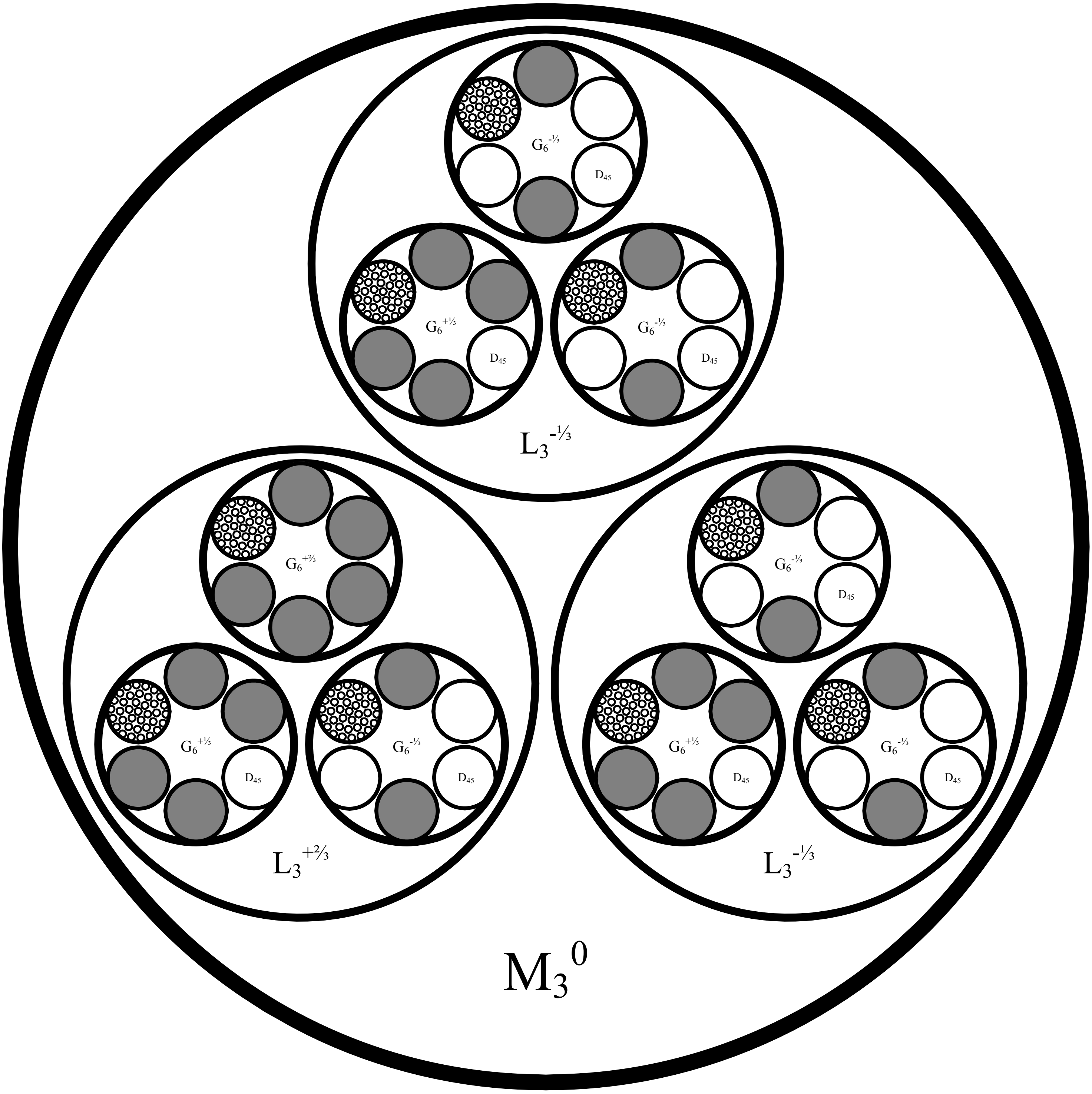
$$\mathrm{I}(p)_{\mathrm{MLGD}} + \mathrm{U}(p)_{\mathrm{MLGD}} = \mathrm{c}^{\pm 2}\,\mathrm{m}(p) = 938.2723027\ (\mathrm{MeV/c^2})$$
$$\mathrm{I}(n)_{\mathrm{MLGD}} + \mathrm{U}(n)_{\mathrm{MLGD}} = \mathrm{c}^{\pm 2}\,\mathrm{m}(n) = 939.5656300\ (\mathrm{MeV/c^2})$$



Intervalic structure of *nucleon*:
$M_3 = 3\ L_3 = 9\ G_6 = 54\ D_{45} = 2430\ \mathbf{I}$



Intervalic structure of *proton* (unlike charges shadowed):
$M_3^+ = 3\ L_3\ (L_3^{+2/3}, L_3^{-1/3}, L_3^{+2/3}) =$
$9\ G_6\ (2G_6^{+2/3}, 4G_6^{-1/3}, 3G_6^{+1/3}) = 54\ D_{45}\ (30D_{+45}, 24D_{-45}) = 2430$ **I**



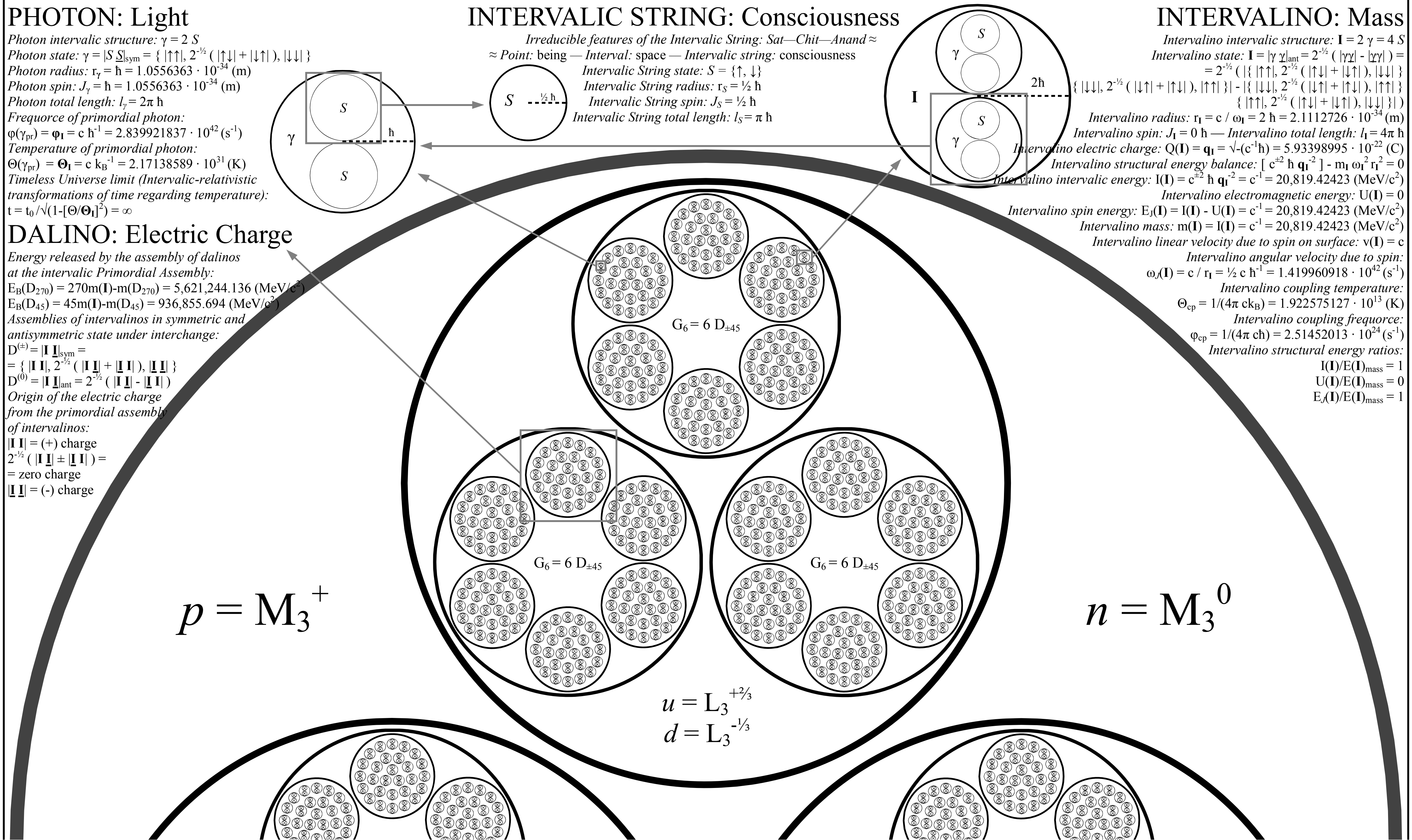
Intervalic structure of *neutron* (unlike charges shadowed):
$M_3^0 = 3\ L_3\ (L_3^{-⅓}, L_3^{+⅔}, L_3^{-⅓}) =$
$9\ G_6\ (1G_6^{+⅔}, 5G_6^{-⅓}, 3G_6^{+⅓}) = 54\ D_{45}\ (27D_{+45}, 27D_{-45}) = 2430\ \mathbf{I}$

INTERVALIC STRUCTURE OF NUCLEON

$p = M_3^{+} = udu = 3\,L_3\,(L_3^{+2/3}, L_3^{-1/3}, L_3^{+2/3}) = 9\,G_6\,\{(2G_6^{+2/3}, 4G_6^{-1/3}, 3G_6^{+1/3}) = (3G_6^{-1}, 3G_6^{+1}, 2G_6^{+2/3}, 1G_6^{-1/3})\} = 54\,D_{45}\,(30D_{+45}, 24D_{-45}) = 2430\,\mathbf{I} = 4860\,\gamma = 9720\,S$

$n = M_3^{0} = dud = 3\,L_3\,(L_3^{-1/3}, L_3^{+2/3}, L_3^{-1/3}) = 9\,G_6\,\{(1G_6^{+2/3}, 5G_6^{-1/3}, 3G_6^{+1/3}) = (3G_6^{-1}, 3G_6^{+1}, 1G_6^{+2/3}, 2G_6^{-1/3})\} = 54\,D_{45}\,(27D_{+45}, 27D_{-45}) = 2430\,\mathbf{I} = 4860\,\gamma = 9720\,S$

Intervalic structure levels: 0: Point, 1: Intervalic String (S), 2: Photon (γ), 3: Intervalino (**I**), 4: Dalino (D), 5: Gaudino (G), 6: Lisztino(L), 7: Monteverdino (M), 8: Palestrino (P)



PHOTON: Light

Photon intervalic structure: $\gamma = 2\,S$

Photon state: $\gamma = |S\,\underline{S}|_{\mathrm{sym}} = \{\,|\uparrow\uparrow|, 2^{-1/2}\,(\,|\uparrow\downarrow| + |\downarrow\uparrow|\,), |\downarrow\downarrow|\,\}$

Photon radius: $r_\gamma = \hbar = 1.0556363 \cdot 10^{-34}$ (m)

Photon spin: $J_\gamma = \hbar = 1.0556363 \cdot 10^{-34}$ (m)

Photon total length: $l_\gamma = 2\pi\,\hbar$

Frequorce of primordial photon:

$\varphi(\gamma_{\mathrm{pr}}) = \boldsymbol{\varphi}_{\mathbf{I}} = c\,\hbar^{-1} = 2.839921837 \cdot 10^{42}\,(s^{-1})$

Temperature of primordial photon:

$\Theta(\gamma_{\mathrm{pr}}) = \boldsymbol{\Theta}_{\mathbf{I}} = c\,k_B^{-1} = 2.17138589 \cdot 10^{31}$ (K)

Timeless Universe limit (Intervalic-relativistic transformations of time regarding temperature):

$t = t_0 / \sqrt{(1-[\Theta/\boldsymbol{\Theta}_{\mathbf{I}}]^2)} = \infty$

DALINO: Electric Charge

Energy released by the assembly of dalinos at the intervalic Primordial Assembly:

$E_B(D_{270}) = 270m(\mathbf{I})\text{-}m(D_{270}) = 5{,}621{,}244.136\ (\mathrm{MeV}/c^2)$

$E_B(D_{45}) = 45m(\mathbf{I})\text{-}m(D_{45}) = 936{,}855.694\ (\mathrm{MeV}/c^2)$

Assemblies of intervalinos in symmetric and antisymmetric state under interchange:

$D^{(\pm)} = |\mathbf{I}\,\underline{\mathbf{I}}|_{\mathrm{sym}} =$

$= \{\,|\mathbf{I}\,\mathbf{I}|, 2^{-1/2}\,(\,|\mathbf{I}\,\underline{\mathbf{I}}| + |\underline{\mathbf{I}}\,\mathbf{I}|\,), |\underline{\mathbf{I}}\,\underline{\mathbf{I}}|\,\}$

$D^{(0)} = |\mathbf{I}\,\underline{\mathbf{I}}|_{\mathrm{ant}} = 2^{-1/2}\,(\,|\mathbf{I}\,\underline{\mathbf{I}}| - |\underline{\mathbf{I}}\,\mathbf{I}|\,)$

Origin of the electric charge from the primordial assembly of intervalinos:

$|\mathbf{I}\,\mathbf{I}|$ = (+) charge

$2^{-1/2}\,(\,|\mathbf{I}\,\underline{\mathbf{I}}| \pm |\underline{\mathbf{I}}\,\mathbf{I}|\,) =$

= zero charge

$|\underline{\mathbf{I}}\,\underline{\mathbf{I}}|$ = (-) charge

INTERVALIC STRING: Consciousness

Irreducible features of the Intervalic String: Sat—Chit—Anand ≈

≈ *Point:* being — *Interval:* space — *Intervalic string:* consciousness

Intervalic String state: $S = \{\uparrow, \downarrow\}$

Intervalic String radius: $r_S = \frac{1}{2}\,\hbar$

Intervalic String spin: $J_S = \frac{1}{2}\,\hbar$

Intervalic String total length: $l_S = \pi\,\hbar$

INTERVALINO: Mass

Intervalino intervalic structure: $\mathbf{I} = 2\,\gamma = 4\,S$

Intervalino state: $\mathbf{I} = |\gamma\,\underline{\gamma}|_{\mathrm{ant}} = 2^{-1/2}\,(\,|\gamma\underline{\gamma}| - |\underline{\gamma}\gamma|\,) =$

$= 2^{-1/2}\,(\,|\{\,|\uparrow\uparrow|, 2^{-1/2}\,(\,|\uparrow\downarrow| + |\downarrow\uparrow|\,), |\downarrow\downarrow|\,\}$

$\{\,|\downarrow\downarrow|, 2^{-1/2}\,(\,|\downarrow\uparrow| + |\uparrow\downarrow|\,), |\uparrow\uparrow|\,\}| - |\{\,|\downarrow\downarrow|, 2^{-1/2}\,(\,|\downarrow\uparrow| + |\uparrow\downarrow|\,), |\uparrow\uparrow|\,\}$

$\{\,|\uparrow\uparrow|, 2^{-1/2}\,(\,|\uparrow\downarrow| + |\downarrow\uparrow|\,), |\downarrow\downarrow|\,\}|\,)$

Intervalino radius: $r_{\mathbf{I}} = c\,/\,\omega_{\mathbf{I}} = 2\,\hbar = 2.1112726 \cdot 10^{-34}$ (m)

Intervalino spin: $J_{\mathbf{I}} = 0\,\hbar$ — *Intervalino total length:* $l_{\mathbf{I}} = 4\pi\,\hbar$

Intervalino electric charge: $Q(\mathbf{I}) = \mathbf{q}_{\mathbf{I}} = \sqrt{}\text{-}(c^{-1}\hbar) = 5.93398995 \cdot 10^{-22}$ (C)

Intervalino structural energy balance: $[\,c^{\pm 2}\,\hbar\,\mathbf{q}_{\mathbf{I}}^{-2}\,] - m_{\mathbf{I}}\,\omega_{\mathbf{I}}^2\,r_{\mathbf{I}}^2 = 0$

Intervalino intervalic energy: $I(\mathbf{I}) = c^{\pm 2}\,\hbar\,\mathbf{q}_{\mathbf{I}}^{-2} = c^{-1} = 20{,}819.42423\ (\mathrm{MeV}/c^2)$

Intervalino electromagnetic energy: $U(\mathbf{I}) = 0$

Intervalino spin energy: $E_J(\mathbf{I}) = I(\mathbf{I}) - U(\mathbf{I}) = c^{-1} = 20{,}819.42423\ (\mathrm{MeV}/c^2)$

Intervalino mass: $m(\mathbf{I}) = I(\mathbf{I}) = c^{-1} = 20{,}819.42423\ (\mathrm{MeV}/c^2)$

Intervalino linear velocity due to spin on surface: $v(\mathbf{I}) = c$

Intervalino angular velocity due to spin:

$\omega_J(\mathbf{I}) = c\,/\,r_{\mathbf{I}} = \frac{1}{2}\,c\,\hbar^{-1} = 1.419960918 \cdot 10^{42}\,(s^{-1})$

Intervalino coupling temperature:

$\Theta_{cp} = 1/(4\pi\,ck_B) = 1.922575127 \cdot 10^{13}$ (K)

Intervalino coupling frequorce:

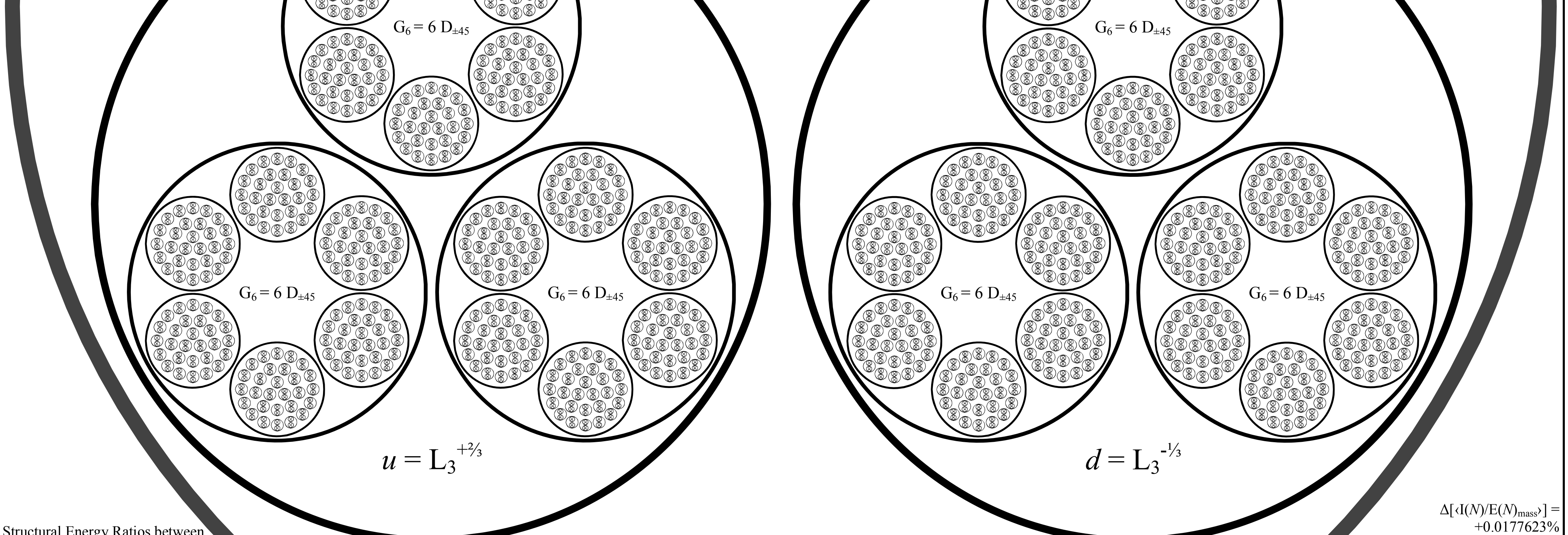
$\varphi_{cp} = 1/(4\pi\,c\hbar) = 2.51452013 \cdot 10^{24}\,(s^{-1})$

Intervalino structural energy ratios:

$I(\mathbf{I})/E(\mathbf{I})_{\mathrm{mass}} = 1$

$U(\mathbf{I})/E(\mathbf{I})_{\mathrm{mass}} = 0$

$E_J(\mathbf{I})/E(\mathbf{I})_{\mathrm{mass}} = 1$



Structural Energy Ratios between the constituent quarks of Nucleons

$I(n)_L / I(p)_L = 1.5000000000$
$U(p)_L / U(n)_L = 1.5000000000$

Quark Up Structural Energy Ratios

$I(u)/U(u) = 1.587148524$
$I(u)/E(u)_{mass} = 0.613474065$
$U(u)/E(u)_{mass} = 0.386525934$

Quark Down Structural Energy Ratios

$I(d)/U(d) = 1.650243062$
$I(d)/E(d)_{mass} = 0.622676118$
$U(d)/E(d)_{mass} = 0.377323881$

Nucl. Quarks Structural Energy Ratios

$\langle I(d)/U(d)\rangle = 1.618695793 \sim \Phi$
$\langle I(d)/E(d)_{mass}\rangle = 0.618075091 \sim \Phi^{-1}$
$\langle U(d)/E(d)_{mass}\rangle = 0.381924907 \sim 1\text{-}\Phi^{-1}$

Deviation from the Golden Mean

Golden Mean, $\Phi = 1.61803398875$
$\Delta[\langle I(d)/U(d)\rangle] = +0.0409018\%$
$\Delta[\langle I(d)/E(d)_{mass}\rangle] = +0.0066505\%$
$\Delta[\langle U(d)/E(d)_{mass}\rangle] = -0.0107624\%$

DIFFERENCE OF MASS BETWEEN PROTON AND NEUTRON

Experimentally: $m(n) - m(p) = 1.29332 \pm 0.00028\ (\text{MeV}/c^2)$.

According to the Intervalic Theory:

$$m(n) - m(p) = [I(n)_{ML} + U(n)_{ML}] - [I(p)_{ML} + U(p)_{ML}] =$$
$$= [(I(M_3^0)+I(u)+2I(d)) + (U(M_3^0)+U(u)+2U(d))] -$$
$$- [(I(M_3^+)+2I(u)+I(d)) + (U(M_3^+)+2U(u)+U(d))] =$$
$$= [(0+0.64257483+5.14059860) + (0+0.465068250+0.232534124)] -$$
$$- [(0.28558880+1.2851497+2.5702993)+(0+0.9301365+0.116267062)]$$
$$= 5.78317343+0.697602374-4.1410378-1.046403562 = 1.293334442\ (\text{MeV}/c^2)$$

Deviation from the Golden Mean

Golden Mean, $\Phi = 1.61803398875$
$\Delta[\langle I(N)/U(N)\rangle] = +0.0491593\%$
$\Delta[\langle I(N)/E(N)_{mass}\rangle] = +0.0177623\%$
$\Delta[\langle U(N)/E(N)_{mass}\rangle] = -0.0289759\%$

Proton Structural Energy Ratios

$I(p)/U(p) = 1.60871148$
$I(p)/E(p)_{mass} = 0.616668452$
$U(p)/E(p)_{mass} = 0.383330671$
$E_J(p)/E(p)_{mass} = 0.233337781$

Neutron Structural Energy Ratios

$I(n)/U(n) = 1.628947324$
$I(n)/E(n)_{mass} = 0.61961908$
$U(n)/E(n)_{mass} = 0.38038006$
$E_J(n)/E(n)_{mass} = 0.23923902$

Nucleon Structural Energy Ratios

$\langle I(N)/U(N)\rangle = 1.618829402 \sim \Phi$

	NUCLEONIC DALINO	NUCLEONIC GAUDINOS	QUARK UP	QUARK DOWN	PROTON	NEUTRON
Intervalic energy, I	$I(D_{45})_D = c^{\pm 2}\hbar\ (45\ \mathbf{q_I})^{-2} = c^{\pm 2}\hbar\ [45\sqrt{-}(c^{-1}h)]^{-2} = 1.6472301\cdot 10^{-12}\ (J) = 10.281197\ (\text{MeV}/c^2)$	$I(G_6^{\pm 1/3})_{GD} = 64.25748329\ (\text{MeV}/c^2)$ $I(G_6^{\pm 2/3})_{GD} = 62.32975882\ (\text{MeV}/c^2)$	$I(u)_{LGD} = I(L_3^{+2/3}) + I(G_6^{+2/3}) + 2I(G_6^{\pm 1/3}) + 18I(D_{45}) = 191.4872982\ (\text{MeV}/c^2)$	$I(d)_{LGD} = I(L_3^{-1/3}) + I(G_6^{-1/3}) + 2I(G_6^{\pm 1/3}) + + 18I(D_{45}) = 195.3427472\ (\text{MeV}/c^2)$	$I(p)_{MLGD} = I(p)_M + I(u+u+d)_L + I[2(G_6^{\pm 2/3}) + + 7(G_6^{\pm 1/3})]_G + 54I(D_{45})_D = 578.6029324\ (\text{MeV}/c^2)$	$I(n)_{MLGD}=I(n)_M + I(u+d+d)_L + I[(G_6^{\pm 2/3}) + + 8(G_6^{\pm 1/3})]_G + 54I(D_{45})_D = 582.1727926\ (\text{MeV}/c^2)$
Electromagnetic energy, U	$U_{G6\pm 1/3}(D_{45})_D = 6.409125138\ (\text{MeV}/c^2)$ $U_{G6\pm 2/3}(D_{45})_D = 6.24848144\ (\text{MeV}/c^2)$	$U(G_6^{\pm 1/3})_{GD} = 41.34633762\ (\text{MeV}/c^2)$ $U(G_6^{\pm 2/3})_{GD} = 39.41861307\ (\text{MeV}/c^2)$	$U(u)_{LGD} = U(L_3^{+2/3}) + U(G_6^{+2/3}) + 2UI(G_6^{\pm 1/3}) + 18U(D_{45}) = 120.6486320\ (\text{MeV}/c^2)$	$U(d)_{LGD} = U(L_3^{-1/3}) + U(G_6^{-1/3}) + 2U(G_6^{\pm 1/3}) + 18U(D_{45}) = 118.3721063\ (\text{MeV}/c^2)$	$U(p)_{MLGD} = U(p)_M + U(u+u+d)_L + U[2(G_6^{\pm 2/3}) + + 7(G_6^{\pm 1/3})]_G + 54U(D_{45})_D = 359.6693703\ (\text{MeV}/c^2)$	$U(n)_{MLGD}=U(n)_M + U(u+d+d)_L + U[(G_6^{\pm 2/3}) + + 8(G_6^{\pm 1/3})]_G + 54U(D_{45})_D = 357.3928374\ (\text{MeV}/c^2)$
Spin energy E_J	$E_J(_{G6\pm 1/3}D_{45})_D = I(D_{45})_D - U_{G6\pm 1/3}(D_{45})_D = = 3.873072012\ (\text{MeV}/c^2)$	$E_J(G_6^{\pm 1/3})_G = I(G_6^{\pm 1/3})_G - E_q(G_6^{\pm 1/3})_G = = 5.133952133\ (\text{MeV}/c^2)$	$E_J(u)_L = I(u)_L - E_q(u)_L = 2.573797104 \cdot \cdot 10^{-13}\ (J) = 1.60643710\ (\text{MeV}/c^2)$	$E_J(d)_L = I(d)_L - E_q(d)_L = 5.662353564 \cdot \cdot 10^{-13}\ (J) = 3.53416158\ (\text{MeV}/c^2)$	$E_J(p)_M = I(p)_M - 0 = 4.5756390 \cdot 10^{-14}\ (J) = = 0.285588809\ (\text{MeV}/c^2)$	$E_J(n)_M = 0 - E_q(n)_M = 5.58841376 \cdot 10^{-14}\ (J) = = 0.34880120\ (\text{MeV}/c^2)$
Mass energy m	$m_{G6\pm 1/3}(D_{45}) = 16.69032229\ (\text{MeV}/c^2)$ $m_{G6\pm 2/3}(D_{45}) = 16.52967859\ (\text{MeV}/c^2)$	$m(G_6^{\pm 1/3}) = 105.6038198\ (\text{MeV}/c^2)$ $m(G_6^{\pm 2/3}) = 101.7483708\ (\text{MeV}/c^2)$	$m(u) = 312.1359302\ (\text{MeV}/c^2)$	$m(d) = 313.7148535\ (\text{MeV}/c^2)$	$m(p) = 938.2723027\ (\text{MeV}/c^2)$	$m(n) = 939.5656300\ (\text{MeV}/c^2)$
Radius r	$r_{G6\pm 1/3}(D_{45}) = 3.12047512 \cdot 10^{-18}\ (m)$	$r_{G6} = 8.299740193 \cdot 10^{-17}\ (m)$	$r_u = 6.88054386 \cdot 10^{-16}\ (m)$	$r_d = 6.88054386 \cdot 10^{-16}\ (m),$	$r_N \approx ½\ (r_{int} + r_{ext}) = 1.237448636 \cdot 10^{-15}\ (m)$	$r_N \approx ½\ (r_{int} + r_{ext}) = 1.237448636 \cdot 10^{-15}\ (m)$
Angular velocity due to spin, ω_J	$\omega_{J\text{-}G6\pm 1/3}(D_{45}) = (E_J(D_{45})_D / m_{D45}\ r_{D45}^2)^{½} = = 4.628021876 \cdot 10^{25}\ (s^{-1})$	$\omega_J(G_6^{\pm 1/3}) = (E_J(G_6^{\pm 1/3})_G / m_{G6}\ r_{G6}^2)^{½} = = 7.964878478 \cdot 10^{23}\ (s^{-1})$	$\omega_J(u) = (E_J(u)_L / m_u\ r_u^2)^{½} = = 3.125776462 \cdot 10^{22}\ (s^{-1})$	$\omega_J(d) = (E_J(d)_L / m_d\ r_d^2)^{½} = = 4.624593827 \cdot 10^{22}\ (s^{-1})$	$\omega_J(p) = (E_J(p)_M / m_p\ r_p^2)^{½} = = 4.252280621 \cdot 10^{21}\ (s^{-1})$	$\omega_J(n) = (E_J(n)_M / m_n\ r_n^2)^{½} = = 4.696141808 \cdot 10^{21}\ (s^{-1})$
Linear velocity due to spin on surface, v_J	$v_{J\text{-}G6\pm 1/3}(D_{45}) = \omega_J(D_{45})\ r_{D45} = = 1.444162712 \cdot 10^8\ (m\ s^{-1}) = 0.48172083\ c$	$v_J(G_6^{\pm 1/3}) = \omega_J(G_6^{\pm 1/3})\ r_{G6} = 6.610642204 \cdot \cdot 10^7\ (m\ s^{-1}) = 0.22050729\ c$	$v_J(u) = \omega_J(u)\ r_u = 2.150704204 \cdot \cdot 10^7\ (m\ s^{-1}) = 0.07173977\ c$	$v_J(d) = \omega_J(d)\ r_d = 3.181972066 \cdot \cdot 10^7\ (m\ s^{-1}) = 0.10613916\ c$	$v_J(p) = \omega_J(p)\ r_N = = 5.230305164 \cdot 10^6\ (m\ s^{-1}) = 0.01744642\ c$	$v_J(n) = \omega_J(n)\ r_N = = 5.776254424 \cdot 10^6\ (m\ s^{-1}) = 0.01926751\ c$

Chapter 18

INTERVALIC BARYON

INTERVALIC MONTEVERDINO: BARYON

THE NEW STATUS OF BARYONS

While nucleons have been supposed to be the fundamental constituents of nucleus, the study and research of baryonic states has become of great importance for Physics. However, after IT has postulated that the constituents of nucleus may not be nucleons, but deeper intervalic structures below the monteverdic level —quarks or gaudinos—, the early importance about baryons has decreased considerably. As baryons only can exist as a single particle, isolated from any other baryons, they are not the usual state of matter, but an extraordinary one (being the only exception to that rule the nucleus of ^{2}H, ^{3}H, and ^{3}He). Therefore, the unique stable baryons of Nature are proton and neutron, which would be only found in ^{1}H, ^{2}H, ^{3}H and ^{3}He nucleus. In any case, the identification of all baryons are not already a main filed by itself, but only another medium to reach a better understand of the intervalic symmetries. However, the development of further devices for the detection of quarks in those processes involving *universality*, such as the decays of massive bosons, appear to be a better way to research the full spectrum of the intervalic symmetries of fundamental particles, as the quarks production is not induced "artificially" as in a collision, but the quarks pairs are produced in a systematic and "natural" way in the decay.

Starting from the intervalic structure of quarks, we have got a new set of physical concepts and quantum numbers to combine for making a new intervalic model of quarks which yield 2-quarks systems (mesons) and 3-quarks systems (baryons). We are going to see that the old model of quarks is, say, to grope about in the dark, and therefore it can match some reveille by chance, as the majority of its quantum numbers in SM are partial or wrongly defined in some way. For example, IT postulated that Nature does not mix intervalic structures —in this case, quarks— pertaining to different symmetry families ({D45}, {D30}, {D18}, {D6}, {D5}, etc.), whilst the misleading SM merely supposes naïve combinations among flavours. But such intended flavours are really nothing but a fantastic name for some intervalic structures of quarks whose approximate masses have been experimentally detected through a purely empirical way. As those supposed flavoured quarks pertains to several symmetry families, the only allowed combinations among them are precisely those ones which does not mix different intervalic symmetries, and event which may or may not happen. That is to say, pure chance, as several of the fundamental principles that govern the assembly of monteverdinos —baryons and mesons— are not right and completely understood inside SM. Fortunately, things go in a different way in IT.

INTERVALIC BARYONS WITH {D45} SYMMETRY

As we have seen opportunely, every set of quark symmetries is composed by 7 intervalic structures. Those corresponding to {D45} symmetry are the following:

$L_{⅓} = ⅓\ G_6 = 2\ D_{45} = 34.537545—36.791934 \rightarrow$ quark L⅓D45$^{(⅓)}$
$L_{⅔} = ⅔\ G_6 = 4\ D_{45} = 69.075090—73.583868 \rightarrow$ quark L⅔D45$^{(⅓,\ ⅔)}$
$L_1 = 1\ G_6 = 6\ D_{45} = 103.61263—110.37580 \rightarrow$ quark L1D45$^{(⅓,\ ⅔)}$
$L_2 = 2\ G_6 = 12\ D_{45} = 207.22526—220.75160 \rightarrow$ quark L2D45$^{(⅓,\ ⅔)}$
$L_3 = 3\ G_6 = 18\ D_{45} = 310.83790—331.12740 \rightarrow$ quark L3D45$^{(⅓,\ ⅔)}$
$L_4 = 4\ G_6 = 24\ D_{45} = 414.45053—441.50320 \rightarrow$ quark L4D45$^{(⅓,\ ⅔)}$
$L_5 = 5\ G_6 = 30\ D_{45} = 518.06316—551.87900 \rightarrow$ quark L5D45$^{(⅓,\ ⅔)}$

Since Nature does not mix quarks from different intervalic symmetry when assembling baryons and mesons, the number of allowed baryons made by the family of intervalic quarks with {D45} symmetry will be the group SU(7) with intervalic structure symmetry:

$7 \otimes 7 \otimes 7 = 343$ baryons

INTERVALIC BARYONS WITH {D30} SYMMETRY

$L_{\frac{1}{3}} = \frac{1}{3}\, G_9 = 3\, D_{30} = 116.56421$—124.17278 → quark L⅓D30$^{(\frac{1}{3})}$
$L_{\frac{2}{3}} = \frac{2}{3}\, G_9 = 6\, D_{30} = 233.12843$—248.34556 → quark L⅔D30$^{(\frac{2}{3})}$
$L_1 = 1\, G_9 = 9\, D_{30} = 349.69264$—372.51833 → quark L1D30$^{(\frac{1}{3})}$
$L_2 = 2\, G_9 = 18\, D_{30} = 699.38520$—745.03666 → quark L2D30$^{(\frac{2}{3})}$
$L_3 = 3\, G_9 = 27\, D_{30} = 1{,}049.0779$—1,117.5550 → quark L3D30$^{(\frac{1}{3})}$
$L_4 = 4\, G_9 = 36\, D_{30} = 1{,}398.7705$—1,490.0733 → quark L4D30$^{(\frac{2}{3})}$
$L_5 = 5\, G_9 = 45\, D_{30} = 1{,}748.4631$—1,862.5916 → quark L5D30$^{(\frac{1}{3})}$

The number of allowed baryons made by the family of intervalic quarks with {D30} symmetry is described by the group SU(7):

$7 \otimes 7 \otimes 7 = 343$ baryons

INTERVALIC BARYONS WITH {D18} SYMMETRY

$L_{\frac{1}{3}} = \frac{1}{3}\, G_{15} = 5\, D_{18} = 539.64917$—574.87400 → quark L⅓D18$^{(\frac{1}{3})}$
$L_{\frac{2}{3}} = \frac{2}{3}\, G_{15} = 10\, D_{18} = 1{,}079.2982$—1,149.7480 → quark L⅔D18$^{(\frac{2}{3})}$
$L_1 = 1\, G_{15} = 15\, D_{18} = 1{,}618.9475$—1,724.6220 → quark L1D18$^{(\frac{1}{3})}$
$L_2 = 2\, G_{15} = 30\, D_{18} = 3{,}237.8950$—3,449.2443 → quark L2D18$^{(\frac{2}{3})}$
$L_3 = 3\, G_{15} = 45\, D_{18} = 4{,}856.8425$—5,173.8660 → quark L3D18$^{(\frac{1}{3})}$
$L_4 = 4\, G_{15} = 60\, D_{18} = 6{,}475.7900$—6,898.4886 → quark L4D18$^{(\frac{2}{3})}$
$L_5 = 5\, G_{15} = 75\, D_{18} = 8{,}094.7375$—8,623.1100 → quark L5D18$^{(\frac{1}{3})}$

The number of allowed baryons made by the family of intervalic quarks with {D18} symmetry is equally described by the group SU(7):

$7 \otimes 7 \otimes 7 = 343$ baryons

INTERVALIC STRUCTURE AND FLAVOUR IN THE MODEL OF QUARKS

Henceforth, it is easy to understand why never have been detected baryons composed by any combination among the supposed quark bottom and the intended quarks up and down (*b, u, d*). On the contrary, combinations among the supposed quarks up, down, strange and charme are possible whenever the masses of those quarks vary in order to coincide with their real masses shown in each symmetry family, as all these quarks have several different intervalic structures allowed near their intended masses. For example, at first sight they can be easily confounded —without knowing it— with the following intervalic structures:

- Quark up: L⅔D45$^{(⅓, ⅔)}$ L1D45$^{(⅓, ⅔)}$ L2D45$^{(⅓, ⅔)}$ L3D45$^{(⅓, ⅔)}$ L4D45$^{(⅓, ⅔)}$ L⅓D30$^{(⅓)}$ L⅔D30$^{(⅔)}$ L1D30$^{(⅓)}$
- Quark down: L⅓D45$^{(⅓)}$ L⅔D45$^{(⅓, ⅔)}$ L1D45$^{(⅓, ⅔)}$ L2D45$^{(⅓, ⅔)}$ L3D45$^{(⅓, ⅔)}$ L4D45$^{(⅓, ⅔)}$ L⅓D30$^{(⅓)}$ L⅔D30$^{(⅔)}$ L1D30$^{(⅓)}$
- Quark strange: L4D45$^{(⅓, ⅔)}$ L5D45$^{(⅓, ⅔)}$ L1D30$^{(⅓)}$ L2D30$^{(⅔)}$ L⅓D18$^{(⅓)}$
- Quark charme: L3D30$^{(⅓)}$ L4D30$^{(⅔)}$ L5D30$^{(⅓)}$ L⅔D18$^{(⅔)}$ L1D18$^{(⅓)}$
- Quark bottom: L2D18$^{(⅔)}$ L3D18$^{(⅓)}$ L4D18$^{(⅔)}$ L5D18$^{(⅓)}$

When summing their masses to compose a monteverdino —baryon or meson— the confusion can be inclusive greater, and affect not only to their masses but also to their electric charges. I think this example may be sufficient to understand the terribly chaos in the classification of the model of quarks in SM.

The total sum of the number of allowed baryons below a mass of ~44.000 (MeV/c^2) are, regarding the SU(7) group of intervalic structure symmetry:

$$(7 \otimes 7 \otimes 7) + (7 \otimes 7 \otimes 7) + (7 \otimes 7 \otimes 7) = 1029$$

Of course, the traditional flavour multiplets in the primitive model of quarks introduced by Gell-Mann, Neeman and Zweig are only some few combinations included in the intervalic model of quarks.

INTERVALIC BARYONS WITH {D6} SYMMETRY

$L_{⅓}$ = ⅓ G_{45} = 15 D_6 = 14,570.527—15,521.598 → quark L⅓D6$^{(⅓)}$
$L_{⅔}$ = ⅔ G_{45} = 30 D_6 = 29,141.055—31,043.196 → quark L⅔D6$^{(⅔)}$
L_1 = 1 G_{45} = 45 D_6 = 43,711.582—46,564.794 → quark L1D6$^{(⅓)}$
L_2 = 2 G_{45} = 90 D_6 = 87,423.165—93,129.588 → quark L2D6$^{(⅔)}$
L_3 = 3 G_{45} = 135 D_6 = 131,134.74—139,694.38 → quark L3D6$^{(⅓)}$
L_4 = 4 G_{45} = 180 D_6 = 174,846.32—186,259.17 → quark L4D6$^{(⅔)}$
L_5 = 5 G_{45} = 225 D_6 = 218,557.91—232,823.97 → quark L5D6$^{(⅓)}$

The number of allowed baryons is the same as in {D30} and {D18} symmetries:

7 ⊗ 7 ⊗ 7 = 343 baryons

INTERVALIC BARYONS WITH {D5} SYMMETRY

$L_{⅓}$ = ⅓ G_{54} = 18 D_5 = 25,177.871—26,821.321 → quark L⅓D5$^{(⅓)}$
$L_{⅔}$ = ⅔ G_{54} = 36 D_5 = 50,355.742—53,642.642 → quark L⅔D5$^{(⅓,\ ⅔)}$
L_1 = 1 G_{54} = 54 D_5 = 75,533.615—80,463.964 → quark L1D5$^{(⅓,\ ⅔)}$
L_2 = 2 G_{54} = 108 D_5 = 151,067.23—160,927.93 → quark L2D5$^{(⅓,\ ⅔)}$
L_3 = 3 G_{54} = 162 D_5 = 226,600.84—241,391.89 → quark L3D5$^{(⅓,\ ⅔)}$
L_4 = 4 G_{54} = 216 D_5 = 302,134.45—321,855.85 → quark L4D5$^{(⅓,\ ⅔)}$
L_5 = 5 G_{54} = 270 D_5 = 377,668.07—402,319.82 → quark L5D5$^{(⅓,\ ⅔)}$

The SU(7) intervalic structure symmetry is the same in all families:

7 ⊗ 7 ⊗ 7 = 343 baryons

INTERVALIC BARYONS WITH {D3} AND {D2} SYMMETRY

They are just equal to the {D5} intervalic symmetry. Of course the energy needed for the production of heavier baryons is so huge that it will be very hard to get it in our present devices. Nevertheless it is postulated that those states should exist at the Big Bang, immediately decaying and following the intervalic sequence of symmetries: {D2} → {D3} → {D5} → {D6} → {D18} → {D30} → {D45}.

The decomposition of each symmetry group is a complex and laborious task that deserves an independent work. However the most important think is perhaps the theoretical postulation of the existence of a wide but highly precise and finite set of combinations for the baryonic states. Thus, according to IT the so named “zoo of baryons” is an *expected* experimental data, whilst according to SM it is an *unexpected* and disconcerting event which only can be hardly *described* —but never *explained* in a reliable fundamental way— through some assumptions ad hoc, like the flavours, colours and excited states introduced by hand and always *after* the obtaining of unpredicted experimental data. Practised in this way, Physics of SM is not different of Zoology: a merely *descriptive* “science”. Of course, the intervalic symmetries of Nature are so powerful to allow that a partial set of them can always be *described* without knowing its underlying foundations through a lot of misleading assumptions and partial ways which give us by chance an incomplete view of the subatomic particles of Nature, as SM really does.

ISOCHARGE SYMMETRY

It can be noted that all the intervalic structures of {D45}, {D5}, {D3} and {D2} symmetries (with the only exception of the first light quark of each set) have two charges *allowed*, ⅓ and ⅔. However both allowed values pertain to a unique and the same intervalic structure, which stay unchanged. This is a remarkable difference between IT and SM, which considered quarks up and down as *two* different flavours, whilst according to IT they are *isoquarks* which have the same intervalic structure and are therefore they are considered as *one* quark with an electric charge degree of freedom. That degree of freedom of the electric charge in those symmetries can be introduced in the usual group formalism, because the value of the electric charge does not affect to the intervalic structure of the quark, which is not similar but *identical* for both charge values. Therefore, we will have got another quantum number which could be appropriately named *isocharge*. This symmetric unitary group will be SU(2) for those intervalic structures which can got both charges, ⅓ *and* ⅔, and a trivial SU(1) for the remaining ones which have got only one charge, ⅓ *or* ⅔. Incorporating this feature the number of allowed baryons in such *dual* families —{D45}, {D5}, {D3} and {D2}— would be described by the group SU(7) x SU(2) contained in SU(14), which yields 2744 allowed baryons (depicting the fact that the first quark L⅓D45$^{(⅓)}$ has forbidden the value ⅔ charge, and the baryons yielded by the {D45} symmetry would have some blank states).

Following the spin-statistics theorem, if we set the isocharge values to +½ for the ⅔ charge, and to -½ for the ⅓ charge, we will obtain the same group of symmetries as in the case of the SU(2) isospin symmetry, as we will see later.

INTERVALIC ISOSPIN SYMMETRY

At first sight we can consider isospin as a *provisional* assumption for a possible underlying physical quantity, not postulated yet, as it is not acceptable the postulation of an isospin ‘abstract space’, without any direct or indirect reference to a fundamental geometry nor to a physical event. Moreover, isospin has now become irrelevant to explain the independence of charge in strong interaction, as it is fully explained by means of the intervalic interaction between the intervalic structures, as I have demonstrated in other site.

From the intervalic structures of quarks it appears to be clear that the concept of isospin can be related with a real physical quantity, instead to suppose the existence of a doubtful isospin ‘abstract space’, as SM does. Really, allowed values of isospin are closely related with electric charge and strangeness of quarks. As strangeness is irrelevant in IT, isospin follows the same way (apart from other reasons). Nevertheless, it is now easy to relate *isospin* with a real physical feature of quarks in IT: the *degree of freedom of the electric charge in the intervalic structures of quarks*, previously defined as *isocharge*. In that case, that degree of freedom would make the following symmetric unitary groups of isospin:

- Quarks of {D45} symmetry:
$L_{⅓}$ = ⅓ G_6 = 2 D_{45} → quark L⅓D45$^{(⅓)}$ → SU(1) isospin symmetry
$L_{⅔}$ = ⅔ G_6 = 4 D_{45} → quark L⅔D45$^{(⅓,\ ⅔)}$ → SU(2) isospin symmetry
L_1 = 1 G_6 = 6 D_{45} → quark L1D45$^{(⅓,\ ⅔)}$ → SU(2) isospin symmetry
L_2 = 2 G_6 = 12 D_{45} → quark L2D45$^{(⅓,\ ⅔)}$ → SU(2) isospin symmetry
L_3 = 3 G_6 = 18 D_{45} → quark L3D45$^{(⅓,\ ⅔)}$ → SU(2) isospin symmetry
L_4 = 4 G_6 = 24 D_{45} → quark L4D45$^{(⅓,\ ⅔)}$ → SU(2) isospin symmetry
L_5 = 5 G_6 = 30 D_{45} → quark L5D45$^{(⅓,\ ⅔)}$ → SU(2) isospin symmetry

- Quarks of {D30} symmetry:
Every quark → SU(1) isospin symmetry

- Quarks of {D18} symmetry:
Every quark → SU(1) isospin symmetry

- Quarks of {D6} symmetry:
Every quark → SU(1) isospin symmetry

- Quarks of {D5} symmetry:
SU(2) + SU(1) isospin symmetry as in {D45}

- Quarks of {D3} symmetry:
SU(2) + SU(1) isospin symmetry as in {D45}

- Quarks of {D2} symmetry:
SU(2) + SU(1) isospin symmetry as in {D45}

Setting the isospin values for the singlet of SU(1) to 0, and for the doublets of SU(2) to ½ for electric charge ⅔, and to -½ for electric charge ⅓, we obtain just the same traditional isospin values which had the former quarks. (I sincerely do not see any advantage on maintaining such absurd and misleading use, instead to introduce the *isocharge* symmetry). As isospin of the supposed quark charm is not always 0, as it can also have some of the following intervalic structures: L4D45$^{(⅓,\, ⅔)}$ or L5D45$^{(⅓,\, ⅔)}$, and likewise the isospin of the supposed quarks up and down is not always ±½, as they can have some of the following intervalic structures: L⅓D30$^{(⅓)}$, L⅔D30$^{(⅔)}$ or L1D30 $^{(⅓)}$, it can be easily understood why it is said that the traditional isospin symmetry of SM is not an "exact" symmetry, without knowing the truthful reason for that inexactness. Really, the isospin symmetry with respect to the supposed flavour is not only inexact but a completely disastrous one.

Whilst the mystic eightfold way of the Gell-Mann model of quarks was intended to appear as a mysterious and almost secret clue of Nature, involving hypercharge and isospin, the fact is simply the following: when the underlying physical concepts holding flavours, colours, hypercharge, isospin and other fantastic assumptions are uncovered and related to a real physical feature —all of them derived from the lisztinian *intervalic structure* of quarks—, the model of quarks becomes a poorly naïve system of combinations involving by chance some of the different degrees of freedom derived from the intervalic structures of quarks: some of these degrees of freedom are no other thing than all those mysterious quantum numbers.

INTERVALIC SPIN SYMMETRY

Since gaudino is postulated to be the first *fermion* of Nature, assembled in the intervalic primordial aggregation at the Big Bang, the most simple assumption is to set the spin of all gaudinos to ½. As quarks are made from the assembly of ⅓, ⅔, 1, 2, 3, 4 or 5 gaudinos in an antisymmetric state under interchange (as the assembly of gaudinos in a symmetric state makes no quarks but zero charge massive bosons), their corresponding groups of spin symmetry will lead to the following basic states (not to mention mixed symmetric and antisymmetric groups of the decomposition which may lead to a lot of excited states of quarks with higher spin; they may increase the already large zoo of baryons almost indefinitely along with the own excited states of the previous constituent gaudinos). In resume, the antisymmetric multiplets of the decomposition made from gaudinos' spin determine the basic states of the quarks' spin:

- Quarks L⅓ of all symmetries made from the assembly of:
gaudinos with SU(1) spin symmetry = 2 → basic spin: ½

- Quarks L⅔ of all symmetries made from the assembly of:
gaudinos with SU(1) spin symmetry = 2 → basic spin: ½

- Quarks L1 of all symmetries made from the assembly of:
gaudinos with SU(1) spin symmetry = 2 → basic spin: ½

- Quarks L2 of all symmetries made from the assembly of:
gaudinos with SU(2) spin symmetry = 2 ⊗ 2 → basic spin: 0

- Quarks L3 of all symmetries made from the assembly of:
gaudinos with SU(2) spin symmetry = 2 ⊗ 2 ⊗ 2 → basic spin: ½

- Quarks L4 of all symmetries made from the assembly of:
gaudinos with SU(2) spin symmetry = 2 ⊗ 2 ⊗ 2 ⊗ 2 → basic spin: 0

- Quarks L5 of all symmetries made from the assembly of:
gaudinos with SU(2) spin symmetry = 2 ⊗ 2 ⊗ 2 ⊗ 2 ⊗ 2 → basic spin: ½

Therefore *even* quarks, L2 and L4, are not fermions but bosons. It can be noted that these *even* lisztinos are just the principal constituent of mesons, in good agreement with experimental data (cfr. our paper on intervalic meson).

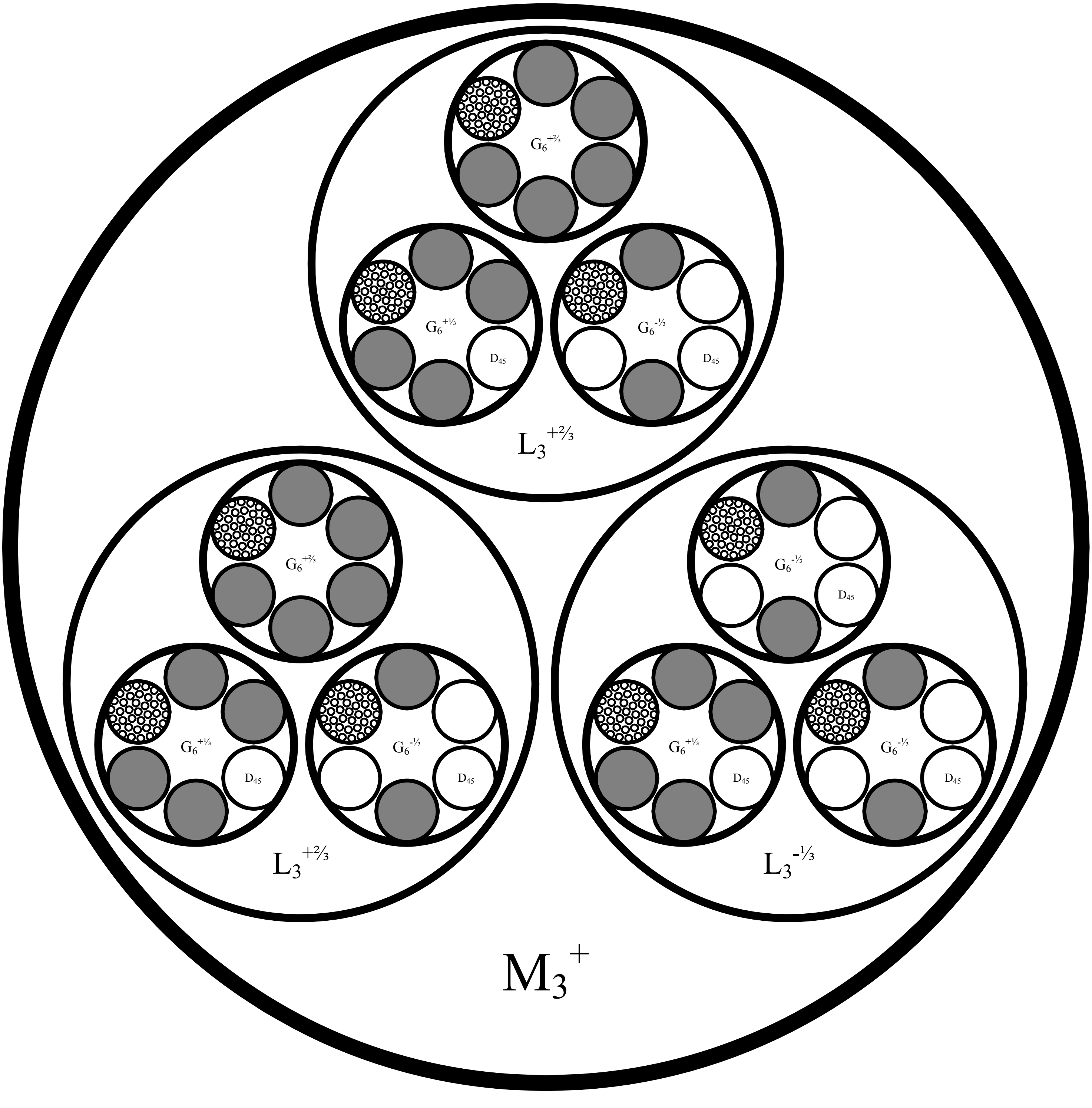
Once more it is clear that another one of the sacred principles in SM, that one which postulated that fermions were source of interaction particles and bosons were the intermediate particles of the interaction is not always truth; what means that it is simply false. Really, we have found at every step of IT a lot of bosons which contradict that supposed principle: spin 0 intervalinos are both source and intermediate particles of the changeless —strong— intervalic interaction, spin 0 dalinos are source particles; spin ½ gaudinos are both leptons and charged massive bosons; lisztinos can have different spin, and they are quarks which can be fermions or bosons, charged massive bosons which are bosons, and nucleus which can be likewise fermions or bosons; finally, monteverdinos are mesons and baryons, being the first ones bosons, but the second ones can be once more fermions as well as bosons. In a word, the traditional interpretation of the supposed high principle of SM which prayed: fermion = source particle, and boson = intermediate particle, has finally resulted to be a total and complete disaster without palliatives as in general there are much more bosons than the intended ones. In IT we can say that this principle is replaced by a deeper comprehension of the mechanism involved in a interaction, as we will see when describing the intervalic interaction.

According to this the spin symmetry of baryons would be described by a doublet and a singlet, in a similar way as the isocharge symmetry. Experimental physicists have a lot of work to do for detecting and writing down these states. However, it is expected that a lot of these allowed baryons will not be able to be detected through our actual primitive devices working at present available energies. Anyway, it will have to be researched why or whether Nature follows a possible main phenomenology sequence in the making of quarks inside each intervalic symmetry. And I am afraid that the answer to this question will not be able to be explained *only* by usual physical principles, as the principle of *minimal energy*, etc. but introducing what perhaps may be the last foundations of Epistemology concerning the still unknown relations between energy, symmetry and form. This fascinating matter would lead us out of the frontiers of Physics, which is far beyond the subject of this paper.

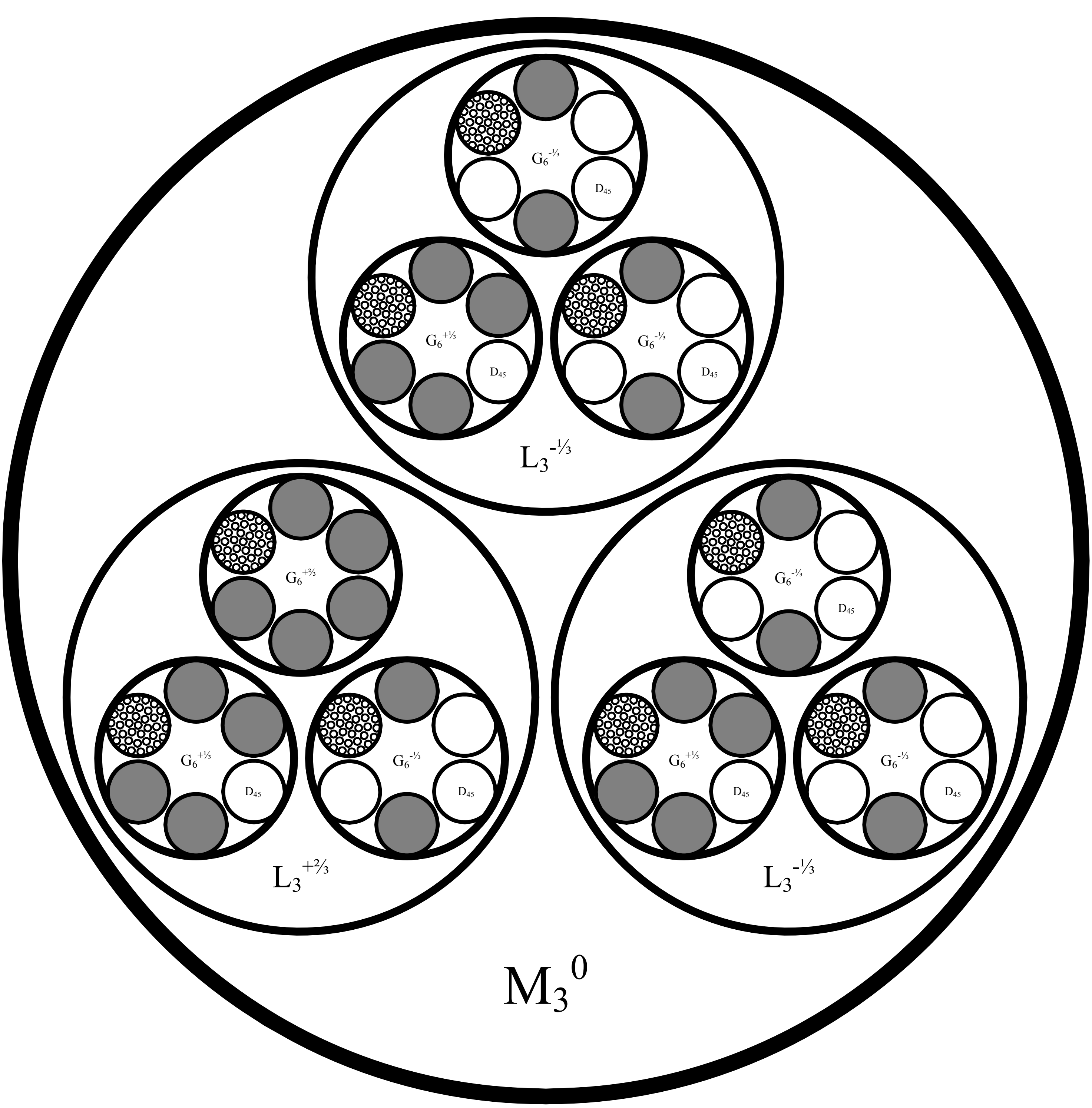
INTERVALIC STRUCTURE OF THE SUPPOSED OCTET OF BARYONS SU(3) OF THE STANDARD MODEL

The particles composing this supposed octet can be totally explained by their intervalic structures which match the experimental data with remarkable precision. Although it is clear that the decomposition of the SU(7) groups of *intervalic structure* symmetry will give at last a reliable basis for a general classification of baryonic states, which will make irrelevant the provisional and misleading classification according the traditional SU(3) *flavour* symmetry of SM, we are going to view which are the intervalic structures of one of these multiplets of baryons, in order to see their truthful intervalic structure:

p (938.3) = ($\mathrm{L3D45}^{(2/3)}\ \mathrm{L3D45}^{(2/3)}\ \mathrm{L3D45}^{(1/3)}$)
n (939.6) = ($\mathrm{L3D45}^{(2/3)}\ \mathrm{L3D45}^{(1/3)}\ \mathrm{L3D45}^{(1/3)}$)
Λ^0 (1115.7) = ($\mathrm{L}\tfrac{2}{3}\mathrm{D45}^{(2/3)}\ \mathrm{L5D45}^{(1/3)}\ \mathrm{L5D45}^{(1/3)}$)
Σ^+ (1189.4) = ($\mathrm{L3D45}^{(2/3)}\ \mathrm{L4D45}^{(2/3)}\ \mathrm{L4D45}^{(1/3)}$)
Σ^0 (1192.6) = ($\mathrm{L3D45}^{(2/3)}\ \mathrm{L4D45}^{(1/3)}\ \mathrm{L4D45}^{(1/3)}$)
Σ^- (1197.4) = ($\mathrm{L3D45}^{(1/3)}\ \mathrm{L4D45}^{(1/3)}\ \mathrm{L4D45}^{(1/3)}$)
Ξ^0 (1314.8) = ($\mathrm{L4D45}^{(2/3)}\ \mathrm{L4D45}^{(1/3)}\ \mathrm{L4D45}^{(1/3)}$)
Ξ^- (1321.3) = ($\mathrm{L4D45}^{(1/3)}\ \mathrm{L4D45}^{(1/3)}\ \mathrm{L4D45}^{(1/3)}$)



Figured intervalic structure of *proton* (unlike charges shadowed):
$M_3^+ = 3\ L_3\ (L_3^{+2/3}, L_3^{-1/3}, L_3^{+2/3}) =$
$9\ G_6\ (2G_6^{+2/3}, 4G_6^{-1/3}, 3G_6^{+1/3}) = 54\ D_{45}\ (30D_{+45}, 24D_{-45}) = 2430\ \mathbf{I}$



Figured intervalic structure of *neutron* (unlike charges shadowed):
$M_3^0 = 3\ L_3\ (L_3^{-1/3},\ L_3^{+2/3},\ L_3^{-1/3}) =$
$9\ G_6\ (1G_6^{+2/3},\ 5G_6^{-1/3},\ 3G_6^{+1/3}) = 54\ D_{45}\ (27D_{+45},\ 27D_{-45}) = 2430\ \mathbf{I}$

The mass due to the intervalic energy, $I = c^{\pm 2} \hbar Q^{-2}$, fully explains why an intervalic structure with electric charge ⅓ has slightly more mass than the same intervalic structure with charge ⅔. This phenomenon appears in a lot of baryons, such as in *p n*, Σ^{+} Σ^{0} Σ^{-} , Ξ^{0} Ξ^{-} , etc. In the case of nucleon, the difference of mass between proton and neutron have been explained by IT with unbelievably precision which not only fit up to the last decimal of the best experimental data, but makes a prediction with an accuracy of two powers beyond such data. The difference of mass between the remaining particles can be now easily explained according to the Intervalic Theory in the same way. This is an important achievement of IT which allow us to understand the masses and other features of subatomic particles.

INTERVALIC STRUCTURE OF THE SUPPOSED DECUPLET OF BARYONS SU(3) OF THE STANDARD MODEL

According to the intervalic structures involved, the supposed decuplet of SU(3) flavour symmetry shows a chaotic classification of baryons where no simple sequence is founded, but the baryons may be remote or partially unrelated regarding their intervalic structures. This can be easily understood since the 6 supposed flavours of SM has been replaced by a wider set of intervalic structures: 7 intervalic structures in each one of the intervalic symmetries —namely {D45}, {D30}, {D18}, {D6}, {D5}, {D3}, {D2}—, totalling 7 x 7 = 49 intervalic structures. The SU(6) x SU(3) supposed *flavour* and *colour* symmetry has been replaced by a SU(7) + SU(7) + SU(7) + SU (7) + SU(7) + SU(7) + SU(7) *intervalic structure* symmetry. By this reason the partial classification of baryons made by the first appears as a unique and ridicule thrown of the dice among the whole set of possibilities realized by the second. Even worst, the vast majority of baryonic combinations —SU(6) x SU(3) = 5832 baryons— predicted by the supposed *flavour* and *colour* symmetry are completely wrong because Nature does not mix intervalic symmetries. It is curious how the group of SU(3) *colour* symmetry is never written down in the traditional model of quarks. Perhaps its incoherence becomes more when it is written down.

Needless to say that according to the SU(7) groups of *intervalic structure* symmetry, the SU(6) group of *flavour* symmetry and the group SU(3) of colour symmetry are pure fantasy, and therefore their derived quantum numbers, as *i.e.* the hypercharge. Thus the traditional classification of baryonic states in SM is entirely disappointing as from the three physical quantities involved in the usual representation of the multiplets —electric charge, hypercharge and isospin— only the first one of them stay as a reliable magnitude inside IT. Besides, flavour, colour, electric charge, spin and isospin are intended to be independent and unrelated physical quantities in SM. On the contrary, inside IT it has to be remarked that all quantum numbers and physical quantities (including mass, intervalic energy, electromagnetic energy, spin energy, etc.) are completely derived from a unique concept: the *intervalic structure*, whose intervalic symmetries determine all the quantum numbers and physical quantities allowed to any subatomic particles. In resume, the classification of particles according to SM is a complete mess which can no longer be maintained.

Δ^{++} (1232) = (L⅔D30$^{(\frac{2}{3})}$ L⅔D30$^{(\frac{2}{3})}$ L2D30$^{(\frac{2}{3})}$)
(L1D45$^{(\frac{1}{3},\,\frac{2}{3})}$ L5D45$^{(\frac{1}{3},\,\frac{2}{3})}$ L5D45$^{(\frac{1}{3},\,\frac{2}{3})}$)
Δ^{+} (1232) = (L⅔D30$^{(\frac{2}{3})}$ L⅔D30$^{(\frac{2}{3})}$ L2D30$^{(\frac{2}{3})}$)
(L1D45$^{(\frac{1}{3},\,\frac{2}{3})}$ L5D45$^{(\frac{1}{3},\,\frac{2}{3})}$ L5D45$^{(\frac{1}{3},\,\frac{2}{3})}$)
Δ^{0} (1232) = (L⅔D30$^{(\frac{2}{3})}$ L⅔D30$^{(\frac{2}{3})}$ L2D30$^{(\frac{2}{3})}$)
(L1D45$^{(\frac{1}{3},\,\frac{2}{3})}$ L5D45$^{(\frac{1}{3},\,\frac{2}{3})}$ L5D45$^{(\frac{1}{3},\,\frac{2}{3})}$)
Δ^{-} (1232) = (L⅔D30$^{(\frac{2}{3})}$ L⅔D30$^{(\frac{2}{3})}$ L2D30$^{(\frac{2}{3})}$)
(L1D45$^{(\frac{1}{3},\,\frac{2}{3})}$ L5D45$^{(\frac{1}{3},\,\frac{2}{3})}$ L5D45$^{(\frac{1}{3},\,\frac{2}{3})}$)
Σ^{+} (1385) = (L3D45$^{(\frac{1}{3},\,\frac{2}{3})}$ L5D45$^{(\frac{1}{3},\,\frac{2}{3})}$ L5D45$^{(\frac{1}{3},\,\frac{2}{3})}$)
(L4D45$^{(\frac{1}{3},\,\frac{2}{3})}$ L4D45$^{(\frac{1}{3},\,\frac{2}{3})}$ L5D45$^{(\frac{1}{3},\,\frac{2}{3})}$)
Σ^{0} (1385) = (L3D45$^{(\frac{1}{3},\,\frac{2}{3})}$ L5D45$^{(\frac{1}{3},\,\frac{2}{3})}$ L5D45$^{(\frac{1}{3},\,\frac{2}{3})}$)
(L4D45$^{(\frac{1}{3},\,\frac{2}{3})}$ L4D45$^{(\frac{1}{3},\,\frac{2}{3})}$ L5D45$^{(\frac{1}{3},\,\frac{2}{3})}$)
Σ^{-} (1385) = (L3D45$^{(\frac{1}{3},\,\frac{2}{3})}$ L5D45$^{(\frac{1}{3},\,\frac{2}{3})}$ L5D45$^{(\frac{1}{3},\,\frac{2}{3})}$)
(L4D45$^{(\frac{1}{3},\,\frac{2}{3})}$ L4D45$^{(\frac{1}{3},\,\frac{2}{3})}$ L5D45$^{(\frac{1}{3},\,\frac{2}{3})}$)
Ξ^{0} (1533) = (L4D45$^{(\frac{1}{3},\,\frac{2}{3})}$ L5D45$^{(\frac{1}{3},\,\frac{2}{3})}$ L5D45$^{(\frac{1}{3},\,\frac{2}{3})}$)
Ξ^{-} (1533) = (L4D45$^{(\frac{1}{3},\,\frac{2}{3})}$ L5D45$^{(\frac{1}{3},\,\frac{2}{3})}$ L5D45$^{(\frac{1}{3},\,\frac{2}{3})}$)
(L⅓D30$^{(\frac{1}{3})}$ L1D30$^{(\frac{1}{3})}$ L3D30$^{(\frac{1}{3})}$)
(L⅓D30$^{(\frac{1}{3})}$ L2D30$^{(\frac{2}{3})}$ L2D30$^{(\frac{2}{3})}$)
(L⅔D30$^{(\frac{2}{3})}$ L⅔D30$^{(\frac{2}{3})}$ L3D30$^{(\frac{1}{3})}$)
Ω^{-} (1672) = (L5D45$^{(\frac{1}{3},\,\frac{2}{3})}$ L5D45$^{(\frac{1}{3},\,\frac{2}{3})}$ L5D45$^{(\frac{1}{3},\,\frac{2}{3})}$)
(L⅓D18$^{(\frac{1}{3})}$ L⅓D18$^{(\frac{1}{3})}$ L⅓D18$^{(\frac{1}{3})}$)

INTERVALIC STRUCTURES OF BARYONS

Every known baryon can be fully explained through a determine intervalic structure. Sceptics please note that the probability to reach such a total match with the set of intervalic symmetries is practically zero. Moreover, it has to be pointed out incessantly that *no one parameter* has been introduced or chosen by hand in the Intervalic Theory, as all the intervalic symmetries are logical and unavoidably derived from the intervalic units, which at once are derived exclusively from the two fundamental constants of Nature, c and h. Thus, the whole IT and the whole IT in Particle Physics has been postulated without introducing by hand any parameter or constant. Really, the theory runs inclusive without setting c and ħ to 1 because the working of the intervalic dimensions does not depend on that setting.

For the SM way of thinking, the obsessive search for further baryons and other subatomic particles was a very strong necessity, as this was the only way SM had to advance blindly across a lot of subatomic particles whose existence, mass and the other physical features did not understand, but only could poorly *describe* ad hoc in a partial and misleading way. Of course, then there was perhaps no other ways to progress in Physics. But once the Intervalic Theory was postulated such obsessive search for baryons leaves obsession and has to be interpreted in a new manner. Now we have a whole *theory* that predicts with detailed precision all the allowed baryonic states. At present there is enough evidence for the existence of the intervalic symmetries {D270}, {D45}, {D30} and {D18} in all sectors, and enough evidence for the existence of {D6} and {D5} symmetries in the lepton-massive boson sector. Therefore once we will have reached full evidence for the existence of the remaining symmetries: {D6} and {D5} symmetries in the quark sector, {D3} and {D2} symmetries in both sectors, there will be no reason to mortify us searching *all* the baryonic states allowed by the intervalic symmetries, but we will be able to address our efforts to other more fruitful tasks, as IT predicts a lot of possibilities for technologic advances which before the postulation of IT could never be imagined.

In resume, we are going to list the baryons which existence has the greatest experimental evidence, showing their intervalic structure. The vast majority of detected baryons pertain to the {D45} and {D30} symmetries, as they are the sets which small energies are nowadays available. It has to be remembered that the mass energy due to the electric charge of the quarks is not included in the masses of the intervalic structures of quarks given in our tables. Therefore, such mass energy have to be added to those masses, and the total mass will be slightly greater that the sum of the constituent quarks masses according to the quark ratio between intervalic energy and electromagnetic energy (really no one quark —including possible heavier ones due to an excited gaudinar structure— reaches a mass according to the electron ratio, written next to the first, although we have written them down for pure systematic way of work).

It can also be noted the powerful constraints imposed by the intervalic structure to the resultant electric charge of baryons, which allows a reduced number of combinations to yield certain values as ⅔ + ⅔ + ⅔ = 2. However, it can be seen that the intervalic structures involved in these cases (for example, the double elementary charge of Δ) are just those *even* ones, but not the *odd* ones. And as we can expect, the masses of such even intervalic structures fit justly with experimental data.

The intervalic symmetries allows to grouping the constituent gaudinos of a baryon into different lisztinos —quarks— without varying the number of constituent gaudinos. In close relation with the preceding paragraph, these different combinations of gaudinos may differ in the electric charge and spin, which allowed magnitudes are anyway strongly constrained by the own intervalic structures. With independence of this, the grouping of gaudinos may be responsible of the existence of the excited states of baryons, along with the own intervalic structures of gaudinos. Some of those possible different groupings have been written down in the following list, which shows the most probable intervalic structure of experimentally well detected baryons.

Finally, we can remember once more that, to determine an allowed baryon, SM has to deal with a minimum of five supposedly independent physical quantities: flavour, charge, spin, isospin and colour; whilst in IT all allowed baryonic states are fully determined by a unique feature: the *intervalic structure*, from which derives the remaining symmetries of spin and isocharge, as well as all the remaining physical quantities of monteverdinos.

N (939) = ($L3D45^{(\frac{1}{3},\frac{2}{3})}\,L3D45^{(\frac{1}{3},\frac{2}{3})}\,L3D45^{(\frac{1}{3},\frac{2}{3})}$)
N (1440) = ($L3D45^{(\frac{1}{3},\frac{2}{3})}\,L5D45^{(\frac{1}{3},\frac{2}{3})}\,L5D45^{(\frac{1}{3},\frac{2}{3})}$)
($L4D45^{(\frac{1}{3},\frac{2}{3})}\,L4D45^{(\frac{1}{3},\frac{2}{3})}\,L5D45^{(\frac{1}{3},\frac{2}{3})}$)
($L\tfrac{1}{3}D30^{(\frac{1}{3})}\,L\tfrac{2}{3}D30^{(\frac{2}{3})}\,L3D30^{(\frac{1}{3})}$)
($L1D30^{(\frac{1}{3})}\,L1D30^{(\frac{1}{3})}\,L2D30^{(\frac{2}{3})}$)
N (1520) = ($L4D45^{(\frac{1}{3},\frac{2}{3})}\,L5D45^{(\frac{1}{3},\frac{2}{3})}\,L5D45^{(\frac{1}{3},\frac{2}{3})}$)
N (1535) = ($L4D45^{(\frac{1}{3},\frac{2}{3})}\,L5D45^{(\frac{1}{3},\frac{2}{3})}\,L5D45^{(\frac{1}{3},\frac{2}{3})}$)
N (1650) = ($L\tfrac{2}{3}D30^{(\frac{2}{3})}\,L2D30^{(\frac{2}{3})}\,L2D30^{(\frac{2}{3})}$)
N (1675) = ($L\tfrac{2}{3}D30^{(\frac{2}{3})}\,L2D30^{(\frac{2}{3})}\,L2D30^{(\frac{2}{3})}$)
N (1680) = ($L\tfrac{1}{3}D30^{(\frac{1}{3})}\,L\tfrac{1}{3}D30^{(\frac{1}{3})}\,L4D30^{(\frac{2}{3})}$)
N (1700) = ($L\tfrac{1}{3}D30^{(\frac{1}{3})}\,L\tfrac{1}{3}D30^{(\frac{1}{3})}\,L4D30^{(\frac{2}{3})}$)
N (1710) = ($L\tfrac{2}{3}D30^{(\frac{2}{3})}\,L1D30^{(\frac{1}{3})}\,L3D30^{(\frac{1}{3})}$)
N (1720) = ($L\tfrac{2}{3}D30^{(\frac{2}{3})}\,L1D30^{(\frac{1}{3})}\,L3D30^{(\frac{1}{3})}$)
N (1900) = ($L\tfrac{1}{3}D30^{(\frac{1}{3})}\,L1D30^{(\frac{1}{3})}\,L4D30^{(\frac{2}{3})}$)
($L\tfrac{1}{3}D30^{(\frac{1}{3})}\,L2D30^{(\frac{2}{3})}\,L3D30^{(\frac{1}{3})}$)
N (1990) = ($L\tfrac{2}{3}D30^{(\frac{2}{3})}\,L1D30^{(\frac{1}{3})}\,L4D30^{(\frac{2}{3})}$)
($L\tfrac{2}{3}D30^{(\frac{2}{3})}\,L2D30^{(\frac{2}{3})}\,L3D30^{(\frac{1}{3})}$)
N (2000) = ($L\tfrac{2}{3}D30^{(\frac{2}{3})}\,L1D30^{(\frac{1}{3})}\,L4D30^{(\frac{2}{3})}$)
($L\tfrac{2}{3}D30^{(\frac{2}{3})}\,L2D30^{(\frac{2}{3})}\,L3D30^{(\frac{1}{3})}$)
N (2080) = ($L\tfrac{2}{3}D30^{(\frac{2}{3})}\,L1D30^{(\frac{1}{3})}\,L4D30^{(\frac{2}{3})}$)
($L\tfrac{2}{3}D30^{(\frac{2}{3})}\,L2D30^{(\frac{2}{3})}\,L3D30^{(\frac{1}{3})}$)
N (2190) = ($L\tfrac{1}{3}D30^{(\frac{1}{3})}\,L\tfrac{2}{3}D30^{(\frac{2}{3})}\,L5D30^{(\frac{1}{3})}$)

N (2200) = (L⅓D30$^{(⅓)}$ L⅔D30$^{(⅔)}$ L5D30$^{(⅓)}$)
N (2220) = (L1D30$^{(⅓)}$ L1D30$^{(⅓)}$ L4D30$^{(⅔)}$)
N (2250) = (L1D30$^{(⅓)}$ L2D30$^{(⅔)}$ L3D30$^{(⅓)}$)
N (2600) = (L⅓D30$^{(⅓)}$ L3D30$^{(⅓)}$ L4D30$^{(⅔)}$)
(L⅓D30$^{(⅓)}$ L2D30$^{(⅔)}$ L5D30$^{(⅓)}$)
N (2700) = (L⅔D30$^{(⅔)}$ L3D30$^{(⅓)}$ L4D30$^{(⅔)}$)
(L⅔D30$^{(⅔)}$ L2D30$^{(⅔)}$ L5D30$^{(⅓)}$)

Δ (1232) = (L⅔D30$^{(⅔)}$ L⅔D30$^{(⅔)}$ L2D30$^{(⅔)}$)
(L1D45$^{(⅓, ⅔)}$ L5D45$^{(⅓, ⅔)}$ L5D45$^{(⅓, ⅔)}$)
Δ (1600) = (L5D45$^{(⅓, ⅔)}$ L5D45$^{(⅓, ⅔)}$ L5D45$^{(⅓, ⅔)}$)
Δ (1620) = (L5D45$^{(⅓, ⅔)}$ L5D45$^{(⅓, ⅔)}$ L5D45$^{(⅓, ⅔)}$)
Δ (1700) = (L⅔D30$^{(⅔)}$ L2D30$^{(⅔)}$ L2D30$^{(⅔)}$)
Δ (1900) = (L⅔D30$^{(⅔)}$ L⅔D30$^{(⅔)}$ L4D30$^{(⅔)}$)
Δ (1905) = (L⅔D30$^{(⅔)}$ L⅔D30$^{(⅔)}$ L4D30$^{(⅔)}$)
Δ (1910) = (L⅔D30$^{(⅔)}$ L⅔D30$^{(⅔)}$ L4D30$^{(⅔)}$)
Δ (1920) = (L⅔D30$^{(⅔)}$ L⅔D30$^{(⅔)}$ L4D30$^{(⅔)}$)
Δ (1930) = (L⅔D30$^{(⅔)}$ L⅔D30$^{(⅔)}$ L4D30$^{(⅔)}$)
Δ (1950) = (L⅔D30$^{(⅔)}$ L⅔D30$^{(⅔)}$ L4D30$^{(⅔)}$)
Δ (2000) = (L⅓D30$^{(⅓)}$ L⅓D30$^{(⅓)}$ L5D30$^{(⅓)}$)
Δ (2300) = (L⅓D30$^{(⅓)}$ L3D30$^{(⅓)}$ L3D30$^{(⅓)}$)
Δ (2400) = (L⅔D30$^{(⅔)}$ L2D30$^{(⅔)}$ L4D30$^{(⅔)}$)
Δ (2420) = (L⅔D30$^{(⅔)}$ L3D30$^{(⅓)}$ L3D30$^{(⅓)}$)
Δ (2750) = (L⅔D30$^{(⅔)}$ L3D30$^{(⅓)}$ L4D30$^{(⅔)}$)
Δ (2950) = (L⅓D30$^{(⅓)}$ L3D30$^{(⅓)}$ L5D30$^{(⅓)}$)

Λ (1116) = (L⅔D45$^{(⅓, ⅔)}$ L5D45$^{(⅓, ⅔)}$ L5D45$^{(⅓, ⅔)}$)
Λ (1405) = (L3D45$^{(⅓, ⅔)}$ L5D45$^{(⅓, ⅔)}$ L5D45$^{(⅓, ⅔)}$)
(L4D45$^{(⅓, ⅔)}$ L4D45$^{(⅓, ⅔)}$ L5D45$^{(⅓, ⅔)}$)
Λ (1520) = (L4D45$^{(⅓, ⅔)}$ L5D45$^{(⅓, ⅔)}$ L5D45$^{(⅓, ⅔)}$)
Λ (1600) = (L5D45$^{(⅓, ⅔)}$ L5D45$^{(⅓, ⅔)}$ L5D45$^{(⅓, ⅔)}$)
Λ (1670) = (L⅔D30$^{(⅔)}$ L1D30$^{(⅓)}$ L3D30$^{(⅓)}$)
Λ (1690) = (L⅓D30$^{(⅓)}$ L⅓D30$^{(⅓)}$ L4D30$^{(⅔)}$)
Λ (1800) = (L⅓D30$^{(⅓)}$ L⅔D30$^{(⅔)}$ L4D30$^{(⅔)}$)
Λ (1810) = (L⅓D30$^{(⅓)}$ L⅔D30$^{(⅔)}$ L4D30$^{(⅔)}$)
Λ (1820) = (L1D30$^{(⅓)}$ L2D30$^{(⅔)}$ L2D30$^{(⅔)}$)
Λ (1830) = (L1D30$^{(⅓)}$ L2D30$^{(⅔)}$ L2D30$^{(⅔)}$)
Λ (1890) = (L⅓D30$^{(⅓)}$ L2D30$^{(⅔)}$ L3D30$^{(⅓)}$)
Λ (2100) = (L⅔D30$^{(⅔)}$ L2D30$^{(⅔)}$ L3D30$^{(⅓)}$)
Λ (2110) = (L⅓D30$^{(⅓)}$ L⅓D30$^{(⅓)}$ L5D30$^{(⅓)}$)
Λ (2325) = (L⅓D30$^{(⅓)}$ L3D30$^{(⅓)}$ L3D30$^{(⅓)}$)
Λ (2350) = (L⅔D30$^{(⅔)}$ L3D30$^{(⅓)}$ L3D30$^{(⅓)}$)

$\Sigma (1193) = (L1D45^{(\frac{1}{3}, \frac{2}{3})}\ L5D45^{(\frac{1}{3}, \frac{2}{3})}\ L5D45^{(\frac{1}{3}, \frac{2}{3})})$
$(L3D45^{(\frac{1}{3}, \frac{2}{3})}\ L3D45^{(\frac{1}{3}, \frac{2}{3})}\ L5D45^{(\frac{1}{3}, \frac{2}{3})})$
$(L3D45^{(\frac{1}{3}, \frac{2}{3})}\ L4D45^{(\frac{1}{3}, \frac{2}{3})}\ L4D45^{(\frac{1}{3}, \frac{2}{3})})$
$\Sigma (1385) = (L3D45^{(\frac{1}{3}, \frac{2}{3})}\ L5D45^{(\frac{1}{3}, \frac{2}{3})}\ L5D45^{(\frac{1}{3}, \frac{2}{3})})$
$(L4D45^{(\frac{1}{3}, \frac{2}{3})}\ L4D45^{(\frac{1}{3}, \frac{2}{3})}\ L5D45^{(\frac{1}{3}, \frac{2}{3})})$
$\Sigma (1560) = (L5D45^{(\frac{1}{3}, \frac{2}{3})}\ L5D45^{(\frac{1}{3}, \frac{2}{3})}\ L5D45^{(\frac{1}{3}, \frac{2}{3})})$
$\Sigma (1580) = (L5D45^{(\frac{1}{3}, \frac{2}{3})}\ L5D45^{(\frac{1}{3}, \frac{2}{3})}\ L5D45^{(\frac{1}{3}, \frac{2}{3})})$
$\Sigma (1620) = (L5D45^{(\frac{1}{3}, \frac{2}{3})}\ L5D45^{(\frac{1}{3}, \frac{2}{3})}\ L5D45^{(\frac{1}{3}, \frac{2}{3})})$
$\Sigma (1660) = (L\frac{2}{3}D30^{(\frac{2}{3})}\ L2D30^{(\frac{2}{3})}\ L2D30^{(\frac{2}{3})})$
$\Sigma (1670) = (L\frac{2}{3}D30^{(\frac{2}{3})}\ L1D30^{(\frac{1}{3})}\ L3D30^{(\frac{1}{3})})$
$\Sigma (1690) = (L\frac{2}{3}D30^{(\frac{2}{3})}\ L1D30^{(\frac{1}{3})}\ L3D30^{(\frac{1}{3})})$
$\Sigma (1750) = (L\frac{1}{3}D30^{(\frac{1}{3})}\ L\frac{2}{3}D30^{(\frac{2}{3})}\ L4D30^{(\frac{2}{3})})$
$\Sigma (1775) = (L1D30^{(\frac{1}{3})}\ L2D30^{(\frac{2}{3})}\ L2D30^{(\frac{2}{3})})$
$\Sigma (1880) = (L\frac{2}{3}D30^{(\frac{2}{3})}\ L\frac{2}{3}D30^{(\frac{2}{3})}\ L4D30^{(\frac{2}{3})})$
$\Sigma (1915) = (L\frac{1}{3}D30^{(\frac{1}{3})}\ L2D30^{(\frac{2}{3})}\ L3D30^{(\frac{1}{3})})$
$\Sigma (1940) = (L\frac{1}{3}D30^{(\frac{1}{3})}\ L\frac{1}{3}D30^{(\frac{1}{3})}\ L5D30^{(\frac{1}{3})})$
$\Sigma (2030) = (L\frac{2}{3}D30^{(\frac{2}{3})}\ L1D30^{(\frac{1}{3})}\ L4D30^{(\frac{2}{3})})$
$\Sigma (2080) = (L\frac{2}{3}D30^{(\frac{2}{3})}\ L2D30^{(\frac{2}{3})}\ L3D30^{(\frac{1}{3})})$
$\Sigma (2250) = (L\frac{1}{3}D30^{(\frac{1}{3})}\ L1D30^{(\frac{1}{3})}\ L5D30^{(\frac{1}{3})})$
$\Sigma (2455) = (L2D30^{(\frac{2}{3})}\ L2D30^{(\frac{2}{3})}\ L3D30^{(\frac{1}{3})})$
$\Sigma (2620) = (L\frac{1}{3}D30^{(\frac{1}{3})}\ L3D30^{(\frac{1}{3})}\ L4D30^{(\frac{2}{3})})$

$\Xi (1318) = (L4D45^{(\frac{1}{3}, \frac{2}{3})}\ L4D45^{(\frac{1}{3}, \frac{2}{3})}\ L4D45^{(\frac{1}{3}, \frac{2}{3})})$
$(L3D45^{(\frac{1}{3}, \frac{2}{3})}\ L4D45^{(\frac{1}{3}, \frac{2}{3})}\ L5D45^{(\frac{1}{3}, \frac{2}{3})})$
$(L2D45^{(\frac{1}{3}, \frac{2}{3})}\ L5D45^{(\frac{1}{3}, \frac{2}{3})}\ L5D45^{(\frac{1}{3}, \frac{2}{3})})$
$\Xi (1530) = (L4D45^{(\frac{1}{3}, \frac{2}{3})}\ L5D45^{(\frac{1}{3}, \frac{2}{3})}\ L5D45^{(\frac{1}{3}, \frac{2}{3})})$
$(L\frac{1}{3}D30^{(\frac{1}{3})}\ L1D30^{(\frac{1}{3})}\ L3D30^{(\frac{1}{3})})$
$(L\frac{1}{3}D30^{(\frac{1}{3})}\ L2D30^{(\frac{2}{3})}\ L2D30^{(\frac{2}{3})})$
$(L\frac{2}{3}D30^{(\frac{2}{3})}\ L\frac{2}{3}D30^{(\frac{2}{3})}\ L3D30^{(\frac{1}{3})})$
$\Xi (1690) = (L\frac{1}{3}D30^{(\frac{1}{3})}\ L\frac{1}{3}D30^{(\frac{1}{3})}\ L4D30^{(\frac{2}{3})})$
$(L\frac{2}{3}D30^{(\frac{2}{3})}\ L1D30^{(\frac{1}{3})}\ L3D30^{(\frac{1}{3})})$
$(L\frac{2}{3}D30^{(\frac{2}{3})}\ L2D30^{(\frac{2}{3})}\ L2D30^{(\frac{2}{3})})$
$\Xi (1820) = (L\frac{1}{3}D30^{(\frac{1}{3})}\ L\frac{2}{3}D30^{(\frac{2}{3})}\ L4D30^{(\frac{2}{3})})$
$(L1D30^{(\frac{1}{3})}\ L1D30^{(\frac{1}{3})}\ L3D30^{(\frac{1}{3})})$
$(L1D30^{(\frac{1}{3})}\ L2D30^{(\frac{2}{3})}\ L2D30^{(\frac{2}{3})})$
$\Xi (1950) = (L\frac{1}{3}D30^{(\frac{1}{3})}\ L1D30^{(\frac{1}{3})}\ L4D30^{(\frac{2}{3})})$
$(L\frac{1}{3}D30^{(\frac{1}{3})}\ L2D30^{(\frac{2}{3})}\ L3D30^{(\frac{1}{3})})$
$(L\frac{2}{3}D30^{(\frac{2}{3})}\ L\frac{2}{3}D30^{(\frac{2}{3})}\ L4D30^{(\frac{2}{3})})$
$\Xi (2030) = (L\frac{2}{3}D30^{(\frac{2}{3})}\ L1D30^{(\frac{1}{3})}\ L4D30^{(\frac{2}{3})})$
$(L\frac{2}{3}D30^{(\frac{2}{3})}\ L2D30^{(\frac{2}{3})}\ L3D30^{(\frac{1}{3})})$
$\Xi (2250) = (L\frac{1}{3}D30^{(\frac{1}{3})}\ L3D30^{(\frac{1}{3})}\ L3D30^{(\frac{1}{3})})$

$(L\tfrac{1}{3}D30^{(\frac{1}{3})}\ L2D30^{(\frac{2}{3})}\ L4D30^{(\frac{2}{3})})$
$(L\tfrac{1}{3}D30^{(\frac{1}{3})}\ L1D30^{(\frac{1}{3})}\ L5D30^{(\frac{1}{3})})$
$\Xi\ (2370) = (L\tfrac{2}{3}D30^{(\frac{2}{3})}\ L3D30^{(\frac{1}{3})}\ L3D30^{(\frac{1}{3})})$
$(L\tfrac{2}{3}D30^{(\frac{2}{3})}\ L2D30^{(\frac{2}{3})}\ L4D30^{(\frac{2}{3})})$
$(L\tfrac{2}{3}D30^{(\frac{2}{3})}\ L1D30^{(\frac{1}{3})}\ L5D30^{(\frac{1}{3})})$

$\Omega\ (1672) = (L\tfrac{1}{3}D18^{(\frac{1}{3})}\ L\tfrac{1}{3}D18^{(\frac{1}{3})}\ L\tfrac{1}{3}D18^{(\frac{1}{3})})$
$(L5D45^{(\frac{1}{3},\, \frac{2}{3})}\ L5D45^{(\frac{1}{3},\, \frac{2}{3})}\ L5D45^{(\frac{1}{3},\, \frac{2}{3})})$
$\Omega\ (2250) = (L\tfrac{1}{3}D18^{(\frac{1}{3})}\ L\tfrac{1}{3}D18^{(\frac{1}{3})}\ L\tfrac{2}{3}D18^{(\frac{2}{3})})$
$(L\tfrac{1}{3}D30^{(\frac{1}{3})}\ L3D30^{(\frac{1}{3})}\ L3D30^{(\frac{1}{3})})$

$\Lambda_c\ (2285) = (L\tfrac{1}{3}D30^{(\frac{1}{3})}\ L1D30^{(\frac{1}{3})}\ L5D30^{(\frac{1}{3})})$
$(L\tfrac{1}{3}D30^{(\frac{1}{3})}\ L3D30^{(\frac{2}{3})}\ L3D30^{(\frac{2}{3})})$
$\Lambda_c\ (2593) = (L\tfrac{1}{3}D30^{(\frac{1}{3})}\ L3D30^{(\frac{1}{3})}\ L4D30^{(\frac{2}{3})})$
$\Lambda_c\ (2625) = (L\tfrac{1}{3}D30^{(\frac{1}{3})}\ L3D30^{(\frac{1}{3})}\ L4D30^{(\frac{2}{3})})$

$\Sigma_c\ (2455) = (L\tfrac{2}{3}D30^{(\frac{2}{3})}\ L1D30^{(\frac{1}{3})}\ L5D30^{(\frac{1}{3})})$
$(L\tfrac{2}{3}D30^{(\frac{2}{3})}\ L3D30^{(\frac{1}{3})}\ L3D30^{(\frac{1}{3})})$
$\Sigma_c\ (2520) = (L1D30^{(\frac{1}{3})}\ L1D30^{(\frac{1}{3})}\ L5D30^{(\frac{1}{3})})$
$(L1D30^{(\frac{1}{3})}\ L3D30^{(\frac{1}{3})}\ L3D30^{(\frac{1}{3})})$

$\Xi_c\ (2465) = (L\tfrac{2}{3}D30^{(\frac{2}{3})}\ L1D30^{(\frac{1}{3})}\ L5D30^{(\frac{1}{3})})$
$(L\tfrac{2}{3}D30^{(\frac{2}{3})}\ L3D30^{(\frac{1}{3})}\ L3D30^{(\frac{1}{3})})$
$\Xi_c\ (2645) = (L\tfrac{1}{3}D30^{(\frac{1}{3})}\ L3D30^{(\frac{1}{3})}\ L4D30^{(\frac{2}{3})})$

$\Omega_c\ (2704) = (L\tfrac{1}{3}D18^{(\frac{1}{3})}\ L\tfrac{2}{3}D18^{(\frac{2}{3})}\ L\tfrac{2}{3}D18^{(\frac{2}{3})})$
$(L\tfrac{1}{3}D18^{(\frac{1}{3})}\ L\tfrac{1}{3}D18^{(\frac{1}{3})}\ L1D18^{(\frac{1}{3})})$
$(L\tfrac{2}{3}D30^{(\frac{2}{3})}\ L3D30^{(\frac{1}{3})}\ L4D30^{(\frac{2}{3})})$

Chapter 19

INTERVALIC π MESON

INTERVALIC π MESON

$\pi^{\pm}$ MESON INTERVALIC STRUCTURE

As we will see when studying the intervalic changeless —strong— interaction, the intervalic structure of the $\pi^{\pm}$ meson which explains in the most simple way the interaction between quarks inside nucleon is the following one:

$$M_2^{\pm} = (L_1, L_{⅓}) \equiv (1\ G_6^{\pm ⅔}, ⅓\ G_6^{\pm ⅓}) = 8\ D_{45}\ (7\ D_{\pm 45}, 1\ D_{\pm 45}) = 360\ \mathbf{I}$$

Please note that lisztinos L⅓, L⅔ and L1 are identical to gaudinos G⅓, G⅔ and G1 because they are just composed by an unique gaudino.

Nevertheless it can be proposed other alternative structures which fit equally good, such as:

$$M_2^{\pm} = 2\ L_{⅔} \equiv 2\ ⅔\ G_6\ (⅔\ G_6^{\pm ⅓}, ⅔\ G_6^{\pm ⅔}\ ) = 8\ D_{45}\ (7\ D_{\pm 45}, 1\ D_{\pm 45}) = 360\ \mathbf{I}$$

Please note that their dalinar structures are completely identical in both cases. The intervalic energy of the alternative structure of the $\pi^{\pm}$ meson: $L⅓D45^{(⅓)}\ L1D45^{(⅔)} = 8\ D_{45} = 360\ \mathbf{I}$, is exactly equal to that of the basic one, L⅔D45$^{(⅓)}$ L⅔D45$^{(⅔)}$ = 8 D_{45} = 360 **I**. Both structures can be equally postulated, and the only difference between them lies in the manner in which their 8 constituent dalinos are grouped, respectively: 2+6 or 4+4, a difference which can vary the electromagnetic mass energy of $\pi^{\pm}$ meson. As the reader may check, there are no other isocharge values of the intervalic structures of $\pi^{\pm}$ meson than the ones above written.

The intervalic structure of pion is in deep and meaningful relation with the intervalic structure of nucleon. This beautiful feature will be explained with detail in the chapter on the changeless —strong— intervalic interaction. However at this moment we are going to describe the $\pi^{\pm}$ meson basic features without making reference to that relation.

π^0 MESON INTERVALIC STRUCTURE

At first sight we find at least three possible intervalic structures for the π^0 meson. They are, showing its compositeness and structurefulness:

$$L_2 = 2\ G_5 = 10\ D_{54} = (5\ D_{+54},\ 5\ D_{-54}) = 540\ \mathbf{I}$$
$$M_2^0 = (L_1,\ L_{⅓}) \equiv (1\ G_6^{\pm⅓},\ ⅓\ G_6^{\pm⅓}) = 8\ D_{45}\ (4\ D_{\pm45},\ 4\ D_{\pm45}) = 360\ \mathbf{I}$$
$$M_2^0 = 2\ L_{⅔} \equiv 2\ ⅔\ G_6 = 8\ D_{45}\ (4\ D_{+45},\ 4\ D_{-45}) = 360\ \mathbf{I}$$

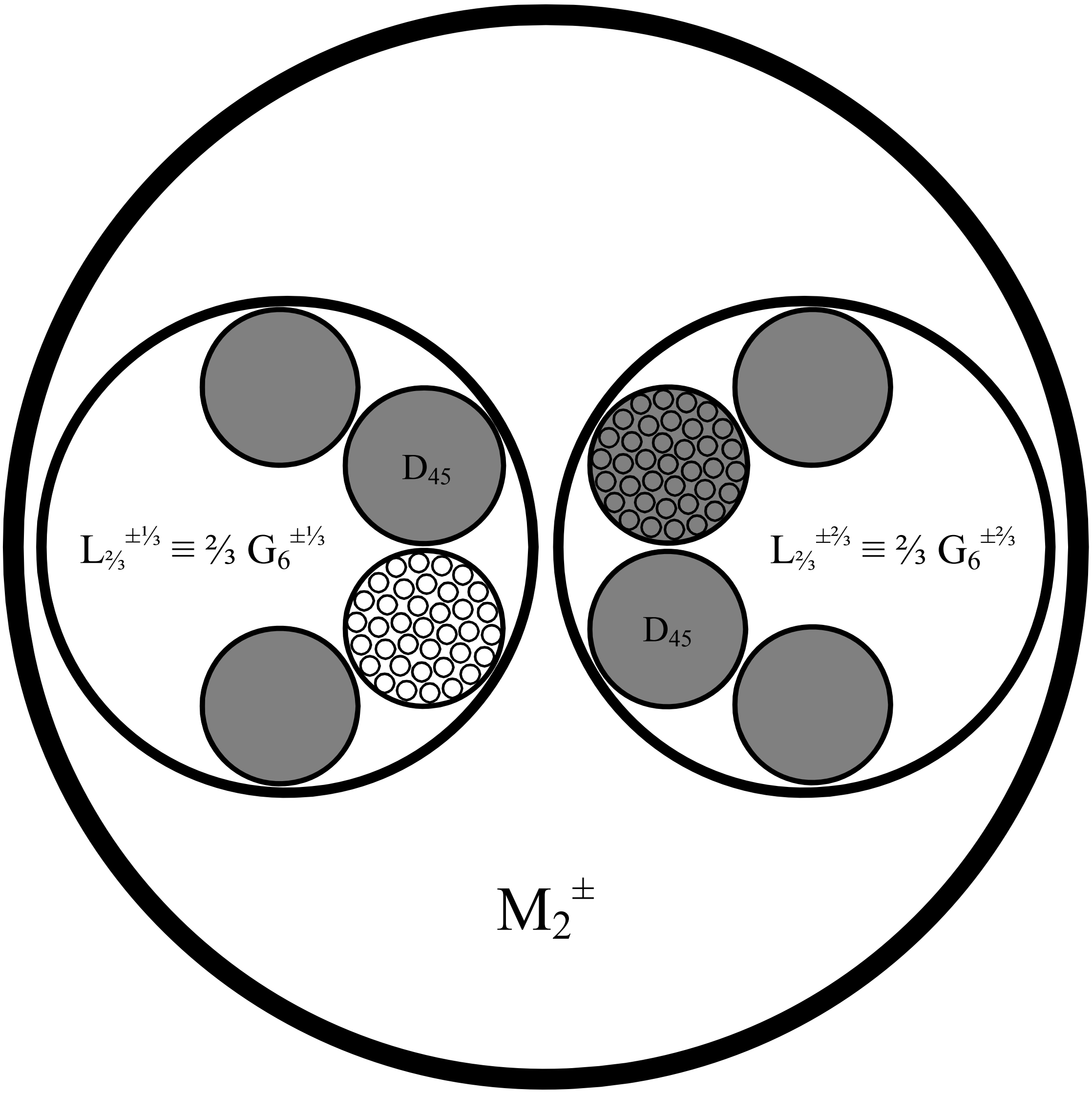
The last one seems to be the most appealing of them, and its isocharge has two possible states:

$$M_2^0 = 2\ L_{⅔} \equiv 2\ ⅔\ G_6\ (⅔\ G_6^{+⅔},\ ⅔\ G_6^{-⅔}\ ) = 8\ D_{45}\ (4\ D_{+45},\ 4\ D_{-45}) = 360\ \mathbf{I}$$
$$M_2^0 = 2\ L_{⅔} \equiv 2\ ⅔\ G_6\ (⅔\ G_6^{+⅓},\ ⅔\ G_6^{-⅓}\ ) = 8\ D_{45}\ (4\ D_{+45},\ 4\ D_{-45}) = 360\ \mathbf{I}$$

In other words, both identical constituent isoquarks, L⅔D45$^{(⅓,\ ⅔)}$, can have got at once isocharge value ⅓ or ⅔:

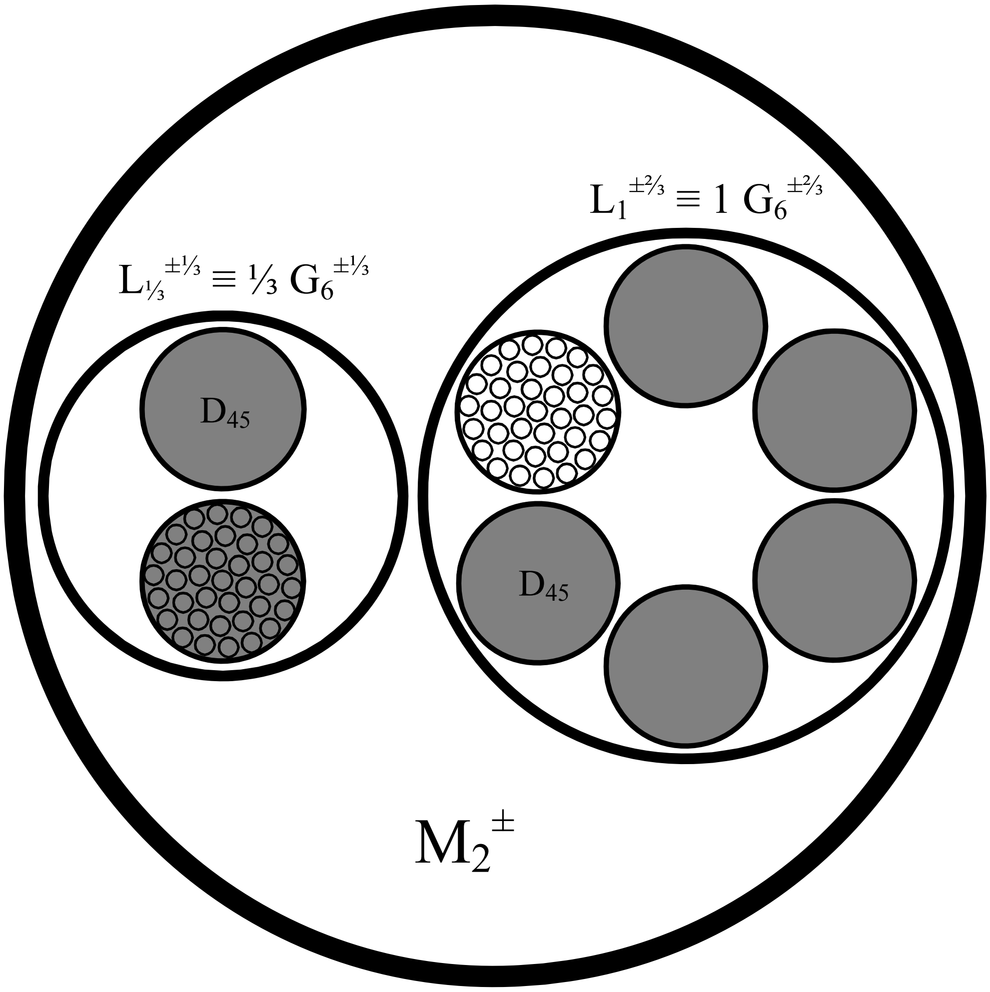
L⅔D45$^{(⅓)}$L⅔D45$^{(⅓)}$ or L⅔D45$^{(⅔)}$L⅔D45$^{(⅔)}$

The first point to inquiry is the value of the isocharge of the constituent quarks of π^0 meson among the two allowed ones. Since we experimentally know that the mass of π^0 is smaller than the mass of $\pi^{\pm}$, and the mass energy of particles with electric charge ⅓ is ever greater than the mass energy of particles with ⅔ charge (because the intervalic energy always predominates over the electromagnetic one at quantum scale, as we already have seen), we can postulate that the intervalic structure of π^0 meson is:



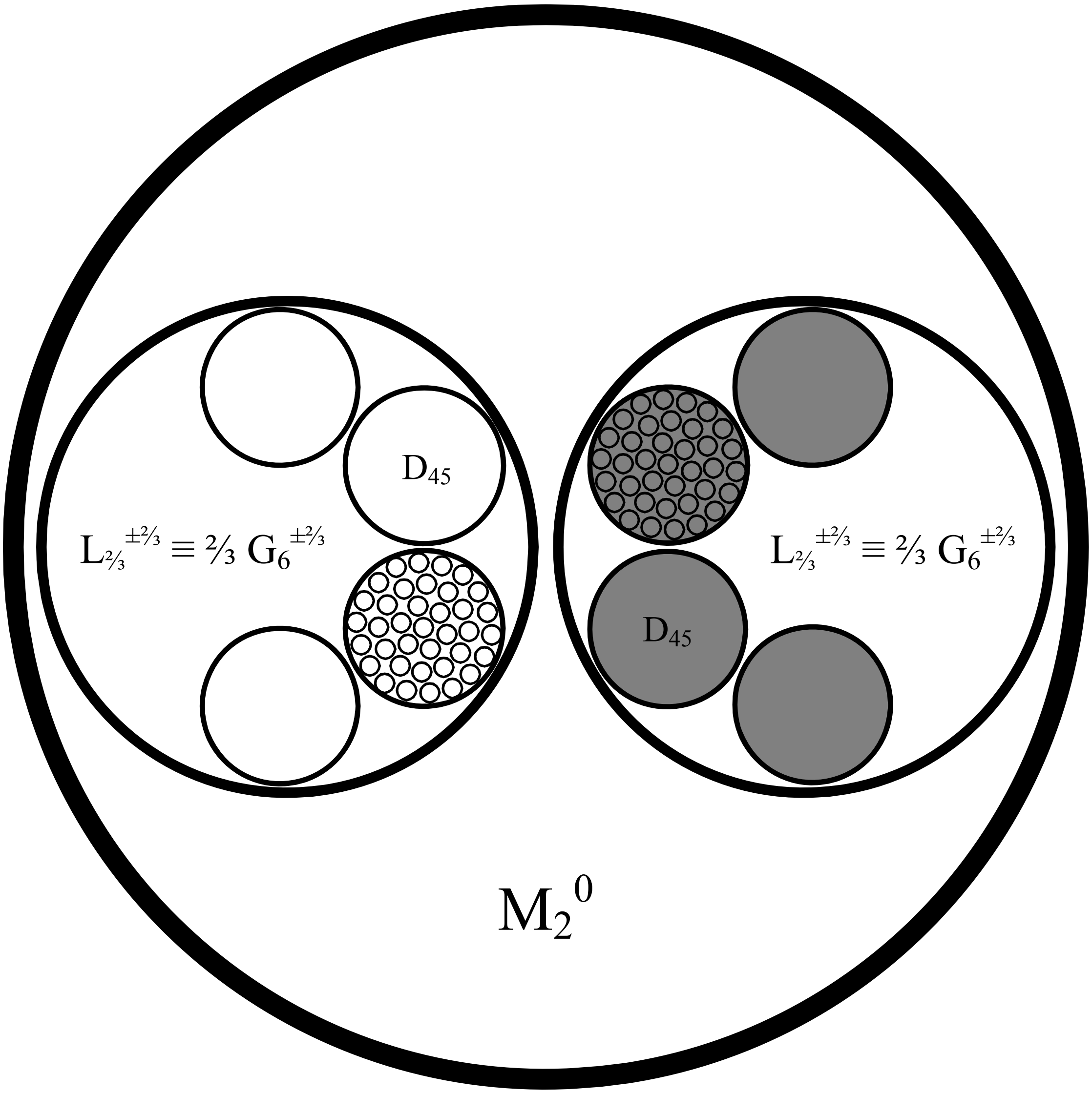
Figured intervalic structure of $\pi^{\pm}$ *meson*:

$M_2^{\pm} = 2\ L_{2/3} \equiv 2\ 2/3\ G_6\ (2/3\ G_6^{\pm 1/3},\ 2/3\ G_6^{\pm 2/3}\ ) = 8\ D_{45}\ (7\ D_{\pm 45},\ 1\ D_{\pm 45}) = 360\ \mathbf{I}$

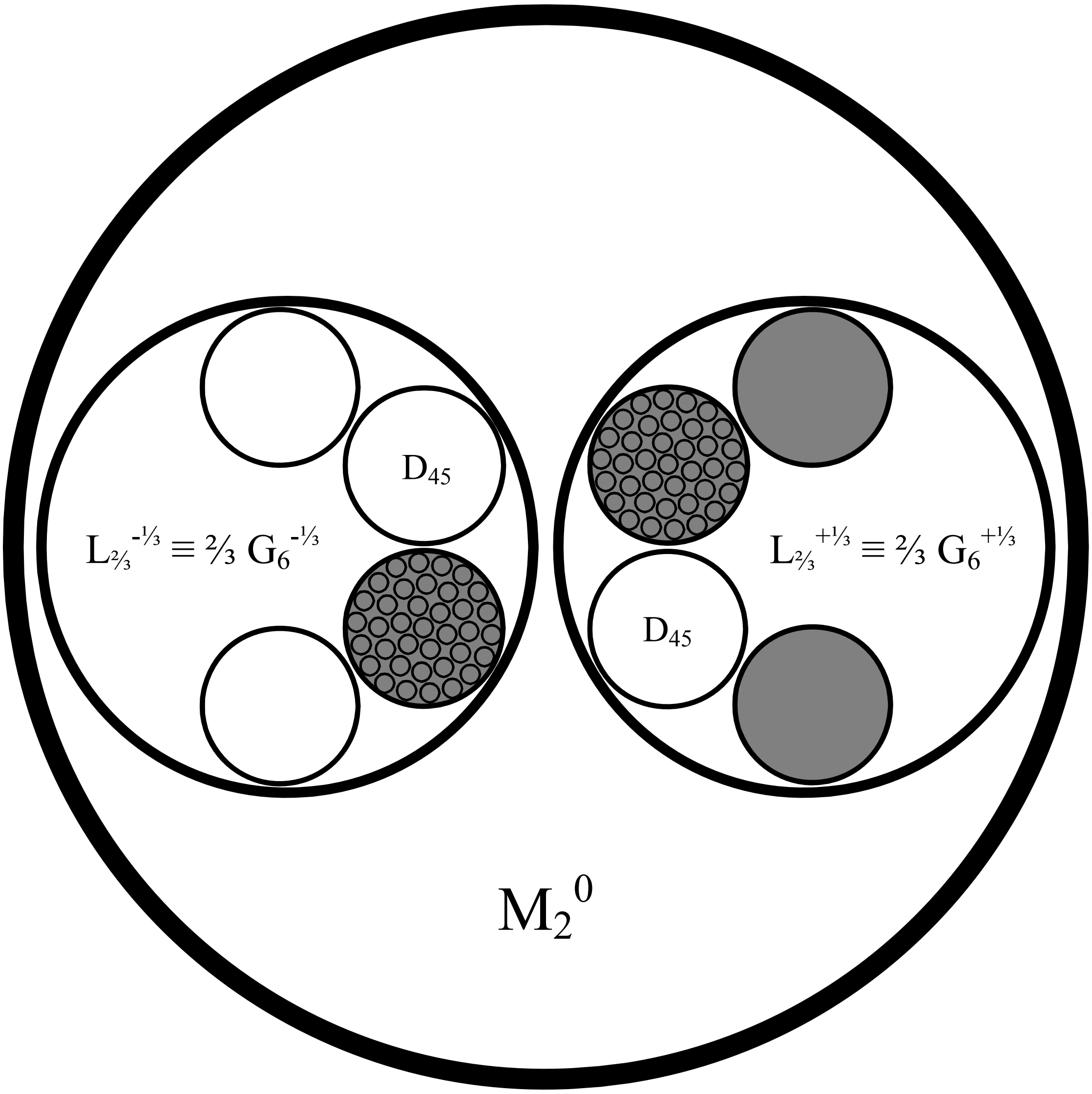


Figured intervalic structure of $\pi^{\pm}$ *meson*:

$M_{2}^{\pm} = (L_{1}, L_{1/3}) \equiv (1\ G_{6}^{\pm 2/3}, 1/3\ G_{6}^{\pm 1/3}) = 8\ D_{45}\ (7\ D_{\pm 45}, 1\ D_{\pm 45}) = 360\ \mathbf{I}$



Figured intervalic structure of π^0 *meson*:
$M_2^0 = 2\ L_{⅔} \equiv 2\ ⅔\ G_6\ (⅔\ G_6^{+⅔},\ ⅔\ G_6^{-⅔}\ ) = 8\ D_{45}\ (4\ D_{+45},\ 4\ D_{-45}) = 360\ \mathbf{I}$



Figured intervalic structure of π^0 *meson*:
$M_2^0 = 2\ L_{⅔} \equiv 2\ ⅔\ G_6\ (⅔\ G_6^{+⅓},\ ⅔\ G_6^{-⅓}\ ) = 8\ D_{45}\ (4\ D_{+45},\ 4\ D_{-45}) = 360\ \mathbf{I}$

π^0 meson: L⅔D45$^{(⅔)}$ L⅔D45$^{(⅔)}$

If, on the contrary, it was: L⅔D45$^{(⅓)}$ L⅔D45$^{(⅓)}$, we would have m(π^0) > m($\pi^\pm$), a phenomenon which is not realized by Nature. (Of course, that structure could still be possible if the electromagnetic energy was as smaller as to match with the experimental mass, but it is more logic to think that both mass energies go in a similar way).

π MESON INTERVALIC DECAY

An important and immediate consequence of the intervalic structure of π^0 meson is the deduction of its intervalic decay. Quark L⅔D45$^{(⅓)}$ only can decay into the lightest quark L⅓D45$^{(⅓)}$, but quark L⅔D45$^{(⅔)}$ has not a lighter quark to decay into, and therefore it only can decay via electromagnetic interaction:

L⅔D45$^{(⅔)}$ L⅔D45$^{(⅔)}$ $\rightarrow \gamma\gamma$

Therefore, the intervalic structure of π^0 meson explains why it can only decay electromagnetically, and vice versa. We could question what would happen if its intervalic structure had got the isocharge ⅓. In this case the decay of π^0 meson would be:

L⅔D45$^{(⅓)}$ L⅔D45$^{(⅓)}$ → L⅓D45$^{(⅓)}$ L⅓D45$^{(⅓)}$ $\rightarrow \gamma\gamma$

But the L⅓D45$^{(⅓)}$ L⅓D45$^{(⅓)}$ meson, with mass ~69 (MeV/c^2), has not been found in the decay of π^0. Therefore, the intervalic structure of its constituent quarks must have isocharge ⅔.

In a similar way, the intervalic structure of $\pi^\pm$ explains its decay and why it does not decay electromagnetically. We will understand better the decay of $\pi^\pm$ and π^0 after studying the chapter devoted to the Intervalic Decay.

Now we are going to describe the intervalic and electromagnetic energy of the π meson at every level of the intervalic structure. For pedagogic purposes (and also in order to brevity) we have chosen the intervalic structure M_2^0 = 2 $L_{⅔}$ ≡ 2 ⅔ G_6 = 8 D_{45} = 360 **I**, which can be common to both $\pi^\pm$ and π^0 mesons.

π MESON INTERVALIC ENERGY

π MESON INTERVALIC ENERGY AT MONTEVERDIC STRUCTURE LEVEL

We obviously have:

$$I(\pi^0)_M = I(M_2{}^0) = 0$$
$$I(\pi^\pm)_M = I(M_2{}^\pm) = c^{\pm 2}\,\hbar\, e^{-2} = c^{\pm 2}\,\hbar\,(270\,\mathbf{q_I})^{-2} = c^{\pm 2}\,\hbar\,[270\,\surd\text{-}(c^{-1}h)]^{-2} =$$
$$= 270^{-2}\,c^{-1} = 4.575639166 \cdot 10^{-14}\,(J) = 0.285588809\,(MeV/c^2)$$

π MESON INTERVALIC ENERGY AT LISZTINIAN-GAUDINAR STRUCTURE LEVEL

The intervalic energy of π^0 meson at lisztinian level of the intervalic structure is the sum of its two constituent lisztinos:

$$I(\pi^0)_L = 2\,I(L_{\frac{2}{3}}{}^{\pm\frac{2}{3}}) = 2\,c^{\pm 2}\,\hbar\,(\tfrac{2}{3}\,e)^{-2} = 2\,c^{\pm 2}\,\hbar\,(180\,\mathbf{q_I})^{-2} = 2\,c^{-1}180^{-2} =$$
$$= 2.059037625 \cdot 10^{-13}\,(J) = 1.285149644\,(MeV/c^2)$$

And the intervalic energy of $\pi^\pm$ is likewise:

$$I(\pi^\pm)_L = I(L_{\frac{2}{3}}{}^{\pm\frac{2}{3}}) + I(L_{\frac{2}{3}}{}^{\pm\frac{1}{3}}) = c^{\pm 2}\,\hbar\,(180\,\mathbf{q_I})^{-2} + c^{\pm 2}\,\hbar\,(90\,\mathbf{q_I})^{-2} =$$
$$c^{-1}180^{-2} + c^{-1}90^{-2} = 5.147594062 \cdot 10^{-13}\,(J) = 3.212874109\,(MeV/c^2)$$

π MESON INTERVALIC ENERGY AT GAUDINAR-LISZTINIAN STRUCTURE LEVEL

The gaudinar structure of π meson is:

$$\tfrac{2}{3}\,G_6{}^{\pm\frac{2}{3}} = (\ D_{\pm 45}\ D_{\pm 45}\ D_{\pm 45}\ D_{\pm 45}\ )$$
$$\tfrac{2}{3}\,G_6{}^{+\frac{1}{3}} = (\ D_{+45}\ D_{+45}\ D_{+45}\ D_{-45}\ )$$
$$\tfrac{2}{3}\,G_6{}^{-\frac{1}{3}} = (\ D_{-45}\ D_{-45}\ D_{-45}\ D_{+45}\ )$$

But since the constituent fractional lisztinos of π meson are at once the fractional gaudinos: $L_{\frac{2}{3}} = \frac{2}{3}\,G_6 = 4\,D_{45}$, the gaudinar structure have already been subsumed into the lisztinian one:

$I(\pi^0)_G = 2\ I(⅔\ G_6^{\pm⅔})$
$I(\pi^{\pm})_G = I(⅔\ G_6^{\pm⅔}) + I(⅔\ G_6^{\pm⅓})$

(Alternatively, we could also say that π meson is a lisztino instead of a monteverdino, as like as electron is a dalino instead of a gaudino, but in order to a better understanding of the general structure and classification of subatomic particles I think it is better to maintain such *limit cases* of structures which are identical to the preceding level of the intervalic structure. Thus, we say that electron is a dalino and, a fortiori, a limit case of gaudino —which adds nothing to the dalinar structure—, or that the two constituent gaudinos of π meson are, a fortiori, limit cases of lisztinos —which adds nothing to the gaudinar structure—).

π MESON INTERVALIC ENERGY AT DALINAR STRUCTURE LEVEL

As both π^0 and $\pi^{\pm}$ meson are composed by eight dalinos 45, their intervalic energies at the dalinar level are identical:

$$I(\pi^0)_D \equiv I(\pi^{\pm})_D = 8\ I(D_{\pm 45}) = 8\ c^{\pm 2}\ \hbar\ (45\ \mathbf{q_I})^{-2} = 8\ c^{-1}\ 45^{-2} =$$
$$= 1.31778408 \cdot 10^{-11}\ (J) = 82.24957719\ (MeV/c^2)$$

π MESON TOTAL INTERVALIC ENERGY

The total intervalic energy of π meson will be the sum its constituent levels:

$$I(\pi^0)_{tot} = I(\pi^0)_M + [\ I(\pi^0)_L \equiv I(\pi^0)_G\ ] + I(\pi^0)_D =$$
$$= 1.338374456 \cdot 10^{-11}\ (J) = 83.53472683\ (MeV/c^2)$$
$$I(\pi^{\pm})_{tot} = I(\pi^{\pm})_M + [\ I(\pi^{\pm})_L \equiv I(\pi^{\pm})_G\ ] + I(\pi^{\pm})_D =$$
$$= 1.37383566 \cdot 10^{-11}\ (J) = 85.74804011\ (MeV/c^2)$$

π MESON ELECTROMAGNETIC ENERGY

π MESON TOTAL ELECTROMAGNETIC ENERGY

Staring from the previously known magnitude of the intervalic energy, and according to the intervalic principle of energy balance for subatomic particles, we have that the total electromagnetic energy is:

$U(\pi^0)_{tot}$ = $c^{\pm 2}m(\pi^0)$ - $I(\pi^0)$ = $8.242445041 \cdot 10^{-12}$ (J) = 51.44527317 (MeV/c^2)
$U(\pi^\pm)_{tot}$ = $c^{\pm 2}m(\pi^\pm)$ - $I(\pi^\pm)$ = $8.623232399 \cdot 10^{-12}$ (J) = 53.82195989 (MeV/c^2)

The ratios among their constituent mass energies and the total mass are:

$I(\pi^0) / U(\pi^0) = 1.623759029$
$I(\pi^0) / E(\pi^0)_{mass} = 0.618867438$
$U(\pi^0) / E(\pi^0)_{mass} = 0.381132561$

$I(\pi^\pm) / U(\pi^\pm) = 1.593179444$
$I(\pi^\pm) / E(\pi^\pm)_{mass} = 0.614373003$
$U(\pi^\pm) / E(\pi^\pm)_{mass} = 0.385626996$

π MESON ELECTROMAGNETIC ENERGY AT DALINAR STRUCTURE LEVEL

Supposing that the electromagnetic energy at the dalinar level of π meson follows the same of quark down's ratio: $I(d)/U(d) = 1.650243062$, we would have:

$U(\pi^0)_D = I(\pi^0)_D / [I(d)/U(d)] = 49.84088652$ (MeV/c^2)
$U(\pi^\pm)_D = I(\pi^\pm)_D / [I(d)/U(d)] = 49.84088652$ (MeV/c^2)

It is sure the these magnitudes are close to the exact value, but in any case, since the electromagnetic energy at this level is equal for both mesons, we can make some deductions only starting from that result.

π MESON ELECTROMAGNETIC ENERGY AT GAUDINAR-LISZTINIAN STRUCTURE LEVEL

As it is experimentally found: $\Delta[m(\pi)] = m(\pi^\pm) - m(\pi^0) = 139.57 - 134.98 = 4.59$ (MeV/c^2). We can also deduce theoretically the difference between the total intervalic energy of both mesons:

$$\Delta[I(\pi)] = I(\pi^{\pm})_{tot} - I(\pi^{0})_{tot} = 2.21331328\ (MeV/c^{2})$$

Therefore the remaining difference between both values is due to the electromagnetic energy, $\Delta[m(\pi)] - \Delta[I(\pi)] = \Delta[U(\pi)]$, being:

$$\Delta[U(\pi)] = U(\pi^{\pm})_{tot} - U(\pi^{0})_{tot} = 2.37668672\ (MeV/c^{2})$$

That magnitude may be shared among the actual structure level and the deeper ones. However, since the dalinar structure is *identical* for both mesons, regardless of their electric charges, we have the certainty that the difference of mass between both zero and charged π mesons is exclusively due to the different electromagnetic energy at the lisztinian-gaudinar level of the intervalic structure.

The total mass of π meson is simply the sum of its constituent intervalic and electromagnetic energies. From those contributions we can deduce the value of the electromagnetic energy at the gaudinar-lisztinian level:

$$E(\pi^{0})_{mass} = I(\pi^{0})_{tot} + U(\pi^{0})_{G} + U(\pi^{0})_{D}$$
$$E(\pi^{\pm})_{mass} = I(\pi^{\pm})_{tot} + U(\pi^{\pm})_{G} + U(\pi^{\pm})_{D}$$

$$U(\pi^{0})_{G} = 1.60438665\ (MeV/c^{2})$$
$$U(\pi^{\pm})_{G} = 3.98107337\ (MeV/c^{2})$$

As can be seen:

$$U(\pi^{\pm})_{G} - U(\pi^{0})_{G} = U(\pi^{\pm})_{tot} - U(\pi^{0})_{tot} = 2.37668672\ (MeV/c^{2})$$

From the difference of electromagnetic energy between π mesons, previously deduced by intervalic geometrical means, we can deduce the average *distance* between quarks inside π meson, d_q:

$$\Delta[U(\pi)] = E_q(L⅔D45^{(⅓)}\, L⅔D45^{(⅔)}) - E_q(L⅔D45^{(⅔)}\, L⅔D45^{(⅔)}) =$$
$$= [(⅓ \cdot ⅔) - (⅔ \cdot ⅔)]\ (1/4\pi\varepsilon_0)\ e^{2} / d_q = -(2/9)\ (1/4\pi\varepsilon_0)\ e^{2} / d_q$$

$$d_q = 1.346378179 \cdot 10^{-15}\ (m)$$

This magnitude is very similar to the distance between nucleonic quarks inside nucleon, $d_q = 1.37610877 \cdot 10^{-15}$ (m), as expected. The minus sign indicates that the radius of $\pi^{\pm}$ meson is smaller that the radius of π^{0}. As the electromagnetic energy of meson at lisztinian-gaudinar level is due to the sum of the electromagnetic potential energy of its constituent quarks, we can write the relation:

$$U(\pi^{\pm})_G / U(\pi^0)_G = [(⅓ + ⅔) / r_q(\pi^{\pm})] / [(⅔ + ⅔) / r_q(\pi^0)]$$
$$r_q(\pi^0) = 3.308490398\ r_q(\pi^{\pm})$$

And the radius of the two equal constituent quarks of π^0 meson will be:

$$r_q(\pi^0) = ½\ (⅔ + ⅔)\ (1/4\pi\varepsilon_0)\ e^2 / U(\pi^0)_G = 5.983443839 \cdot 10^{-16}\ (m)$$

As the two constituent quarks of $\pi^{\pm}$ meson are unlike, their radius may be different and the following magnitude would be their average radius:

$$\langle r_q(\pi^{\pm})\rangle = ½\ (⅓ + ⅔)\ (1/4\pi\varepsilon_0)\ e^2 / U(\pi^{\pm})_G = 1.808511774 \cdot 10^{-16}\ (m)$$

π MESON ELECTROMAGNETIC ENERGY AT MONTEVERDIC STRUCTURE LEVEL

$$U(\pi^0)_M = 0$$

As in the case of proton, we can be tempted to write for the $\pi^{\pm}$ meson:

$$U(\pi^{\pm})_M = U(M_2^{\pm}) = ½\ (1/4\pi\varepsilon_0)\ (270\ \mathbf{q_I})^2 / r_\pi$$

However this electromagnetic energy is just the energy of the electromagnetic *field*, and therefore it is not manifested as *mass* energy.

$$U(\pi^{\pm})_M = 0$$

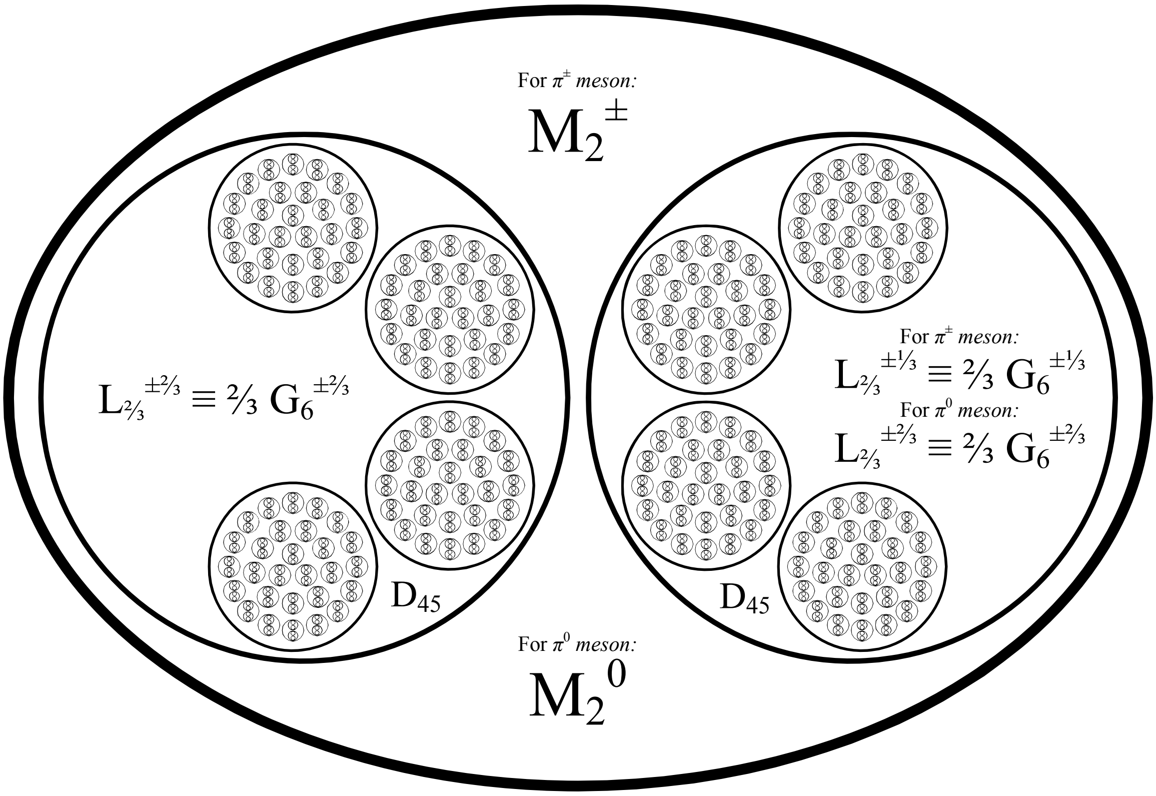
On the contrary, the intervalic energy at this level is the “equivalent energy” of the total charge which is always manifested as mass energy.

INTERVALIC STRUCTURE OF **π MESON**

$\pi^{\pm}$ *meson* $= M_2^{\pm} = 2\ L_{2/3} \equiv 2\ \tfrac{2}{3}\ G_6\ (\tfrac{2}{3}\ G_6^{\pm 1/3},\ \tfrac{2}{3}\ G_6^{\pm 2/3}\ ) = 8\ D_{45}\ (7\ D_{\pm 45},\ 1\ D_{\pm 45}) = 360\ \mathbf{I} = 720\ \gamma = 1440\ S$

π^{0} *meson* $= M_2^{0} = 2\ L_{2/3} \equiv 2\ \tfrac{2}{3}\ G_6\ (\tfrac{2}{3}\ G_6^{+2/3},\ \tfrac{2}{3}\ G_6^{-2/3}\ ) = 8\ D_{45}\ (4\ D_{+45},\ 4\ D_{-45}) = 360\ \mathbf{I} = 720\ \gamma = 1440\ S$

Intervalic structure levels: 1 Intervalic String (S), 2 Photon (γ), 3 Intervalino (**I**), 4 Dalino (D), 5 Gaudino (G), 6 Lisztino(L), 7 Monteverdino (M)



Chapter 20

INTERVALIC MESON

INTERVALIC MONTEVERDINO: MESON

Now we are going to introduce a general view on the intervalic structure of mesons. As in the case of intervalic baryon, to the SU(7) symmetry of *intervalic structure* it have to be added an important symmetry: the *isocharge* symmetry, which can be now interpreted as the underlying physical quantity of the former ‘abstract’ *isospin* symmetry. This set of symmetries composes the combinations which lead to the principal classification of the intervalic model of mesons. Considering that the three families of dalinar symmetries {D45}, {D30} and {D18} make “light” quarks, there will be just 7 x 3 = 21 intervalic structures of light quarks, the possible combinations of pairs of intervalic quarks to yield light mesons are much more wide than in SM, which worked with the ancient 5 bizarre flavours. Of course, the intervalic structure of quarks can explain in a fundamental manner all the experimentally detected mesons pertaining to the zoo of particles which are waiting for a theoretical satisfactory explanation. In the case of “heavy” mesons the difference between the pretty richness of the four families of dalinar symmetries {D6}, {D5}, {D3} and {D2}, and the unique isolated heavy flavour showed by the delusive SM is still more apparent.

Finally, we will find that it can be proposed an alternative quarkless structure for a lot of mesons which would be monteverdinos composed by 2^n quarks, with n = 1, 2, 3, mainly. This leads to an alternative description of some mesons which is not postulated but that is interesting to study.

INTERVALIC MESONS WITH {D45} SYMMETRY

As we have seen opportunely, every set of quark symmetries is composed by 7 intervalic structures. Those corresponding to {D45} symmetry are the following:

$L_{\frac{1}{3}}$ = ⅓ G_6 = 2 D_{45} = 34.537545—36.791934 → quark L⅓D45$^{(\frac{1}{3})}$
$L_{\frac{2}{3}}$ = ⅔ G_6 = 4 D_{45} = 69.075090—73.583868 → quark L⅔D45$^{(\frac{1}{3},\,\frac{2}{3})}$
L_1 = 1 G_6 = 6 D_{45} = 103.61263—110.37580 → quark L1D45$^{(\frac{1}{3},\,\frac{2}{3})}$
L_2 = 2 G_6 = 12 D_{45} = 207.22526—220.75160 → quark L2D45$^{(\frac{1}{3},\,\frac{2}{3})}$
L_3 = 3 G_6 = 18 D_{45} = 310.83790—331.12740 → quark L3D45$^{(\frac{1}{3},\,\frac{2}{3})}$
L_4 = 4 G_6 = 24 D_{45} = 414.45053—441.50320 → quark L4D45$^{(\frac{1}{3},\,\frac{2}{3})}$
L_5 = 5 G_6 = 30 D_{45} = 518.06316—551.87900 → quark L5D45$^{(\frac{1}{3},\,\frac{2}{3})}$

Since Nature does not mix quarks from different intervalic symmetry when assembling baryons and mesons, the number of allowed mesons made by the family of intervalic quarks with {D45} symmetry will be the group SU(7) with intervalic structure symmetry:

$7 \otimes 7 = 49$ mesons

In a similar way as we have done with the description of intervalic baryons, we are going to write down all the quark families involved in the assembly of intervalic mesons.

INTERVALIC MESONS WITH {D30} SYMMETRY

$L_{\frac{1}{3}}$ = ⅓ G_9 = 3 D_{30} = 116.56421—124.17278 → quark L⅓D30$^{(\frac{1}{3})}$
$L_{\frac{2}{3}}$ = ⅔ G_9 = 6 D_{30} = 233.12843—248.34556 → quark L⅔D30$^{(\frac{2}{3})}$
L_1 = 1 G_9 = 9 D_{30} = 349.69264—372.51833 → quark L1D30$^{(\frac{1}{3})}$
L_2 = 2 G_9 = 18 D_{30} = 699.38520—745.03666 → quark L2D30$^{(\frac{2}{3})}$
L_3 = 3 G_9 = 27 D_{30} = 1,049.0779—1,117.5550 → quark L3D30$^{(\frac{1}{3})}$
L_4 = 4 G_9 = 36 D_{30} = 1,398.7705—1,490.0733 → quark L4D30$^{(\frac{2}{3})}$
L_5 = 5 G_9 = 45 D_{30} = 1,748.4631—1,862.5916 → quark L5D30$^{(\frac{1}{3})}$

The number of allowed mesons made by the family of intervalic quarks with {D30} symmetry is described by the group SU(7):

$7 \otimes 7 = 49$ mesons

INTERVALIC MESONS WITH {D18} SYMMETRY

$L_{1/3} = \frac{1}{3} G_{15} = 5 D_{18}$ = 539.64917—574.87400 → quark L⅓D18$^{(1/3)}$
$L_{2/3} = \frac{2}{3} G_{15} = 10 D_{18}$ = 1,079.2982—1,149.7480 → quark L⅔D18$^{(2/3)}$
$L_1 = 1 G_{15} = 15 D_{18}$ = 1,618.9475—1,724.6220 → quark L1D18$^{(1/3)}$
$L_2 = 2 G_{15} = 30 D_{18}$ = 3,237.8950—3,449.2443 → quark L2D18$^{(2/3)}$
$L_3 = 3 G_{15} = 45 D_{18}$ = 4,856.8425—5,173.8660 → quark L3D18$^{(1/3)}$
$L_4 = 4 G_{15} = 60 D_{18}$ = 6,475.7900—6,898.4886 → quark L4D18$^{(2/3)}$
$L_5 = 5 G_{15} = 75 D_{18}$ = 8,094.7375—8,623.1100 → quark L5D18$^{(1/3)}$

The number of allowed mesons made by the family of intervalic quarks with {D18} symmetry is equally described by the group SU(7):

$7 \otimes 7 = 49$ mesons

INTERVALIC STRUCTURE AND FLAVOUR IN THE MODEL OF QUARKS

Henceforth, it is easy to understand why never have been detected mesons composed by any combination among the supposed quark bottom and the intended quarks up and down (*b, u, d*). On the contrary, combinations among the supposed quarks up, down, strange and charme are possible whenever the masses of those quarks vary in order to coincide with their real masses shown in each symmetry family, as all these quarks have several different intervalic structures allowed near their intended masses. For example, at first sight they can be easily confounded —without knowing it— with the following intervalic structures:

- Quark up: L⅔D45$^{(1/3,\,2/3)}$ L1D45$^{(1/3,\,2/3)}$ L2D45$^{(1/3,\,2/3)}$ L3D45$^{(1/3,\,2/3)}$
  L4D45$^{(1/3,\,2/3)}$ L⅓D30$^{(1/3)}$ L⅔D30$^{(2/3)}$ L1D30$^{(1/3)}$
- Quark down: L⅓D45$^{(1/3)}$ L⅔D45$^{(1/3,\,2/3)}$ L1D45$^{(1/3,\,2/3)}$ L2D45$^{(1/3,\,2/3)}$
  L3D45$^{(1/3,\,2/3)}$ L4D45$^{(1/3,\,2/3)}$ L⅓D30$^{(1/3)}$ L⅔D30$^{(2/3)}$ L1D30$^{(1/3)}$
- Quark strange: L4D45$^{(1/3,\,2/3)}$ L5D45$^{(1/3,\,2/3)}$ L1D30$^{(1/3)}$ L2D30$^{(2/3)}$ L⅓D18$^{(1/3)}$
- Quark charm: L3D30$^{(1/3)}$ L4D30$^{(2/3)}$ L5D30$^{(1/3)}$ L⅔D18$^{(2/3)}$ L1D18$^{(1/3)}$
- Quark bottom: L2D18$^{(2/3)}$ L3D18$^{(1/3)}$ L4D18$^{(2/3)}$ L5D18$^{(1/3)}$

When summing their masses to compose a monteverdino —meson or baryon— the confusion can be inclusive greater, and affect not only their masses but also their electric charges. I think this example may be sufficient to understand the terribly chaos which stand out in the classification of the model of quarks in SM.

The total sum of the number of allowed light mesons are, regarding the SU(7) group of intervalic structure symmetry:

(7 ⊗ 7) + (7 ⊗ 7) + (7 ⊗ 7) = 147

Of course, the traditional flavour multiplets in the primitive model of quarks introduced by Gell-Mann, Neeman and Zweig are only some few combinations included in the intervalic model of quarks.

INTERVALIC MESONS WITH {D6} SYMMETRY

$L_{⅓}$ = ⅓ G_{45} = 15 D_6 = 14,570.527—15,521.598 → quark L⅓D6$^{(⅓)}$
$L_{⅔}$ = ⅔ G_{45} = 30 D_6 = 29,141.055—31,043.196 → quark L⅔D6$^{(⅔)}$
L_1 = 1 G_{45} = 45 D_6 = 43,711.582—46,564.794 → quark L1D6$^{(⅓)}$
L_2 = 2 G_{45} = 90 D_6 = 87,423.165—93,129.588 → quark L2D6$^{(⅔)}$
L_3 = 3 G_{45} = 135 D_6 = 131,134.74—139,694.38 → quark L3D6$^{(⅓)}$
L_4 = 4 G_{45} = 180 D_6 = 174,846.32—186,259.17 → quark L4D6$^{(⅔)}$
L_5 = 5 G_{45} = 225 D_6 = 218,557.91—232,823.97 → quark L5D6$^{(⅓)}$

The number of allowed mesons is the same as in {D30} and {D18} symmetries:

7 ⊗ 7 = 49 mesons

INTERVALIC MESONS WITH {D5} SYMMETRY

$L_{⅓}$ = ⅓ G_{54} = 18 D_5 = 25,177.871—26,821.321 → quark L⅓D5$^{(⅓)}$
$L_{⅔}$ = ⅔ G_{54} = 36 D_5 = 50,355.742—53,642.642 → quark L⅔D5$^{(⅓, ⅔)}$
L_1 = 1 G_{54} = 54 D_5 = 75,533.615—80,463.964 → quark L1D5$^{(⅓, ⅔)}$
L_2 = 2 G_{54} = 108 D_5 = 151,067.23—160,927.93 → quark L2D5$^{(⅓, ⅔)}$
L_3 = 3 G_{54} = 162 D_5 = 226,600.84—241,391.89 → quark L3D5$^{(⅓, ⅔)}$
L_4 = 4 G_{54} = 216 D_5 = 302,134.45—321,855.85 → quark L4D5$^{(⅓, ⅔)}$

$L_5 = 5\ G_{54} = 270\ D_5 = 377{,}668.07—402{,}319.82 \rightarrow$ quark $L5D5^{(⅓,\ ⅔)}$

The SU(7) intervalic structure symmetry is the same in all families:

$7 \otimes 7 = 49$ mesons

INTERVALIC MESONS WITH {D3} AND {D2} SYMMETRY

They are just equal to the {D5} intervalic symmetry. Of course the energy needed for the production of heavier mesons is so huge that it will be very hard to get them in our present laboratories. Nevertheless it is postulated that those states should exist at the Big Bang, immediately decaying and following the intervalic sequence of symmetries: {D2} → {D3} → {D5} → {D6} → {D18} → {D30} → {D45}, as we will see opportunely.

As in the case of the 3-quarks systems (baryons), in the case of 2-quarks systems (mesons) it has to be added the SU(2) *isocharge* symmetry to the *intervalic structure* symmetry, which makes for each intervalic family, roughly, the product SU(7) x SU(2), contained in the group SU(14), which yields 196 mesons.

As we may already suppose and will see later, mesons can be fully explained by the intervalic structures of their constituent quarks. Nevertheless, as the constituent gaudinos of quarks are postulated to be *fermions* with spin ½ —as dalinos and intervalinos are both *bosons*—, the basic spin of those quarks composed by *even* lisztinos, namely L_2 and L_4, would be 0 (being spin 1 and 2 excited states). This surprising result —the existence of quarks with integer spin, which have a share of 2/7 among the total allowed quarks of every family, as the quarks composed by lisztinos L⅓, L⅔, L1, L3 and L5 are all of them fermions—, lead us to a question: could be those quarks with spin 0 the principal constituents of some mesons?

INTERVALIC STRUCTURE OF THE SUPPOSED NONET OF MESONS SU(3) OF THE STANDARD MODEL

Apart from the alternative bilisztinian structure, L_2, uncannily applicable to a majority of mesons, the particles composing the supposed flavoured SU(3) nonet of mesons have got the typical quarkful intervalic structure, which matches with experimental data with remarkable accuracy:

$\pi^{\pm}$ (139.57) = (L⅔D45$^{(⅔)}$ L⅔D45$^{(⅓)}$)
(L1D45$^{(⅔)}$ L⅓D45$^{(⅓)}$)
π^{0} (134.98) = (L⅔D45$^{(⅔)}$ L⅔D45$^{(⅔)}$)
(L5D90$^{(⅓)}$ L5D90$^{(⅓)}$)s
(L2D54$^{(0)}$)
$K^{\pm}$ (493.68) = (L⅔D45$^{(⅔)}$ L4D45$^{(⅓)}$)
(L⅔D45$^{(⅓)}$ L4D45$^{(⅔)}$)
K^0, $\underline{K}^0$ (497.67) = (L⅔D45$^{(⅓)}$ L4D45$^{(⅓)}$)
η^0 (547.3) = (L⅓D45$^{(⅓)}$ L5D45$^{(⅓)}$)
η' (958) = (L4D45$^{(⅓, ⅔)}$ L5D45$^{(⅓, ⅔)}$)

QUARKFUL INTERVALIC STRUCTURES OF EXPERIMENTALLY DETECTED MESONS

All experimentally detected mesons have a typical quarkful structure, apart from their alternative bilisztinian one (L$_2$). This multiplicity of possible intervalic structures can explain partially the existence of excited states in the zoo of particles detected experimentally. In any case, this stunning coincidence only reconfirm strongly the reliability and fruitfulness of the intervalic structures, although it may be sometimes disconcerting until a new classification of mesons is made. As they fit impressively with those of Nature, we believe that the symmetries of Nature have been really made in an intervalic mode, or in other words, that the intervalic symmetries are the genuine symmetries of Nature.

$K{*}_2$ (1430) = (L1D30$^{(⅓)}$ L3D30$^{(⅓)}$)
(L2D30$^{(⅔)}$ L2D30$^{(⅔)}$)
K_2 (1770) = (L2D30$^{(⅔)}$ L3D30$^{(⅓)}$)
$K{*}_3$ (1780) = (L1D30$^{(⅓)}$ L4D30$^{(⅔)}$)

ρ (770) = (L3D45$^{(⅓, ⅔)}$ L4D45$^{(⅓, ⅔)}$)
ω (783) = (L3D45$^{(⅓, ⅔)}$ L4D45$^{(⅓, ⅔)}$)
η' (958) = (L4D45$^{(⅓, ⅔)}$ L5D45$^{(⅓, ⅔)}$)
f_0 (975) = (L4D45$^{(⅓, ⅔)}$ L5D45$^{(⅓, ⅔)}$)
a_0 (980) = (L4D45$^{(⅓, ⅔)}$ L5D45$^{(⅓, ⅔)}$)
Φ (1020) = (L5D45$^{(⅓, ⅔)}$ L5D45$^{(⅓, ⅔)}$)
h_1 (1190) = (L⅓D30$^{(⅓)}$ L3D30$^{(⅓)}$)
b_1 (1235) = (L⅓D30$^{(⅓)}$ L3D30$^{(⅓)}$)
f_2 (1270) = (2L3D45$^{(⅓, ⅔)}$ 2L3D45$^{(⅓, ⅔)}$)
a_1 (1270) = (2L3D45$^{(⅓, ⅔)}$ 2L3D45$^{(⅓, ⅔)}$)

f$_1$ (1285) = (2L3D45$^{(1/3,\ 2/3)}$ 2L3D45$^{(1/3,\ 2/3)}$)
f$_0$ (1300) = (L⅔D30$^{(2/3)}$ L3D30$^{(1/3)}$)
π (1300) = (2L3D45$^{(1/3,\ 2/3)}$ 2L3D45$^{(1/3,\ 2/3)}$)
a$_2$ (1320) = (L⅔D30$^{(2/3)}$ L3D30$^{(1/3)}$)
f$_1$ (1420) = (L2D30$^{(2/3)}$ L2D30$^{(2/3)}$)
η (1440) = (L1D30$^{(1/3)}$ L3D30$^{(1/3)}$)
f'$_2$ (1525) = (L⅓D30$^{(1/3)}$ L4D30$^{(2/3)}$)
f$_0$ (1590) = (L⅓D30$^{(1/3)}$ L4D30$^{(2/3)}$)
ρ (1600) = (L⅓D30$^{(1/3)}$ L4D30$^{(2/3)}$)
ω_3 (1670) = (L⅔D30$^{(2/3)}$ L4D30$^{(2/3)}$)
π_2 (1680) = (L⅔D30$^{(2/3)}$ L4D30$^{(2/3)}$)
Φ (1680) = (L⅔D30$^{(2/3)}$ L4D30$^{(2/3)}$)
ρ_3 (1690) = (L⅔D30$^{(2/3)}$ L4D30$^{(2/3)}$)
f$_2$ (1720) = (L⅔D30$^{(2/3)}$ L4D30$^{(2/3)}$)
Φ_J (1850) = (L⅓D30$^{(1/3)}$ L5D30$^{(2/3)}$)
f$_4$ (2030) = (L⅔D30$^{(2/3)}$ L5D30$^{(1/3)}$)
η_c (2980) = (L3D30$^{(1/3)}$ L5D30$^{(1/3)}$)
(L4D30$^{(2/3)}$ L4D30$^{(2/3)}$)
X$_0$ (3415) = (L1D18$^{(1/3)}$ L1D18$^{(1/3)}$)
X$_1$ (3510) = (L5D30$^{(1/3)}$ L5D30$^{(1/3)}$)
X$_2$ (3555) = (L5D30$^{(1/3)}$ L5D30$^{(1/3)}$)
ψ (4415) = (2L3D30$^{(1/3)}$ 2L3D30$^{(1/3)}$)
X$_{b0}$ (9860) = (L2D18$^{(2/3)}$ L4D18$^{(2/3)}$)
X$_{b1}$ (9895) = (L3D18$^{(1/3)}$ L3D18$^{(1/3)}$)
X$_{b2}$ (9915) = (L1D18$^{(1/3)}$ L5D18$^{(1/3)}$)

INTERVALIC STRUCTURE OF QUARKONIUMS

It is intended that the six supposed bizarre quarks of SM make six basic mesons composed by pairs quark-antiquark, which could be named *quarkoniums,* $q\underline{q}$. They can be identified with the following intervalic structures:

$u\underline{u}$ (upomium) → ρ (770) = (L3D45$^{(2/3)}$ L4D45$^{(2/3)}$)
$d\underline{d}$ (downomium) → ω (783) = (L3D45$^{(1/3)}$ L4D45$^{(1/3)}$)
$s\underline{s}$ (strangenium) → Φ (1,020) = (L5D45$^{(1/3)}$ L5D45$^{(1/3)}$)
$c\underline{c}$ (charmomium) → J/ψ (3,097) = (L4D30$^{(2/3)}$ L4D30$^{(2/3)}$)
$b\underline{b}$ (bottomium) → Y (9,460) = (L3D18$^{(1/3)}$ L3D18$^{(1/3)}$)
$t\underline{t}$ (topomium) → T (?) = (L4D6$^{(2/3)}$ L4D6$^{(2/3)}$)

It can be easily seen that quarkoniums follow just the *principal intervalic sequence* of quarks:

- quark L3D45$^{(⅓,\, ⅔)}$ → former quark up, down
- quark L4D30$^{(⅔)}$ → former quark charm
- quark L3D18$^{(⅓)}$ → former quark bottom
- quark L4D6$^{(⅔)}$ → former quark top
- quark L3D5$^{(⅓,\, ⅔)}$ → predicted new heavy quark

The only lack is the first quarkonium of {D45} symmetry:

L3D45$^{(⅓)}$ L3D45$^{(⅓)}$

which mass would roughly be 626 (MeV/c^2). This meson would be just composed by two of the three constituent quarks of nucleons, but in its place we find the "fatter" states *ρ, ω, Φ,* a phenomenon which deserves further research to be fully explained at a fundamental level. By some reason the "normal" {D45} quarkonium is not realized at low temperatures, but only are favoured a few of their fatter states. Probably this will be in close relation with the extreme stability of the intervalic structure of nucleon, which may avoid the mesonic state of the nucleonic quarks.

In any case and as can be easily seen, any classification of mesons or any other particles according to the vicissitudes of SM is an entirely partial and chaotic task, since it only has found a few particles by chance and without a minimal knowledge of the underlying intervalic symmetries which governs the structures of Nature in the subatomic world. Nevertheless, and until we have got a whole new intervalic classification of mesons, we can see some moderately interesting features in that intervalic structures of disperse mesons, as for example the decay of strangenium, charmonium and bottomium in two pairs of mesons, respectively, mesons of the families K, D and B. It can be checked that the intervalic symmetries of either strangenium, charmonium and bottomium and their corresponding two pairs of mesons of the decay are, respectively, {D45}, {D30} and {D18}:

K$^{\pm}$ (493.68) = (L⅔D45$^{(⅔)}$ L4D45$^{(⅓)}$)
(L⅔D45$^{(⅓)}$ L4D45$^{(⅔)}$)
K^0, $\underline{\mathrm{K}}^0$ (497.67) = (L⅔D45$^{(⅓)}$ L4D45$^{(⅓)}$)

D^0, $\underline{\mathrm{D}}^0$ (1864.5) = (L⅓D30$^{(⅓)}$ L5D30$^{(⅓)}$)
(2L⅔D30$^{(⅔)}$ 2L2D30$^{(⅔)}$)
D$^{\pm}$ (1869.3) = (L1D30$^{(⅓)}$ L4D30$^{(⅔)}$)
(L2D30$^{(⅔)}$ L3D30$^{(⅓)}$)

$D_s^{\pm}$ (1968.5) = (L⅔D30$^{(\frac{2}{3})}$ L5D30$^{(\frac{1}{3})}$)

$B^{\pm}$ (5279.0) = (L1D18$^{(\frac{1}{3})}$ L2D18$^{(\frac{2}{3})}$)
B^0, $\underline{B}^0$ (5279.4) = (L⅓D18$^{(\frac{1}{3})}$ L3D18$^{(\frac{1}{3})}$)
B_s^0 (5369.6) = (2L⅔D18$^{(\frac{2}{3})}$ 2L1D18$^{(\frac{1}{3})}$)

This information may be of interest when we will study the intervalic decay of subatomic particles, an important feature which follows rigorously the order of the chain of quarks and leptons-massive bosons according to their masses and intervalic structures, whilst on the contrary, SM has no any *fundamental* explanation for the decay of particles and can not give any theoretical *prediction* about the features of the zoo of particles made in any decay, but only to name some of them as “X” —a symbol of great help to understand the structure of mesons—.

THE ALTERNATIVE QUARKLESS INTERVALIC STRUCTURE OF MESONS

We will suppose that meson is the subatomic particle that intermediates the changeless —strong— intervalic interaction from the lisztinian level of the intervalic structure an onwards. After the postulation of the intervalic structure of quarks, it is clear that the intervalic structure of mesons could easily be deduced through SM, since we only have to combine the intervalic structures of quarks according to traditional rules. Nevertheless we should check if some mesons could have a quarkless structure. Since mesons are intended to be composed by a pair quark-antiquark, we could explore those intervalic structures composed by two lisztinos in a systematic way. After all, nobody can assure us that there were no mesons out of the quarkic structure. Of course, since every lisztino 1, L_1, makes the intervalic structure of a quark, any lisztino 2 can be also interpreted as having a quarkful as well as an alternative quarkless structure.

Following this way, the most simple kind of lisztinos is the combination of a two unlike charged gaudinos with elementary charge for composing a lisztino 2 (L_2) with zero charge, integrated by 2 x 270 = 540 constituent intervalinos. If it is supposed, in a rough approximation, that the ratio intervalic energy / electromagnetic energy of dalinos is similar to that of the electron, ~5/4, the masses of the whole set of the 16 possible lisztinos 2 are as follows (in MeV/c^2):

$L_2 = 2\ G_1 = 2\ D_{270} = 1.0219982$
$L_2 = 2\ G_2 = 4\ D_{135} = 8.1759856$
$L_2 = 2\ G_3 = 6\ D_{90} = 27.593950$
$L_2 = 2\ G_5 = 10\ D_{54} = 127.74977$
$L_2 = 2\ G_6 = 12\ D_{45} = 220.75160$
$L_2 = 2\ G_9 = 18\ D_{30} = 745.03666$
$L_2 = 2\ G_{10} = 20\ D_{27} = 1{,}021.9982$
$L_2 = 2\ G_{15} = 30\ D_{18} = 3{,}449.2440$
$L_2 = 2\ G_{18} = 36\ D_{15} = 5{,}960.2932$
$L_2 = 2\ G_{27} = 54\ D_{10} = 20{,}115.990$
$L_2 = 2\ G_{30} = 60\ D_9 = 27{,}593.950$
$L_2 = 2\ G_{45} = 90\ D_6 = 93{,}129.588$
$L_2 = 2\ G_{54} = 108\ D_5 = 160{,}927.93$
$L_2 = 2\ G_{90} = 180\ D_3 = 745{,}036.66$
$L_2 = 2\ G_{135} = 270\ D_2 = 2{,}514{,}498.8$
$L_2 = 2\ G_{270} = 540\ D_1 = 11{,}242{,}489$

Since the majority of intervalic mesons has a lisztinian 2 structure, it could be postulated that the spin energy scarcely intervenes in the energy mass balance of the particle. Therefore the structural energy mass balance for the intervalic meson would be:

$I - I^{-1} \approx 0$

That is to say, in the case of meson the electromagnetic mass energy is almost equal to the intervalic mass energy. According to this new balance we would have the following masses of lisztinos 2. These magnitudes of the mass are the maximum allowed values for those particles (in MeV/c^2):

$L_2 = 2\ G_1 = 2\ D_{270} \leq 1.1423552$
$L_2 = 2\ G_2 = 4\ D_{135} \leq 9.1388424$
$L_2 = 2\ G_3 = 6\ D_{90} \leq 30.843592$
$L_2 = 2\ G_5 = 10\ D_{54} \leq 142.79441$
$L_2 = 2\ G_6 = 12\ D_{45} \leq 246.74873$
$L_2 = 2\ G_9 = 18\ D_{30} \leq 832.77698$
$L_2 = 2\ G_{10} = 20\ D_{27} \leq 1{,}142.3552$
$L_2 = 2\ G_{15} = 30\ D_{18} \leq 3{,}855.4490$
$L_2 = 2\ G_{18} = 36\ D_{15} \leq 6{,}662.2158$
$L_2 = 2\ G_{27} = 54\ D_{10} \leq 22{,}484.978$
$L_2 = 2\ G_{30} = 60\ D_9 \leq 30{,}843.592$
$L_2 = 2\ G_{45} = 90\ D_6 \leq 104{,}097.12$
$L_2 = 2\ G_{54} = 108\ D_5 \leq 179{,}879.83$

$L_2 = 2\ G_{90} = 180\ D_3 \leq 832{,}776.98$
$L_2 = 2\ G_{135} = 270\ D_2 \leq 2{,}810{,}622.3$
$L_2 = 2\ G_{270} = 540\ D_1 \leq 11{,}242{,}489$

In this set we find a lot of already detected mesons, as we show below. And the remaining ones are pairs of the lisztino 2, that is to say, the majority of mesons appears to have an *even* lisztinian structure. Therefore, as in the intervalic structure of quarks, it can be seen a *principal intervalic sequence* in the intervalic structure of mesons.

PRINCIPAL INTERVALIC SEQUENCE OF MESONS

In the alternative quarkless structure of mesons, the *principal intervalic sequence* for mesons is focused on the intervalic structures $\{2^n L_2\}$, being n = 0, 1, 2, 3,… as can be seen below:

$M_1 = L_2 = 2\ G_5 = 10\ D_{54} \leq 142.79441 \rightarrow \pi^0$ meson
$M_2 = 2\ L_2 = 4\ G_5 = 20\ D_{54} \leq 285.58882 \rightarrow$
$M_4 = 4\ L_2 = 8\ G_5 = 40\ D_{54} \leq 571.17764 \rightarrow \eta^0$ meson
$M_8 = 8\ L_2 = 16\ G_5 = 80\ D_{54} \leq 1{,}142.35528 \rightarrow \Phi$ meson

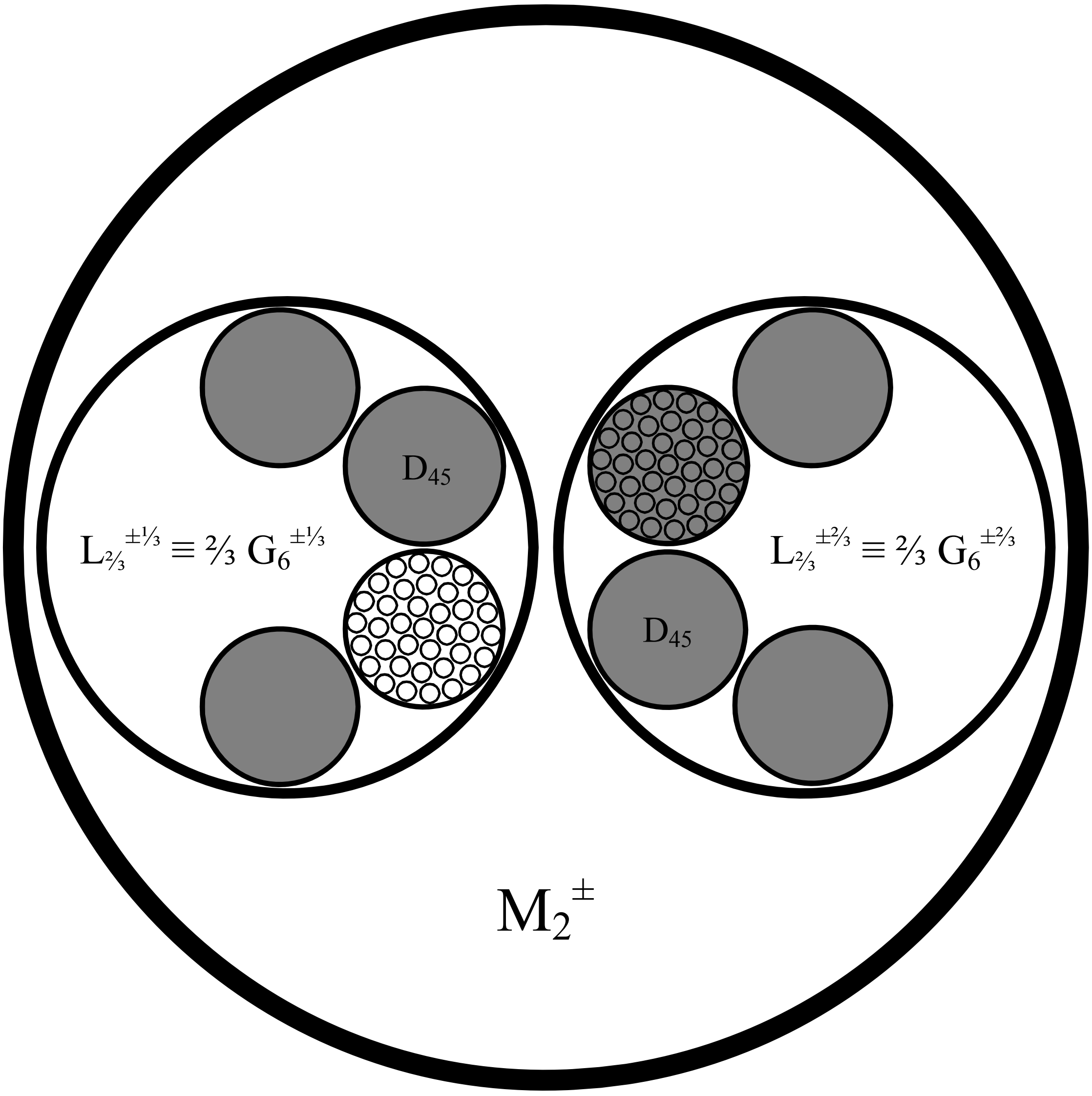
$M_1 = L_2 = 2\ G_6 = 12\ D_{45} \leq 246.74873 \rightarrow$
$M_2 = 2\ L_2 = 4\ G_6 = 24\ D_{45} \leq 493.49746 \rightarrow$ K mesons
$M_4 = 4\ L_2 = 8\ G_6 = 48\ D_{45} \leq 986.99492 \rightarrow \eta', f_0, a_0$ mesons
$M_8 = 8\ L_2 = 16\ G_6 = 96\ D_{45} \leq 1{,}973.9898 \rightarrow$ D mesons

$M_1 = L_2 = 2\ G_9 = 18\ D_{30} \leq 832.77698 \rightarrow \rho, \omega$ mesons
$M_2 = 2\ L_2 = 4\ G_9 = 36\ D_{30} \leq 1{,}665.5539 \rightarrow \eta, f_0$ mesons
$M_4 = 4\ L_2 = 8\ G_9 = 72\ D_{30} \leq 3{,}331.1079 \rightarrow J/\psi$ meson
$M_8 = 8\ L_2 = 16\ G_9 = 144\ D_{30} \leq 6{,}662.2158 \rightarrow$

$M_1 = L_2 = 2\ G_{10} = 20\ D_{27} \leq 1{,}142.3552 \rightarrow \Phi$ meson
$M_2 = 2\ L_2 = 4\ G_{10} = 40\ D_{27} \leq 2{,}284.7104 \rightarrow$ several mesons
$M_4 = 4\ L_2 = 8\ G_{10} = 80\ D_{27} \leq 4{,}569.4208 \rightarrow \psi$ mesons
$M_8 = 8\ L_2 = 16\ G_{10} = 160\ D_{27} \leq 9{,}138.8416 \rightarrow$

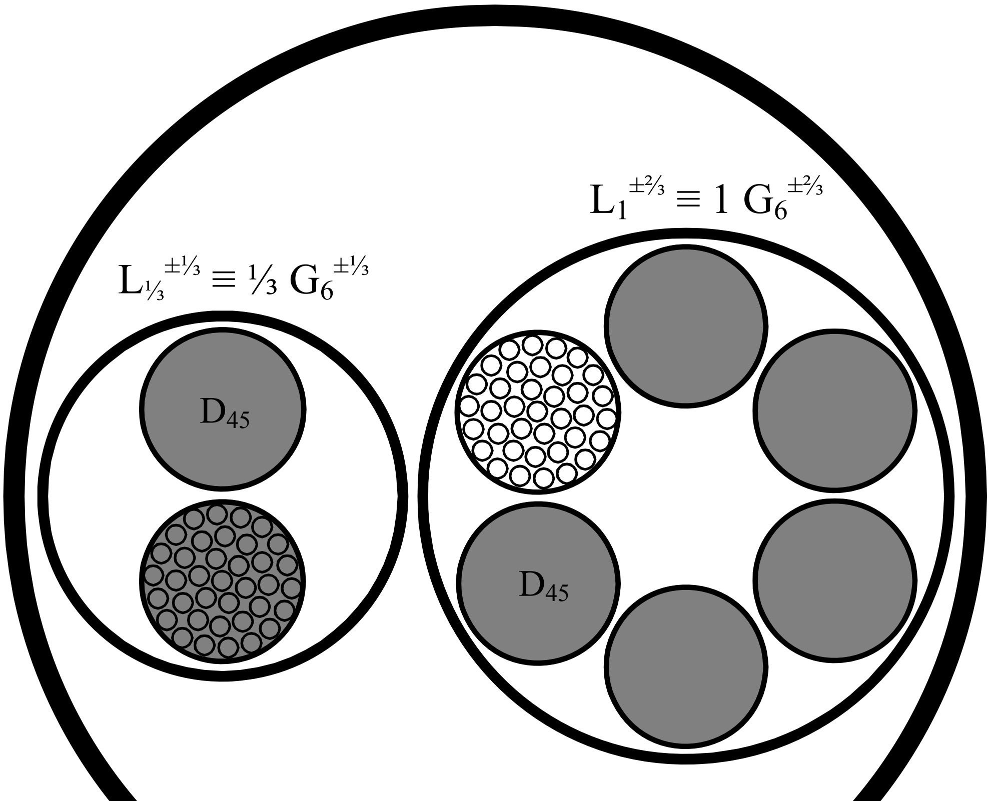
$M_1 = L_2 = 2\ G_{15} = 30\ D_{18} \leq 3{,}855.449 \rightarrow \chi$ mesons
$M_2 = 2\ L_2 = 4\ G_{15} = 60\ D_{18} \leq 7{,}710.898 \rightarrow$
$M_4 = 4\ L_2 = 8\ G_{15} = 120\ D_{18} \leq 15{,}421.796 \rightarrow$
$M_8 = 8\ L_2 = 16\ G_{15} = 240\ D_{18} \leq 30{,}843.592 \rightarrow$

Obviously, mesons placed in the symmetries {D54} and {D27} can’t be composed by quarks because such symmetries are not allowed in the intervalic structure of quarks.

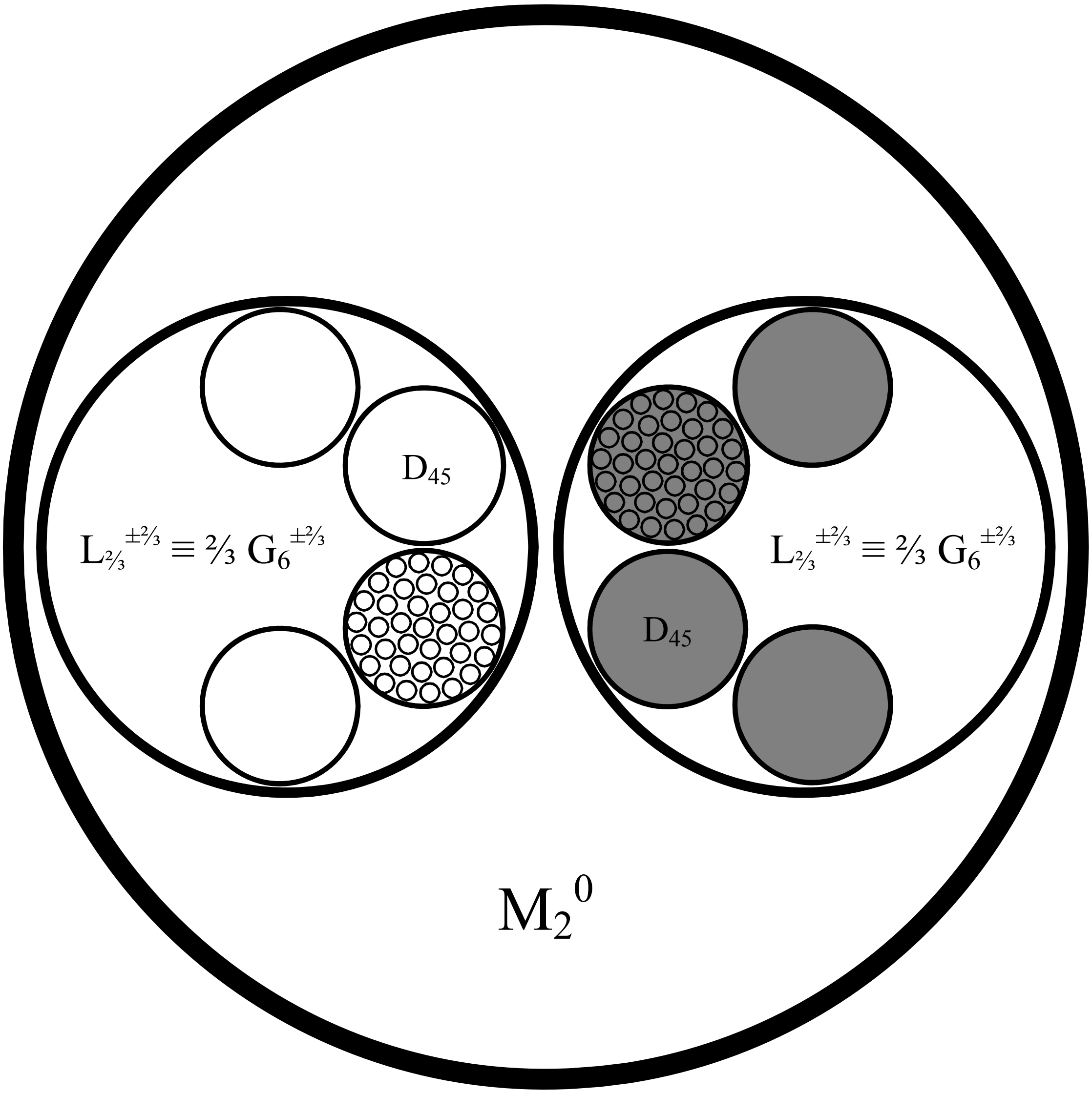


Figured intervalic structure of $\pi^{\pm}$ *meson*:

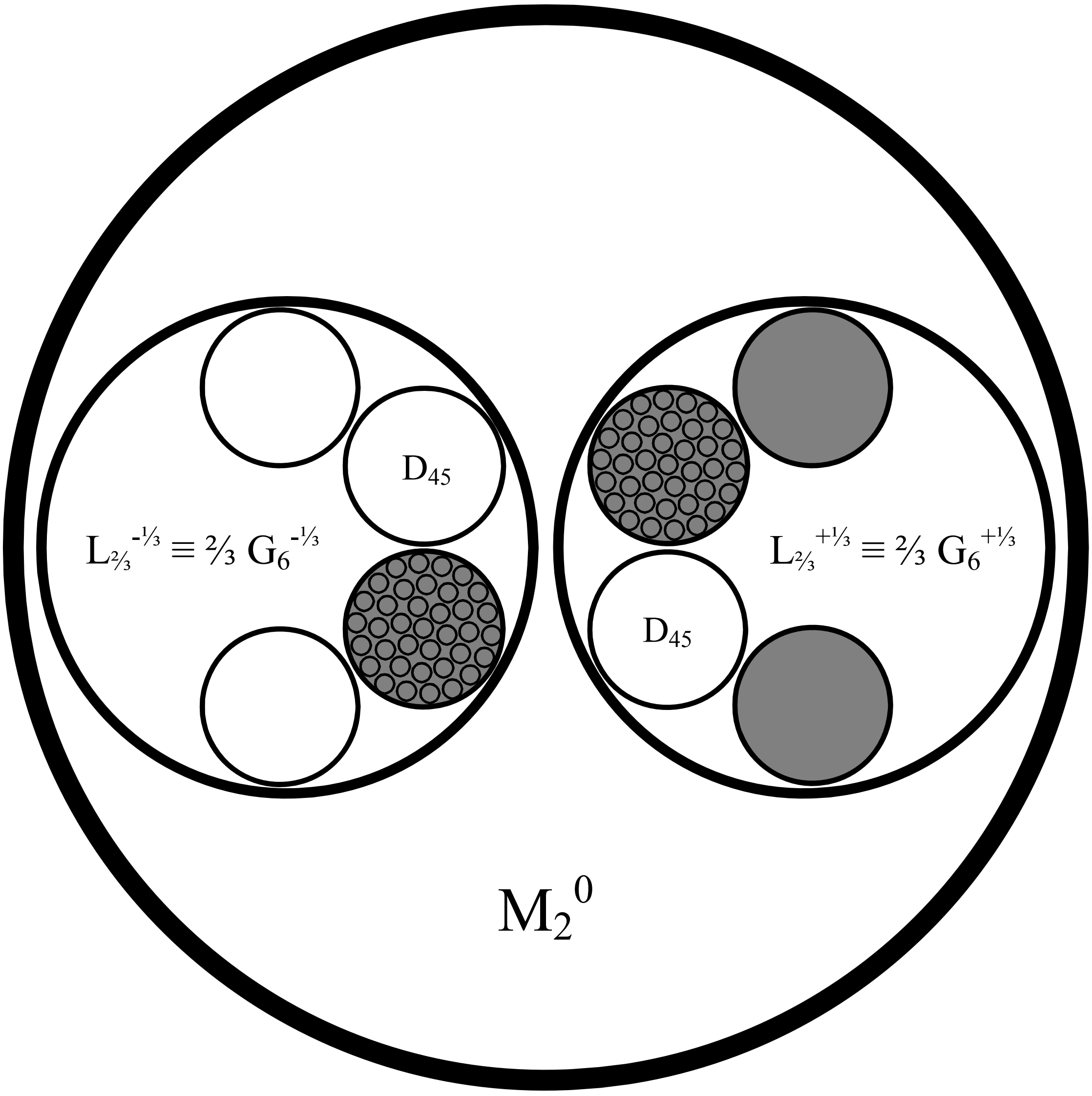
$M_2^{\pm} = 2\ L_{⅔} \equiv 2\ ⅔\ G_6\ (⅔\ G_6^{\pm⅓},\ ⅔\ G_6^{\pm⅔}\ ) = 8\ D_{45}\ (7\ D_{\pm45},\ 1\ D_{\pm45}) = 360\ \mathbf{I}$



Figured intervalic structure of $\pi^{\pm}$ *meson*:
$M_2^{\pm} = (L_1, L_{⅓}) \equiv (1\ G_6^{\pm ⅔},\ ⅓\ G_6^{\pm ⅓}) = 8\ D_{45}\ (7\ D_{\pm 45},\ 1\ D_{\pm 45}) = 360\ \mathbf{I}$



Figured intervalic structure of π^0 *meson*:
$M_2^0 = 2\ L_{⅔} \equiv 2\ ⅔\ G_6\ (⅔\ G_6^{+⅔},\ ⅔\ G_6^{-⅔}) = 8\ D_{45}\ (4\ D_{+45},\ 4\ D_{-45}) = 360\ \mathbf{I}$



Figured intervalic structure of π^0 *meson*:

$M_2^0 = 2\ L_{2/3} \equiv 2\ 2/3\ G_6\ (2/3\ G_6^{+1/3},\ 2/3\ G_6^{-1/3}\ ) = 8\ D_{45}\ (4\ D_{+45},\ 4\ D_{-45}) = 360\ \mathbf{I}$

Chapter 21

INTERVALIC PRIMORDIAL SYNTHESIS (IPS)

SYMMETRIC PRIMORDIAL SYNTHESIS OF INTERVALIC STRINGS: PHOTON (CLOSED STRING)

> The grand aim of all science is to cover the greatest number of empirical facts by logical deduction from the smallest number of hypotheses or axioms.
>
> ALBERT EINSTEIN
> *"Life" magazine, 09.01.1950*

Lets postulate the existence of a primordial string. Why and how does exist that string is a task of the Intervalic String Theory. To explain all the massive subatomic particles of our Universe starting only from that string is a task of IT in Particle Physics.

We start postulating a total single symmetry in the beginning of the primordial Universe, when it was constituted only by intervalic strings, *before* the creation of all known massful and massless particles. We call this postulate the *intervalic whole symmetry assumption*.

Let us take the most simple string, an open string, S, which longitude is

π in intervalic units, that is to say, $l_S = \pi\hbar = 3.316379245 \cdot 10^{-34}$ (m).

Now we are going to develop the first step of the Intervalic Primordial Synthesis (IPS) without introducing the deep relation existing between the intervalic string and the intervalic quanta, which will be explained in the next chapter. In this case, the only assumption we need for yielding the first step of IPS is that strings can be treated as structureless particles which follows the well known laws of symmetry under interchange (the spin-statistics theorem). This means that all the intervalic strings are identical and can have only one degree of freedom.

In this case the only energy of the string would be the *transversal energy* due to a harmonic oscillation, which in IT is defined as:

$$E = 2\pi J\varphi$$

where J is the spin of the string and φ the frequorce of oscillation. The most simple and basic state is that all the kinetic energy of the string comes from its transversal energy, which is the only invariant energy that does not depend on the frame of reference. This kinetic energy will be a rotational energy can be interpreted as the energy of a de Broglie wave. Being I the string moment of inertia, ω the angular velocity, and p and λ the momentum and wavelength of the de Broglie wave, we have:

$$K = ½ I \omega^2 = ½ m r^2 \omega^2 = ½ p r \omega = ½ (h \lambda^{-1}) r \omega = ½ h \omega = \pi\hbar \omega = l_S \omega$$

Equalizing E = K, it can be deduced the *spin* of the intervalic string:

$$2\pi J\varphi = \pi\hbar \omega$$
$$J = ½ \hbar$$

It can be noted the similarity between the kinetic energy of the intervalic string and the *energy of vacuum* postulated by SM, which Hamiltonian is: $H = ½ \hbar \omega$.

According to well known spin-statistics theorem there are only two ways for the possible aggregations of a set of *identical* particles: symmetric and antisymmetric under interchange. In principle there is no reason to expect that a system of particles will be in a symmetric *or* an antisymmetric state, but the most simple assumption is that *both* states will be *made*: symmetric *and* antisymmetric. Actually, this logic assumption is no other than we call as the *intervalic whole symmetry assumption*.

If the permutation of any two particles is antisymmetric, there must be one degree of freedom —and therefore they are identical excepting this one degree of freedom—, which the spin-statistics theorem postulated to be the spin of the particle. Nevertheless, it can be postulated other spin-like degrees of freedom apart from spin (*i.e.,* the doubtful assumption of isospin). Thus, the primordial assembly of a pair of intervalic strings, S, in symmetric state under interchange made a state which has well defined symmetry: a triplet of particles with spin 1:

$$|S\underline{S}|_s = \{\ |SS|,\ 2^{-½}\ (\ |S\underline{S}| + |\underline{S}S|\ ),\ |\underline{SS}|\ \}$$

However the constituent strings are symmetric under interchange, which is not allowed for particles with spin ½. But we postulated that the intervalic string could have one degree of freedom, which can be postulated to be a former primordial spin-like of the open string that we can name *prespin*. For our purpose at this moment, we do not need to define the values of the quantum numbers of prespin now, but only the existence of such degree of freedom. Therefore strings can be supposed to be in an antisymmetric state with respect to that degree of freedom, making a prespin singlet which preserves the connection spin-statistics. What may be this spin 1 triplet? IT postulates that it is a closed string (later named *photon*).

ANTISYMMETRIC PRIMORDIAL SYNTHESIS OF INTERVALIC STRINGS: BISTRING OR CHI (REAL SPACE)

Now we can to question about why there should not exist assemblies of intervalic strings in an *antisymmetric* state under interchange with respect to spin, instead of only in a symmetrical one, since there is no reason to think about any breaking of the global symmetry in the general laws of the primordial since “God does not play dice”. Therefore, the most logic and almost obligated assumption is to postulate the existence of an *antisymmetric state* in the primordial synthesis of intervalic strings, with the same range of the analogous symmetric state. A pair of intervalic string in an antisymmetric state under interchange makes a singlet with spin 0:

$$|S\underline{S}|_a = 2^{-½}\ (\ |S\underline{S}| - |\underline{S}S|\ )$$

States $|SS|$ and $|\underline{SS}|$ are not allowed in an antisymmetric state because its wave function would vanish. Therefore we have a unique antisymmetric state of paired intervalic strings composed by two strings with unlike spins. What can be this primordial particle composed by an assembly of intervalic strings? We will name that primordial assembly of fermions as *bistring or* *chi*, and will see that it is not other than the assembly of quanta of space that today we know as the *continuum* of space.

And when was created *spacetime*? Just at this step because *time* only exist since the introduction of some kind of *movement* or *energy* —that is to say, *velenergy*— in the primordial Universe. When did occur that? Just at the assembly of photon. Therefore photon, time, movement and energy were introduced at once in the Universe and recall to a unique underlying phenomenology which will acquire character of fundamental dimension and which is beautifully described in IT by the imaginary number (*i*). But remember that bistring or chi —the continuum space— was assembled along with photon —which involves time and velenergy—. Then the two physical quantities space (continuum) and time —later paired as *spacetime* due to its inner relation in the geometry of the Intervalic Space— were created at once starting from the intervalic string.

Hereinafter bistring or chi may also be identified as the so named *dark energy* of vacuum.

It can be noted the great difference between this elegant beginning of *spacetime* and the absolute (really "Newtonian" yet) conception of spacetime in modern Physics. Einstein uncovered and destroyed the *absoluteness* of space and time in Classic Mechanics, but in Quantum Mechanics it was replaced by another absoluteness: *absolute space* and *absolute time* were simply substituted by *absolute space-time*, which is poorly intended to exist before the birth of the own energy of the Universe in some unknown realm.

IT postulates a stop in the possible continuation of further aggregations of these antisymmetric constituted particles. Only the symmetric constituted particles —the ulterior photon— will continue with further assemblies. This represents a breaking in the whole symmetry initially supposed, which is named the *first intervalic symmetry breaking*.

At this moment there is only constituted one global symmetry due to the primordial synthesis of intervalic strings according to the spin-statistics theorem. We will name this primordial interaction of Nature, which relies on spin, as *intervalic interaction*.

Finally, and although it is not necessary for the consistency of IT, we are going to introduce a visual idea about the structure of intervalino which, although it is surely not reliable, might have some intuitive curiosity since the scale of observation (10^{-34} (m)) is far from what is reached by experimental devices. There is a more reliable intuitive picture of intervalino that will be commented in the chapter on the informational interaction. Now going to the other one, it can be supposed that the spinning open string could adopt a state of lower energy when joining its extremes making a ring, that is to say, a closed string. The longitude of that closed string —both the bi-string as well as the ulterior photon, γ— would be: $l_\gamma = 2\pi\hbar = 6.63275849 \cdot 10^{-34}$ (m), where the radius ħ is no other than the intervalic length, ħ = 1 (L) = $1.0556363 \cdot 10^{-34}$ (m). Now, it the intervalic string is a symmetric state under interchange it can be supposed that the prespin of the open strings turns likely and the whole line of the closed string will be spinning uniformly. On the contrary, in an antisymmetric state the prespins of the constituent open strings turns unlikely, and therefore there will be a *fold* in the ring. We can try to visualize this fold like a Moebius band in one dimension: in the same way as a Moebius band is a two dimensional space which "intuitively" make its fold going in the third dimension, an antisymmetric closed string is a one dimensional space which "intuitively" make its fold going in the second dimension. Since this fold will be moving incessantly along the closed string, it will create a perturbation in the geometry of spacetime which did not exist in the symmetric closed string. Theoretically we can measure the frequency of such movement of the fold or perturbation along the ring, which will appear as if the ring was turning along its central perpendicular axis (without displacement along its perpendicular axis). Thus, using intervalic units, we have that the corresponding *transversal energy* due to that movement will simply be:

$$E = 2\pi r\, \varphi = 2\pi\hbar\, \varphi = h\varphi$$

which is the traditional Einstein's equation for photon.

SYMMETRIC PRIMORDIAL SYNTHESIS OF CLOSED STRINGS: GRAVITON

The primordial synthesis of paired closed strings was made in a symmetric state under interchange, making a triplet of particles with spin 2 (it can be supposed that photon and antiphoton are identical):

$$|\gamma\underline{\gamma}|_s = \{\ |\gamma\gamma|,\ 2^{-\frac{1}{2}}\ (\ |\gamma\underline{\gamma}| + |\underline{\gamma}\gamma|\ ),\ |\underline{\gamma}\underline{\gamma}|\ \}$$

What is this spin 2 triplet? The only particle that can match with it appears to be the *graviton*. But this would imply that the gravitational interaction should be a derivation of the electromagnetic interaction, which is just according to what postulates the Intervalic Theory.

IT postulates that the gravitational energy, O, is the non linear contribution of the energy mass —which relies on the intervalic energy, I, and its derivation, the electromagnetic energy, U—. Resuming what has been explained in other sites, we have:

$$O = k\, c^{\pm 2}\, (n\hbar)^{-1}\, (I + U)^2 = k\, c^{\pm 2}\, (c^{\pm 2}m)^2 / r = (k\, c^{\pm 2}\, m^2 / r)$$

Here k an unknown dimensionful constant and, in intervalic units, $c^{\pm 4} = 1$ (1) is a rotation of ±360º in the Intervalic Space. Defining k as: $G = k\, c^{\pm 2}$, being G the non linear energy intervalic constant, we have:

$$O = G\, m^2 / r$$

which is the well known Newtonian formulation of the gravitational potential energy. The magnitude of the constant G is deduced from intervalic dimensional analysis, and its value in intervalic units is:

$$G = \pi\, 270^2\, \mathbf{t_I}$$

where $\mathbf{t_I}$ is the intervalic quantum of time, $\mathbf{t_I} = c^{-1}\hbar$. In SI units G is defined as:

$$G = \pi\alpha c^3\hbar = 6.5140911 \cdot 10^{-11}\ (s)$$

The slight deviation of the magnitude of G with respect to the experimental value of Newton's gravitational constant G_N is highly *meaningful* in IT and has been fully explained in other sites according to the intervalic symmetries of gravitation.

From the graviton did not follow any synthesis to make new particles. This stop in the systematic evolution of the symmetry process involves a breaking in the symmetry of primordial synthesis of particles and their related interactions. It represents the *second symmetry breaking* in IT, which is responsible of the arising of the global symmetries of gravitational interaction. This means that until this moment, when graviton had been created, gravity did not exist in the primordial Universe, against all expected in the traditional cosmologic models.

ANTISYMMETRIC PRIMORDIAL SYNTHESIS OF CLOSED STRINGS: INTERVALINO

The state of a pair photon-antiphoton in an antisymmetric state under interchange makes a well defined singlet with spin 0:

$$|\gamma\underline{\gamma}|_a = 2^{-½} (|\gamma\underline{\gamma}| - |\underline{\gamma}\gamma|)$$

For obvious reasons the states $|\gamma\gamma|$ and $|\underline{\gamma}\underline{\gamma}|$ are not allowed in this antisymmetric state because its wave function would vanish. We have a singlet composed by a photon and an antiphoton spinning in opposite ways, say, photon will be left handed and antiphoton will be right handed.

Which is this primordial particle composed by two coupled closed strings? If we believe that all subatomic particles are the result of the primordial synthesis of intervalic strings, according to spin-statistics theorem, that particle should be the mother of all massive particles, the fundamental block of Nature, since the symmetric synthesis of closed strings can not make, obviously, any other particle than the postulated graviton. This is the most economical assumption. If we postulate it, such a particle would be no other than the *intervalino,* **I**.

We already know that the intervalino mass energy comes completely from the intervalic energy, which degree of freedom is the *spin*, although later it will be manifested widely through the electric charge. If we equalize the intervalino intervalic energy with the *transversal energy* of a pair of massless closed strings coupled at a distance of the intervalic length, ħ —antisymmetric closed strings— we have:

$$E(\mathbf{I}) = c^{\pm 2}\ \hbar\ \mathbf{q_I}^{-2} = c^{\pm 2}\ \hbar\ [\surd\text{-}(c^{-1}\hbar)]^{-2} = c^{-1} = 3.335640952 \cdot 10^{-9}\ (J) =$$
$$= 20{,}819.42423\ (MeV/c^2)$$
$$E(\gamma) + E(\underline{\gamma}) = 2 \cdot 2\pi J\varphi = 4\pi\hbar\varphi = E(\mathbf{I})$$

Therefore, the corresponding frequorce of the closed string is:

$$\varphi_m = 1/(4\pi\ c\hbar) = 2.51452013 \cdot 10^{24}\ (s^{-1})$$

This magnitude can be interpreted as the *coupling frequorce of matter*, since all intervalinos of the Universe are coupled at that frequorce. It is also clear that it will be the minimal allowed energy of the resultant pair photon-antiphoton in the theoretical electromagnetic decay of the intervalino (regardless the threshold energy needed for the decay). Therefore, we can affirm that the frequorce of the primordial isolated closed strings —ulterior photons— was necessarily *greater* that this one, since in other case the primordial synthesis of closed strings was not happened because it was not led to a state of lesser energy. We can know the *coupling temperature of matter*, Θ_m, which is the minimal temperature of the primordial Universe at the creation of intervalinos. By means of the geometrical properties of the intervalic units, taking dimensionless intervalic light-units for the coupling frequorce and for the coupling temperature, being $\boldsymbol{\varphi_I}$ and $\boldsymbol{\Theta_I}$ respectively the *intervalic* *frequorce* and the *intervalic temperature* (namely, the geometric *intervalic limits* in the Intervalic Space), we have:

$$\varphi_c = \varphi_m / \boldsymbol{\varphi_I} = 1/(4\pi\ c\hbar) / c\ \hbar^{-1} = 1/(4\pi\ c^2)$$
$$\Theta_c = \Theta_m / \boldsymbol{\Theta_I} = \Theta_\gamma\ c^{-1}\ k_B$$
$$\Theta_m = 1/(4\pi\ c\, k_B) = 1.922575127 \cdot 10^{13}\ (K)$$

Please note that the total mass energy of intervalino comes uniquely from the intervalic energy. The electromagnetic energy of intervalino is *zero*, as I have explained in other site, because an *isolated* intervalino has not the degree of freedom of the electric charge yet. Once more, this would imply that the electromagnetic interaction is a derivation of the intervalic interaction, just as it is postulated by IT. The electromagnetic energy is derived from the intervalic energy, being just its *inverse* in intervalic units:

$$U \equiv I^{-1} = c^{\pm 2}\,(n\hbar)^{-1}\,Q^2 = c^{\pm 2}\,Q^2 / r$$

In SI units it has to be added to the equation the permeability of vacuum factor, which was conventionally set by definition as $\mu_0/4\pi = 10^{-7}$ (-1), instead of 1 (-1) as in intervalic units.

By the way, it can be commented that the two remaining ones of the four supposed “forces” of Nature, *strong* and *weak* interactions, are no other than the proper intervalic interaction: respectively, the *changeless* and the *changeful intervalic interactions*. The first one was born along with the first symmetry breaking, while the last one will be due, as we are going to see, to the fourth symmetry breaking.

It can be noted that the results of these assemblies verify the *intervalic zero assumption* regarding the total intrinsic angular momentum due to the constituent intervalic strings of both graviton and antigraviton, and equally in the case of the isolated intervalino.

To conclude with a comment, the definition of intervalino as the assembly of two closed strings (photons) in antisymmetric state under interchange and of graviton as the same assembly in symmetric state, may be considered, due to several and variegated reasons, as a beautiful achievement of IT which spreads beyond Particle Physics, being perhaps one of the finest shows of logical economy which can be achieved in a faultless theory, and whose fabulous technological implications we scarcely have begun to uncover yet.

<table>
<tr><th colspan="8">INTERVALIC PRIMORDIAL SYNTHESIS OF SUBATOMIC PARTICLES</th></tr>
<tr><td rowspan="8">INTER-VALIC STRING (spin ½)</td><td rowspan="7">Symmetric aggregation of intervalic strings = PHOTON (spin 1)</td><td>Symmetric aggr.of photons = GRAVITON (spin 2)</td><td colspan="5">Second symmetry breaking → GRAVITATIONAL INTERACTION</td></tr>
<tr><td rowspan="6">Antisymmetric aggregation of photons = INTERVALINO (spin 0)</td><td rowspan="5">Symmetric aggregation of intervalinos = 16 DALINOS (ELECTRON)</td><td rowspan="4">Symmetric aggregation of dalinos = 40 GAUDINOS (MUON, TAU, CHARGED MASSIVE BOSONS)</td><td>Symmetric aggregation of gaudinos = LISZTINOS (ZERO CHARGED MASSIVE BOSONS)</td><td colspan="2">Fifth symmetry breaking → → “ELEMENTARY PSEUDO INTERACTION”</td></tr>
<tr><td rowspan="3">Antisymmetric aggregation of gaudinos = FRACTIONAL LISZTINOS (QUARKS)</td><td rowspan="2">Symmetric aggregation of lisztinos = MONTEVERDI-NOS (MESONS)</td><td>Sixth symmetry breaking (despicable)</td></tr>
<tr><td>-</td></tr>
<tr><td>Antisymmetric aggregation of lisztinos = MONTEVERDI-NOS (BARYONS)</td><td>Antisymmetric aggregation of monteverdinos = PALESTRINOS</td></tr>
<tr><td>Antisymmetric aggregation of dalinos = DARK MATTER</td><td colspan="3">Fourth symmetry breaking → → INTERVALIC CHANGEFUL INTERACTION</td></tr>
<tr><td>Antisymmetric aggregation of intervalinos = DARK MATTER</td><td colspan="4">Third symmetry breaking → ELECTROMAGNETIC INTERACTION</td></tr>
<tr><td>Antisym. aggr. of intervalic strings = DARK ENERGY (spin 0)</td><td colspan="6">First symmetry breaking → INTERVALIC CHANGELESS INTERACTION</td></tr>
<tr><td>NOTHING</td><td colspan="7">Zero symmetry breaking → INFORMATIONAL INTERACTION</td></tr>
</table>

SYMMETRIC PRIMORDIAL SYNTHESIS OF INTERVALINOS: DALINO

As in the previous assembly, the primordial synthesis of intervalinos can make a state symmetric or antisymmetric under interchange. It is clear that bosons, instead of fermions, are preferable for large aggregations of particles, if we desire to preserve at each step the most logical and economical assumptions of the theory. On the contrary, the assembly of fermions seems to run better for small aggregations of particles, as we are going to view.

Considering one degree of freedom, we have four well defined spin intervalic symmetries according the spin-statistics theorem, a spin 0 triplet in the symmetric state and a spin 0 singlet in the antisymmetric state. In the symmetric state we have:

$$|\mathbf{I}\ \underline{\mathbf{I}}|_{s} = \{\ |\mathbf{I}\ \mathbf{I}|,\ 2^{-\frac{1}{2}}\ (\ |\mathbf{I}\ \underline{\mathbf{I}}| + |\underline{\mathbf{I}}\ \mathbf{I}|\ ),\ |\underline{\mathbf{I}}\ \underline{\mathbf{I}}|\ \}$$

Now we have to identify the resultant degree of freedom which makes the intervalino and the antintervalino, unless they are *identical* particles as photon and antiphoton. Writing the same but focusing on spin, with the usual spin notation, it would be:

$$|\mathbf{I}\ \underline{\mathbf{I}}|_{s} = \{\ |\uparrow\uparrow|,\ 2^{-\frac{1}{2}}\ (\ |\uparrow\downarrow| + |\downarrow\uparrow|\ ),\ |\downarrow\downarrow|\ \}$$

Undoubtedly, the most simple assumption is to identify that degree of freedom —which relies on spin— with the *electric charge*, which should be the result of the symmetric or antisymmetric aggregations of closed strings according to spin-statistics theorem, a deduction of remarkable simplicity and economy which makes to derive the electric charge degree of freedom from the own spin!:

$$|\uparrow\uparrow| = \{+\}$$
$$2^{-\frac{1}{2}}\ (\ |\uparrow\downarrow| + |\downarrow\uparrow|\ ) = \{0\}$$
$$|\downarrow\downarrow| = \{-\}$$

Astonishing, the two electric charge signs —{+} and {-}— *arise* naturally from the symmetric synthesis between intervalinos. Besides we have in the triplet the zero charge {0}.

It can be noted that the electric charge sign of an isolated intervalino is not {0} because the intervalino has not defined that degree of freedom yet, being its electric charge sign inexistent or undetermined. We can say that it is “neutrally undetermined”, {±}, because the sign of the electric charge of an *isolated* intervalino is *irrelevant* since it does not have electromagnetic energy and does not interact electromagnetically, but only intervalic and gravitationally. In other words, it can be said that the intervalino only *acquires* its electric charge sign when it is aggregated with another intervalino(s) by means of the intervalic interaction. Obviously, the magnitude of the squared amplitude of the wave function to yield {+} and {-} are just identical. This is a very beautiful feature in IT which probably can be considered as a paradigmatic example of the quantum uncertainty from a epistemological way of view.

Moreover, as the intervalinos composing the dalinos are completely symmetric under interchange, it is obvious that only can exist dalinos with *like* intervalinos, but not dalinos with *unlike* intervalinos. Such assembly of unlike intervalinos is not a dalino, and will be commented in the next paragraph.

Now it can be better understood the necessity for the, at first sight, strange square root that appears in the intervalic dimension of the electric charge, $\mathbf{q_I} = \sqrt{}\text{-}(c^{-1}\hbar)\ (i^{-1/2}L^{1/2})$, which means that the electric charge have to be a composite (paired) physical quantity. Although in an elemental naïve way, and only as a metaphoric comparison, the electric charge sign can be related with the square root of its constituent spins:

$$\sqrt{(\uparrow\uparrow)} = \sqrt{(\uparrow)^2} = (\uparrow) = (+)\text{ charge}$$
$$\sqrt{(\uparrow\downarrow)} = \sqrt{(\downarrow\uparrow)} = \sqrt{0} = (0)\text{ charge}$$
$$\sqrt{(\downarrow\downarrow)} = \sqrt{(\downarrow)^2} = (\downarrow) = (-)\text{ charge}$$

At this moment arose the *intervalic principle of energy balance for subatomic particles* because now there are two relevant interactions involved in the synthesis of intervalinos: the intervalic and the electromagnetic ones, plus the kinetic energy due to the intrinsic angular momentum, E(*J*). Therefore it will have to be reached a balance between its involved energies in order to compose *stable* particles. This fundamental intervalic principle states an important equation of great elegance:

$$I - I^{-1} - E(J) = 0$$

where I^{-1} is the inverse of the intervalic energy, namely, the electromagnetic energy, $U \equiv I^{-1}$.

This intervalic principle led to the compositeness of the dalino which has the *lowest energy* allowed by the involved interactions. The intervalic structure of this fundamental dalino is fixed only and in an univocal way by the number of its constituent intervalinos. As I have explained in other site, this number is just 270 and the corresponding magnitude of the electric charge is named *elementary charge*, which established a spontaneous order, as the reference state of minimal energy, for the electric charge of all further composite particles. According to this, there are only 16 kinds of compositeness for dalinos, D_n, those which number of constituent intervalinos is a divisor of the elementary charge, that is to say, n = 1, 2, 3, 5, 6, 9, 10, 15, 18, 27, 30, 45, 54, 90, 135, 270.

Symmetric assembly of Intervalinos
$D^{(\pm 1/1,2,3,5,6,9,10,15,18,27,30,45,54,90,135,270)}$
—16 electric charged dalinos geometrically
allowed by the intervalic symmetries of Nature—
(Geometric values derived only from D^{270} electron's
structural energy ratio and balance:
$I - I^{-1} - E(\mathcal{J}) = [\ c^{\pm 2}\ \hbar\ (270\ \mathbf{q_I})^{-2}\ ] - [\ \frac{1}{2}\ (1/4\pi\varepsilon_0)\ e^2\ /\ r_e\ ] - m_e\ \omega_{\mathcal{J}}(e)^2\ r_e^2 = 0$)

(0.51099909) $D_{270} = 270\ \mathbf{I} = 540\ \gamma = 1080\ S$
(2.0439964) $D_{135} = 135\ \mathbf{I} = 270\ \gamma = 540\ S$
(4.5989918) $D_{90} = 90\ \mathbf{I} = 180\ \gamma = 360\ S$
(12.774977) $D_{54} = 54\ \mathbf{I} = 108\ \gamma = 216\ S$
(18.395967) $D_{45} = 45\ \mathbf{I} = 90\ \gamma = 180\ S$
(41.390926) $D_{30} = 30\ \mathbf{I} = 60\ \gamma = 120\ S$
(51.099909) $D_{27} = 27\ \mathbf{I} = 54\ \gamma = 108\ S$
(114.97480) $D_{18} = 18\ \mathbf{I} = 36\ \gamma = 72\ S$
(165.56370) $D_{15} = 15\ \mathbf{I} = 30\ \gamma = 60\ S$
(372.51833) $D_{10} = 10\ \mathbf{I} = 20\ \gamma = 40\ S$
(459.89918) $D_9 = 9\ \mathbf{I} = 18\ \gamma = 36\ S$
(1,034.7732) $D_6 = 6\ \mathbf{I} = 12\ \gamma = 24\ S$
(1,490.0734) $D_5 = 5\ \mathbf{I} = 10\ \gamma = 20\ S$
(4,139.0926) $D_3 = 3\ \mathbf{I} = 6\ \gamma = 12\ S$
(9,312.9584) $D_2 = 2\ \mathbf{I} = 4\ \gamma = 8\ S$
(20,819.424) $D_1 = 1\ \mathbf{I} = 2\ \gamma = 4\ S$

Recombination set of dalinos above the threshold temperature, whose intervalinar composition is identical to the recombination set of gaudinos:

$\leftrightarrow D_{270} \leftrightarrow 2\ D_{135} \leftrightarrow 3\ D_{90} \leftrightarrow 5\ D_{54} \leftrightarrow 6\ D_{45} \leftrightarrow 9\ D_{30} \leftrightarrow 10\ D_{27} \leftrightarrow 15\ D_{18} \leftrightarrow 18\ D_{15} \leftrightarrow 27\ D_{10} \leftrightarrow 30\ D_9 \leftrightarrow 45\ D_6 \leftrightarrow 54\ D_5 \leftrightarrow 90\ D_3 \leftrightarrow 180\ D_2 \leftrightarrow 270\ D_1$
$\leftrightarrow$
=
$\leftrightarrow G_1 \leftrightarrow G_2 \leftrightarrow G_3 \leftrightarrow G_5 \leftrightarrow G_6 \leftrightarrow G_9 \leftrightarrow G_{10} \leftrightarrow G_{15} \leftrightarrow G_{18} \leftrightarrow G_{27} \leftrightarrow G_{30} \leftrightarrow G_{45} \leftrightarrow G_{54} \leftrightarrow G_{90} \leftrightarrow G_{135} \leftrightarrow G_{270} \leftrightarrow$

ANTISYMMETRIC PRIMORDIAL SYNTHESIS OF INTERVALINOS: BINTERVALINO AND ZERO CHARGED DALINOS

The primordial synthesis of intervalinos yields the following antisymmetric states under interchange:

$$|\mathbf{I}\,\underline{\mathbf{I}}|_a = 2^{-\frac{1}{2}}\,(\,|\mathbf{I}\,\underline{\mathbf{I}}| - |\underline{\mathbf{I}}\,\mathbf{I}|\,)$$

Writing the same but focusing on spin, with the usual spin notation, it would be:

$$|\mathbf{I}\,\underline{\mathbf{I}}|_a = 2^{-\frac{1}{2}}\,(\,|\uparrow\downarrow| - |\downarrow\uparrow|\,)$$

Clearly we have a couple of intervalinos with zero charge. We can be sure that this particle is not a constituent of visible matter because it could not aggregate since it did not interact with other particles neither through intervalic nor electromagnetic interactions. We will call also this *zero charged dalino,* D_2^0, as *bintervalino*, which is another important member among the several particles that constitute the dark matter. We will see opportunely the strange and fascinating physical features of bintervalino.

The eight zero charged dalinos geometrically allowed by the intervalic symmetries of Nature are the following ones, being all of them dark matter:

$$D_{270}^0,\ D_{90}^0,\ D_{54}^0,\ D_{30}^0,\ D_{18}^0,\ D_{10}^0,\ D_6^0,\ D_2^0$$

At this step the primordial synthesis stopped once more. This is the *third symmetry breaking*, when arose the global symmetries and physical features of electromagnetic interaction. This surprisingly means that, until this moment, electromagnetism did not exist in primordial Universe because there was no particles which could act as *source* of the electromagnetic interaction. The electric charge has only been created when joining two or more intervalinos, an synthesis which happened just at this stage.

SYMMETRIC PRIMORDIAL SYNTHESIS OF DALINOS: GAUDINO

The primordial synthesis of dalinos in a symmetric state under interchange made a set of particles with well defined intervalic structure: the *gaudinos*. As we know, there are only 16 kinds of compositeness for gaudinos, G_n, according to the intervalic symmetries derived form the elementary charge, where n denotes de number of constituent identical dalinos: n = 1, 2, 3, 5, 6, 9, 10, 15, 18, 27, 30, 45, 54, 90, 135, 270. Among them we find the leptons-charged massive bosons.

Although intervalino, graviton and photon are really composite particles, being the unique single particle and the mother of all of them the intervalic string, we may use to consider them as single particles when studying massful particles. In this view the first level of compositeness would be the dalino and the second level —where arise structurefulness: compositeness of compositeness— would be the gaudino.

GAUDINOS

(Share = 1/16)

= Symmetric assembly of Dalinos

$G^{(\pm)}$: ***Leptons-C.M.Bosons: e, μ, τ, $Z^{\pm}$, $W^{\pm}$, $Y^{\pm}$, $X^{\pm}$***

—16 elementary charged gaudinos geometrically
allowed by the intervalic symmetries of Nature—
(Geometric values derived only from electron's
structural energy ratio)

(0.51099909) $G_1 = 1\ D_{270} = 270\ \mathbf{I} = 540\ \gamma$
(4.0879928) $G_2 = 2\ D_{135} = 270\ \mathbf{I} = 540\ \gamma$
(13.796975) $G_3 = 3\ D_{90} = 270\ \mathbf{I} = 540\ \gamma$
(63.874885) $G_5 = 5\ D_{54} = 270\ \mathbf{I} = 540\ \gamma$
(110.37580) $G_6 = 6\ D_{45} = 270\ \mathbf{I} = 540\ \gamma$
(372.51833) $G_9 = 9\ D_{30} = 270\ \mathbf{I} = 540\ \gamma$
(510.99909) $G_{10} = 10\ D_{27} = 270\ \mathbf{I} = 540\ \gamma$
(1,724.6220) $G_{15} = 15\ D_{18} = 270\ \mathbf{I} = 540\ \gamma$
(2,980.1466) $G_{18} = 18\ D_{15} = 270\ \mathbf{I} = 540\ \gamma$
(10,057.995) $G_{27} = 27\ D_{10} = 270\ \mathbf{I} = 540\ \gamma$
(13,796.975) $G_{30} = 30\ D_9 = 270\ \mathbf{I} = 540\ \gamma$
(46,564.794) $G_{45} = 45\ D_6 = 270\ \mathbf{I} = 540\ \gamma$
(80,463.964) $G_{54} = 54\ D_5 = 270\ \mathbf{I} = 540\ \gamma$

(372,518.33) $G_{90} = 90\ D_3 = 270\ \mathbf{I} = 540\ \gamma$

(1,257,249.4) $G_{135} = 135\ D_2 = 270\ \mathbf{I} = 540\ \gamma$

(5,621,244.5) $G_{270} = 270\ D_1 = 270\ \mathbf{I} = 540\ \gamma$

$G^{(\pm 1/3,\ \pm 2/3)}$: ***Fractional Gaudinos***

—24 fractional charged gaudinos geometrically allowed by the intervalic symmetries of Nature—

(36.791934) $L_{1/3} = \frac{1}{3}\ G_6 = 2\ D_{45} = 90\ \mathbf{I} = 180\ \gamma$

(73.583868) $L_{2/3} = \frac{2}{3}\ G_6 = 4\ D_{45} = 180\ \mathbf{I} = 360\ \gamma$

(124.17278) $L_{1/3} = \frac{1}{3}\ G_9 = 3\ D_{30} = 90\ \mathbf{I} = 180\ \gamma$

(248.34556) $L_{2/3} = \frac{2}{3}\ G_9 = 6\ D_{30} = 180\ \mathbf{I} = 360\ \gamma$

(574.87400) $L_{1/3} = \frac{1}{3}\ G_{15} = 5\ D_{18} = 90\ \mathbf{I} = 180\ \gamma$

(1,149.7480) $L_{2/3} = \frac{2}{3}\ G_{15} = 10\ D_{18} = 180\ \mathbf{I} = 360\ \gamma$

(15,521.598) $L_{1/3} = \frac{1}{3}\ G_{45} = 15\ D_6 = 90\ \mathbf{I} = 180\ \gamma$

(31,043.196) $L_{2/3} = \frac{2}{3}\ G_{45} = 30\ D_6 = 180\ \mathbf{I} = 360\ \gamma$

(26,821.321) $L_{1/3} = \frac{1}{3}\ G_{54} = 18\ D_5 = 90\ \mathbf{I} = 180\ \gamma$

(53,642.642) $L_{2/3} = \frac{2}{3}\ G_{54} = 36\ D_5 = 180\ \mathbf{I} = 360\ \gamma$

(124,172.78) $L_{1/3} = \frac{1}{3}\ G_{90} = 30\ D_3 = 90\ \mathbf{I} = 180\ \gamma$

(248,345.56) $L_{2/3} = \frac{2}{3}\ G_{90} = 60\ D_3 = 180\ \mathbf{I} = 360\ \gamma$

...

Recombination set of the 12 fractional (⅓) gaudinos

$$\leftrightarrow \tfrac{1}{3} G_3 \leftrightarrow \tfrac{1}{3} G_6 \leftrightarrow \tfrac{1}{3} G_9 \leftrightarrow \tfrac{1}{3} G_{15} \leftrightarrow$$
$$\leftrightarrow \tfrac{1}{3} G_{18} \leftrightarrow \tfrac{1}{3} G_{27} \leftrightarrow \tfrac{1}{3} G_{30} \leftrightarrow \tfrac{1}{3} G_{45} \leftrightarrow$$
$$\leftrightarrow \tfrac{1}{3} G_{54} \leftrightarrow \tfrac{1}{3} G_{90} \leftrightarrow \tfrac{1}{3} G_{135} \leftrightarrow \tfrac{1}{3} G_{270} \leftrightarrow \tfrac{1}{3} G_3 \leftrightarrow$$

Recombination set of the 12 fractional (⅔) gaudinos

$$\leftrightarrow \tfrac{2}{3} G_3 \leftrightarrow \tfrac{2}{3} G_6 \leftrightarrow \tfrac{2}{3} G_9 \leftrightarrow \tfrac{2}{3} G_{15} \leftrightarrow$$
$$\leftrightarrow \tfrac{2}{3} G_{18} \leftrightarrow \tfrac{2}{3} G_{27} \leftrightarrow \tfrac{2}{3} G_{30} \leftrightarrow \tfrac{2}{3} G_{45} \leftrightarrow$$
$$\leftrightarrow \tfrac{2}{3} G_{54} \leftrightarrow \tfrac{2}{3} G_{90} \leftrightarrow \tfrac{2}{3} G_{135} \leftrightarrow \tfrac{2}{3} G_{270} \leftrightarrow \tfrac{2}{3} G_3 \leftrightarrow$$

Recombination of fractional gaudinos can be made from the recombination set of the elementary gaudinos:

$$1\ G_n \leftrightarrow \tfrac{2}{3}\ G_n + \tfrac{1}{3}\ G_n$$

ANTISYMMETRIC PRIMORDIAL SYNTHESIS OF DALINOS: BIDALINO AND ZERO CHARGED DALINOS

The primordial synthesis of dalinos in antisymmetric state under interchange has a lot of analogies with the preceding antisymmetric synthesis of intervalinos:

$$|D\underline{D}|_a = 2^{-½} \left(|D\underline{D}| - |\underline{D}D| \right)$$

This is a couple of dalinos with zero charge, say, *bidalino*, which surely could not make further assemblies since it recombined its constituent dalinos to make gaudinos because dalinos assembled in a antisymmetric state under interchange have much more intervalic energy than the same ones in a symmetric state. Therefore, the intervalic energy, which predominates largely over the electromagnetic energy at quantum scale, favours the symmetric state in the constituent dalinos of gaudinos, as well as in the constituent intervalinos of dalinos (with the only exception of bintervalino).

The 25 zero charged gaudinos geometrically allowed by the intervalic symmetries of Nature are the following ones, being likewise all of them dark matter:

G_2^0, G_6^0, G_{10}^0, G_{18}^0, G_{30}^0, G_{54}^0, G_{90}^0, G_{270}^0,
⅓ G_6^0, ⅓ G_{18}^0, ⅓ G_{30}^0, ⅓ G_{54}^0, ⅓ G_{90}^0, ⅓ G_{270}^0,
⅔ G_6^0, ⅔ G_9^0, ⅔ G_{15}^0, ⅔ G_{18}^0, ⅔ G_{27}^0, ⅔ G_{30}^0,
⅔ G_{45}^0, ⅔ G_{54}^0, ⅔ G_{90}^0, ⅔ G_{135}^0, ⅔ G_{270}^0

At this step the primordial synthesis stopped once more. This is the *fourth symmetry breaking*, when arose the global symmetries and features of another kind of intervalic interaction which charge the intervalic structure of particles, namely, the changeful intervalic interaction —formerly named weak interaction—.

We are accustomed to think on assemblies of particles in symmetric and antisymmetric states as very similar particles, but this feature did not happen at the beginning of the Universe, when spin, mass, electric charge, intervalic structure, etc. appeared as the degree of freedom which differentiated symmetric from antisymmetric states of particles.

ANTYSYMMETRIC PRIMORDIAL SYNTHESIS OF GAUDINOS: INTEGER CHARGED LISZTINOS

The primordial synthesis of gaudinos in antisymmetric state under interchange made the *integer charged lisztinos*. All the lisztinos of this kind of assembly must have total charge 0, $e^{\pm}$ or a multiple of $e^{\pm}$. Among this set we find the zero charged massive bosons.

ZERO CHARGED LISZTINOS

(Share = 1/32)

= Antisymmetric assembly of Gaudinos

***Bileptons-Z.C.M.Bosons*: $\mathbf{Z^0}$, $\mathbf{W^0}$, $\mathbf{Y^0}$, $\mathbf{X^0}$**

(91,188) $L_22G_{45}90D_6^{(0)}$: $\mathbf{Z^0}$ ***massive boson***
(160,928) $L_22G_{54}108D_5^{(0)}$: W^0 *massive boson*
(745,037) $L_22G_{90}180D_3^{(0)}$: $\mathbf{Y^0}$ ***massive boson***
(2,514,499) $L_22G_{135}270D_2^{(0)}$: X^0 *massive boson*

Integer lisztinos does not assemble to make further particles, and therefore we find with another stop in the systematic synthesis of particles. Thus, this is the *fifth symmetry breaking*, which properly speaking do not yield any new interaction since all of them have already been created. Nevertheless, now appears a feature which looks like a false interaction in the further assembly of fractional charged lisztinos —namely, quarks— to make hadrons with neutral or the elementary charge. Since fractional charges are not allowed for isolated particles due to intervalic symmetries coming as far as from the own intervalic system of units and dimensions, the aggregations of quarks could appear to be mediated by a new kind of interaction (the doubtful colour with it gluon field in SM). However this is only the result of powerful symmetry constraints which we interpret as a set of quantum numbers given by Nature, and it is not due to any new interaction, in the same way as the allowed values of a lot of quantum numbers are simply symmetry constraints which do not involve the existence of a new kind of interaction for each one of them. By this reason, we can name this apparent interaction between quarks as elementary pseudo interaction.

SYMMETRIC PRIMORDIAL SYNTHESIS OF GAUDINOS: FRACTIONAL CHARGED LISZTINO

The assembly of gaudinos in symmetric state under interchange made the fractional charged lisztinos, which are lisztinos which total charge is ⅔ or ⅓. The powerful intervalic symmetries which govern these step has been described in the corresponding sites.

LISZTINOS$^{(\pm\frac{1}{3}, \pm\frac{2}{3})}$

(Share = 1/32)
= Symmetric assembly of Gaudinos
Quarks —49 quarks = 7 lisztinian families × 7 dalinar symmetries—

25 **Uniquarks**
(quarks with one allowed charge: ⅓ *or* ⅔)

(35) Quark $L_{\frac{1}{3}}\frac{1}{3}G_{6}2D_{45}^{(\frac{1}{3})}$
last radiant decaying quark
(117) Quark $L_{\frac{1}{3}}\frac{1}{3}G_{9}3D_{30}^{(\frac{1}{3})}$
(350) Quark $L_{1}1G_{9}9D_{30}^{(\frac{1}{3})}$
(1,049) Quark $L_{3}3G_{9}27D_{30}^{(\frac{1}{3})}$
(1,748) Quark $L_{5}5G_{9}45D_{30}^{(\frac{1}{3})}$
(233) Quark $L_{\frac{2}{3}}\frac{2}{3}G_{9}6D_{30}^{(\frac{2}{3})}$
(699) Quark $L_{2}2G_{9}18D_{30}^{(\frac{2}{3})}$
(1,399) Quark $L_{4}4G_{9}36D_{30}^{(\frac{2}{3})}$
former quark charm
(540) Quark $L_{\frac{1}{3}}\frac{1}{3}G_{15}5D_{18}^{(\frac{1}{3})}$
(1,619) Quark $L_{1}1G_{15}15D_{18}^{(\frac{1}{3})}$
(4,857) Quark $L_{3}3G_{15}45D_{18}^{(\frac{1}{3})}$
former quark bottom
(8,095) Quark $L_{5}5G_{15}75D_{18}^{(\frac{1}{3})}$
(1,079) Quark $L_{\frac{2}{3}}\frac{2}{3}G_{15}10D_{18}^{(\frac{2}{3})}$
(3,238) Quark $L_{2}2G_{15}30D_{18}^{(\frac{2}{3})}$
(6,476) Quark $L_{4}4G_{15}60D_{18}^{(\frac{2}{3})}$
(14,571) Quark $L_{\frac{1}{3}}\frac{1}{3}G_{45}15D_{6}^{(\frac{1}{3})}$
(43,712) Quark $L_{1}1G_{45}45D_{6}^{(\frac{1}{3})}$
(131,135) Quark $L_{3}3G_{45}135D_{6}^{(\frac{1}{3})}$
(218,558) Quark $L_{5}5G_{45}225D_{6}^{(\frac{1}{3})}$
(29,141) Quark $L_{\frac{2}{3}}\frac{2}{3}G_{45}30D_{6}^{(\frac{2}{3})}$

(87,426) Quark $L_2 2G_{45} 90D_6^{(\frac{2}{3})}$
(174,846) Quark $L_4 4G_{45} 180D_6^{(\frac{2}{3})}$
former quark top
(25,178) Quark $L_{\frac{1}{3}} \frac{1}{3}G_{54} 18D_5^{(\frac{1}{3})}$
(116,564) Quark $L_{\frac{1}{3}} \frac{1}{3}G_{90} 30D_3^{(\frac{1}{3})}$
(393,404) Quark $L_{\frac{1}{3}} \frac{1}{3}G_{135} 45D_2^{(\frac{1}{3})}$

24 **Isoquarks**

(quarks with two allowed charges: ⅓ *and* ⅔)

(69) Quark $L_{\frac{2}{3}} \frac{2}{3}G_6 4D_{45}^{(\frac{1}{3}, \frac{2}{3})}$
constituent quark of π meson
(104) Quark $L_1 1G_6 6D_{45}^{(\frac{1}{3}, \frac{2}{3})}$
(207) Quark $L_2 2G_6 12D_{45}^{(\frac{1}{3}, \frac{2}{3})}$
(311) Quark $L_3 3G_6 18D_{45}^{(\frac{1}{3}, \frac{2}{3})}$
former quarks up, down
(414) Quark $L_4 4G_6 24D_{45}^{(\frac{1}{3}, \frac{2}{3})}$
(518) Quark $L_5 5G_6 30D_{45}^{(\frac{1}{3}, \frac{2}{3})}$
former quark strange
(50,356) Quark $L_{\frac{2}{3}} \frac{2}{3}G_{54} 36D_5^{(\frac{1}{3}, \frac{2}{3})}$
(75,534) Quark $L_1 1G_{54} 54D_5^{(\frac{1}{3}, \frac{2}{3})}$
(151,068) Quark $L_2 2G_{54} 108D_5^{(\frac{1}{3}, \frac{2}{3})}$
(226,601) Quark $L_3 3G_{54} 162D_5^{(\frac{1}{3}, \frac{2}{3})}$
(302,134) Quark $L_4 4G_{54} 216D_5^{(\frac{1}{3}, \frac{2}{3})}$
(377,668) Quark $L_5 5G_{54} 270D_5^{(\frac{1}{3}, \frac{2}{3})}$
(233,128) Quark $L_{\frac{2}{3}} \frac{2}{3}G_{90} 60D_3^{(\frac{1}{3}, \frac{2}{3})}$
(349,693) Quark $L_1 1G_{90} 90D_3^{(\frac{1}{3}, \frac{2}{3})}$
(699,384) Quark $L_2 2G_{90} 180D_3^{(\frac{1}{3}, \frac{2}{3})}$
(1,049,078) Quark $L_3 3G_{90} 270D_3^{(\frac{1}{3}, \frac{2}{3})}$
(1,398,771) Quark $L_4 4G_{90} 360D_3^{(\frac{1}{3}, \frac{2}{3})}$
(1,748,463) Quark $L_5 5G_{90} 450D_3^{(\frac{1}{3}, \frac{2}{3})}$
(786,808) Quark $L_{\frac{2}{3}} \frac{2}{3}G_{135} 90D_2^{(\frac{1}{3}, \frac{2}{3})}$
(1,180,213) Quark $L_1 1G_{135} 135D_2^{(\frac{1}{3}, \frac{2}{3})}$
(2,360,424) Quark $L_2 2G_{135} 270D_2^{(\frac{1}{3}, \frac{2}{3})}$
(3,540,638) Quark $L_3 3G_{135} 405D_2^{(\frac{1}{3}, \frac{2}{3})}$
(4,720,850) Quark $L_4 4G_{135} 540D_2^{(\frac{1}{3}, \frac{2}{3})}$
(5,901,063) Quark $L_5 5G_{135} 675D_2^{(\frac{1}{3}, \frac{2}{3})}$

INTERVALIC PRIMORDIAL SYNTHESIS OF QUARKS: MONTEVERDINO

The primordial synthesis of fractional charged lisztinos made the *monteverdinos*. Among monteverdinos we find *mesons* and *baryons:*

Baryons = Assembly of three Lisztinos$^{(\pm\frac{1}{3},\, \pm\frac{2}{3})}$
Mesons = Assembly of two Lisztinos$^{(\pm\frac{1}{3},\, \pm\frac{2}{3})}$

INTERVALIC PRIMORDIAL SYNTHESIS OF MONTEVERDINOS: PALESTRINO

The last assembly of intervalic structures is that of monteverdinos, to make the so named *palestrinos,* in honour of the great Italian Renaissance musician Giovanni Pierluigi da Palestrina (1525-1594). At this final step the *sixth breaking symmetry* is despicable as it is not a proper breaking of symmetry, but merely a fading end in the systematic synthesis of particles.

RESUME OF SYMMETRIC AND ANTISYMMETRIC STATES

Recapitulating such states:

0 level:
Nothing (symmetric-like) *versus* Intervalic string (antisymmetric-like)
Introduced degree of freedom: prespin —information—
Corresponding interaction: informational
Resulting particles of the assembly:
$|S\underline{S}|_s = \{ |SS|, 2^{-\frac{1}{2}} (|S\underline{S}| + |\underline{S}S|), |\underline{SS}| \}$ = photon (closed string)
$|S\underline{S}|_a = 2^{-\frac{1}{2}} (|S\underline{S}| - |\underline{S}S|)$ = bistring or chi (real space)

1st. level:
Bistring or chi (symmetric) *versus* Photon (antisymmetric)
Introduced degree of freedom: spin
Corresponding interaction: changeless intervalic —strong—
Resulting particles of the assembly:
$|\gamma\underline{\gamma}|_s = \{ |\gamma\gamma|, 2^{-\frac{1}{2}} (|\gamma\underline{\gamma}| + |\underline{\gamma}\gamma|), |\underline{\gamma\gamma}| \}$ = graviton
$|\gamma\underline{\gamma}|_a = 2^{-\frac{1}{2}} (|\gamma\underline{\gamma}| - |\underline{\gamma}\gamma|)$ = intervalino

2nd. level:
Graviton (symmetric) *versus* Intervalino (antisymmetric)
Introduced degree of freedom: mass
Corresponding interaction: gravitational
Resulting particles of the assembly:
$|\mathbf{I}\ \underline{\mathbf{I}}|_{\mathrm{s}} = \{\ |\mathbf{I}\ \mathbf{I}|,\ 2^{-\frac{1}{2}}\ (\ |\mathbf{I}\ \underline{\mathbf{I}}| + |\underline{\mathbf{I}}\ \mathbf{I}|\ ),\ |\underline{\mathbf{I}}\ \underline{\mathbf{I}}|\ \}$ = dalinos
$|\mathbf{I}\ \underline{\mathbf{I}}|_{\mathrm{a}} = 2^{-\frac{1}{2}}\ (\ |\mathbf{I}\ \underline{\mathbf{I}}| - |\underline{\mathbf{I}}\ \mathbf{I}|\ )$ = bintervalino

3rd. level:
Dalino (symmetric) *versus* Zero Charged Dalinos (antisymmetric)
Introduced degree of freedom: electric charge
Corresponding interaction: electromagnetic
Resulting particles of the assembly:
$|\mathrm{D}\underline{\mathrm{D}}|_{\mathrm{s}} = \{\ |\mathrm{DD}|,\ 2^{-\frac{1}{2}}\ (\ |\mathrm{D}\underline{\mathrm{D}}| + |\underline{\mathrm{D}}\mathrm{D}|\ ),\ |\underline{\mathrm{DD}}|\ \}$ = gaudino
$|\mathrm{D}\underline{\mathrm{D}}|_{\mathrm{a}} = 2^{-\frac{1}{2}}\ (\ |\mathrm{D}\underline{\mathrm{D}}| - |\underline{\mathrm{D}}\mathrm{D}|\ )$ = bidalino

4th.. level:
Gaudino (symmetric) *versus* Zero Charged Gaudinos (antisymmetric)
Introduced degree of freedom: intervalic structure
Corresponding interaction: changeful intervalic —weak—
Resulting particles of the assembly:
$|\mathrm{G}\underline{\mathrm{G}}|_{\mathrm{s}} = \{\ |\mathrm{GG}|,\ 2^{-\frac{1}{2}}\ (\ |\mathrm{G}\underline{\mathrm{G}}| + |\underline{\mathrm{G}}\mathrm{G}|\ ),\ |\underline{\mathrm{GG}}|\ \}$ = integer charged lisztinos (zero charged massive bosons)
$|\mathrm{G}\underline{\mathrm{G}}|_{\mathrm{a}} = 2^{-\frac{1}{2}}\ (\ |\mathrm{G}\underline{\mathrm{G}}| - |\underline{\mathrm{G}}\mathrm{G}|\ )$ = fractional charged lisztinos (quarks)

7 MONTEVERDINO

Assembly of 3 lisztinos = **MONTEVERDINOS**
Baryons

Assembly of 2 lisztinos = **MONTEVERDINOS**
Mesons

Dimensional Basis of the Intervalic System of Units: (L, *i*)
dim (ħ) = L
dim (c) = i^{-1}

6 LISZTINO

Symmetric assembly of Gaudinos = **LISZTINOS**$^{(\pm⅓,\ \pm⅔)}$
Quarks
$u^{+⅔} = L_3 = G_6^{+⅔} G_6^{-⅓} G_6^{+⅓} =$
$= 18\ D_{45} = 810\ \mathbf{I}$
$d^{-⅓} = L_3 = G_6^{+⅓} G_6^{-⅓} G_6^{-⅓} =$
$= 18\ D_{45} = 810\ \mathbf{I}$

Antisymmetric… = **LISZTINOS**$^{(0)}$
Bileptons-Zero charged massive bosons
$Z^0 = L_2 = 2\ G_{45} = 90\ D_6 = 540\ \mathbf{I}$
$X^0 = L_2 = 2\ G_{135} = 270\ D_2 = 540\ \mathbf{I}$

5 GAUDINO

Symmetric assembly of Dalinos = **GAUDINOS**$^{(\pm⅓,\ \pm⅔)}$
Nucleonic gaudinos
$G_6^{\pm⅓} = 4D_{\pm45}\ 2D_{\pm45} = 270\ \mathbf{I}$
$G_6^{\pm⅔} = 5D_{\pm45}\ 1D_{\pm45} = 270\ \mathbf{I}$
GAUDINOS$^{(\pm)}$
Leptons-Charged massive bosons:
Muon
$\mu = G_6 = 6\ D_{45} = 270\ \mathbf{I}$
Tau
$\tau = G_{15} = 15\ D_{18} = 270\ \mathbf{I}$
Charged massive bosons
$W^{\pm} = G_{54} = 54 D_5 = 270\ \mathbf{I}$
$Y^{\pm} = G_{90} = 90\ D_3 = 270\ \mathbf{I}$

Antisymmetric… = **GAUDINO**$^{(0)}$
Bidalino (dark matter)
$\mathbf{BD} = 2\ D_1^{\pm} = 2\ \mathbf{I}$

4 DALINO

Symmetric assembly of Intervalinos (Big Bang origin)= **DALINOS**$^{(\pm 1/1,2,3,5,6,9,10,15,18,27,30,45,54,90,135,270)}$

Electron
$e = G_1 = D_{270} = 270\ \mathbf{I}$
Electron charge
$e = 270\ \mathbf{q_I} = 270\ \sqrt{}\text{-}(c^{-1}\hbar)$
Electron intervalic energy
$I(e) = c^{\pm2}\ \hbar\ e^{-2} =$
$= 0.28558881\ (\mathrm{MeV}/c^2)$
Electromagnetic energy
$U(e) = m(e) - I(e) =$
$= 0.22541025\ (\mathrm{MeV}/c^2)$
Electron spin energy
$E_J(e) = I(e) - U(e) =$
$= 0.060178559\ (\mathrm{MeV}/c^2)$
Electron angular velocity
$\omega_J\ (e) = (\ \varphi(e)_J\ /\ m_e\ r_e\ )^{½} =$
$3.220944289 \cdot 10^{22}\ (s^{-1})$

Antisymmetric… = **DALINO**$^{(0)}$
Bintervalino (dark matter)
$\mathbf{BI} = D_2^{\ 0} = 2\ \mathbf{I}$
BI state: $\mathbf{BI} = 2^{-½}\ (\ |\mathbf{I}\underline{\mathbf{I}}| - |\underline{\mathbf{I}}\mathbf{I}|\ )$

3 INTERVALINO

Antisymmetric assembly of Photons = **INTERVALINO**
Intervalino state
$\mathbf{I} = 2^{-½}\ (\ |\gamma\underline{\gamma}| - |\underline{\gamma}\gamma|\ )$
Intervalino charge
$\mathbf{q_I} = \sqrt{}\text{-}(c^{-1}\hbar) = 1\ (i^{-1/2}L^{1/2}) =$
$= 5.9339900 \cdot 10^{-22}\ (C)$
Intervalino intervalic energy
$I(\mathbf{I}) = c^{\pm2}\ \hbar\ \mathbf{q_I}^{-2} = c^{-1} =$
$= 20{,}819.424\ (\mathrm{MeV}/c^2)$
Intervalino electromagnetic potential energy: $U(\mathbf{I}) = 0$
Intervalino mass: $m(\mathbf{I}) = I(\mathbf{I})$
Intervalino spin energy
$E_J(\mathbf{I}) = I(\mathbf{I}) - U(\mathbf{I}) = c^{-1}$
Intervalino linear velocity on surface: $v(\mathbf{I}) = c$
Intervalino radius
$r_\mathbf{I} = c\ /\ \omega_\mathbf{I} = 2\ \hbar =$
$= 2.1112726 \cdot 10^{-34}\ (m)$
Coupling frequorce and temperature of intervalino
$\varphi_{cp} = 1/(4\pi\ c\hbar) =$
$= 2.51452013 \cdot 10^{24}\ (s^{-1})$
$\Theta_{cp} = 1/(4\pi\ ck_B) =$
$= 1.922575127 \cdot 10^{13}\ (K)$

Symmetric… = **GRAVITON** (dark energy)
$g = |\gamma\underline{\gamma}|_s = [\ |\gamma\gamma|,$
$2^{-½}\ (\ |\gamma\underline{\gamma}| + |\underline{\gamma}\gamma|\ ),\ |\underline{\gamma}\underline{\gamma}|\ ]$

2 PHOTON

Symmetric assembly of Intervalic Strings = **PHOTON**
Photon state
$\gamma = \{\ |\uparrow\uparrow|,$
$2^{-½}\ (\ |\uparrow\downarrow| + |\downarrow\uparrow|\ ),\ |\downarrow\downarrow|\ \}$
Photon radius
$r_\gamma = \hbar =$
$= 1.0556363 \cdot 10^{-34}\ (m)$
Frequorce of primordial photon
$\varphi_\gamma = \boldsymbol{\varphi}_\mathbf{I} = c\ \hbar^{-1} =$
$= 2.8399227 \cdot 10^{42}\ (s^{-1})$
Total energy of primordial photons
$\Sigma E_\gamma = ¼\ c^7\ \hbar^2\ \boldsymbol{\varphi}_\mathbf{I}^{\ 2} =$
$= 4.890196776 \cdot 10^{75}\ (J)$
Total number of assembled primordial photons
$n_\gamma = \Sigma E_\gamma\ /\ c =$
$= 1.631194063 \cdot 10^{67}$
Intervalic temperature
$\boldsymbol{\Theta}_\mathbf{I} = c\ k_B^{-1} =$
$= 2.17138589 \cdot 10^{31}\ (K)$
Timeless Universe Limit
(Intervalic-relativistic transformations of time regarding temperature)
$t = t_0 / \sqrt{}(1-[\Theta/\boldsymbol{\Theta}_\mathbf{I}]^2) = \infty$

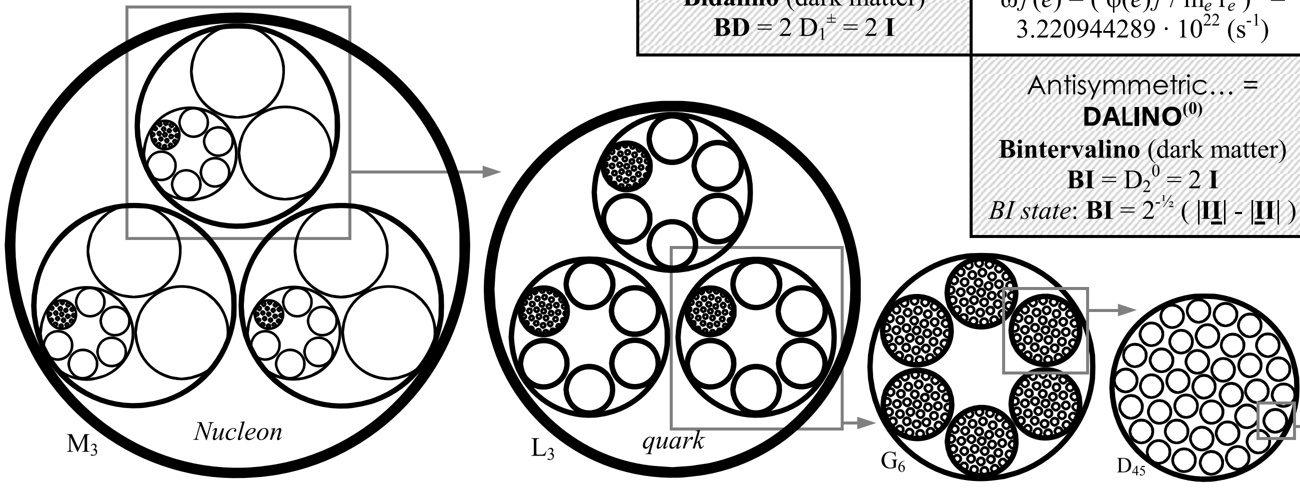
Antisymmetric… = **CHI** (dark energy)
$¢ = 2^{-½}\ (\ |\uparrow\downarrow| - |\downarrow\uparrow|\ )$

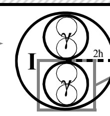
1 INTERV. STRING

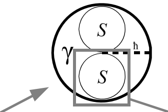
The existence of **Mathematics**, **Information** or **Consciousness** involve unavoidably the existence of **space** (Timeless Universe).
Quantum of space:
INTERVALIC STRING
Intervalic string state
$\{\uparrow, \downarrow\}$
Intervalic string radius
$r_S = ½\ \hbar$
Intervalic string spin
$J_S = ½\ \hbar$
Intervalic string length
$l_S = \pi \mathbf{l_I} = \pi\hbar$
Composition of the finite group of Physical Quantities from (i, L^n).
No. of Ph.Q. for $n = 3$:
$4 + 12n = 40$

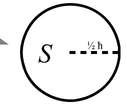
Neutrino
Neutrino is defined as an intervalic string came to light. The majority of neutrinos have been made at the Intervalic Primordial Assembly (IPA) of *dalinos*, which began between $1.521843955 \cdot 10^{-10}$ (s) and $1.979589614 \cdot 10^{-9}$ (s) after the *beginning of time*. The dalino-synthesis caused the so named Big Bang, which released 5,621,244.136 and 936,855.694 (MeV/c²) respectively per each electron and nucleonic dalino assembled.

Compositeness & Intervalic Structure of Nucleon
$M_3 = 3\ L_3 = 9\ G_6 = 54\ D_{45} = 2430\ \mathbf{I} = 4860\ \gamma$









ELEMENTARY CHARGE ATRACTOR — $\alpha = 270^2 \cdot 10^{-7} = 1/137.1742112000\ (1)$ $\quad e = 270\ \mathbf{q_I} = 270\ \sqrt{}\text{-}(c^{-1}\hbar) = 270\ (i^{-1/2}L^{1/2}) = 1.60217733 \cdot 10^{-19}\ (C)$ $\quad \mathbf{q_I} = \sqrt{}\text{-}(c^{-1}\hbar) = 1\ (i^{-1/2}L^{1/2}) = 5.9339900 \cdot 10^{-22}\ (C)$

INTERVALIC CHANGEFUL INTERACTION ← (Formerly WEAK INTERAC.) ← **FORM** — $\boldsymbol{\varphi}_\mathbf{I} = c\ \hbar^{-1} = 1\ (i^{-1}L^{-1}) = 2.839921837 \cdot 10^{42}(s^{-1})$ $\quad \mathbf{t_I} = c^{-1}\hbar = 1\ (iL) = 3.521223673 \cdot 10^{-43}(s)$ $\quad \mathbf{l_I} = \hbar = 1\ (L) = 1.0556363 \cdot 10^{-34}(m)$

Visible Matter Universe ← ELECTROMAGNETIC INTERACTION ← **ELECTRIC CHARGE** — $\mathbf{m_I} = c^{-1} = 1\ (i) = 3.335640952 \cdot 10^{-9}\ (kg)$ $\quad \mathbf{v_I} = c = 1\ (i^{-1}) = 2.99792458 \cdot 10^{8}\ (m\ s^{-1})$

Dark Matter Universe ← GRAVITATIONAL INTERACTION ← **MASS** — $\mathbf{a_I}\ \&\ \mathbf{g_I} = c^{\pm2}\ \hbar^{-1} = 1\ (-L^{-1}) = 8.51387148 \cdot 10^{50}\ (m\ s^{-2})$

Light Universe (Spacetime Universe) ← INTERVALIC CHANGELESS INTERACTION (Formerly STRONG INTERACTION) ← **SPIN** — **INTERVALIC QUANTA & LIMITS**

Information Universe (Timeless Universe) ← INFORMATIONAL INTERACTION ← **INFORMATION**

INTERVALIC PRIMORDIAL ASSEMBLY

Structure Level	*Intervalic structure*	*Degree of freedom*	*Interaction introduced*	*Particles assembled*	*Symmetry breaking*
0	Point	Ø	Ø	Intervalic String	goes to next structure level
				Intervalic Length	-
1	Intervalic String	Space	Informational	Photon	goes to next structure level
				Chi	dark energy
2	Photon	Spin	Intervalic Changeless —strong—	Intervalino	goes to next structure level
				Graviton	dark energy
3	Intervalino	Mass	Gravitational	16 Dalinos: *electron*	goes to next structure level
				Bintervalino	dark matter
4	Dalino	Electric charge	Electromagnetic	40 Gaudinos: *nucl. Gs, leptons-CMBs*	goes to next structure level
				Bidalino	dark matter
5	Gaudino	Electric charge structure	Intervalic Changeful —weak—	Lisztinos: *49 quarks*	goes to next structure level
				Lisztinos: *bileptons-ZCMBs*	decay
6	Lisztino	Elementary charge	Elementary charge attractor	Monteverdinos: *baryons*	goes to next structure level
				Monteverdinos: *mesons*	decay
7	Monteverdino	ø	ø	Palestrinos: *nuclei*: $1< A \leq 3$	-
				Pseudopalestrinos: *nuclei:* $A > 3$	-

INTERVALIC PRIMORDIAL ASSEMBLY OF INTERVALIC STRUCTURES
WHICH ORIGINATED ALL DEGREES OF FREEDOM AND INTERACTIONS

<table>
<tr><th>Tree level</th><th>1</th><th>2</th><th>3</th><th>4</th><th>5</th><th>6</th><th>7</th><th>8</th></tr>
<tr>
<td rowspan="10">Assemblies are made in symmetric and antisymmetric states under interchange, with identical shares. The appearance of each new *intervalic structure* assembled makes automatically the introduction of a new degree of freedom with its corresponding *fundamental interaction* in the Universe. When some intervalic structures do not make further assemblies, there is a *symmetry breaking* in the tree and that branch of the Intervalic Primordial Assembly ends.</td>
<td rowspan="8">INTERVALIC STRING
—quantum of space—
(Share = 1)
Intervalic string state
$S = \{\uparrow, \downarrow\}$
Intervalic string radius
$r_S = \tfrac12\,\hbar$
Intervalic string spin
$J_S = \tfrac12\,\hbar$
Intervalic string length
$l_S = \pi\,\mathbf{l_I} = \pi\,\hbar$
Number of intervalic strings
$n(S) = 4\,n(\gamma) =$
$= 4\ \tfrac14\,c^8 = c^8$

Neutrino
Neutrino is defined as *an intervalic string came to light.* The majority of neutrinos have been made at the Intervalic Primordial Assembly of gaudinos and dalinos, which began between $1.521843955 \cdot 10^{-10}$ (s) and $1.979589614 \cdot 10^{-9}$ (s) after the intervalic structure level No. 2 (synthesis of photon and chi) which marked the *beginning of time.*</td>
<td rowspan="7">PHOTON
—quantum of light—
(Share = 1/2)
= Symmetric assembly of Intervalic Strings:
$\gamma = \{\, |\uparrow\uparrow|,$
$2^{-1/2}\,(\,|\uparrow\downarrow| + |\downarrow\uparrow|\,),\ |\downarrow\downarrow|\,\}$
Photon radius
$r_\gamma = \hbar =$
$= 1.0556363 \cdot 10^{-34}$ (m)
Frequorce of primordial photon
$\varphi_\gamma = \boldsymbol{\varphi}_\mathbf{I} = c\,\hbar^{-1} =$
$= 2.839921837 \cdot 10^{42}\ (s^{-1})$
Temperature of primordial photon
$\Theta_\gamma = \boldsymbol{\Theta}_\mathbf{I} = c\,k_B^{-1} =$
$= 2.17138589 \cdot 10^{31}$ (K)
Intervalic-relativistic transformations of time regarding temperature
$t = t_0 / \sqrt{(1-[\Theta/\boldsymbol{\Theta}_\mathbf{I}]^2)}$
Total energy of primordial photons
$\Sigma E(\gamma) = \tfrac14\,c^7\,\hbar^2\,\boldsymbol{\varphi}_\mathbf{I}^2 = \tfrac14\,c^9$
$= 4.890196776 \cdot 10^{75}$ (J)
Since the energy of primordial photons was exactly the intervalic velenergy, $c = 2.99792458 \cdot 10^8$ (J), we can surprisingly know with astonishing simplicity the *number of primordial photons* assembled from intervalic strings at the beginning of the Universe:
$n(\gamma) = \Sigma E(\gamma) / c = \tfrac14\,c^8 =$
$= 1.631194063 \cdot 10^{67}$</td>
<td rowspan="6">INTERVALINO
—quantum of matter—
(Share = 1/4)
= Antisymmetric assembly of Photons
Intervalino state
$\mathbf{I} = 2^{-1/2}\,(\,|\gamma\underline{\gamma}| - |\underline{\gamma}\gamma|\,)$
Intervalino radius
$r(\mathbf{I}) = c / \omega(\mathbf{I}) = 2\,\hbar =$
$= 2.1112726 \cdot 10^{-34}$ (m)
Intervalino spin: $J(\mathbf{I}) = 0$
Intervalino charge
$\mathbf{q_I} = \sqrt{-(c^{-1}\hbar)} = 1\,(i^{-1/2}L^{1/2}) =$
$= 5.93398995 \cdot 10^{-22}$ (C)
Intervalino intervalic energy
$I(\mathbf{I}) = c^{\pm 2}\,\hbar\,\mathbf{q_I}^{-2} = c^{-1} =$
$= 20{,}819.42423\ (MeV/c^2)$
Intervalino electromagnetic potential energy: $U(\mathbf{I}) = 0$
Intervalino mass: $m(\mathbf{I}) = I(\mathbf{I})$
Intervalino spin energy
$E_J(\mathbf{I}) = I(\mathbf{I}) - U(\mathbf{I}) = c^{-1} =$
$= 20{,}819.42423\ (MeV/c^2)$
Intervalino linear velocity on surface:
$v(\mathbf{I}) = c$
Total energy of primordial intervalinos and gravitons
$\Sigma E(\mathbf{I}) \equiv \Sigma E(g) = \tfrac12\,\Sigma E(\gamma) =$
$= (1/8)\,c^9 =$
$= 2.445098388 \cdot 10^{75}$ (J)
Number of primordial intervalinos assembled at the IPA
$n(\mathbf{I}) = \Sigma E(\mathbf{I}) / I(\mathbf{I}) =$
$= (1/8)\,c^{10} = 7.330220558 \cdot 10^{83}$
Threshold temperature of annihilation-materialization of intervalinos, $\gamma\gamma \leftrightarrow \mathbf{I}$
$\Theta_t(\mathbf{I}) \geq c^{\pm 2} m(\mathbf{I}) / k_B = 4\pi\,\Theta_m =$
$= 2.415992632 \cdot 10^{14}$ (K)
Threshold frequorce of photons at the annihilation-materialization of intervalinos, φ_t
$\varphi_t = 4\pi\,\varphi_m = 1/(c\hbar) = 3.159839191 \cdot 10^{25}\ (s^{-1})$</td>
<td rowspan="5">DALINOS
—quanta of electric charge—
(Share = 1/8)
= Symmetric assembly of Intervalinos
$D^{(\pm 1/1,2,3,5,6,9,10,15,18,27,30,45,54,90,135,270)}$
—16 electric charged dalinos geometrically allowed by the intervalic symmetries of Nature—

Electron
$e = G_1 = D_{270} = 270\,\mathbf{I} = 540\,\gamma = 1080\,S$
Electron charge
$e = 270\,\mathbf{q_I} = 270\,\sqrt{-(c^{-1}\hbar)}$
Structural energy balance
$I - I^{-1} - E(J) =$
$= [\,c^{\pm 2}\,\hbar\,(270\,\mathbf{q_I})^{-2}\,] -$
$- [\,\tfrac12\,(1/4\pi\varepsilon_0)\,e^2 / r_e\,] -$
$m_e\,\omega_J(e)^2\,r_e^2 = 0$

Total energy of primordial dalinos:
$\Sigma E(D^{\pm}) \equiv \Sigma E(D^0) = \tfrac12\,\Sigma E(\mathbf{I}) =$
$= (1/16)\,c^9 = 1.222549194 \cdot 10^{75}$ (J)

(Big Bang origin)</td>
<td rowspan="4">GAUDINOS
(Share = 1/16)
= Symmetric assembly of Dalinos
$G^{(\pm 1/3,\ \pm 2/3)}$: ***Nucleonic gaudinos***
$G^{(\pm)}$: ***Leptons-Charged Massive Bosons***
—16 elementary charged gaudinos geometrically allowed by the intervalic symmetries of Nature—

Muon, Tau,
$\boldsymbol{Z^{\pm}, W^{\pm}, Y^{\pm}, X^{\pm}}$</td>
<td rowspan="3">LISZTINOS$^{(\pm 1/3,\ \pm 2/3)}$
(Share = 1/32)
= Symmetric assembly of gaudinos
Quarks
(49 quarks =
7 lisztinian families ×
× 7 dalinar symmetries)
Inasmuch as the vast majority of ZCMB decayed into quarks, and as the vast majority of primordial quarks decayed finally into the isoquark $L_3 3G_6 18D_{45}^{(1/3,\ 2/3)}$—former *quarks up* and *down*—, we can deduce the *maximum number of nucleonic isoquarks* generated at the primordial Universe (taking roughly $m(q) \sim 313\ MeV/c^2$):
$n(q) \leq \Sigma m(L^{\pm 1/3,\ \pm 2/3}) / \Sigma m(q) =$
$1.218937472 \cdot 10^{85}$</td>
<td rowspan="2">MONTEVERDINOS
= Assembly of
3 lisztinos$^{(\pm 1/3,\ \pm 2/3)}$
Baryons</td>
<td>PALESTRINOS
Nuclei: $1 < A \leq 3$</td>
</tr>
<tr>
<td>PSEUDO-PALESTRINOS
Nuclei: $A > 3$</td>
</tr>
<tr>
<td>MONTEVERDINOS
= Assembly of
2 Lisztinos$^{(\pm 1/3,\ \pm 2/3)}$
Mesons</td>
<td>7th. symmetry breaking</td>
</tr>
<tr>
<td>LISZTINOS$^{(0)}$
= Antisymmetric assembly of Gaudinos
Bileptons-Z.C.M.Bosons:
$\mathbf{Z^0, W^0, Y^0, X^0}$</td>
<td colspan="2">6th. symmetry breaking</td>
</tr>
<tr>
<td>ZERO CHARGED GAUDINOS
(Share = 1/16)
= Antisymmetric assembly of **D**
—25 zero charged gaudinos —
Dark matter</td>
<td colspan="3">ELEMENTARY CHARGE ATTRACTOR
5th. symmetry breaking</td>
</tr>
<tr>
<td>ZERO CHARGED DALINOS
(Share = 1/8)
= Antisymmetric assembly of **I**
—8 zero charged dalinos —
$D_{270}^0, D_{90}^0, D_{54}^0, D_{30}^0, D_{18}^0, D_{10}^0, D_6^0, D_2^0$
Dark matter</td>
<td colspan="4">INTERVALIC CHANGEFUL INTERACTION
(formerly weak interaction). 4th. symmetry breaking</td>
</tr>
<tr>
<td>GRAVITON
(Share = 1/4)
= Symmetric assembly of γ
$g = |\gamma\underline{\gamma}|_s = [\,|\gamma\gamma|,\ 2^{-1/2}\,|\gamma\underline{\gamma}|+|\underline{\gamma}\gamma|),\ |\underline{\gamma}\underline{\gamma}|\,]$
Dark energy</td>
<td colspan="5">Degree of freedom: **ELECTRIC CHARGE** → ELECTROMAGNETIC INTERACTION. 3rd. symmetry breaking</td>
</tr>
<tr>
<td>CHI
(Share = 1/2)
= Antisym. assembly of *S*
$¢ = 2^{-1/2}\,(\,|\uparrow\downarrow| - |\downarrow\uparrow|\,)$
Dark energy</td>
<td colspan="6">Degree of freedom: **MASS** → GRAVITATIONAL INTERACTION. DARK MATTER UNIVERSE. 2nd. symmetry breaking</td>
</tr>
<tr>
<td>INTERVALIC LENGTH</td>
<td colspan="7">Degree of freedom: **SPIN** → INTERVALIC CHANGELESS INTERACTION (formerly strong interaction). LIGHT UNIVERSE. 1st. symmetry breaking</td>
</tr>
<tr>
<td colspan="8">Degree of freedom: **INFORMATION** → INFORMATIONAL INTERACTION. INFORMATION UNIVERSE (TIMELESS). Zero symmetry breaking</td>
</tr>
</table>

Chapter 22

INTERVALIC SYMMETRY BREAKINGS

When compositeness —or structurefulness— is wholly introduced in Particle Physics, symmetry breakings acquire a new meaning related with every primordial synthesis of particles. According to the spin-statistics theorem, every assembly of particles can be symmetric or antisymmetric under interchange. If those two possibilities were ever fully realized in a systematic way, there should be much more particles than detected in Nature and compositeness would probably be evident. Therefore, we are compelled to think that the Intervalic Primordial Synthesis (IPS) process did not realized all the possible states —symmetric and antisymmetric— in every step, but the synthesis process had to stop at some steps; in other manner, compositeness process would last till today and inclusive could continue, which we suppose it is not the case. Henceforth, we will have several *intervalic symmetry breakings* intimately related with the *intervalic compositeness*, which at once made and determine all the *frequorces* of Nature. In this paper is described the global relation between the primordial intervalic symmetry breakings and the intervalic frequorces and compositeness —manifested in the *intervalic structure* of subatomic particles—. Obviously, this conception of symmetry breaking is totally different from the traditional one: the intervalic one involves an *increasing* of the symmetry in Nature, whilst the traditional one involves a *decreasing* of the symmetry in Nature.

THE FIRST DEGREE OF FREEDOM OF NATURE: *PRESPIN*

Unless we believe that the compositeness of subatomic particles is infinite, and we do not believe it by no means, it is clear that the compositeness of Nature must have and definite end, THE END. Actually, we are going to see some fundamental particles which represent important partial ends: the *intervalino* for massive particles, the *photon* for the own intervalino and graviton, and the *intervalic string* for the own photon. Since we have been touched by the sparks of goddess and have discovered the truthful intervalic dimensions of Nature, it seems that the final end of ends must be a *geometric* one. In other words, beyond all fundamental subatomic particles we must finally find no further subatomic particles, but the own intervalic geometry of Nature. And what is that? Well, it should be the own stuff of which is made the geometry of the Intervalic Space: the real space (L) and the imaginary space (*i*). So, it would be a great achievement if we would find the relation between the primordial Intervalic Space and the first subatomic particle of Nature.

Now we have to ask what may be the first degree of freedom of Nature, that is to say, the first degree of freedom in the Intervalic Space existing before the assembly of any particle. What existed before the assembly of the first particle of matter —intervalino—? Closed strings (photons), bistring or chis (spacetime) and intervalic strings (open strings). But what existed before the assembly of the first particle of light —photon—? In that step there only were intervalic strings; I mean that the own spacetime did not exist yet because spacetime (bistring or chi) was assembled at once with light (photon). Therefore, we have an extreme primordial Universe made exclusively by intervalic strings, which are open strings of intervalic length, ħ. This Universe was *timeless* inasmuch as photon —and *a fortiori* velenergy (energy and movement)— did not exit yet, but it can not be named *spaceless* since the intervalic strings before its first assembly can be described as some kind of “unassembled space”. In other words, at this step there was no any *physical quantity* involving the imaginary dimension (*i*) in its equation of dimensions, and *a fortiori* no one particle since both energy and matter involves (*i*). We can say that we are in a phase which is beyond the birth of the own Physics. What can therefore be the nature of such radically first degree of freedom, *prespin*, and its corresponding interaction that it did introduce in the Intervalic Space? It seems that prespin should only have a *mathematical* origin since what we understand under ‘Physics’ did not exist yet. Obviously, we only can think about one “physical” quantity: *information*. And its related interaction introduced by the intervalic string, by means of which was made the primordial assembly photon and bistring or chi, giving birth to spacetime, will be named *informational interaction*.

Following an independent reasoning for this question, now based on the spin-statistics theorem, we can also arrive to a similar answer.

According to the spin-statistics theorem, it should be a spin-like degree of freedom, say, *prespin*. What may be such prespin? Let try to deduce it. Let us go to apply the prespin-statistics theorem to the genuine Intervalic Space. On what stuff it can be applied? Only on the own elements which compose the genuine stuff of the Intervalic Space: the intervalic quantum of real space, ħ (L) or the intervalic quantum of imaginary space, c (±*i*).

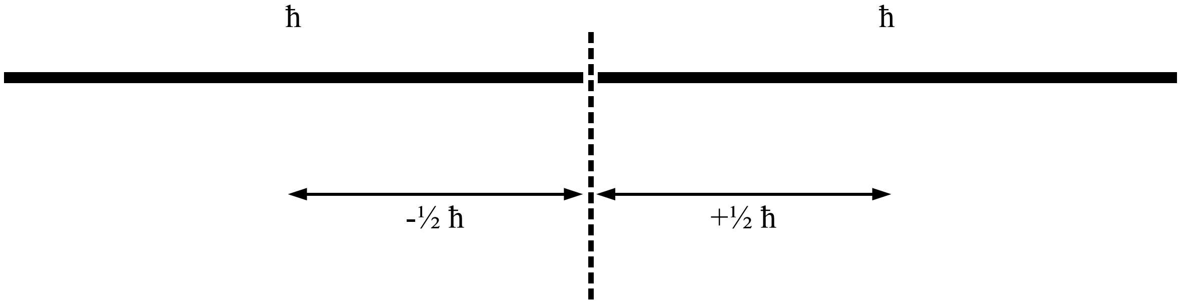
(Please remember that the intervalic system of dimension has two entirely equivalent formulations whose dimensional basis are: ħ (L) and c (i^{-1}) ≡ c (-*i*), or alternatively: ħ (L) and c (*i*). Since we have developed the IT in Particle Physics starting from the IT in Music, we have chosen the first dimensional basis because it matches with our definition of time as imaginary space, t = (*i*L). However, if we should have to chose the dimensional basis at this moment we probably take the second one, ħ (L) and c (*i*), which yields a completely equivalent Physics. In that case in the equation of dimension of all physical quantities it has to be flipped (-*i*) by (*i*). Thus, for example, the dimension of velenergy would be (*i*) instead of (i^{-1}) ≡ (-*i*), the dimension of mass would be (i^{-1}) instead of (*i*), etc. by this reason we have written above the dimension of the intervalic quantum of imaginary space, c, as (±*i*).).

Following our reasoning, the prespin-statistics theorem in the primordial Intervalic Space only can be applied on the assembly of intervalic quanta of real space, ħ (L), or on the assembly of intervalic quanta of imaginary space, c (±*i*). As the first is just the intervalic length, ħ, and the second is just the intervalic velenergy —the speed of light—, c, it seems to be absolutely clear due to elemental features of geometry, that the unique possible assembly of elements is that one which involves *quanta*, but not *limits*, that is to say, it must necessarily be an assembly of intervalic lengths. Let us go to draw a figured picture of such primordial assembly. Please note that the only elements or stuff we have in the genuine Intervalic Space is the intervalic quantum of length, ħ, so we can't draw anything more that intervalic lengths. What looks like those intervalic quanta of length? Obviously, they are simply like one-dimensional lines of length ħ, that is to say, the are like *strings* of length ħ. By definition, we name these strings as *intervalic strings*. What distance may separate such strings? Obviously, the only distance which exist in the primordial Intervalic Space: ħ.

Thus, in one-dimensional real space (L^1) we have just that, in two-dimensional real space (L^2) we would have surfaces of side ħ instead of lines, in three-dimensional real space (L^3) we would have volumes of side ħ instead of surfaces, etc. And in all cases the distance between elements would always be the same, ħ.

It is important to point out that the formula about the number of physical quantities in the Intervalic Space, Q = 4 + 12D, where Q is the number of physical quantities and D the number of real spatial dimensions, is valid only in the Intervalic Space —composed by real and imaginary spatial dimensions—, but not in this early frame in which the imaginary dimension has not been introduced yet. Therefore taking a look at the table of the intervalic group of physical quantities (in the chapter on the intervalic dimension) it is clear that the only existing physical quantities in this ultra primordial Universe are those ones which do not involve (*i*) and any power of (*i*). They are solely length (L) and its powers, surface (L^2) and volume (L^3). Although within the logical framework of IT all these naïvely deep but definitively important physical features are easily derived, in other realms like those of SM nothing is yielded about this subject. When and how were created physical quantities? Did they existed before the Big Bang? SM has not got answer to any of these or similar questions.

Applying the prespin-statistics theorem we face with the question: what is such prespin, the degree of freedom in the genuine Intervalic Space before the creation of matter, when there is no one degree of freedom yet? Looking at the picture, we see that we have two *identical* intervalic strings. The assembly of *identical* intervalic strings only can be symmetric or antisymmetric under interchange. And the prespin degree of freedom is just what allows to that assembly of *identical* intervalic strings to be symmetric or antisymmetric under interchange. Thus, we are compelled to identify the prespin degree of freedom with the only feature existing in the primordial Intervalic Space which differentiates one intervalic string from the other: its *position*. It is the most simple kind of *information* that can be derived in the Intervalic Space, and probably the very first and most simple kind of information that can be introduced in the primordial Universe at all. Since the separation between intervalic strings is just the intervalic length, ħ, the position which differentiates two identical intervalic strings must take *discrete* values, and it is clear that the only ones it can take, as can be seen in the picture, are: -½ ħ and +½ ħ. This means two important features:



1) The *continuum* space in the Intervalic Space is made from an assembly of *discrete* intervalic quanta of length.

2) The continuum space in the Intervalic Space is made from an assembly of intervalic strings with prespin ½, that is to say, *vacuum* will be an *assembly of fermions.*

It must also be noted that the intervalic dimension of prespin is (L), that is to say, just the dimension of real space, which is the unique dimensional stuff existing at this step in the primordial Intervalic Space. Moreover, the intervalic dimension of prespin is just equal to the intervalic dimension of the next degree of freedom in the Intervalic Space: the *spin*, ћ (L). Therefore, prespin and spin must be the same underlying physical quantity because they have the same intervalic dimension —which have got an epistemological rank over the physical quantities—. This result has an innermost importance which can only be achieved in the intervalic system of dimensions, the unique truthful one of Nature.

Henceforth, we are in front of a paramount dramatic phenomenology with four possible scenarios:

1) *If* the primordial assembly of intervalic strings was only symmetric:

$|S\underline{S}|_s = \{ |SS|, 2^{-½} (|S\underline{S}| + |\underline{S}S|), |\underline{SS}| \}$

All the intervalic strings would be identical inclusive for the prespin degree of freedom. This means that all of them would have got exactly the same prespin, that is to say, the same position. In this case, we would have got all the intervalic strings, and *a fortiori*, all real space of the Universe crushed into a unique pseudo “particle” of length ћ.

2) *If* the primordial assembly of intervalic strings was only antisymmetric:

$|S\underline{S}|_a = 2^{-½} (|S\underline{S}| - |\underline{S}S|)$

We would have an assembly of intervalic strings where all of them would be identical excepting for the prespin degree of freedom, which can be -½ ћ or +½ ћ. This means that all intervalic strings are identical excepting their positions, which are exactly separated by the discrete distance ћ. In this case, the space of the Universe would be an assembly of fermions, and we would have got a sort of Kantian or Newtonian *absolute space*, or *ether*, which would be completely *empty*, as no movement and no one particle had been assembled yet, nor could be assembled in the future. Really, there would only exist the *real* space, since the *imaginary* space —and its corresponding dimension, the speed of light, c (±*i*)— was not arisen yet as there was not movement at all.

3) *If* the primordial assembly of intervalic strings was both symmetric and antisymmetric, as it is postulated by IT according to the *intervalic whole symmetry assumption*, we would have got both a continuum real space made from as assembly of fermions, and also the same particle as in point 1), but with the great difference that now there exist a continuum real space —the vacuum of the Universe— it can move along. However, we have to surpass a difficulty: the symmetric assembly of intervalic strings joins two intervalic strings with the same prespin, that is to say, in the same position. How can be this possible? Here we have to say that arises the excellent magic of Nature: through introducing the *movement*. In this way, the assembly of two intervalic string makes a *closed string* which spins, and thus the two constituent open strings have got the same prespin. At this stage the *imaginary* space is introduced in the Intervalic Space, which reaches its actual geometry. Now we realize that movement implies necessarily the existence of imaginary space and vice versa. Of course, the Nature's idea of creating *movement* —or *imaginary space*— is simply astonishing, and we may wonder about we have been able to reach an understanding of such marvel through mathematics, in concrete, through the imaginary numbers, as it is clear that the last essence of movement lies in the creation of an additional dimension of space, which is, however, different form real space (!). This is, simply, unbelievably magic, as like as it is the imaginary space described splendorously by IT.

The physical features of the primordial closed strings assembled —later named as *photons*— can not be more simple because they must be directly derived from the geometry of the primordial Intervalic Space: the intervalic quanta of real space, ħ (L), and the intervalic quanta of imaginary space, c (±*i*). Therefore, the longitudinal velenergy of photons is necessarily the speed of light, c, and the transversal velenergy is equally c. Therefore, being *J* the spin, its frequorce, φ, will be —according to the intervalic equation, $E = 2\pi J\varphi$, which enhances the former Einstein equation, $E = h\nu$—:

$$c = 2\pi J\varphi$$
$$\varphi = c\,\hbar^{-1} = 2.839921837 \cdot 10^{42}\ (s^{-1})$$

This is just no other than the *intervalic frequorce*, $\boldsymbol{\varphi_I}$. Thus we can affirm that primordial photons were assembled at the beginning of the Universe with the genuine intervalic frecuency $\boldsymbol{\varphi_I}$.

4) *If* the primordial assembly of intervalic strings was neither symmetric

nor antisymmetric, the spin-statistics theorem would not run and our Universe would not exist at all.

THE RELATIONLESS BETWEEN BOSONS AND FERMIONS IN THE STANDARD MODEL

SM was so infiltrated in Physics that it was difficult to being aware of its enormous lacks and contradictions. Among them we find the relationless between bosons —as carriers of interactions— and fermions as source of interactions—. According to SM, some bosons carry the interaction between some fermions: photons carry the interaction between structureless charged particles and in a similar way gravitons carry the interaction between structureless massive particles. However there is no a deep and meaningful relationship between such bosons and the *source* of interaction because the source is structureless (!). This is analogous to affirm that hydrogen and oxygen have no relation with water since hydrogen and oxygen are structureless (?). Really, SM affirms exactly that absurdity in any reaction in which is involved any annihilation, as for example:

$$e^+ + e^- \rightarrow \gamma\gamma$$

Everybody wonders about how could hydrogen and oxygen leave from water if they were not compounding water. In a similar way, everyone may wonder about how can matter decay into photons, and how can photons leave matter if matter is not composed by photons at some level. Actually, there had been heard that matter was some sort of "condensed energy". After this supposition was still more difficult to understand why energy did condense structurelessly to make matter (!). According to this, that we name "matter" must be the most mysterious thing of all the Universe since it is a miraculous structureless stuff from which energy goes out endlessly, and which can be wholly transformed into energy.

On the contrary, according to IPS, there is a deep relation between the three last fundamental particles of Nature: photon, graviton and intervalino, which explains brightly all the above questions since the intervalino is the last block of Nature from which are composed all massive particles, insofar as intervalino and graviton are not structureless particles but they are also made from the assembly —in symmetric or antisymmetric state under interchange— of two photons. All fermions usually viewed as sources of interactions are finally made from intervalinos, that is to say, from bosons, and thus it makes sense that some suited bosons are the carriers of the interactions between fermions, and that all fermions decay finally into its everlasting constituent bosons.

THE ORIGIN OF FREQUORCES IN NATURE

IT postulates that all frequorces of Nature are the result of successive primordial synthesis of particles. Moreover, all frequorces are derived from a unique pristine interaction: the *intervalic interaction*. What is the nature of this interaction. If it is really fundamental, it should be auto sufficient and should not rely on any feature. On the contrary, physical features should be a consequence of that pristine interaction. Besides, the traditional conception of the interaction, where the existence of a force involves the interchange of a particle (a boson), could not be applicable just exactly to the beginning of the Universe, where perhaps they did not exist that advanced structure of matter with fermions and bosons yet. Following this reasoning, the only kind of interaction which could exist at the very beginning would be an *exchange frequorce*, where the own particles plays both as source and carrier of the interaction. Thus, in wide sense, the concept of exchange frequorce is much more fundamental than the concept of force as interchange of a boson, which would be only a kind of exchange frequorce, where the interchanged particle has become differentiate from the source particle. In any case, the carrier comes from the source, is a portion of the source, or is the whole source as in the exchange frequorce in restricted sense.

Now we may go further and to question about why there are frequorces in Physics: which is the origin of frequorces in Nature?

SM postulates the unification of all frequorces at high energy. Once more, this is a misleading assumption which, in any case, it would not be a starting point but a trivial consequence of the global balance among particles in the Universe. If a unification of all frequorces at high energies was postulated, it would mean that all frequorces should exist from primordial times, and they only differentiate when going progressively to a colder Universe. This assumption presupposes the eternal existence of the same actual constituent of matter, baryons, electrons, etc. at primordial times, which is a naïve false assumption since any kind of compositeness has been introduced in Particle Physics.

On the contrary, IT postulates that all physics features must derive and must be explained from IPS. This means that if there was not such synthesis, today it would exist no one frequorce. Each interaction was born at once with a new synthesis of particles, and as a consequence of that synthesis. Moreover, all frequorces are no other than the same intervalic interaction, which appears with different phenomenology according to the new particles assembled in each new step of the primordial synthesis. Therefore, it can be said that every new synthesis of particles involve its corresponding frequorce, and vice versa.

SHORT RANGED *VERSUS* LONG RANGED INTERACTIONS

An essential point to understand the intervalic interactions of Nature is to discriminate clearly the features that distinguish the short ranged from the long ranged interactions.

It can be said that every interaction is an exchange interaction. To this respect the only difference resides in the boson that intermediates the interaction. In long ranged interactions the boson is a unique massless particle, and it is possible to define a coupling constant for the interaction. On the contrary, in short ranged interactions the boson is ever massful, and besides there is no a unique boson, but a lot of them according to the source particles involved in the interaction. By this reason it can't be defined a unique coupling constant for short ranged interactions, as SM still tries to do.

We have said that all interactions are exchange interactions. This means that the exchange boson have to be previously "contained" in the source particle. In the case of massless bosons it does not represent a problem because such bosons can be considered, metaphorically speaking, as some massless vapour emanated from the liquid or solid source particle which is spreaded along over the spacetime: the gravitational field from the mass source, and the electromagnetic field from the electric charge source. On the contrary, in the case of massful bosons, they must be originated or contained in the source particle. At first sight this is a serious problem since we don't know such a mechanism of exchange. But IT does know it. The primordial particles —closed strings, intervalinos and dalinos— are particles with integer spin which plays at once as source and carrier of the interaction because the exchanged boson is the whole source particle. From gaudinos and onward, exchanged boson can't be the whole particle since they already have a complex intervalic structure. Therefore the exchanged bosons is a portion or fraction of the source particle chosen among the *allowed* intervalic symmetries at disposal and which also fits with the quantum constraints of a boson considered as an intermediate state.

In this last case we have to distinguish once more between two kinds of interaction: that which does not involve a change in the *intervalic structure* of the particles involved, and the other one which does involve such a change. The first kind is called *changeless intervalic interaction*, and can be assimilated to the former strong interaction; and the last one is named *changeful intervalic interaction*, and can be identified as the former weak interaction. The details of both interactions and the changes in the intervalic structures of the bosons involved has been explained opportunely in the corresponding chapters.

THE ORIGIN OF SYMMETRY BREAKINGS

The symmetry breakings postulated by IT are absolutely different than those postulated by SM. In the last one it is supposed a high unknown symmetry which is broken giving *residual* symmetries, *i.e.*, from a SU(2) remain a U(1) symmetry in the spiteful GWS model. Thus, Nature would walk *backwards*, and there is no relation between symmetry breakings and the creation of particles, since all particles are supposed to be eternal (or made directly from strings as postulated by String Theory).

On the contrary, according to IT, Nature does not walk backwards, diminishing a supposed unknown high symmetry, but it goes in the way of *increasing* symmetries, since the intervalic symmetries and their corresponding interactions are a consequence of the successive steps in the primordial synthesis of particles. Really, we could or should talk about *symmetry makings* better than 'symmetry breakings'. Thus, as more intervalic structures are yielded and more particles assembled, more symmetries are incorporated to Nature. Besides, particles are *not* supposed to be eternal *nor* yielded direct and magically form a string. All particles were born from the successive synthesis of particles, starting from the intervalic string, which synthesis yielded the photon, which at once yielded the graviton and the intervalino, and so on since the intervalino is the mother-particle whose successive primordial aggregations made all subatomic particles of Nature. In resume, IT postulates just the contrary assumptions of SM: a minimal beginning symmetry followed by an synthesis of particles according only to the logical constraints involved by the *spin-statistics theorem*, and developing it in a *systematic* mode. By this simple and economic way there was an increasing in the intervalic symmetries and we arrived, without introducing any new assumption, to the assembly of all subatomic particles which compose our present world.

In IT the primordial synthesis of particles was successively "broken" at each new synthesis step because only a half of the resultant particles could follow the process of synthesis, remaining the other half as the today named *dark matter*. This is explained because the synthesis of particles with symmetry under interchange, led to different degrees of freedom in the particles born from the *symmetric state* under interchange, than those born from the *antisymmetric state*. Therefore, only one of those two branches led to a new synthesis of particles, which one more makes two new branches of particles according to its interchange symmetry. And so on, up to all subatomic particles was assembled and the primordial synthesis of particles stopped due to the finishing of the apparition of new degrees of freedom —with its related frequorces— in the synthesis process.

According to this, every synthesis of particles, every frequorce and every symmetry breaking can be placed in the map of the primordial synthesis as the consequence of the *intervalic structure* of the particles born at each step of the primordial synthesis.

We are going to see it in a schematic way, resuming the features of each phase of the primordial synthesis, which have been explained in other sites. Please remember that we will find an apparently new kind of interalic interaction at each new level of the intervalic structure, but all these different frequorces are an effect from and derive from an unique and fundamental intervalic interaction.

ZERO SYMMETRY BREAKING

Introduced degree of freedom: *prespin (—information—)*
Name of the related interaction: *informational*
Source of interaction: *intervalic open string*
Carrier of interaction: *intervalic open string*
Kind of interaction: whole exchange, short ranged
Particles yielded from the synthesis of intervalic strings:
-antisymmetric under interchange: bistring or chis
-symmetric under interchange: closed string (ulterior photon)

The bistring or chis did not made further particles through synthesis, arising the first symmetry breaking. Only the closed strings (ulterior photon) followed the synthesis process and led to the assembly of further particles: graviton and intervalino. The bistring or chis are intended to be a sort of dark energy.

We can say that the zero symmetry breaking is only a work assumption which may or may not existed since we don't know whether the intervalic string came from the symmetric or antisymmetric synthesis of a hypothetical more fundamental particle. Nevertheless, it is clear that the number of steps in IPS must be *finite*. Henceforth, there must exist a very last primordial particle which has not been made from the assembly of any other particle. This

<table>
<tr><th colspan="9">INTERVALIC LEVELS IN THE INTERVALIC PRIMORDIAL AGGREGATION</th></tr>
<tr><td>*Level of compositeness and symmetry*</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td></tr>
<tr><td>*Degree of freedom*</td><td>Prespin</td><td>Spin</td><td>Mass</td><td>Electric charge</td><td>Intervalic structure</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td rowspan="9">*Intervalic bifurcations and symmetry breakings*</td><td rowspan="8">INTER-VALIC STRING</td><td rowspan="7">PHOTON</td><td>GRAVITON</td><td colspan="5">Second symmetry breaking → GRAVITATIONAL INTERACTION</td></tr>
<tr><td rowspan="6">INTER-VALINO</td><td rowspan="5">DALINO (ELECTRON)</td><td rowspan="4">GAUDINO (MUON, TAU, CHARGED MASSIVE BOSONS)</td><td>LISZTINOS (ZERO CHARGED MASSIVE BOSONS)</td><td colspan="2">Fifth symmetry breaking → Elementary pseudo interaction</td></tr>
<tr><td rowspan="3">FRACTIONAL LISZTINOS (QUARKS)</td><td>MONTE-VERDINOS (MESONS)</td><td>Sixth symmetry breaking</td></tr>
<tr><td rowspan="2">MONTE-VERDINOS (BARYONS)</td><td>-</td></tr>
<tr><td>PALESTRI-NOS</td></tr>
<tr><td>BIDALINO (DARK MATTER)</td><td colspan="3">Fourth symmetry breaking →
→ INTERVALIC CHANGEFUL INTERACTION</td></tr>
<tr><td>BINTER-VALINO (DARK MATTER)</td><td colspan="4">Third symmetry breaking →
→ ELECTROMAGNETIC INTERACTION</td></tr>
<tr><td>BISTRING (DARK ENERGY OF VACUUM)</td><td colspan="6">First symmetry breaking → INTERVALIC CHANGELESS INTERACTION</td></tr>
<tr><td>NOTHING</td><td colspan="7">Zero symmetry breaking → INFORMATIONAL INTERACTION</td></tr>
</table>

is the true first intervalic particle of Nature, and IT postulates that such particle is the *intervalic string*. We will see later that the intervalic string can be identified with the own *intervalic length*. Moreover, both would be indistinguishable. In this way, the zero symmetry breaking really does not exist as like the next symmetry breakings.

FIRST SYMMETRY BREAKING

Introduced degree of freedom: *spin*
Name of the related interaction: *changeless intervalic*
Source of interaction: *closed string (photon)*
Carrier of interaction: *closed string (photon)*
Kind of interaction: whole exchange, short ranged
Particles yielded from the synthesis of closed strings:
-symmetric under interchange: *graviton*, spin 2
-antisymmetric under interchange: *intervalino*, spin 0

The graviton did not made further particles through synthesis, arising the second symmetry breaking. Only the synthesis of intervalinos followed the synthesis process and led to the assembly of further particles: dalinos and zero charged dalinos.

In this step can be remarked the introduction of a new degree of freedom, the *spin*, from the preceding closed strings (ulterior photon), and the apparition of the first *massful* particle of Nature, namely, the *intervalino*, and at once the carrier of the gravitational interaction, the *graviton*.

It have to be also noted that the spin is the degree of freedom of the fundamental *intervalic interaction*. As I have explained in other sites, all fre-

ZERO SYMMETRY BREAKING

Intervalic structure level	*Interchange symmetry*	*Particles yielded*	*Introduced degree of freedom*	*Interaction created*	*Lead to further aggregations*
-	-	Intervalic string	Prespin	Informational Interaction	yes

quorces are derived from the intervalic interaction; therefore it can be said that, to a later extent, all frequorces of Nature derive finally from spin. In order to distinguish this strong intervalic interaction from the weak interalic interaction which will arise at the fourth symmetry breaking, involving a change in the intervalic structure of particles, the present strong interaction is named *changeless* and the further weak interaction is named *changeful*.

SECOND SYMMETRY BREAKING

Introduced degree of freedom: *mass*
Name of the related interaction: *gravitational*
Source of interaction: *intervalino*
Carrier of interaction: *graviton*
Kind of interaction: massless exchange, long ranged
Particles yielded from the synthesis of intervalinos:
-symmetric under interchange: 16 *dalinos* (electron)
-antisymmetric under interchange: zero charged dalinos

The zero charged dalinos did not made further particles through synthesis, arising the third symmetry breaking. Only the synthesis of dalinos followed the synthesis process and led to the assembly of further particles: *gaudinos*. The zero charged dalinos is intended to be a very important constituent among those ones that integrate the dark matter of the Universe, as we have explained in other site. Really, the existence of primordial particles with only some kinds of interactions —dark matter— is a logical necessity in IT.

<table>
<tr><th colspan="6">FIRST SYMMETRY BREAKING</th></tr>
<tr><th><i>Intervalic structure level</i></th><th><i>Interchange symmetry</i></th><th><i>Particles yielded</i></th><th><i>Introduced degree of freedom</i></th><th><i>Interaction created</i></th><th><i>Lead to further aggregations</i></th></tr>
<tr><td rowspan="2">INTER-VALIC STRING</td><td>Antisymmetric aggregation of intervalic strings</td><td>Chi</td><td colspan="3">FIRST SYMMETRY BREAKING</td></tr>
<tr><td>Symmetric aggregation of intervalic strings</td><td>Photon</td><td>Spin</td><td>Changeless Intervalic Interaction</td><td>yes</td></tr>
</table>

The intervalino born in the preceding step introduced here another degree of freedom, the *mass*. It should also be pointed out the apparition of the first *electric charged* particle of Nature, namely, the *dalino*.

Therefore, when the primordial Universe was composed only by the three fundamental particles of Nature —namely, *photon*, *graviton* and *intervalino*—, the unique interactions existing between particles at that era were the *gravitational* and the *intervalic changeless* —strong— interactions. Thus the primordial assembly of dalinos was made only by means of these two interactions as the source particle of the electromagnetic interaction —the dalino— did not exist at this stage yet. However, in the primordial synthesis of dalinos to make gaudinos did intervene three interactions: the two previous ones plus the electromagnetic one. It will not be only until the primordial synthesis of gaudinos to make lisztinos (quarks) when all the four supposed forces of Nature will exist in the early Universe. This is a fascinating scenario which was never imagined by the SM cosmology.

THIRD SYMMETRY BREAKING

Introduced degree of freedom: *electric charge*
Name of the related interaction: *electromagnetic*
Source of interaction: *dalinos*
Carrier of interaction: *photon*
Kind of interaction: massless exchange, long ranged
Particles yielded from the synthesis of dalinos:
-symmetric under interchange: 40 *gaudinos* (muon, tau, $W^{\pm}$)
-antisymmetric under interchange: zero charged gaudinos (dark matter)

SECOND SYMMETRY BREAKING					
Intervalic structure level	*Interchange symmetry*	*Particles yielded*	*Introduced degree of freedom*	*Interaction created*	*Lead to further aggregations*
PHOTON	Symmetric aggregation of photons	Graviton	SECOND SYMMETRY BREAKING		
	Antisymmetric aggregation of photons	Intervalino	Mass	Gravitational Interaction	yes

The zero charged gaudinos did not made further particles through synthesis, arising the fourth symmetry breaking. Only the synthesis of gaudinos followed the synthesis process and led to the assembly of further particles: *lisztinos*. The zero charged gaudino can be supposed to be an unstable particle which constituent dalinos recombined in a symmetric state under interchange to make gaudinos. This process can be fully understand through the equation of the intervalic energy, which predominates over the electromagnetic energy at quantum scale. In order to reach a state of minimal energy, the intervalic energy has to maximize the resultant electric charge of the synthesis.

The dalino created in the preceding step introduces the new degree of freedom of the *electric charge* at this step. The intervalic structure born from the synthesis of dalinos is the *gaudino*, which is the first particle of Nature that interacts through *changeful* intervalic interaction.

FOURTH SYMMETRY BREAKING

Introduced degree of freedom: *intervalic structure*
Name of the related interaction: *changeful intervalic*
Source of interaction: *gaudinos*
Carrier of interaction: *intermediate massive bosons*
Kind of interaction: massful exchange, short ranged
Particles yielded from the synthesis of gaudinos:
-symmetric under interchange: *zero charged lisztinos* (Z^0)

<table>
<tr><th colspan="6">THIRD SYMMETRY BREAKING</th></tr>
<tr><td><i>Intervalic structure level</i></td><td><i>Interchange symmetry</i></td><td><i>Particles yielded</i></td><td><i>Introduced degree of freedom</i></td><td><i>Interaction created</i></td><td><i>Lead to further aggregations</i></td></tr>
<tr><td rowspan="2">INTER-VALINO</td><td>Symmetric aggregation of intervalinos</td><td>16 Dalinos (electron)</td><td>Electric charge</td><td>Electro-magnetic Interaction</td><td>yes</td></tr>
<tr><td>Antisymmetric aggregation of intervalinos</td><td>8 Zero Charged Dalinos (dark matter)</td><td colspan="3">THIRD SYMMETRY BREAKING</td></tr>
</table>

-antisymmetric under interchange: *fractional charged lisztinos* (quarks)

The integer charged lisztinos did not made further particles through synthesis, arising the fifth symmetry breaking. Only the synthesis of fractional charged lisztinos followed the synthesis process and led to the assembly of further particles: *monteverdinos*.

The gaudinos recently assembled introduces at this step a new degree of freedom, the *intervalic structure*.

The changeful intervalic interaction goes into scene when there have been created a number of particles with enough complex intervalic structure as to allow the decay of a particle into another with less intervalic energy. Please note that dalinos are composed exclusively by intervalinos with like charges can not decay in any massful particle since they are already the particles with the minimal intervalic energy allowed by Nature. On the contrary, when going into the gaudinar level there appears two new features:

1) With the *same* number of constituent intervalinos, there are different kinds of gaudinos according to its constituent dalinos. We have particles composed by identical number of intervalinos which however have very different intervalic energies. Therefore, particles with great intervalic energy will look forward to decay into similar particles with lesser energy. This is the origin of the so named purely leptonic processes.
2) Gaudinos can have constituent dalinos with like or unlike charges in any proportion. This lead to the existence of a set of gaudinos with slightly different intervalic energy and identical intervalic structures (excepting the sign of the dalinos electric charges). Therefore, particles with slightly greater energy will look forward

<table>
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<tr><th><i>Intervalic structure level</i></th><th><i>Interchange symmetry</i></th><th><i>Particles yielded</i></th><th><i>Introduced degree of freedom</i></th><th><i>Interaction created</i></th><th><i>Lead to further aggregations</i></th></tr>
<tr><td rowspan="2">DALINOS</td><td>Symmetric aggregation of dalinos</td><td>40 Gaudinos (muon, tau, charged massive bosons)</td><td>Intervalic Structure</td><td>Changeful Intervalic Interaction</td><td>yes</td></tr>
<tr><td>Antisymmetric aggregation of dalinos</td><td>25 Zero Charged Gaudinos (dark matter)</td><td colspan="3">FOURTH SYMMETRY BREAKING</td></tr>
</table>

to decay into similar particles with lesser energy. This is the origin of the so named semi leptonic and non leptonic processes.

The *changeful* —weak— *intervalic interaction* can be defined as the process of changing the intervalic structure of a subatomic particle, and the *changeless* —strong— *intervalic interaction* can be interpreted as a mere transmission of information which is necessary for holding the structure of subatomic particles; in this view, it would be a consequence of the existence of the which maintain the structure of subatomic particles. Of course, both weak intervalic and strong interactions only can be understood after the postulation of the energy interval and the threshold energy corresponding to the intervalic energy: $I = c^{\pm 2}\ \hbar\ Q^{-2}$, from which derive the four supposed "forces" of Nature, as I have explained in other site.

We can say that the intervalic interaction is named "weak" when there is a change in the intervalic structure of particles, and "strong" when there is not. From here it is evident that the weak and the strong interactions are simply two zones of the full energy spectrum of the intervalic interaction, which is much more wide than it could be previously imagined, since the intervalic interaction does not finish with the supposed strong interaction between nucleons and quarks, but it comprises the full range of levels of the intervalic structure of subatomic particles.

It have to be noted that the weak interaction is much more unusual than the strong one, which does not involve a change in the intervalic structure of the particles. Moreover, the weak interaction only occurs between some intervalic structures, while strong interaction is permanently occurring, holding the intervalic structures of all subatomic particles. In other case, any intervalic structure could not stay during more than a time $c^{-2}\hbar\ m^{-1}$ and the matter would not exist. Therefore, it have to be a permanent transmission of information —carried by several intervalic massive bosons— between nucleons, between lisztinos, gaudinos, dalinos and intervalinos, that is to say, between the constituent particles in all the levels of the intervalic structure of subatomic particles.

FIFTH SYMMETRY BREAKING

Introduced degree of freedom: *elementary charge quantum number*
Name of the related pseudo interaction: *elementary pseudo interaction*
Source of interaction: *fractional charged lisztinos*
Carrier of interaction: *fractional charged lisztinos*
Kind of interaction: massful exchange, short ranged

Particles yielded from the synthesis of fractional charged lisztinos:
-assembly of two quarks: *monteverdinos* (mesons)
-assembly of three quarks: *monteverdinos* (baryons)

The monteverdino hardly made further particles through synthesis, which are named *palestrinos* (like the deuteron), finishing the breaking of symmetries —which would the sixth one— as the primordial synthesis process faded out.

The lisztinos born at the preceding step introduces a pseudo degree of freedom, the *elementary charge quantum number*, which may be confounded as an interaction. However, this is due to the strong attraction felt by the fractional electric charges towards the magnitude of the *elementary charge*, which is the expression of the minimal state of energy allowed to the electric charge. The value of the elementary charge was reached as the perfect *balance* between the involved energies of subatomic particles, namely, intervalic, electromagnetic and spin energies, as it is stated by the fundamental *intervalic principle of energy balance for subatomic particles*, profusely used throughout IT in Particle Physics.

Finally, we can recapitulate the particles which cause a stop in some bifurcations of IPS leading to the apparition of a corresponding symmetry breaking:

- The first two stop particles are *bistring or chi* —dark energy of vacuum— and *graviton*. Both conform the *spacetime*: the first one is the own “substance” of spacetime, that is to say, its *intervalic dimensions* —real and imaginary—; and the second one holds the geometric features of spacetime, that is to say, its *intervalic geometry*. Such two particles are really *dark energy* and are not allowed

<table>
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<tr><th><i>Intervalic structure level</i></th><th><i>Interchange symmetry</i></th><th><i>Particles yielded</i></th><th><i>Introduced degree of freedom</i></th><th><i>Interaction created</i></th><th><i>Lead to further aggregations</i></th></tr>
<tr><td rowspan="2">GAUDINOS</td><td>Symmetric aggregation of gaudinos</td><td>4 Lisztinos (Zero Charged Massive Bosons)</td><td colspan="3">FIFTH SYMMETRY BREAKING</td></tr>
<tr><td>Antisymmetric aggregation of gaudinos</td><td>49 Fractional Lisztinos (Quarks)</td><td>Elementary charge quantum number</td><td>Elementary pseudo interaction</td><td>yes</td></tr>
</table>

to make further aggregations.

- The next two stop particles are *dark matter*: *zero charged dalinos* and *zero charged gaudino*, which do not make further assemblies either.
- And the last two ones, lisztinos and monteverdinos, are zero charged massive bosons and mesons which do not make further assemblies because both decay intervalically or recombine mainly into their corresponding constituent particles assembled in anti-symmetric states, respectively: quarks and baryons.

In resume, the first and second symmetry breakings are due to the assembly of *dark energy*; the third and fourth symmetry breakings are due to the assembly of *dark matter*; and finally the fifth and sixth symmetry breakings appear because of the assembled particles are not stable and *decay* intervalicly.

THE CORRESPONDENCE BETWEEN SUBATOMIC PARTICLES AND INTERACTIONS

In SM there is no criterion to know what particles are affected by a determined interaction, and vice versa. The only way to know that important features is the empirical way… and later to make some assumption *ad hoc* and try to glue it somehow inside SM. An elegant and powerful way!

IPS give us immediately the correspondence between subatomic particles and interactions. We have seen that each intervalic structure assembled introduced a new interaction in the primordial Universe. Therefore we al-

SIXTH SYMMETRY BREAKING					
Intervalic structure level	*Interchange symmetry*	*Particles yielded*	*Introduced degree of freedom*	*Interaction created*	*Lead to further aggregations*
FRACTIONAL LISZTINOS	Assembly of two lisztinos	Monteverdinos (mesons)	SIXTH SYMMETRY BREAKING (despicable)		
	Assembly of three lisztinos	Monteverdinos (baryons)	-	-	Palestrinos

ready know that every intervalic structure is closely related by the interaction introduced by its own. And what about the remaining interactions? Do affect them to that intervalic structure? The law can't be more simple: every intervalic structure is affected by the existing interactions created before and until its assembly in IPS, and is not affected by the interactions introduced after its primordial assembly. Really, it could not be in other way. Thus we only have to take a look at the picture of IPS to know what interactions affect to a subatomic particle and vice versa.

For example, intervalino interacts under the interaction which itself introduces —the gravitational one—, and also under the pre existing interactions in the primordial Universe: the informational and the intervalic changeless —strong— interactions. But intervalino is not affected by electromagnetic, intervalic changeful —weak— and elementary pseudo interactions, interactions which were introduced, before its primordial assembly, respectively by dalinos (electron), gaudinos (muon, tau, charged massive bosons) and lisztinos (quarks).

STOP PARTICLES AND SYMMETRY BREAKINGS		
Symmetry breakings	*Stop particles which make symmetry breaking*	*Cause of the stop in making further assemblies*
1st.	Chi (or Bistring)	Dark energy
2nd.	Graviton	Dark energy
3rd.	Zero Charged Dalinos	Dark matter
4th.	Zero Charged Gaudinos	Dark matter
5th.	Lisztinos: zero charged massive bosons	Decay
6th.	Monteverdinos: mesons	Decay

DEGREES OF FREEDOM INTRODUCED IN THE INTERVALIC PRIMORDIAL AGGREGATION

Level of compositeness	*Intervalic structure*	*Interaction introduced by the intervalic structure*	*Interchan. sym.*	*Further aggregations*	*Particles yielded*
0	Intervalic string	Informational	S	yes	Photon
			A	First symmetry breaking	Chi (dark energy)
1	Photon	Intervalic Changeless	S	Second symmetry breaking	Graviton (dark energy)
			A	yes	Intervalino
2	Intervalino	Gravitational	S	yes	16 Dalinos: electron
			A	Third symmetry breaking	8 Zero Charged Dalinos (dark matter)
3	Dalino	Electromagnetic	S	yes	40 Gaudinos: leptons-charged massive bosons
			A	Fourth symmetry breaking	25 Zero Charged Gaudinos (dark matter)
4	Gaudino	Intervalic Changeful	S	Fifth symmetry breaking	4 Lisztinos: Zero Charged Massive Bosons
			A	yes	49 Fractional lisztinos: quarks
5	Fractional Lisztino	Elementary pseudo interaction	-	Sixth symmetry breaking	Monteverdinos: mesons
			-	despicable	Monteverdinos: baryons
6	Monteverdino	-	-	no	-
			-	no	Palestrinos

Chapter 23

SYNTHESIS OF INTERVALIC STRUCTURES

INTERVALIC PRIMORDIAL UNIVERSE

We can say that the intervalic primordial Universe is very different from the usual one postulated by the traditional Big Bang, and in some cases, it is just opposite: leptons and quarks are not pre existing particles but they were created in precise steps, the Universe does not need the doubtful inflationary assumption, etc. All this is a consequence of the primordial SYNTHESIS of intervalinos, which establishes an unimagined picture for the creation of matter, which could only be developed in one way, incorporating the greatest and fullest symmetry demands, since “God does not play dice”. Now we are going to describe briefly every step of this intervalic primordial Universe.

PHOTON-SYNTHESIS

The study of photon-synthesis from the intervalic string is an interesting subject which does not really pertain to this paper but to the Intervalic String Theory. The matter of IST is the study of the primordial Universe from the very beginning up to the assembly of the intervalino, that is to say, the study of the intervalic string, photon, bistring or chi, intervalino and graviton, according to the Intervalic Primordial SYNTHESIS (IPS). Indeed, this subject is nearer the first original formulation of some String Theory, although obviously it have to be entirely reformulated in intervalic dimensions, which will surely give astonishing results. From intervalino and onwards any String Theory has to say nothing because the intervalic symmetries of compositeness yields all the existing massive particles, explaining completely their physical features. In its actual formulation, I regret to say that String Theory might be the most foolish hoax that have ever been postulated, because of Nature simply does not use a Lagrangian density formalism for yielding subatomic particles, but the intervalic symmetries of compositeness.

In any case, for the core subject of IT in Particle Physics the synthesis of massless particles created *before* the intervalino may be considered to be in the frontiers of its subject. Actually, the theory could start only on the supposition of the existence of photon, graviton and intervalino as the unique single and fundamental particles of Nature. Nevertheless, if it is postulated that the two last particles were derived from a closed string —the photon—, the theory would be more simple and elegant. And if a closed string and the own spacetime —bistring or chi— were be derived from an open string —the intervalic string—, we would be almost reading the mind of the Goddess. Actually, I believe we might be near that place by means of IT.

INTERVALINO-SYNTHESIS

In the calculation of the *coupling temperature of matter* (explained when describing the intervalino features) we have not introduced the kinetic energy which appears when it is considered the primordial Universe as a gas in thermodynamic equilibrium. Introducing that kinetic energy as an average energy we will obtain the traditional *threshold temperature* of annihilation-materialization of intervalinos, $\gamma\gamma \leftrightarrow \mathbf{I}$, which will necessarily be greater than the preceding coupling temperature:

$$\Theta_t(\mathbf{I}) \geq c^{\pm 2} m_{\mathbf{I}} / k_B = 4\pi\ \Theta_m = 2.415992632 \cdot 10^{14}\ (K)$$

In a similar way, we can define the *threshold frequorce* of the involved photons in the annihilation-materialization of intervalinos, φ_t:

$$\varphi_t = 4\pi\ \varphi_m = 1/(c\hbar) = 3.159839191 \cdot 10^{25}\ (s^{-1})$$

The compositeness of intervalino has intriguing possibilities of research. According to traditional view, the collision of opposite polarized beams of light leads to a total annihilation of the wave function, where the principle of conservation of energy may be perhaps violated, not mathematically but physically, as particles "vanish" completely. On the contrary, according to IT such annihilation of photons will make determined pairs of coupled closed strings: in a *symmetric* state under interchange they will make spin 2 *graviton*, and the assembly of photons above the threshold frequorce in an *antisymmetric* state under interchange will make spin 0 *intervalino*:

$$\gamma\gamma \leftrightarrow \mathbf{I}$$

In this way the principle of conservation of energy is anyway preserved since there is no a complete annihilation of the photon wave function, but only a transformation of it into other particles not detected yet, as isolated intervalinos are dark matter.

At any cold temperature, above the *threshold frequorce* of annihilation-materialization of intervalinos, φ_t, the materialization of intervalinos may be possible in laboratory through collisions of photons with such frequorce. And then it could be at last reached the miracle of the creation of matter through the assembly of the unique stable isolated dalino —the electron—, if 270 intervalinos could finally be produced at once inside the effective short range of the intervalinar interaction —namely, $R(\mathbf{I}) = c^{-1}\hbar \ / \ m_{\mathbf{I}} = c^2 \hbar = 9.487585915 \cdot 10^{-18}$ (m)—:

$$270\ \gamma\gamma \rightarrow 270\ \mathbf{I} \rightarrow e + \nu_e$$

In other case we would obtain isolated intervalinos, that is to say, dark matter.

GRAVITON-SYNTHESIS

The assembly of photons in a *symmetric* state under interchange make the spin 2 *graviton*:

$$\gamma\gamma \rightarrow g$$

According to the *intervalic symmetries of gravitation*, described in other papers, such graviton might be an *antigraviton*. I do not understand the prevention against using the word 'antigravity'. In first place, antigravity was already postulated in General Relativity. And in second place, the technologic consequences on the eventual control of antigravity are so enormous for human life that I think it merits some efforts of theoretical and experimental research.

In resume, when finishing the primordial SYNTHESIS of closed strings the Universe would already have got the three fundamental *"single"* particles of Nature: *photon*, *graviton* and *intervalino*. Since all massive particles are composed by intervalinos, we can say that all subatomic particles and all frequorces of Nature are realized only starting from these three fundamental particles (although intervalic neutrino have got mass, we usually do not refer to it as a "massive particle", but as a further intervalinoless particle).

ANNIHILATION-MATERIALIZATION OR PHOTOINTEGRATION-PHOTODISINTEGRATION

Since there was observed that matter annihilates with antimatter through photodisintegration, $X^+X^- \rightarrow \gamma\gamma$, it was postulated by mere —and not enoughly based— analogy that the matter of the Universe could have been made at the Big Bang by photointegration, $\gamma\gamma \rightarrow X^+X^-$. The mass of the particles to materialize defines by dimensional equivalence the *threshold temperature* for the creation of those particles.

This naïve reasoning only can go *if* the particles are supposed to be *structureless*. Nevertheless, we have seen that all subatomic particles are far from to be structureless: all massive particles are *structureful* (with the unique exception of neutrino, which is intervalinoless). Thus, supposed reaction in thermodynamic equilibrium, as for example:

$$p^+ + p^- \leftrightarrow \gamma\gamma$$

are completely wrong, since between both pairs —monteverdinos and photons— there are a lot of intervalic structures: lisztino, gaudino, dalino and intervalino. A proton can not be made *by no means* without assembling, by order, each one of these intervalic structures. And every one of these structures has its own threshold temperature, which is not necessarily below the threshold temperature of proton. For example, the threshold temperature of only an intervalino is already much greater than that one of a proton:

$$\Theta_t(\mathbf{I}) = c^{\pm 2} m_{\mathbf{I}} / k_B = 2.415992632 \cdot 10^{14} \text{ (K)}$$
$$\Theta_t(p) = c^{\pm 2} m_p / k_B = 1.088818296 \cdot 10^{13} \text{ (K)}$$

In other words, a proton could not be made by photointegration at the threshold temperature proposed by the modern cosmology based on SM.

Moreover, in the annihilation-materialization model the particles with heavy masses are made *before* lighter particles because the temperature of the primordial Universe is continuously dropping. But as we are going to see this is just the contrary of what really occurs, as the particles are assembled by an order according to their intervalic structure in a well defined hierarchy: 1st) intervalino, 2nd) dalino, 3rd) gaudino, 4th) lisztino, 5th) monteverdino and 6th) palestrino.

For these and other reasons, we have to say once more that the cosmologic model of photointegration-photodisintegration is completely false in strict sense.

GEOMETRIC TIME OF ANNIHILATION-MATERIALIZATION

By the way, we can define the time which matter and antimatter need for annihilating. That is to say, the time which takes the annihilation between unlike intervalinos (forming part of a wider dalinar structure):

$$t\,(\,\mathbf{I}^{+}\mathbf{I}^{-} \rightarrow \gamma\gamma\,)$$

This magnitude is not defined in modern Physics and it is supposed to be “instantaneous”. But it is not by no means. The only information coming from traditional Physics consist on considering that such a time must be equal or smaller than the lifetime of the pair considered as a virtual state:

$$t(\mathbf{I})_{v} \leq c^{\pm 2}\hbar\, m_{\mathbf{I}}^{-1} = c\,\hbar = 3.164718011 \cdot 10^{-26}\,(s)$$

However, IT give us an explanation for such physical feature. Since we already know the spin energy of intervalino, the spinning time of an intervalino is:

$$t(\mathbf{I})_{J} = r_{\mathbf{I}} / c = 2.0048068 \cdot 10^{-33}\,(s)$$

It can be supposed that the annihilation between two intervalinos takes just —or at least— the time of a complete intervalino spinning. But it could not be lesser because the “information” regarding both intervalic structures can not go between instantaneously. Therefore, the intervalino annihilation time will be equal (or greater) than the above magnitude.

As like as with the intervalino, it can be intended that every intervalic structure has a *geometric* time of annihilation which will be equal to the spinning time of the own intervalic structure. In this way, any pair of unlike particles will have a specific annihilation time which will be the sum of the annihilation times of their involved intervalic structures at all their constituent levels.

For example, the traditional lifetime of a pair electron-positron considered as virtual state is:

$$t(e)_v \leq c^{\pm 2}\hbar\, m_e^{-1} = 1.28938912 \cdot 10^{-21}\ (s)$$

On the intervalic hand, the geometric annihilation time of a pair electron-positron would be the sum of the spinning time of dalino 270 and of intervalino. The first one magnitude, which is much greater than the second, is:

$$t(e)_J = (\ \varphi(e)_J\ /\ m_e\, r_e\ )^{-½} = 3.104679592 \cdot 10^{-23}\ (s)$$

This magnitude is ~41.53 times smaller than the lifetime of virtual electron. And obviously:

$$t\ (e^+e^- \rightarrow \gamma\gamma\ ) = t(e)_J + t(\mathbf{I})_J \approx t(e)_J$$

The remaining time —if any— up to cover the magnitude of the experimental time of annihilation in any pair of subatomic particles will be due to secondary *dynamical* features derived from the intervalic structures involved, which have to be added to the primary *geometric* ones.

DALINO-SYNTHESIS

According to traditional Cosmology we would foundationlessly say that the temperature for the annihilation-materialization of intervalinos, $\gamma\gamma \leftrightarrow D$, is:

$$\Theta_t = c^{\pm 2} m_D\ /\ k_B$$

However, as we have seen this is not true because the actual reaction for the synthesis of dalinos at the primordial Universe was not $\gamma\gamma \rightarrow D$, but dalino comes from an assembly of intervalinos in a symmetric state under interchange (therefore all the constituent intervalinos of any dalino only can have like charges):

$$n\ \gamma\gamma \rightarrow n\ \mathbf{I} \rightarrow D_n + \text{energy}$$

where n will be the 16 divisors of 270: 1, 2, 3, 5, 6, 9, 10, 15, 18, 27, 30, 45, 54, 90, 135, 270.

Here we find once more the magic of intervalic symmetry. Which of those dalinos was created in first place? Why appears precisely those 16 values instead other ones? As we have explained in our paper on the intervalic lepton, the number of constituent intervalinos of electron is determined precisely by the law of minimal energy, and the number of intervalinos which can be assembled to obtain the state of minimal energy is just… 270, the number of constituent intervalinos of the lightest dalino, the electron. Therefore, we can postulate that in the primordial egg composed by photons and intervalinos in thermodynamic equilibrium, could inclusive be assembled at random dalinos with *any* number of constituent intervalinos, not only the 16 intervalic ones. However, as the dalino D_{270} is the most stable and was the first created, it imposed an order acting as an attractor to that value, while the remaining ones recombined and only stayed those ones which were related to that value, that is to say, the 16 divisors of 270. Although modern Physics has difficulty to quantifying in terms of energy such fundamental order that we call *symmetry*, it is absolutely clear that Nature —and not only life— evolved towards a state of maximum order and minimum energy, as the mere existence of our present Universe clearly demonstrates.

The dalino-synthesis was the most exothermic reaction happened in the Universe, which left a huge and extraordinary amount of energy in form of radiation:

$$n\ \mathbf{I} \rightarrow D_n + \gamma\gamma$$

This radiation is actually the cause and what constitutes the so named Big Bang, staying up to date as the residual radiation which have been detected: the cosmic microwave background (CMB). The unimaginable energy liberated at the Big Bang by each dalino assembled is determined by the difference between the constituent masses:

$E_B(D_{270}) = m(270\ \mathbf{I}) - m(D_{270}) = 270\ I(\mathbf{I}) - m_e = 5{,}621{,}244.136\ (MeV/c^2)$
$E_B(D_{45}) = m(45\ \mathbf{I}) - m(D_{45}) = 45\ I(\mathbf{I}) - m_{D45} = 936{,}855.694\ (MeV/c^2)$
$E_B(D_{30}) = m(30\ \mathbf{I}) - m(D_{30}) = 30\ I(\mathbf{I}) - m_{D30} = 624{,}541.3359\ (MeV/c^2)$
$E_B(D_{18}) = m(18\ \mathbf{I}) - m(D_{18}) = 18\ I(\mathbf{I}) - m_{D18} = 374{,}634.6613\ (MeV/c^2)$
$E_B(D_6) = m(6\ \mathbf{I}) - m(D_6) = 6\ I(\mathbf{I}) - m_{D6} = 123{,}881.7722\ (MeV/c^2)$
$E_B(D_5) = m(5\ \mathbf{I}) - m(D_5) = 5\ I(\mathbf{I}) - m_{D5} = 102{,}607.0477\ (MeV/c^2)$

That is to say, per each electron —$e = D_{270}$— assembled at the Big bang, there was left an amount of radiant energy equivalent to around 11 millions of times the mass of electron (!), while per each dalino 45 assembled the amount is around 50 times the mass of dalino 45. These kind of reactions are by far the most exothermic ones ever made in Nature and fully explains why at available energies an electron or any other dalino has never been disassembled into its constituent intervalinos. The traditional model of the Big Bang does not give any explanation from the *origin* of the energy which made the huge explosion of the Big Bang; on the contrary, IT gives us a simple and clear explanation of the origin of that huge primordial energy.

In order to dalinos can stay definitively assembled the temperature of the primordial fireball must be lesser than the related binding energy of every dalino:

$\Theta_B\ (D_{270}) < E_B(D_{270})\ /\ k_B = 6.523179514 \cdot 10^{16}\ (K)$
$\Theta_B\ (D_{45}) < E_B(D_{45})\ /\ k_B = 1.087175336 \cdot 10^{16}\ (K)$
$\Theta_B\ (D_{30}) < E_B(D_{30})\ /\ k_B = 7.247497574 \cdot 10^{15}\ (K)$
$\Theta_B\ (D_{18}) < E_B(D_{18})\ /\ k_B = 4.347452511 \cdot 10^{15}\ (K)$
$\Theta_B\ (D_6) < E_B(D_6)\ /\ k_B = 1.437587541 \cdot 10^{15}\ (K)$
$\Theta_B\ (D_5) < E_B(D_5)\ /\ k_B = 1.190704741 \cdot 10^{15}\ (K)$

This explains why when dropping the temperature of the primordial Universe the electron was the first dalino which stayed definitively as a stable particle, while heavier dalinos were assembled later (and not before).

On the other hand, according to SM cosmology the unique supposed threshold temperatures of all dalinos would be:

$\Theta_t\ (D_{270}) = c^{\pm 2} m_{D270}\ /\ k_B = 5.929889806 \cdot 10^{9}\ (K)$
$\Theta_t\ (D_{45}) = c^{\pm 2} m_{D45}\ /\ k_B = 2.13476222 \cdot 10^{11}\ (K)$
$\Theta_t\ (D_{30}) = c^{\pm 2} m_{D30}\ /\ k_B = 4.803214978 \cdot 10^{11}\ (K)$
$\Theta_t\ (D_{18}) = c^{\pm 2} m_{D18}\ /\ k_B = 1.334226415 \cdot 10^{12}\ (K)$
$\Theta_t\ (D_6) = c^{\pm 2} m_{D6}\ /\ k_B = 1.200803781 \cdot 10^{13}\ (K)$
$\Theta_t\ (D_5) = c^{\pm 2} m_{D5}\ /\ k_B = 1.729157485 \cdot 10^{13}\ (K)$

Please note that all of them are lesser than the threshold temperature of intervalino. Therefore no one particle could have been assembled according to the misleading Standard Model.

The *recombinations* among dalinos at this stage are those allowed by the intervalic symmetries of compositeness. Please note that we use the word ‘recombination’ in a very different meaning than the traditional one —the assembly of Hydrogen atoms, which appears not to be a suitable term for that phenomenon—. Of course, above the threshold temperature of intervalino there were possible any recombinations among any dalinos in any order:

↔ D_{270} ↔ 2 D_{135} ↔ 3 D_{90} ↔ 5 D_{54} ↔
↔ 6 D_{45} ↔ 9 D_{30} ↔ 10 D_{27} ↔ 15 D_{18} ↔
↔ 18 D_{15} ↔ 27 D_{10} ↔ 30 D_{9} ↔ 45 D_{6} ↔
↔ 54 D_{5} ↔ 90 D_{3} ↔ 180 D_{2} ↔ 270 D_{1} ↔

At this step all dalinos have got *spin 0*, including electron, which at this temperature are still *bosons*.

Only when the temperature drops and recombinations cease the dalino D_{270} is transformed into a *fermion*, that is to say, the electron. At this moment appears the corresponding electronic antineutrino, $\underline{\nu}_{D270} = \underline{\nu}_e$, which remains up to the present as a cosmic background of neutrinos which unfortunately has not been detected yet:

$270\,\mathbf{I} \leftrightarrow D_{270} + \gamma\gamma$
$270\,\mathbf{I} \rightarrow e + \underline{\nu}_e + \gamma\gamma$

NEUTRAL DALINO-SYNTHESIS

The assembly of intervalinos in an antisymmetric state under interchange made only one particle: the *neutral dalino*, also named *bintervalino*, **BI** = D_2^0, which is an important and fascinating constituent of dark matter, and will be described opportunely when describing the composition and shares of the intervalic dark matter. The application of the universality assumption to the Intervalic Primordial SYNTHESIS introduces highly precise values for the number of neutral dalinos existing in the Universe, and therefore, for the quantity of dark matter composed by neutral dalinos.

In resume, when finishing the primordial SYNTHESIS of intervalinos the Universe have got one further particle which remain up to our times: *bintervalino*. Besides, it has been assembled at this step the lepton-massive boson D_{270}, which is simply the own *electron* in a Bose-Einstein state, the former state of electron existing in the primitive egg as boson yet.

GAUDINO-SYNTHESIS

Immediately after dalino-synthesis began the gaudino-synthesis. We have seen that the state of recombination of dalinos in thermodynamic equilibrium includes the following 16 possible combinations:

$\leftrightarrow D_{270} \leftrightarrow 2\ D_{135} \leftrightarrow 3\ D_{90} \leftrightarrow 5\ D_{54} \leftrightarrow$
$\leftrightarrow 6\ D_{45} \leftrightarrow 9\ D_{30} \leftrightarrow 10\ D_{27} \leftrightarrow 15\ D_{18} \leftrightarrow$
$\leftrightarrow 18\ D_{15} \leftrightarrow 27\ D_{10} \leftrightarrow 30\ D_{9} \leftrightarrow 45\ D_{6} \leftrightarrow$
$\leftrightarrow 54\ D_{5} \leftrightarrow 90\ D_{3} \leftrightarrow 180\ D_{2} \leftrightarrow 270\ D_{1} \leftrightarrow$

But this combinations are just the gaudinar structures of the 16 elementary gaudinos! Writing them down:

$270\ \mathbf{I} = 1\ D_{270} = G_1 = L_1 = 0.51099909$
$270\ \mathbf{I} = 2\ D_{135} = G_2 = L_1 = 4.0879928$
$270\ \mathbf{I} = 3\ D_{90} = G_3 = L_1 = 13.796975$
$270\ \mathbf{I} = 5\ D_{54} = G_5 = L_1 = 63.874885$
$270\ \mathbf{I} = 6\ D_{45} = G_6 = L_1 = 110.37580$
$270\ \mathbf{I} = 9\ D_{30} = G_9 = L_1 = 372.51833$
$270\ \mathbf{I} = 10\ D_{27} = G_{10} = L_1 = 510.99909$
$270\ \mathbf{I} = 15\ D_{18} = G_{15} = L_1 = 1{,}724.6220$
$270\ \mathbf{I} = 18\ D_{15} = G_{18} = L_1 = 2{,}980.1466$
$270\ \mathbf{I} = 27\ D_{10} = G_{27} = L_1 = 10{,}057.995$
$270\ \mathbf{I} = 30\ D_{9} = G_{30} = L_1 = 13{,}796.975$
$270\ \mathbf{I} = 45\ D_{6} = G_{45} = L_1 = 46{,}564.794$
$270\ \mathbf{I} = 54\ D_{5} = G_{54} = L_1 = 80{,}463.964$
$270\ \mathbf{I} = 90\ D_{3} = G_{90} = L_1 = 372{,}518.33$
$270\ \mathbf{I} = 135\ D_{2} = G_{135} = L_1 = 1{,}257{,}249.4$
$270\ \mathbf{I} = 270\ D_{1} = G_{270} = L_1 = 5{,}621{,}244.5$

The state of recombination of gaudinos in thermodynamic equilibrium is therefore traced from the dalinos ones:

$\leftrightarrow G_1 \leftrightarrow G_2 \leftrightarrow G_3 \leftrightarrow G_5 \leftrightarrow$
$\leftrightarrow G_6 \leftrightarrow G_9 \leftrightarrow G_{10} \leftrightarrow G_{15} \leftrightarrow$
$\leftrightarrow G_{18} \leftrightarrow G_{27} \leftrightarrow G_{30} \leftrightarrow G_{45} \leftrightarrow$
$\leftrightarrow G_{54} \leftrightarrow G_{90} \leftrightarrow G_{135} \leftrightarrow G_{270} \leftrightarrow$

In other words, although for theoretical purposes we have separated the dalino-synthesis from the gaudino-synthesis, both steps may took place immediately one after another in the primordial Universe.

The synthesis and recombination of the 24 fractional gaudinos, ⅓ G_n and ⅔ G_n, allowed by the intervalic symmetry is similar to the one of 1 G_n:

$\leftrightarrow ⅓\ G_3 \leftrightarrow ⅓\ G_6 \leftrightarrow ⅓\ G_9 \leftrightarrow ⅓\ G_{15} \leftrightarrow$
$\leftrightarrow ⅓\ G_{18} \leftrightarrow ⅓\ G_{27} \leftrightarrow ⅓\ G_{30} \leftrightarrow ⅓\ G_{45} \leftrightarrow$

$\leftrightarrow \frac{1}{3}\,G_{54} \leftrightarrow \frac{1}{3}\,G_{90} \leftrightarrow \frac{1}{3}\,G_{135} \leftrightarrow \frac{1}{3}\,G_{270} \leftrightarrow$

$\leftrightarrow \frac{2}{3}\,G_{3} \leftrightarrow \frac{2}{3}\,G_{6} \leftrightarrow \frac{2}{3}\,G_{9} \leftrightarrow \frac{2}{3}\,G_{15} \leftrightarrow$
$\leftrightarrow \frac{2}{3}\,G_{18} \leftrightarrow \frac{2}{3}\,G_{27} \leftrightarrow \frac{2}{3}\,G_{30} \leftrightarrow \frac{2}{3}\,G_{45} \leftrightarrow$
$\leftrightarrow \frac{2}{3}\,G_{54} \leftrightarrow \frac{2}{3}\,G_{90} \leftrightarrow \frac{2}{3}\,G_{135} \leftrightarrow \frac{2}{3}\,G_{270} \leftrightarrow$

Moreover, the making of fractional gaudinos can be postulated to be born from simple recombination of elementary gaudinos in another magic match of IT:

$1\,G_n \leftrightarrow \frac{2}{3}\,G_n + \frac{1}{3}\,G_n$

According to this, the number of fractional gaudinos which existed above the threshold temperature of intervalino, in the recombination era, was the same as the number of elementary gaudinos.

As in the case of electron, all gaudinos are *bosons* above the recombination temperature, and only will transform into *fermions* emitting their corresponding antineutrinos once the recombination stops at the lisztino-synthesis, making the lisztinian quarks and the already known leptons-massive bosons:

$270\,\mathbf{I} \leftrightarrow 6\,D_{45} \leftrightarrow G_6 \rightarrow \mu + \underline{\nu}_{\mu} + \gamma\gamma$
$270\,\mathbf{I} \leftrightarrow 15\,D_{18} \leftrightarrow G_{15} \rightarrow \tau + \underline{\nu}_{\tau} + \gamma\gamma$
$270\,\mathbf{I} \leftrightarrow 54\,D_{5} \leftrightarrow G_{54} \rightarrow W^{\pm} + \underline{\nu}_{W} + \gamma\gamma$

This is a very beautiful example which demonstrates that the state of fermion or boson is not as fix and immutable as SM does suppose. The transition between both states is very easy as soon as a recombination —which is a change in the intervalic structure of the particle— is involved, and shows why the $W^{\pm}$ boson may be considered as a *fermion* when it exists as an individual particle (for example, at the beginning of the W decay) or as a *boson* when it is inside a recombination of gaudinos, as an intermediate state (as in a changeful —weak— intervalic interaction, which change the intervalic structure of a particle at the dalinar level).

However, since dalinos were assembled, anyway, under the *universality assumption*, as soon as the temperature dropped below the intervalino's threshold, the recombination which finally stayed was:

$\leftrightarrow D_{270} \leftrightarrow D_{135} \leftrightarrow D_{90} \leftrightarrow D_{54} \leftrightarrow$
$\leftrightarrow D_{45} \leftrightarrow D_{30} \leftrightarrow D_{27} \leftrightarrow D_{18} \leftrightarrow$
$\leftrightarrow D_{15} \leftrightarrow D_{10} \leftrightarrow D_{9} \leftrightarrow D_{6} \leftrightarrow$
$\leftrightarrow D_{5} \leftrightarrow D_{3} \leftrightarrow D_{2} \leftrightarrow D_{1} \leftrightarrow$

It can be seen that this final recombination can be made with around 194 times less energy than the first one, deduced from the mass ratio between the full set of dalinos to gaudinos: 38,040.09338 / 7,407,675.889.

Please note that it can't be postulated a further universality assumption for the gaudinar assembly because it would be in contradiction with the previous universality assumption for the dalinar assembly. Obviously, the assembly of dalinos came first and the assembly of gaudinos have to rely on and continue with the features yielded from the dalinar assembly.

Thus, for example, it is needed only one dalino 270 to make a gaudino 1 —the own *electron*—, but there are needed six dalinos 45 to get a gaudino 6 —*muon*—, fifteen dalinos 18 to make a gaudino 15 —*tau*— or fifty four dalinos 5 to get a gaudino 54 —$W^{\pm}$ boson—. For each electron assembled in this way there were created only 1/6 muons, 1/15 taus or 1/54 $W^{\pm}$ bosons.

In resume, according to the *universality assumption* for the assembly of dalinos in *symmetric* state under interchange, the recombination which remained just after the Big Bang —when the temperature of the primordial Universe dropped below the threshold temperature of intervalino— between both dalinos and gaudinos was:

$270\ G_1 = 270 \cdot 0.51099909\ (MeV/c^2) = 270\ D_{270} = 72{,}900\ \mathbf{I}$

$135\ G_2 = 135 \cdot 4.0879928\ (MeV/c^2) = 270\ D_{135} = 36{,}450\ \mathbf{I}$

$90\ G_3 = 90 \cdot 13.796975\ (MeV/c^2) = 270\ D_{90} = 24{,}300\ \mathbf{I}$

$54\ G_5 = 54 \cdot 63.874885\ (MeV/c^2) = 270\ D_{54} = 14{,}580\ \mathbf{I}$

$45\ G_6 = 45 \cdot 110.37580\ (MeV/c^2) = 270\ D_{45} = 12{,}150\ \mathbf{I}$

$30\ G_9 = 30 \cdot 372.51833\ (MeV/c^2) = 270\ D_{30} = 8{,}100\ \mathbf{I}$

$27\ G_{10} = 27 \cdot 510.99909\ (MeV/c^2) = 270\ D_{27} = 7{,}290\ \mathbf{I}$

$18\ G_{15} = 18 \cdot 1{,}724.6220\ (MeV/c^2) = 270\ D_{18} = 4{,}860\ \mathbf{I}$

$15\ G_{18} = 15 \cdot 2{,}980.1466\ (MeV/c^2) = 270\ D_{15} = 4{,}050\ \mathbf{I}$

$10\ G_{27} = 10 \cdot 10{,}057.995\ (MeV/c^2) = 270\ D_{10} = 2{,}700\ \mathbf{I}$

$9\ G_{30} = 9 \cdot 13{,}796.975\ (MeV/c^2) = 270\ D_9 = 2{,}430\ \mathbf{I}$

$6\ G_{45} = 6 \cdot 46{,}564.794\ (MeV/c^2) = 270\ D_6 = 1{,}620\ \mathbf{I}$

$5\ G_{54} = 5 \cdot 80{,}463.964\ (MeV/c^2) = 270\ D_5 = 1{,}350\ \mathbf{I}$

$3\ G_{90} = 3 \cdot 372{,}518.33\ (MeV/c^2) = 270\ D_3 = 810\ \mathbf{I}$

$2\ G_{135} = 2 \cdot 1{,}257{,}249.4\ (MeV/c^2) = 270\ D_2 = 540\ \mathbf{I}$

$1\ G_{270} = 1 \cdot 5{,}621{,}244.5\ (MeV/c^2) = 270\ D_1 = 270\ \mathbf{I}$

The assembly of dalinos in an *antisymmetric* state under interchange made the *neutral gaudino*, also named *bidalino*, **BD** = G_2^0, which is a constituent of dark matter, as it will be explained with more detail in the site devoted to the intervalic dark matter.

The assembly of dalinos in *mixed symmetric and antisymmetric* states under interchange made the isogaudinos with electric charges ⅔, ⅓, 0, which will finally be the constituent of quarks (zero charged gaudinos recombined into $⅔^{\pm}$ and $⅓^{\pm}$ isogaudinos). Therefore, according to the universality assumption, the share between symmetric, antisymmetric and mixed — symmetric and antisymmetric— states of gaudinos is:

- 1 set of symmetric states: gaudinos
- 1 set of mixed states: $⅔^{\pm}$ charged isogaudinos
- 1 set of mixed states: $⅓^{\pm}$ charged isogaudinos
- 1 set of antisymmetric states: bidalino

The determination of the number of the constituent isogaudinos of each set is enough complex because universality assumption applies to the *intervalic structure* of isogaudinos, not to the mere resultant charge. After recombination, there only last the gaudinos of the {D45} symmetry, that is to say, the gaudinos 6 —which later will be assembled to make the nucleonic quarks—. The intervalic structures of those isogaudinos are, as we have explained in other site:

$G_6^{+⅔}$:
(+++++-) = (++++-+) = (+++-++) = (++-+++) = (+-++++) = (-+++++)

$G_6^{+⅓}$:
(++++--) = (+++--+) = (++--++) = (+--+++) = (--++++) = (-++++-)
(+++-+-) = (++-+-+) = (+-+-++) = (-+-+++) = (+-+++-) = (-+++-+)
(++-++-) = (+-++-+) = (-++-++) = (++-++-) = (+-++-+) = (-++-++)

And just the opposite charges for $G_6^{-⅔}$ and $G_6^{-⅓}$. In total we have a ratio 2/6 between the number of $G_6^{\pm⅔}$ and $G_6^{\pm⅓}$ assembled. As it can be supposed that each $G_6^{-⅔}$ was annihilated with two $G_6^{+⅓}$, the remaining ratio would be: $G_6^{+⅔}$ / $G_6^{\pm⅓}$ = 1/4.

In resume, at the step of the SYNTHESIS of dalinos the primordial Universe have got a lot of subatomic particles, adding to the already existing ones the following: all leptons-charged massive bosons and a 3/7 parts of quarks, that one composed by fractional and elementary gaudinos —L⅓, L⅔ and L1, being the other 4/7 parts L2, L3, L4 and L5— (masses in MeV/c^2):

⅓ G_6 = 2 D_{45} = 90 **I** = 36.791934
⅔ G_6 = 4 D_{45} = 180 **I** = 73.583868
1 G_6 = 6 D_{45} = 270 **I** = 110.37580

⅓ G_9 = 3 D_{30} = 90 **I** = 124.17278
⅔ G_9 = 6 D_{30} = 180 **I** = 248.34556
1 G_9 = 9 D_{30} = 270 **I** = 372.51833

⅓ G_{15} = 5 D_{18} = 90 **I** = 574.87400
⅔ G_{15} = 10 D_{18} = 180 **I** = 1,149.7480
1 G_{15} = 15 D_{18} = 270 **I** = 1,724.6220

⅓ G_{45} = 15 D_6 = 90 **I** = 15,521.598
⅔ G_{45} = 30 D_6 = 180 **I** = 31,043.196
1 G_{45} = 45 D_6 = 270 **I** = 46,564.794

⅓ G_{54} = 18 D_5 = 90 **I** = 26,821.321
⅔ G_{54} = 36 D_5 = 180 **I** = 53,642.642
1 G_{54} = 54 D_5 = 270 **I** = 80,463.964

⅓ G_{90} = 30 D_3 = 90 **I** = 124,172.78
⅔ G_{90} = 60 D_3 = 180 **I** = 248,345.56
1 G_{90} = 90 D_3 = 270 **I** = 372,518.33

⅓ G_{135} = 45 D_2 = 90 **I** = 419,083.13
⅔ G_{135} = 90 D_2 = 180 **I** = 838,166.26
1 G_{135} = 135 D_2 = 270 **I** = 1,257,249.4

LISZTINO-SYNTHESIS

Up to gaudino-synthesis the system of SYNTHESIS of particles has been complete, that is to say, every constituent particle has been assembled and recombined in every of the manners allowed by the intervalic symmetries to make the whole possible sets of dalinos and gaudinos because those allowed sets was *finite* and *unavoidably* determined by the intervalic symmetries of compositeness —derived only from the magnitude of the intervalic quantum of electric charge—. From the step of lisztino-synthesis and onwards the SYNTHESIS of particles is not completely determined by the intervalic symmetries but also go in stage the rules of composition of the interchange symmetry, intimately related with the spin-statistics theorem. All steps in IPS are governed only by these two high principles, but at the first steps the 16 charges allowed by the intervalic symmetries determine completely the possibilities of the assembly, leaving very little freedom to the possibilities of combination under interchange symmetry, which merely, let's say, "witness" the consistency of the SYNTHESIS. On the contrary, as the intervalic structures grown, the charges allowed by the intervalic symmetries reduce drastically from sixteen to three —1, ⅔, ⅓— in the lisztino-synthesis, and to one —1, the elementary charge— in the monteverdino and palestrino-synthesis. Then the interchange symmetry begins to play an important role to determine the finiteness of the SYNTHESIS sets of particles, as it is clear that the allowed number of aggregations must be finite. The first steps of IPS have been deduced straightaway by strong logical means. Only at the lisztino-synthesis the intervalic symmetries of compositeness loosen moderately its strong logic and allows more than one closed possibility of SYNTHESIS. Fortunately, just at this step the experimental data comes in our help, so we can reconstruct all the steps of the creation of matter in the Universe.

The assembly of gaudinos in a symmetric state under interchange make all nucleus with the only exception of the lightest ones: ^{1}H, ^{2}H, ^{3}H, ^{3}He, which have got further intervalic structures, having therefore greater *structural energy* than the others, being this fact the explanation of the formerly supposed "binding energy of nucleus" —which is a partial or misleading concept as it has been explained with some detail—. The SYNTHESIS of gaudinos in a symmetric state makes a hundred of atomic nucleus with a resultant charge always multiple of the elementary one. As can be seen, the number of gaudinos assembled in this mode has no a geometric limit derived from any of the symmetries involved, but it will finish due to the dynamical balance of the particle. While the intervalic energy at the last structure level of the nucleus becomes smaller as greater is the resultant charge of the nucleus, the electromagnetic energy becomes greater as the nucleus grows, and therefore the spin energy has to increase very much to maintain the internal energetic balance of the particle: $I - U - E(J) = 0$. Of course, in that balance also can be involved the electronic cortex, but this is out of the subject of our study which deals only with subatomic structures.

We could question whether some nucleus could have a primordial origin, that is to say, if someone were created in the Big Bang. The answer to that question is categorically *no*: for obvious symmetry reasons no one nucleus with a resultant electric charge *multiple* of the elementary one could be assembled at the Big Bang, but only those ones with just the elementary one or its fractions. Therefore only the Hydrogen nucleus —the nucleon— could be assembled at the Big Bang.

Moreover, although nucleus with $A > 3$ are lisztinos, they have been no composed coming from gaudinos, but from the merging of nucleons, which are monteverdinos. This one is the only SYNTHESIS of particles which goes against the natural order of the increasing complexity of the intervalic structure of subatomic particles (Intervalino → Dalino → Gaudino → Lisztino → Monteverdino → Palestrino), the only one which subtract a level to the intervalic structure of the constituent particles instead to adding a further level:

Lisztino (nucleus, A > 3) ← Monteverdino (nucleon)
Monteverdino (nucleon) → Palestrino (nucleus, A ≤ 3)

As this SYNTHESIS occurs really between atoms instead between fundamental particles, we can say that it happened *after* IPS was finished.

If the assembly of gaudinos in a symmetric state under interchange make nucleus, the assembly in an antisymmetric state made quarks. Although they have been wrongly interpreted by SM, we can say that we have enough indirect evidence to affirm that all quarks correspond to a finite set of seven lisztinos:

$L_{1/3}$, $L_{2/3}$, L_1, L_2, L_3, L_4, L_5

Gaudinos of every dalinar symmetry —D45, D30, D18, D6, D5, D3, D2— aggregates composing just that seven lisztinos, which make all the 7 x 7 = 49 allowed intervalic structures of quarks already known.

The first three of them, $L_{1/3}$, $L_{2/3}$, L_1, are at once gaudinos, so they are limit cases of lisztinos (in the same way as electron, which is a dalino, is at once a limit case of gaudino). The determination of the intervalic structures of the constituent gaudinos of the remaining lisztinos L_2, L_3, L_4, L_5 is perhaps one of the most complex tasks because there are more than one possibility for determining those structures. Although the lisztinian structures are clear and have enough experimental evidence, their constituent gaudinar ones have not a unique way to making the SYNTHESIS. The spin of the lisztinos will rely on the spin of its constituent gaudinos, which is intended to be ½:

- Quarks L⅓, SU(1) spin symmetry → basic spin: ½
- Quarks L⅔, SU(1) spin symmetry → basic spin: ½
- Quarks L1, SU(1) spin symmetry → basic spin: ½
- Quarks L2, SU(2) spin symmetry: 2 ⊗ 2 → basic spin: 0
- Quarks L3, SU(2) spin symmetry: 2 ⊗ 2 ⊗ 2 → basic spin: ½
- Quarks L4, SU(2) spin symmetry: 2 ⊗ 2 ⊗ 2 ⊗ 2 → basic spin: 0
- Quarks L5, SU(2) spin symmetry: 2 ⊗ 2 ⊗ 2 ⊗ 2 ⊗ 2 → basic spin: ½

Since it is supposed that gaudinos are in an antisymmetric state, this means that at least one of the three constituent gaudinos of L3 must have different electric charge of the other two, that is to say, they are *isogaudinos* —gaudinos with identical intervalic structures but different electric charge (in the same way as all quarks of {D45} are isoquarks)—. The *isocharge symmetry* is more complex at the gaudinar level that at the lisztinian one, where it could be only set to +⅔ or -⅓, being this the reason why the clumsy assumption of isospin, with values ±½, have had some success, as the truthful underlying physical quantity was the isocharge symmetry at the lisztinian level. On the contrary, at the gaudinar level the isocharge symmetry has four allowed values ±⅔ and ±½, apart from the degenerate one, 0.

The constituent gaudinos of L4 and L5 are likewise composed by isogaudinos, being in this way preserved the antisymmetry of the wavefunction.

According to the antisymmetry of the combination, the set of lisztinos allowed would be completed with the structures L6, L7 and L8, but as L8 only can make zero charged quarks it can be discarded. However, we empirically find that L6 and L7 do not appear in the experiments. Thus, if the series effectively finish at L5 it should mean that the isocharge symmetry has three allowed values instead of the four ones previously supposed. Really, we have seen that the *stable* quarks only use just three degrees of freedom of isocharge at the *gaudinar* level —+⅔, -⅓, +⅓— due to the balance between the intervalic and electromagnetic energies involved at the gaudinar level, but this result appears to be no reason for not observing quarks L6 and L7 in the laboratory. This is perhaps the only point of the intervalic structure of subatomic particles not completely understood yet. A possible assumption for explaining it could be to postulate that the heaviest lisztinos are composed by the lightest ones. The most simple way to make that possible combination would be:

L2 = L⅔ + L⅔ + L⅔
L3 = L1 + L1 + L1
L4 = L1 + L1 + L2
L5 = L1 + L2 + L2

But in that case these four lisztinos would really be monteverdinos, a result which although is may be look simple, I am afraid that it lacks of immaculate elegance and therefore I am not going to postulate it.

When going into L9 and beyond the isocharge symmetry (along with the spin symmetry) is already not sufficient to maintain the interchange antisymmetry of gaudinos, and therefore one of the constituent gaudinos must have its intervalic structure in an "excited" state —remember that gaudinos can have a lot of "excited" intervalic structures—. This is a strong handicap to make possible the existence of such big lisztinos, and actually, their existence is not expected by no means.

The combinations of lisztinos in the egg above the corresponding recombination temperature included all the allowed states, as in the previous recombinations of the gaudinos and dalinos:

$\leftrightarrow 180\ L_{1/3} \leftrightarrow 90\ L_{2/3} \leftrightarrow 60\ L_1 \leftrightarrow 30\ L_2 \leftrightarrow 20\ L_3 \leftrightarrow 15\ L_4 \leftrightarrow 12\ L_5 \leftrightarrow$

The SYNTHESIS of gaudinos also make a set of zero charged lisztinos, L_2, among which we find all the *zero charged leptons-massive bosons* allowed by the intervalic symmetries (with their masses according to the theoretical electron's ratio, and expressed in $(\mathrm{MeV/c^2})$):

$L_2 = 2\ G_1 = 2\ D_{270} = 540\ \mathbf{I} = 1.0219982$
$L_2 = 2\ G_2 = 4\ D_{135} = 540\ \mathbf{I} = 8.1759856$
$L_2 = 2\ G_3 = 6\ D_{90} = 540\ \mathbf{I} = 27.593950$
$L_2 = 2\ G_5 = 10\ D_{54} = 540\ \mathbf{I} = 127.74977$
$L_2 = 2\ G_6 = 12\ D_{45} = 540\ \mathbf{I} = 220.75160$
$L_2 = 2\ G_9 = 18\ D_{30} = 540\ \mathbf{I} = 745.03666$
$L_2 = 2\ G_{10} = 20\ D_{27} = 540\ \mathbf{I} = 1{,}021.9982$
$L_2 = 2\ G_{15} = 30\ D_{18} = 540\ \mathbf{I} = 3{,}449.2440$
$L_2 = 2\ G_{18} = 36\ D_{15} = 540\ \mathbf{I} = 5{,}960.2932$
$L_2 = 2\ G_{27} = 54\ D_{10} = 540\ \mathbf{I} = 20{,}115.990$
$L_2 = 2\ G_{30} = 60\ D_9 = 540\ \mathbf{I} = 27{,}593.950$
$L_2 = 2\ G_{45} = 90\ D_6 = 540\ \mathbf{I} = 93{,}129.588 \rightarrow Z^0$
$L_2 = 2\ G_{54} = 108\ D_5 = 540\ \mathbf{I} = 160{,}927.93 \rightarrow W^0$
$L_2 = 2\ G_{90} = 180\ D_3 = 540\ \mathbf{I} = 745{,}036.66 \rightarrow Y^0$
$L_2 = 2\ G_{135} = 270\ D_2 = 540\ \mathbf{I} = 2{,}514{,}498.8 \rightarrow X^0$
$L_2 = 2\ G_{270} = 540\ D_1 = 540\ \mathbf{I} = 11{,}242{,}489 \rightarrow I^0$

It can be commented that such zero charged lisztinos have always their constituent gaudinos in an antisymmetric state under interchange, since isocharge symmetry must be antisymmetric. Therefore they can take only the two following states, being (↑, ↓) the degrees of freedom of spin and (+, -) the same ones of the electric charge:

$L_2 = (G_n{\uparrow}+, G_n{\uparrow}-)$: spin 1 zero charged massive boson
$L_2 = (G_n{\uparrow}+, G_n{\downarrow}-)$: spin 0 zero charged massive boson

If the interchange symmetry of gaudinos regarding spin is symmetric we have a massive boson with spin 1, if it is antisymmetric the spin will be

0. All these two states appear to be equally consistent. Please remember that the electric charge in IT is a physical quantity that *relies* on spin; actually it can be viewed as the “resultant spin” of the intervalino-antintervalino symmetric assembly, as we have seen in the paper on the Intervalic Primordial SYNTHESIS. Therefore the *isocharge* symmetry is entirely consistent with the spin-statistics theorem, whilst the former *isospin* symmetry is a doubtful “abstract space” introduced *ad hoc* without any relation with spin —but a similar name deliberately chosen—. Since the shy GWS electroweak theory is not reliable we have no theoretical reasons to prefer one or other state yet.

In resume, at the step of the SYNTHESIS of gaudinos the primordial Universe have got a lot of subatomic particles, adding to the already existing ones the zero charged massive bosons and the quarks. The assembly of gaudinos also make nucleus from ^{4}He and onwards, though this SYNTHESIS was not produced at IPS but in a later step and coming from Hydrogen atom, after IPS was finished.

MONTEVERDINO-SYNTHESIS

The monteverdino-synthesis makes the only two existing particles with that intervalic structure: mesons and baryons.

We do not know yet how to calculate the energy liberated in processes which introduce an increasing in the order of the Universe, since we do not have a reliable and complete way to determine the equivalence between the order and the energy of a structure, in this case, of an intervalic structure. Apart from the *elementary charge*, Nature shows a great number of phenomena characterized by the existence of an “attractor” which represents the state of minimal energy of a determined medium or structure. We can think about so variegated things as the grains of sand in a beach, the crystallographic lattices, the cells of a honeycomb, the Benard’s *tourbillons cellulaires*, the Leduc’s artificial cellular tissues, or in general all physical processes governed by the apparition of an auto organization which lead to a spontaneous order which is spread along the Universe (cfr. authors as, for example, Prigogine, Stengers, Ghyka, D’Arcy Thompson, Sheldrake, Mandelbrot, etc.). Of course the energy at which these phenomena are realized is ridicule in comparison with the huge energy involved in the intervalic structures of subatomic particles. The underlying reason for the existence of any spontaneous order and the apparent auto organization of Nature is no other than the well known Physical law of the tendency of all matter to reach a state of minimal energy. When this state of minimal energy is repeated in a systematic way, and seems to us as bizarre or we do not understand its physical quantities involved, we call it as “spontaneous order”. In the case of subatomic particles, the state of minimal energy of the electric charge —the elementary charge— is so powerful because the energies involved are tremendous, an also because it was introduced as soon an in the dalino-synthesis, that is to say, much before the assembly of mesons and baryons. For these reasons, we have talked about an “elementary pseudo interaction” which maintain the value of the elementary charge as a strong attractor of minimal energy. However, as it is not an interaction in strict sense, perhaps should be better to refer to the value of the elementary charge as a *quantum number*. As any other reliable quantum number, it must be conserved and can not be violated *regardless* of the energy available, since they was set as an intervalic symmetry at the primordial Universe and lying on the strongest physical principles: the own intervalic geometry. In other words, to question why, in spite of the higher energy available, we can not break yet a monteverdino to obtain an isolated quark with fractional charge, is so absurd as to question why we can’t break a spin to obtain a particle with spin, say, 1/4. The obvious answer is that such magnitudes are *intervalic symmetries* of Nature, symmetries which will not be able to be broken at *any* energy available. To a later extent, we should come back to the very beginning of the Universe, ant try to create demiurgically an alternative set of symmetries which was different from the intervalic ones… Although someone believe that this may be possible, I am afraid that “God does not play dice”.

To point the intervalic energy at the monteverdinian level we can remember the magnitudes of the intervalic energy involved in the assembly of mesons and baryons:

$$
\begin{aligned}
\mathrm{I}(\mathrm{L}^{\pm 1/3}) &= \mathrm{c}^{\pm 2}\,\hbar\,(90\,\mathbf{q_I})^{-2} = \mathrm{c}^{\pm 2}\,\hbar\,[90\,\sqrt{}\text{-}(\mathrm{c}^{-1}\mathrm{h})]^{-2} = \mathrm{c}^{-1}\,90^{-2} = \\
&= 4.1180752 \cdot 10^{-13}\ (\mathrm{J}) = 2.5702993\ (\mathrm{MeV/c^2}) \\
\mathrm{I}(\mathrm{L}^{\pm 2/3}) &= \mathrm{c}^{\pm 2}\,\hbar\,(180\,\mathbf{q_I})^{-2} = \mathrm{c}^{\pm 2}\,\hbar\,[180\,\sqrt{}\text{-}(\mathrm{c}^{-1}\mathrm{h})]^{-2} = \mathrm{c}^{-1}\,180^{-2} = \\
&= 1.0295188 \cdot 10^{-13}\ (\mathrm{J}) = 0.64257482\ (\mathrm{MeV/c^2}) \\
\mathrm{I}(\mathrm{M}^{\pm 1}) &= \mathrm{c}^{\pm 2}\,\hbar\,(270\,\mathbf{q_I})^{-2} = \mathrm{c}^{\pm 2}\,\hbar\,[270\,\sqrt{}\text{-}(\mathrm{c}^{-1}\mathrm{h})]^{-2} = 270^{-2}\,\mathrm{c}^{-1} = \\
&= 4.575639166 \cdot 10^{-14}\ (\mathrm{J}) = 0.285588809\ (\mathrm{MeV/c^2}) \\
\mathrm{I}(\mathrm{M}^{\pm 2}) &= \mathrm{c}^{\pm 2}\,\hbar\,(540\,\mathbf{q_I})^{-2} = \mathrm{c}^{\pm 2}\,\hbar\,[540\,\sqrt{}\text{-}(\mathrm{c}^{-1}\mathrm{h})]^{-2} = 540^{-2}\,\mathrm{c}^{-1} = \\
&= 1.143909792 \cdot 10^{-14}\ (\mathrm{J}) = 0.071397202\ (\mathrm{MeV/c^2})
\end{aligned}
$$

As the intervalic energy diminishes with the square of the electric charge, the electromagnetic energy has not enough frequorce to maintain the dynamical structure of monteverdinos beyond the assembly of three lisztinos. To this respect we can make three comments: 1) lisztino is already a complex particle, and therefore it is not expected a very large number in the assembly of lisztinos to make still more complex particles; 2) the higher number in the assembly of constituent gaudinos in an antisymmetric state under interchange was five, to make the lisztino 5, L_5, therefore it can also be expected that the higher number of constituent lisztinos involved in the assembly of a monteverdino was not greater than 5, but probably smaller; 3) the number of particles assembled in a *plane* can be two or three, but from four particles and onward the assembly is necessarily made in a *volume*, which surely demands greater energy. This may be a law of the "order of forms" unknown to Physics yet. It appears to be a strong evidence for holding that assumption: among all the diverse allowed values of lisztinos, the only *stable* one is just the lisztino 3 —the nucleonic quark—, which is composed precisely by three gaudinos.

Besides we have the usual laws of composition. It has to be considered that the majority of lisztinos are fermions and therefore, their assembly in a total antisymmetric state under interchange can not contain a big number of particles.

In resume, at the step of the intervalic SYNTHESIS of monteverdinos the primordial Universe added mesons and baryons —mainly nucleons— to the already existing particles, with whom there is completed the assembly of all fundamental subatomic particles of Nature.

PALESTRINO-SYNTHESIS

Remembering the previous comments about the number of constituent particles in the most complex intervalic structures, we should conclude that there will not be palestrinos P4 and beyond, existing only palestrinos P2 and P3. This appears justly to be the case, being those particles the allowed assemblies between nucleons: deuteron, tritium and ^{3}He nucleus. They are, along with proton and neutron, the four stable subatomic particles with the greatest *structural energy*, and at once with the most complex intervalic structures, which are as follows:

p (^{1}H), *n*: $P_1 = 1\ M_3 = 3\ L_3 = 9\ G_6 = 54\ D_{45} = 2430\ \mathbf{I}$
pn (^{2}H): $P_2 = 2\ M_3 = 6\ L_3 = 18\ G_6 = 108\ D_{45} = 4860\ \mathbf{I}$
pnn(^{3}H), *ppn*(^{3}He): $P_3 = 3\ M_3 = 9\ L_3 = 27\ G_6 = 162\ D_{45} = 7290\ \mathbf{I}$

The spin symmetry and isocharge symmetry of the combinations are —at once and without precedent— well understood by SM (we only have to substitute 'abstract' isospin by 'concrete and existing' isocharge to get a reliable model), so we are not going to make further commentary.

On the other hand, according to modern cosmology deuteron could stay assembled when the temperature of the egg dropped below its related “binding energy”, 2.225 (MeV/c^2):

$T(^2H) < 2.225/k_B = 2.582003973 \cdot 10^{10}$ (K)

Following SM’s way, the difference on the rest mass energy of protons and neutrons in thermodynamic equilibrium, $\Delta(N) = 1.293334967$ (MeV/c^2) = $2.072151965 \cdot 10^{-13}$ (J), gives the an alternative value of the ratio of neutrons to protons through the Boltzmann factor:

$R_\Delta(n/p) = \exp [-\Delta(N) / k_B T(^2H)] = 0.581274142$

which is far from the desired value according to empirical data, ~0.2. But don’t worry, after *adjusting shamelessly ad hoc* the temperature of deuterium to near 10^{10} (K) it can be obtained the suitable value ~0.2.

But the painful fact still remains: SM cosmology can not deduce without adjusting *by hand* such value, nor have a theoretical model to give an exact value, but only an approximation based on empirical data. On the contrary, IT predicts an exact theoretical value by means of simple consequences deduced from the intervalic structures of nucleons: $R_\mathbf{I}(n/p) = 0.222222222$. This result involves a temperature for the beginning of the synthesis of deuterium in the primordial Universe of:

$T(^2H) = -\Delta(N) / [k_B \ln R_\mathbf{I}(n/p)] = 9.978556607 \cdot 10^9$ (K)

And this result has been derived exclusively from the intervalic structures of the involved particles, that is to say, by geometric means. The Universe is pure intervalic symmetry. Is there still any fool who claims that God plays dice?

In resume, at the step of the intervalic SYNTHESIS of palestrinos all the fundamental particles of Nature were previously assembled and there were only added the few palestrinos allowed by the intervalic symmetries: ^{2}H, ^{3}H and ^{3}He nucleus. The study of the nuclear reactions among their corresponding *atoms* is not a suitable subject for a book of Particle Physics, but of Atomic Physics, although this one will benefit substantially after incorporating the intervalic achievements.

INTERVALIC PRIMORDIAL ASSEMBLY OF INTERVALIC STRU

0 | **1** | **2** | **3** | **4**

POINT
—quantum of being—

INTERVALIC STRING
—quantum of space—
(Share = 1)

= Symmetric assembly of points. An **interval** is, by definition, the distance (relation, assembly) between two points. The primordial irreducible interval is the intervalic length, ħ. The existence of mathematics, information or consciousness involve unavoidably the existence of space.

Intervalic length
$\mathbf{l_I} = ħ$
Intervalic string state
$S = \{↑, ↓\}$
Intervalic string radius
$r(S) = ½\ ħ$
Intervalic string spin
$J(S) = ½\ ħ$
Intervalic string length
$l(S) = π\mathbf{l_I} = πħ$

The total length of intervalic strings is the *total length of space* existing in the Universe:
$Σl(S) =$
$= 2π\ r(S)\ n(S) =$
$= π\ c^8\ ħ$

Neutrino

Neutrino is defined as *an intervalic string came to light*. The majority of neutrinos have been made at the Intervalic Primordial Assembly of gaudinos and dalinos, which began between $1.521843955 \cdot 10^{-10}$ (s) and $1.979589614 \cdot 10^{-9}$ (s) after the intervalic structure level No. 2 (synthesis of photon and chi) which marked the *beginning of time*. There are 16 kinds of neutrinos, so many as dalinar symmetries in Nature.

INTERVALIC LENGTH
—quantum of space—
=Antisym. as. points

PHOTON
—quantum of light—
(Share = 1/2)
= Symmetric assembly of Intervalic Strings

Photon state
$γ = \{ |↑↑|,$
$2^{-½} (|↑↓| + |↓↑|), |↓↓| \}$

Photon radius
$r(γ) = ħ =$
$= 1.0556363 \cdot 10^{-34}$ (m)

Photon total length
$l(γ) = 2l(S) = 2πħ$

Photon spin
$J(γ) = ħ =$
$= 1.0556363 \cdot 10^{-34}$ (m)

Frequorce of primordial photon
$φ(γ) = \mathbf{φ_I} = c\ ħ^{-1} =$
$= 2.839921837 \cdot 10^{42}$ (s^{-1})

Temperature of primordial photon
$Θ(γ) = \mathbf{Θ_I} = c\ k_B^{-1} =$
$= 2.17138589 \cdot 10^{31}$ (K)

Intervalic-relativistic transformations of time regarding temperature
$t = t_0 / \sqrt{}(1-[Θ/\mathbf{Θ_I}]^2)$

Total energy of primordial photons
$ΣE(γ) = ¼\ c^7\ ħ^2\ \mathbf{φ_I}^2 = ¼\ c^9$
$= 4.890196776 \cdot 10^{75}$ (J)

Since the energy of primordial photons was exactly the intervalic velenergy, $c = 2.99792458 \cdot 10^8$ (J), we can surprisingly know with astonishing simplicity the *number of primordial photons* assembled from intervalic strings at the beginning of the Universe:
$n(γ) = ΣE(γ) / c = ¼\ c^8 =$
$= 1.631194063 \cdot 10^{67}$

Number of intervalic strings
$n(S) = 4\ n(γ) =$
$= 4\ ¼\ c^8 = c^8$

The *value of the speed of light*, c, is therefore absolutely determined by the number of intervalic strings assembled, that is to say, by the total length of space in the Universe:
$c = n(S)^{1/8}$

CHI
(Share = 1/2)
= Antisym. assembly of *S*
Dark energy
$¢ = 2^{-½} (|↑↓| - |↓↑|)$

INTERVALINO
—quantum of matter—
(Share = 1/4)
= Antisymmetric assembly of Photons

Intervalino state
$\mathbf{I} = 2^{-½} (|γ\underline{γ}| - |\underline{γ}γ|)$

Intervalino radius
$r(\mathbf{I}) = c / ω(\mathbf{I}) = 2\ ħ =$
$= 2.1112726 \cdot 10^{-34}$ (m)

Intervalino spin
$J(\mathbf{I}) = 0$

Intervalino charge
$\mathbf{q_I} = \sqrt{}\text{-}(c^{-1}ħ) =$
$= 1\ (i^{-1/2}L^{1/2}) = 5.93398995 \cdot 10^{-22}$ (C)

Intervalino intervalic energy
$I(\mathbf{I}) = c^{±2}\ ħ\ \mathbf{q_I}^{-2} = c^{-1} =$
$= 20{,}819.42423$ (MeV/c^2)

Intervalino electromagnetic potential energy
$U(\mathbf{I}) = 0$

Intervalino mass
$m(\mathbf{I}) = I(\mathbf{I})$

Intervalino spin energy
$E_J(\mathbf{I}) = I(\mathbf{I}) - U(\mathbf{I}) = c^{-1} =$
$= 20{,}819.42423$ (MeV/c^2)

Intervalino linear velocity on surface
$v(\mathbf{I}) = c$

Total energy of primordial intervalinos and gravitons
$ΣE(\mathbf{I}) ≡ ΣE(g) = ½\ ΣE(γ) = (1/8)\ c^9 =$
$= 2.445098388 \cdot 10^{75}$ (J)

Number of primordial intervalinos assembled at the IPA
$n(\mathbf{I}) = ΣE(\mathbf{I}) / I(\mathbf{I}) = (1/8)\ c^{10} =$
$= 7.330220558 \cdot 10^{83}$

All dark and visible matter vanishes in front of gravitons, and all matter and gravitons vanish in front of dark energy. In other words, all energy-matter of the Universe vanishes within itself, being the only remaining stuff of the Universe the own mathematical dimensional basis of the Intervalic System of Dimensions and Units: (L, *i*).

Threshold temperature of annihilation-materialization of intervalinos, γγ ↔ **I**
$Θ_t(\mathbf{I}) ≥ c^{±2}m(\mathbf{I}) / k_B = 4π\ Θ_m =$
$= 2.415992632 \cdot 10^{14}$ (K)

Threshold frequorce of photons at the annihilation-materialization of intervalinos, $φ_t$
$φ_t = 4π\ φ_m = 1/(cħ) =$
$= 3.159839191 \cdot 10^{25}$ (s^{-1})

GRAVITON
(Share = 1/4)
= Symmetric assembly of Photons
Dark energy
$g = |γ\underline{γ}|_s = [|γγ|, 2^{-½} (|γ\underline{γ}|+|\underline{γ}γ|), |\underline{γ}\underline{γ}|]$

DALINOS
—quanta of electric charge—
(Share = 1/8)
= Symmetric assembly of Intervalinos
$D^{(±1/1,2,3,5,6,9,10,15,18,27,30,45,54,90,135,270)}$
—16 electric charged dalinos geometrically allowed by the intervalic symmetries of Nature—
(Geometric values derived only from D^{270} electron's structural energy ratio and balance: $I - I^{-1} - E(J) = [\ c^{±2}\ ħ\ (270\ \mathbf{q_I})^{-2}\ ] - [\ ½\ (1/4πε_0)\ e^2 / r_e\ ] - m_e\ ω_J(e)^2\ r_e^2 = 0$)

(0.51099909) $D_{270} = 270\ \mathbf{I} = 540\ γ = 1080\ S$
(2.0439964) $D_{135} = 135\ \mathbf{I} = 270\ γ = 540\ S$
(4.5989918) $D_{90} = 90\ \mathbf{I} = 180\ γ = 360\ S$
(12.774977) $D_{54} = 54\ \mathbf{I} = 108\ γ = 216\ S$
(18.395967) $D_{45} = 45\ \mathbf{I} = 90\ γ = 180\ S$
(41.390926) $D_{30} = 30\ \mathbf{I} = 60\ γ = 120\ S$
(51.099909) $D_{27} = 27\ \mathbf{I} = 54\ γ = 108\ S$
(114.97480) $D_{18} = 18\ \mathbf{I} = 36\ γ = 72\ S$
(165.56370) $D_{15} = 15\ \mathbf{I} = 30\ γ = 60\ S$
(372.51833) $D_{10} = 10\ \mathbf{I} = 20\ γ = 40\ S$
(459.89918) $D_9 = 9\ \mathbf{I} = 18\ γ = 36\ S$
(1,034.7732) $D_6 = 6\ \mathbf{I} = 12\ γ = 24\ S$
(1,490.0734) $D_5 = 5\ \mathbf{I} = 10\ γ = 20\ S$
(4,139.0926) $D_3 = 3\ \mathbf{I} = 6\ γ = 12\ S$
(9,312.9584) $D_2 = 2\ \mathbf{I} = 4\ γ = 8\ S$
(20,819.424) $D_1 = 1\ \mathbf{I} = 2\ γ = 4\ S$

Total energy of primordial dalinos: $ΣE(D^±) ≡ ΣE(D^0) =$
$= ½\ ΣE(\mathbf{I}) = (1/16)\ c^9 = 1.222549194 \cdot 10^{75}$ (J).

Energy released in dalino-synthesis (this energy is the origin of the so named Big Bang —which of course it is neither the beginning of the Universe, nor its cause—)
$E_B(D_{270}) = m(270\ \mathbf{I}) - m(D_{270}) = 5{,}621{,}244.136$ (MeV/c^2)
$E_B(D_{45}) = m(45\ \mathbf{I}) - m(D_{45}) = 936{,}855.694$ (MeV/c^2)
$E_B(D_{30}) = m(30\ \mathbf{I}) - m(D_{30}) = 624{,}541.3359$ (MeV/c^2)
$E_B(D_{18}) = m(18\ \mathbf{I}) - m(D_{18}) = 374{,}634.6613$ (MeV/c^2)
$E_B(D_6) = m(6\ \mathbf{I}) - m(D_6) = 123{,}881.7722$ (MeV/c^2)
$E_B(D_5) = m(5\ \mathbf{I}) - m(D_5) = 102{,}607.0477$ (MeV/c^2)
…
This explains why when dropping the temperature of the primordial Universe the electron was the first dalino which stayed definitively as a stable particle, while heavier dalinos were assembled later, not before).

Dalinos threshold temperature
$Θ_B\ (D_{270}) < E_B(D_{270}) / k_B = 6.523179514 \cdot 10^{16}$ (K)
$Θ_B\ (D_{45}) < E_B(D_{45}) / k_B = 1.087175336 \cdot 10^{16}$ (K)
$Θ_B\ (D_{30}) < E_B(D_{30}) / k_B = 7.247497574 \cdot 10^{15}$ (K)
$Θ_B\ (D_{18}) < E_B(D_{18}) / k_B = 4.347452511 \cdot 10^{15}$ (K)
$Θ_B\ (D_6) < E_B(D_6) / k_B = 1.437587541 \cdot 10^{15}$ (K)
$Θ_B\ (D_5) < E_B(D_5) / k_B = 1.190704741 \cdot 10^{15}$ (K)
...
Recombination set of dalinos above the threshold temperature, whose intervalinar composition is identical to the recombination set of gaudinos:
$↔ D_{270} ↔ 2\ D_{135} ↔ 3\ D_{90} ↔ 5\ D_{54} ↔ 6\ D_{45} ↔ 9\ D_{30} ↔ 10\ D_{27} ↔ 15\ D_{18} ↔ 18\ D_{15} ↔ 27\ D_{10} ↔ 30\ D_9 ↔ 45\ D_6 ↔ 54\ D_5 ↔ 90\ D_3 ↔ 180\ D_2 ↔ 270\ D_1 ↔$
=
$↔ G_1 ↔ G_2 ↔ G_3 ↔ G_5 ↔ G_6 ↔ G_9 ↔ G_{10} ↔ G_{15} ↔ G_{18} ↔ G_{27} ↔ G_{30} ↔ G_{45} ↔ G_{54} ↔ G_{90} ↔ G_{135} ↔ G_{270} ↔$

ZERO CHARGED DALINOS
(Share = 1/8)
= Antisymmetric assembly of Intervalinos
Dark matter
—8 zero charged dalinos geometrically allowed by the intervalic symmetries of Nature—
(Geometric values derived only from bintervalino structural energy ratio)
$D_{270}^0, D_{90}^0, D_{54}^0, D_{30}^0, D_{18}^0, D_{10}^0, D_6^0, D_2^0$

= Symmet
$G^{(±)}$: ***Leptons-C.M***
—16 elementary
allowed by the int
(Geometric values derived
(0.51099909)
(4.0879928)
(13.796975)
(63.874885)
(110.37580)
(372.51833)
(510.99909)
(1,724.6220)
(2,980.1466)
(10,057.995)
(13,796.975)
(46,564.794)
(80,463.964)
(372,518.33)
(1,257,249.4)
(5,621,244.5)
$G^{(±⅓,\ ±⅔)}$:
—24 fractional
allowed by the int
(36.791934) $L_{⅓}$
(73.583868) $L_{⅔}$ =
(124.17278) $L_{⅓}$
(248.34556) $L_{⅔}$ =
(574.87400) $L_{⅓}$
(1,149.7480) $L_{⅔}$ =
(15,521.598) $L_{⅓}$
(31,043.196) $L_{⅔}$ =
(26,821.321) $L_{⅓}$
(53,642.642) $L_{⅔}$ =
(124,172.78) $L_{⅓}$
(248,345.56) $L_{⅔}$ =

Recombination set
$↔ ⅓\ G_3 ↔$
$↔ ⅓\ G_{18} ↔$
$↔ ⅓\ G_{54} ↔ ⅓\ G_{90}$
Recombination set
$↔ ⅔\ G_3 ↔$
$↔ ⅔\ G_{18} ↔$
$↔ ⅔\ G_{54} ↔ ⅔\ G_{90}$
Recombination of fra
the recombination
1 G
The share of gaudinar
of the *visible matte*
$≤ c^{±2}\ ΣE(D^±) = (1/$

ZERO CH
= Antisymm
—25 zero char
allowed by the int
$G_2^0, G_6^0, G_{10}^0,$
$⅓\ G_6^0, ⅓\ G_{18}^0, ⅓$
$⅔\ G_6^0, ⅔\ G_9^0,$
$⅔\ G_{45}^0, ⅔\ G_5$

INTERVALIC

Introduced degree of freedom (derived): **ELECTRIC CHARGE** →

Introduced degree of freedom (derived): **MASS** → GRAVITATIONAL INTERACTION. DARK MATTER UNIVERS

Introduced degree of freedom (fundamental): c → **ENERGY** → INTERVALIC CHANGELESS INTERACTION (formerly strong interacti

NOTHINGNESS

Primordial irreducible degree of freedom (fundamental): ħ → **CONSCIOUSNESS = SPACE = INFORMATION** → PRIMORDIAL IRREDUCIBLE INTERACTIO

UCTURES WHICH ORIGINATED ALL DEGREES OF FREEDOM AND INTERACTIONS

5

GAUDINOS
(Share = 1/16)
tric assembly of Dalinos
.Bosons: e, μ, τ, $Z^{\pm}$, $W^{\pm}$, $Y^{\pm}$, $X^{\pm}$
charged gaudinos geometrically
ervalic symmetries of Nature—
only from electron's structural energy ratio)
$G_1 = 1\ D_{270} = 270\ \mathbf{I} = 540\ \gamma$
$G_2 = 2\ D_{135} = 270\ \mathbf{I} = 540\ \gamma$
$G_3 = 3\ D_{90} = 270\ \mathbf{I} = 540\ \gamma$
$G_5 = 5\ D_{54} = 270\ \mathbf{I} = 540\ \gamma$
$G_6 = 6\ D_{45} = 270\ \mathbf{I} = 540\ \gamma$
$G_9 = 9\ D_{30} = 270\ \mathbf{I} = 540\ \gamma$
$G_{10} = 10\ D_{27} = 270\ \mathbf{I} = 540\ \gamma$
$G_{15} = 15\ D_{18} = 270\ \mathbf{I} = 540\ \gamma$
$G_{18} = 18\ D_{15} = 270\ \mathbf{I} = 540\ \gamma$
$G_{27} = 27\ D_{10} = 270\ \mathbf{I} = 540\ \gamma$
$G_{30} = 30\ D_{9} = 270\ \mathbf{I} = 540\ \gamma$
$G_{45} = 45\ D_{6} = 270\ \mathbf{I} = 540\ \gamma$
$G_{54} = 54\ D_{5} = 270\ \mathbf{I} = 540\ \gamma$
$G_{90} = 90\ D_{3} = 270\ \mathbf{I} = 540\ \gamma$
$G_{135} = 135\ D_{2} = 270\ \mathbf{I} = 540\ \gamma$
$G_{270} = 270\ D_{1} = 270\ \mathbf{I} = 540\ \gamma$
Fractional Gaudinos
harged gaudinos geometrically
ervalic symmetries of Nature—
$= \tfrac{1}{3}\ G_6 = 2\ D_{45} = 90\ \mathbf{I} = 180\ \gamma$
$= \tfrac{2}{3}\ G_6 = 4\ D_{45} = 180\ \mathbf{I} = 360\ \gamma$
$= \tfrac{1}{3}\ G_9 = 3\ D_{30} = 90\ \mathbf{I} = 180\ \gamma$
$= \tfrac{2}{3}\ G_9 = 6\ D_{30} = 180\ \mathbf{I} = 360\ \gamma$
$= \tfrac{1}{3}\ G_{15} = 5\ D_{18} = 90\ \mathbf{I} = 180\ \gamma$
$\tfrac{2}{3}\ G_{15} = 10\ D_{18} = 180\ \mathbf{I} = 360\ \gamma$
$= \tfrac{1}{3}\ G_{45} = 15\ D_{6} = 90\ \mathbf{I} = 180\ \gamma$
$= \tfrac{2}{3}\ G_{45} = 30\ D_{6} = 180\ \mathbf{I} = 360\ \gamma$
$= \tfrac{1}{3}\ G_{54} = 18\ D_{5} = 90\ \mathbf{I} = 180\ \gamma$
$= \tfrac{2}{3}\ G_{54} = 36\ D_{5} = 180\ \mathbf{I} = 360\ \gamma$
$= \tfrac{1}{3}\ G_{90} = 30\ D_{3} = 90\ \mathbf{I} = 180\ \gamma$
$= \tfrac{2}{3}\ G_{90} = 60\ D_{3} = 180\ \mathbf{I} = 360\ \gamma$
...
of the 12 fractional (⅓) gaudinos
$\tfrac{1}{3}\ G_6 \leftrightarrow \tfrac{1}{3}\ G_9 \leftrightarrow \tfrac{1}{3}\ G_{15} \leftrightarrow$
$\tfrac{1}{3}\ G_{27} \leftrightarrow \tfrac{1}{3}\ G_{30} \leftrightarrow \tfrac{1}{3}\ G_{45} \leftrightarrow$
$\leftrightarrow \tfrac{1}{3}\ G_{135} \leftrightarrow \tfrac{1}{3}\ G_{270} \leftrightarrow \tfrac{1}{3}\ G_3 \leftrightarrow$
of the 12 fractional (⅔) gaudinos
$\tfrac{2}{3}\ G_6 \leftrightarrow \tfrac{2}{3}\ G_9 \leftrightarrow \tfrac{2}{3}\ G_{15} \leftrightarrow$
$\tfrac{2}{3}\ G_{27} \leftrightarrow \tfrac{2}{3}\ G_{30} \leftrightarrow \tfrac{2}{3}\ G_{45} \leftrightarrow$
$\leftrightarrow \tfrac{2}{3}\ G_{135} \leftrightarrow \tfrac{2}{3}\ G_{270} \leftrightarrow \tfrac{2}{3}\ G_3 \leftrightarrow$
ctional gaudinos can be made from
set of the elementary gaudinos:
$_n \leftrightarrow \tfrac{2}{3}\ G_n + \tfrac{1}{3}\ G_n$
matter is the upper limit of the share
r of the Universe: $\Sigma m_{\text{visible matter}} \leq$
$32)\ c^7 = 6.801347147 \cdot 10^{57}$ (kg)

HARGED GAUDINOS
(Share = 1/16)
netric assembly of Dalinos
Dark matter
rged gaudinos geometrically
ervalic symmetries of Nature—
$G_{18}{}^0, G_{30}{}^0, G_{54}{}^0, G_{90}{}^0, G_{270}{}^0,$
$G_{30}{}^0, \tfrac{1}{3}\ G_{54}{}^0, \tfrac{1}{3}\ G_{90}{}^0, \tfrac{1}{3}\ G_{270}{}^0,$
$G_{15}{}^0, \tfrac{2}{3}\ G_{18}{}^0, \tfrac{2}{3}\ G_{27}{}^0, \tfrac{2}{3}\ G_{30}{}^0,$
${}_4{}^0, \tfrac{2}{3}\ G_{90}{}^0, \tfrac{2}{3}\ G_{135}{}^0, \tfrac{2}{3}\ G_{270}{}^0$

6

LISZTINOS$^{(\pm\frac{1}{3},\ \pm\frac{2}{3})}$
(Share = 1/32)
= Symmetric assembly of Gaudinos
Quarks —49 quarks = 7 lisztinian families × 7 dalinar symmetries—

25 **Uniquarks** (quarks with one allowed charge: ⅓ *or* ⅔)	24 **Isoquarks** (quarks with two allowed charges: ⅓ *and* ⅔)
(35) Quark $L_{\frac{1}{3}}\tfrac{1}{3}G_{6}2D_{45}{}^{(\frac{1}{3})}$ *last radiant decaying quark* (117) Quark $L_{\frac{1}{3}}\tfrac{1}{3}G_{9}3D_{30}{}^{(\frac{1}{3})}$ (350) Quark $L_{1}1G_{9}9D_{30}{}^{(\frac{1}{3})}$ (1,049) Quark $L_{3}3G_{9}27D_{30}{}^{(\frac{1}{3})}$ (1,748) Quark $L_{5}5G_{9}45D_{30}{}^{(\frac{1}{3})}$ (233) Quark $L_{\frac{2}{3}}\tfrac{2}{3}G_{9}6D_{30}{}^{(\frac{2}{3})}$ (699) Quark $L_{2}2G_{9}18D_{30}{}^{(\frac{2}{3})}$ (1,399) Quark $L_{4}4G_{9}36D_{30}{}^{(\frac{2}{3})}$ *former quark charm* (540) Quark $L_{\frac{1}{3}}\tfrac{1}{3}G_{15}5D_{18}{}^{(\frac{1}{3})}$ (1,619) Quark $L_{1}1G_{15}15D_{18}{}^{(\frac{1}{3})}$ (4,857) Quark $L_{3}3G_{15}45D_{18}{}^{(\frac{1}{3})}$ *former quark bottom* (8,095) Quark $L_{5}5G_{15}75D_{18}{}^{(\frac{1}{3})}$ (1,079) Quark $L_{\frac{2}{3}}\tfrac{2}{3}G_{15}10D_{18}{}^{(\frac{2}{3})}$ (3,238) Quark $L_{2}2G_{15}30D_{18}{}^{(\frac{2}{3})}$ (6,476) Quark $L_{4}4G_{15}60D_{18}{}^{(\frac{2}{3})}$ (14,571) Quark $L_{\frac{1}{3}}\tfrac{1}{3}G_{45}15D_{6}{}^{(\frac{1}{3})}$ (43,712) Quark $L_{1}1G_{45}45D_{6}{}^{(\frac{1}{3})}$ (131,135) Quark $L_{3}3G_{45}135D_{6}{}^{(\frac{1}{3})}$ (218,558) Quark $L_{5}5G_{45}225D_{6}{}^{(\frac{1}{3})}$ (29,141) Quark $L_{\frac{2}{3}}\tfrac{2}{3}G_{45}30D_{6}{}^{(\frac{2}{3})}$ (87,426) Quark $L_{2}2G_{45}90D_{6}{}^{(\frac{2}{3})}$ (174,846) Quark $L_{4}4G_{45}180D_{6}{}^{(\frac{2}{3})}$ *former quark top* (25,178) Quark $L_{\frac{1}{3}}\tfrac{1}{3}G_{54}18D_{5}{}^{(\frac{1}{3})}$ (116,564) Quark $L_{\frac{1}{3}}\tfrac{1}{3}G_{90}30D_{3}{}^{(\frac{1}{3})}$ (393,404) Quark $L_{\frac{1}{3}}\tfrac{1}{3}G_{135}45D_{2}{}^{(\frac{1}{3})}$	(69) Quark $L_{\frac{2}{3}}\tfrac{2}{3}G_{6}4D_{45}{}^{(\frac{1}{3},\ \frac{2}{3})}$ *constituent quark of π meson* (104) Quark $L_{1}1G_{6}6D_{45}{}^{(\frac{1}{3},\ \frac{2}{3})}$ (207) Quark $L_{2}2G_{6}12D_{45}{}^{(\frac{1}{3},\ \frac{2}{3})}$ (311) Quark $L_{3}3G_{6}18D_{45}{}^{(\frac{1}{3},\ \frac{2}{3})}$ *former quarks up, down* (414) Quark $L_{4}4G_{6}24D_{45}{}^{(\frac{1}{3},\ \frac{2}{3})}$ (518) Quark $L_{5}5G_{6}30D_{45}{}^{(\frac{1}{3},\ \frac{2}{3})}$ *former quark strange* (50,356) Quark $L_{\frac{2}{3}}\tfrac{2}{3}G_{54}36D_{5}{}^{(\frac{1}{3},\ \frac{2}{3})}$ (75,534) Quark $L_{1}1G_{54}54D_{5}{}^{(\frac{1}{3},\ \frac{2}{3})}$ (151,068) Quark $L_{2}2G_{54}108D_{5}{}^{(\frac{1}{3},\ \frac{2}{3})}$ (226,601) Quark $L_{3}3G_{54}162D_{5}{}^{(\frac{1}{3},\ \frac{2}{3})}$ (302,134) Quark $L_{4}4G_{54}216D_{5}{}^{(\frac{1}{3},\ \frac{2}{3})}$ (377,668) Quark $L_{5}5G_{54}270D_{5}{}^{(\frac{1}{3},\ \frac{2}{3})}$ (233,128) Quark $L_{\frac{2}{3}}\tfrac{2}{3}G_{90}60D_{3}{}^{(\frac{1}{3},\ \frac{2}{3})}$ (349,693) Quark $L_{1}1G_{90}90D_{3}{}^{(\frac{1}{3},\ \frac{2}{3})}$ (699,384) Quark $L_{2}2G_{90}180D_{3}{}^{(\frac{1}{3},\ \frac{2}{3})}$ (1,049,078) Quark $L_{3}3G_{90}270D_{3}{}^{(\frac{1}{3},\ \frac{2}{3})}$ (1,398,771) Quark $L_{4}4G_{90}360D_{3}{}^{(\frac{1}{3},\ \frac{2}{3})}$ (1,748,463) Quark $L_{5}5G_{90}450D_{3}{}^{(\frac{1}{3},\ \frac{2}{3})}$ (786,808) Quark $L_{\frac{2}{3}}\tfrac{2}{3}G_{135}90D_{2}{}^{(\frac{1}{3},\ \frac{2}{3})}$ (1,180,213) Quark $L_{1}1G_{135}135D_{2}{}^{(\frac{1}{3},\ \frac{2}{3})}$ (2,360,424) Quark $L_{2}2G_{135}270D_{2}{}^{(\frac{1}{3},\ \frac{2}{3})}$ (3,540,638) Quark $L_{3}3G_{135}405D_{2}{}^{(\frac{1}{3},\ \frac{2}{3})}$ (4,720,850) Quark $L_{4}4G_{135}540D_{2}{}^{(\frac{1}{3},\ \frac{2}{3})}$ (5,901,063) Quark $L_{5}5G_{135}675D_{2}{}^{(\frac{1}{3},\ \frac{2}{3})}$

Inasmuch as the vast majority of ZCMB decayed into quarks, and as the vast majority of primordial quarks decayed finally into the isoquark $L_{3}3G_{6}18D_{45}{}^{(\frac{1}{3},\ \frac{2}{3})}$—former *quarks up* and *down*—, we can deduce the *maximum number of nucleonic isoquarks* generated at the primordial Universe (taking roughly $m(q) \sim 313$ MeV/c^2):
$n(q) \leq \Sigma m(L^{\pm\frac{1}{3},\ \pm\frac{2}{3}}) / \Sigma m(q) = 1.218937472 \cdot 10^{85}$

ZERO CHARGED LISZTINOS
(Share = 1/32)
= Antisymmetric assembly of Gaudinos
***Bileptons-Z.C.M.Bosons*: Z^0, W^0, Y^0, X^0**
(91,188) $L_{2}2G_{45}90D_{6}{}^{(0)}$: **$Z^0$ *massive boson***
(160,928) $L_{2}2G_{54}108D_{5}{}^{(0)}$: W^0 *massive boson*
(745,037) $L_{2}2G_{90}180D_{3}{}^{(0)}$: **$Y^0$ *massive boson***
(2,514,499) $L_{2}2G_{135}270D_{2}{}^{(0)}$: X^0 *massive boson*

7

MONTEVERDINOS
= Assembly of 3 Lisztinos$^{(\pm\frac{1}{3},\ \pm\frac{2}{3})}$
Baryons

Maximum number of nucleons assembled at the Intervalic Primordial Assembly:
$n(N) \leq \tfrac{1}{3}\ n(q) = 4.063124907 \cdot 10^{84}$.
As the baryon number of the observed Universe is supposed to be empirically around 10^{78}, this means that the real size of the whole Universe would approximately be one million times greater than the observed Universe.

MONTEVERDINOS
= Assembly of 2 Lisztinos$^{(\pm\frac{1}{3},\ \pm\frac{2}{3})}$
Mesons

8

PALESTRINOS
Nuclei: $1 < A \leq 3$
Intervalic structure
made by 8 levels.
Only nuclei with $A \leq 3$ are
composed by nucleons: ^{2}H, ^{3}H, ^{3}He.

Intervalic overall frequorce
$\varphi(N) = I(N) / \hbar$
$\varphi(H) = I(H) / \hbar = c^{\pm 2}\,(e)^{-2} =$
$= 4.334484251 \cdot 10^{20}\ (s^{-1})$
$\varphi(He) = I(He) / \hbar = c^{\pm 2}\,(2e)^{-2} =$
$= 1.083621063 \cdot 10^{20}\ (s^{-1})$

PSEUDO-PALESTRINOS
Nuclei: $A > 3$
Intervalic structure made by 7 levels
(they lack the monteverdic level
of the intervalic structure).
Nuclei with $A > 3$ are not composed by nucleons but by quarks. The traditionally named *binding energy per nucleon* is the energy needed to take out three quarks of a nucleus and to assemble them making the last 7th. level of the intervalic structure of nucleon, namely the monteverdic level (of which all quarks inside a nucleus do lack). In other words, it is the energy needed to "arm" a nucleon starting from the quarks inside a nucleus. By this reason this *nucleon arming energy,* or binding energy per nucleon, ~8 (MeV/c^2), is similar for all nuclei with $A > 3$ disregarding its mass number.

7th. symmetry breaking

6th. symmetry breaking

ELEMENTARY CHARGE ATTRACTOR. 5th. symmetry breaking

CHANGEFUL INTERACTION (formerly weak interaction). 4th. symmetry breaking

ELECTROMAGNETIC INTERACTION. VISIBLE MATTER UNIVERSE. 3rd. symmetry breaking

E. 2nd. symmetry breaking

on). LIGHT UNIVERSE. 1st. symmetry breaking

N (INFORMATIONAL). INFORMATION UNIVERSE. TIMELESS UNIVERSE. Zero symmetry breaking

INTERVALIC BIG CRUNCH

"Some day a door will surely open and expose the glittering central mechanism of the world in its beauty and simplicity. Toward the arrival of that day, no development holds out more hope than the paradox of the gravitational collapse". That day has arrived with IT, and now the mentioned paradox of John A. Wheeler (***The Physicists Conception of Nature***) becomes science-fiction, bad science-fiction —not to say irrelevant and absolutely false—. The assumption of Robert H. Dicke, who postulated the model of an *oscillating Universe*, did not receive the favour of cosmologists because general relativity does not have a mechanism to allow the "bounce" of the Universe; on the contrary, a contracting Universe ends according to general relativity in a *singularity*, where any structure of subatomic particles are supposed to disappear mysteriously. The fact that this absurd prediction involves *infinity* in smallness of spacetime —and therefore the singularity "goes out" of the geometry of Nature— appears to not worry seriously to cosmologists, a detail that I personally can not understand. As the intelligent female reader may divine, we are entering in one of the most fascinating fields of IT: the inner relation between microcosmos and macrocosmos, between particle physics and general relativity, the "Physics' lost link" of Nature up to present. Although here we can't comment this crucial subject, which will be described in the Intervalic Cosmology, we have to say at least two words in advance. (By the way, Hawking's black hole radiation is as false as Wheeler's phrase since there is no structureless star in the Universe).

According to modern cosmology, a *neutron star* with a mass greater than approximately five solar masses will collapse indefinitely becoming a black hole, and immediately later a singularity. On the contrary, according to Intervalic Cosmology a neutron star will not collapse into a singularity by no means. Lets remember the phases of IPS: intervalino synthesis, dalino synthesis, gaudino synthesis, lisztino synthesis, monteverdino synthesis and palestrino synthesis. In every of these steps a huge amount of binding energy is converted into gravitational energy and released through their corresponding explosions as the Universe expands and cools down. Well, starting from a neutron star begins just the inverse process: an intervalic disaggregation of intervalic structures. If a neutron star have got much more than five solar masses and reaches a critical mass, the gravitational energy will be converted into binding energy and the star will collapse and heat as the stellar spacetime implodes, making a *quark star*. Once the magnitudes of the binding energy of all intervalic structures are known, the details on the calculation of the critical masses of stars to make the next star type is straightforwardly obvious. A similar process will be repeated with the quark star to make a *gaudino star*, which critical mass is of course much more greater than the one of the quark star. The same way, the heaviest gaudino stars will collapse into *dalino stars*, and these ones will finally collapse into an *intervalino star* approaching to the Big Crunch. In other words, just the opposite way of IPS:

White dwarf
↓
Neutron star
↓
Quark star
↓
Gaudino star
↓
Dalino star
↓
Intervalino star

These collapses are detectable from the Earth: apart from supernovae which leaves a neutron star, they are no other than the unexplained X-ray bursts and γ-ray bursts. Of course, no one intervalino star will be made until the end of the Universe, when it is near to collapse into the Big Crunch, and then "bounce" once more into a new renovated Big Bang.

Another unexplained body of the Universe are the active galactic nuclei, AGN and among them the most extreme ones are the quasars. They are fascinating stars of the intervalic cosmology. AGN are highly compact and emit energy at an enormous rate, but the most challenging feature is that their spectrum does not match with the radiation that normally produces any star or gas or whatsoever body composed by atoms. Their spectrum spread continuously from radio waves to γ-ray. All these features fit with a star which is like a factory of intervalic structures, that is to say, a star in which there is still happening the intervalic assembly of the last intervalic structures: from gaudino to palestrino and atoms. Thus the star would have a onion-like disposition by capes: in the core there will be assembled gaudinos from dalinos, in the second cape there will be made lisztinos from gaudinos, in the third one there will be assembled monteverdinos from lisztinos, and in the last capes there can be made palestrinos and Hydrogen and Helium atoms.

It is clear that there are no singularities in the Universe due to two main reasons:

1) There is no any structureless star because any star is composed by some intervalic structures; inclusive the most imaginable compact stars will be composed by monteverdinos or lisztinos or gaudinos or dalinos or intervalinos, apart from gravitons and photons. The supposition of SM that a collapsing neutron star makes the total decay of matter in pure "mass" without

any physical substance and in pure “electric charge” in a similar way, only can be appraised as one of the most fantastic assumptions ever proposed.

2) The infinite magnitudes of some physical quantities involved by singularities are simply not allowed by the intervalic geometry: the intervalic limits and quanta can not be surpassed by no means. The behaviour of matter when any physical quantity approaches to those limits and quanta is completely determined in the Intervalic Space by the intervalic transformations, of which the unique known before was the former Lorentz-Einstein transformations, which is only one transformation set among a lot of them: that one regarding velocity —but each one of the 16 physical quantities which have got intervalic limits has its own transformation set, and not solely the intervalic velocity—.

Among other consequences, this means that the fantastic evaporating small holes predicted by Hawking may be amusing science-fiction but bad science, since there are no such “small” black holes in the Universe. Please note that no one supposed black hole, regardless of its mass-energy, can surpass the intervalic limits of physical quantities. Therefore, although black holes may exist —being the Universe as a whole the most important of them—, their physical features are very different to those ones that have been postulated, and singularities are not allowed in the Intervalic Space by no means. I am afraid that the end of theoretical Physics —also erroneously postulated by Hawking— is much more far away than he ever thought.

In the mechanism of the “bounce” of the Intervalic Big Crunch into a new Intervalic Big Bang the magic of IT arises once more: here we find laws and symmetries pertaining to the three main fields in which may be divided IT in Physics: Intervalic Cosmology (the intervalic symmetries of gravitation, which enhances General Relativity), the Intervalic Geometry of Physics (the geometric transformations of physical quantities in the intervalic space, which enlarges special relativity), and the own IT in Particle Physics (direct IPS at the Big Bang and inverse IPS at the Big Crunch). At this step the Universe is composed only by the three fundamental particles of Nature: spin 1 photon —closed string—, and its two derived particles made from its two possible assemblies: in antisymmetric state under interchange —spin 0 intervalino— and in symmetric state under interchange —spin 2 graviton—.

Of course, the supposed unification of the four forces of Nature postulated by SM is one more gross mistake to add to a long list. As the intervalic structures which are source of interaction ceases to exist in the Universe (through the disassembly in its constituent deeper intervalic structure) their corresponding interactions disappear simply and necessarily. Thus, the disappearing of gaudinos come along with the changeful intervalic interaction, and the disappearing of dalinos come along with the electromagnetic interaction. Thus, in the Three Particles Universe —photon (closed string), graviton and intervalino— the only existing interactions are the changeless intervalic and the gravitational, just in the same manner, but opposite way, as it happened in IPS.

Finally, one of the basic principles of IT is that the total energy of the Universe is zero. Logical and aesthetical reasons make this assumption practically indispensable in IT. Now is the moment to remember that the total energy of an oscillating Universe, like the Intervalic one, is exactly zero. This result was already probed and proved in 1934 by Richard C. Tolman in his book ***Relativity Thermodynamics and Cosmology***, and also appears in the well known textbook by L. D. Landau and E. M. Lifshitz ***The Classical Theory of Fields*** (1962). To postulate that the total energy of the Universe is not zero, like SM leads to and the model of inflation affirms, is so uneconomic and inelegant that we are not willing to consider that the Great Architect could have made so clumsy and miserable creation. Definitively "God does not play dice" (and much less, the trick dice which plays SM).

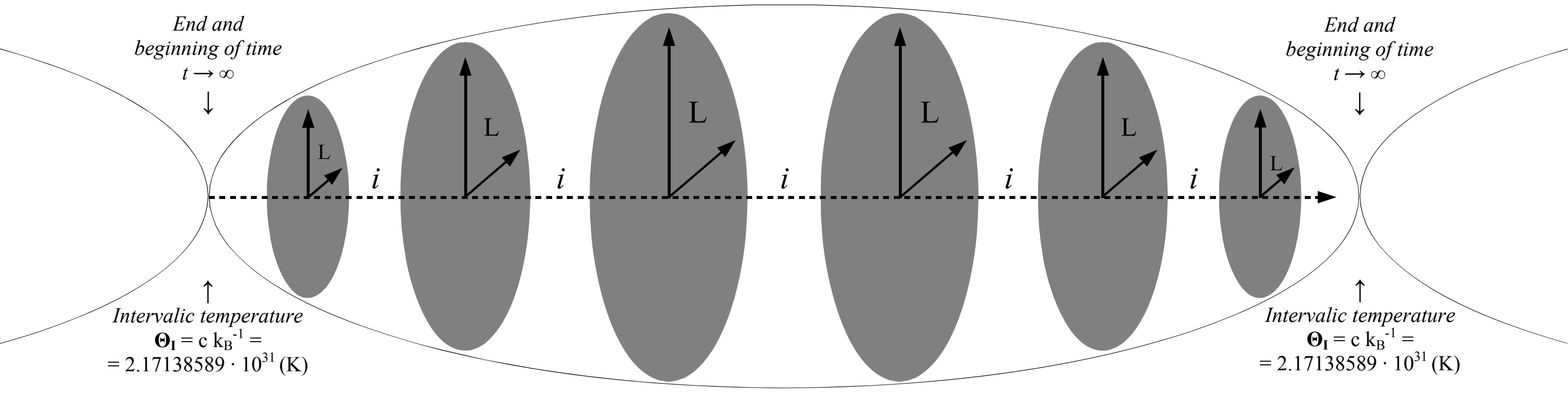
THE OSCILLATING INTERVALIC UNIVERSE

The intervalic dimension of all intervalic physical quantities is made from a combination of the dimensional basis (L, *i*). According to the epistemological rank of the Intervalic System of Units (of which lack completely the other dimensional systems), this involves that the unique physical stuff of which is made the Universe is (L, *i*), whose units are respectively the geometric quantum and limit ħ and c.

The dimension (L) can be interpreted as *space*, *information* or *consciousness* —anyone of these terms involve the two others—. The dimension (*i*) = (√-1), being by definition an *imaginary* number, has not got actual existence in the real space. This is the reason why the fourth dimension apparently does not *stay* like the other three real ones: it is just imaginary.

Both dimensions (L, *i*) are completely unfolded at each oscillation —from the beginning to the end of time—, which makes a full universe.

Photonful particles can only be forever moving at the rate of the speed of light in spacetime because c is just the unit of the imaginary axe, so they are actually "at rest" in an unfolded universe. Nevertheless *photonless* particles do not move in *spacetime* but in *space*, and therefore they have not such constraint. In this way intervalic strings —*consciousness*— has full access to its own *information* as it remains itself.



Chapter 24

CHANGELESS —STRONG— INTERVALIC INTERACTION

INTRODUCING CHANGELESS —STRONG— INTERVALIC INTERACTION

We name *changeless* —strong— intervalic interaction to that intervalic interaction where there is no change in the intervalic structure of the particles involved in the interaction, that is to say, this interaction holds the structure of subatomic particles. On the contrary, we name *changeful* —weak— intervalic interaction to that one where there is a change in the intervalic structure of the subatomic particles, which ever goes towards a state of lower structural energy.

The Yukawa potential tries to explain the strong interaction as it was similar to a classic force, but there is something wrong in the classic concept of force. Perhaps, a deeper comprehension of this phenomenon can be achieved when understanding the physical meaning of the *frequorce*, a physical quantity derived from the logical merging of the former *frequency* and *force* in intervalic dimensions. In a nutshell, we can say that 'frequency' and 'force' are two names for a unique underlying physical quantity, the 'frequorce'. We name it as 'force' at macroscopic scale and as 'frequency' at quantum scale. But we have to be aware that macroscopic concepts are always mere approximations or simplifications at large scale of the truthful intervalic concepts at quantum scale. To this respect it could perhaps be useful to remember briefly example on the similitude that arises in the Einstein equation of the quantization of energy, $E = n\hbar\ \varphi$. Showing its intervalic dimensions between brackets, we have: $E\ (i^{-1}) = n\hbar\ (L)\ \varphi\ (i^{-1}L^{-1})$, where φ is the frequorce —or frequency-force—. At macroscopic scale the quantization of the intervalic length, ħ, is not measurable, and therefore we have the identity $n\hbar \equiv s$, which yields directly the classic formulation of macroscopic energy (force times space): $E = s\ \varphi$.

According to IT, *force* is no other thing that the propensity of a body to reach a state of lowest energy. When it is reached, force disappears. Therefore we can suppose properly that there no exists any strong force acting between quarks or nucleons, as like as there no exists any gravitational force acting between stars and planets according to General Relativity. Both quarks and stars follows geodesics and do not feel any force unless they leave geodesics. Thus, *frequorce* —or frequency-force— can be defined in IT as *the propensity of a particle to stay in a geodesic*. The difference of energy when it is *in* and *out* a geodesic is named *energy interval*, from which is derived the magnitude of the classic force. The so named *confinement* of constituent subparticles is no other than the huge energy interval due to the short ranged intervalic interaction in the aggregation of intervalinos, dalinos, gaudinos and lisztinos to make the subatomic particles. On the contrary, the energy interval of gravitational energy is much more smaller, and by this reason we do not talk about confinement regarding gravitational force.

The intervalic interaction is short ranged since the energies involved in a typical intervalinar interaction are $\sim 10^9$ greater than the energies involved in the corresponding electromagnetic interaction. As intermediate state, or equally from the point of view of the information theory, the transmission of that huge amount of information containing the intervalic structures of the involved particles can't be carried out by a long ranged massless particle. Thus, it can be deduced that the interaction is short ranged because its intermediate particles have mass, and vice versa, as it is sometimes supposed in the traditional view but without an accurate understanding of the whole picture. According to this, the deduction of the π meson by Yukawa, using ad hoc the supposed rough distance between nucleons in the nucleus, can perhaps be considered as a deduction by chance, since an analogous deduction has failed in the case of quarks, having been postulated the gluon field —one more gross mistake to add on the account of SM—. Really, the intervalic symmetries are so powerful that it is not surprising that they could be indirectly deduced starting from different points, but a fortunate chance is very different to understand properly the foundations and the underlying symmetries of Nature.

The bosons of the strong intervalic interaction in SM is painfully confusing since particles so different as gluons, pions and perhaps other mesons are supposed to be involved in the interaction. On the contrary, IT postulates that the holding of the intervalic structure of particles is carried by means of the exchange frequorce corresponding to the intervalic energy of the intervalic structures involved. According to this, the intervalic interaction is short ranged, and should have a lot of bosons corresponding to each level of the intervalic structure. Apart form the conservation of quantum numbers and other traditional laws, in those bosons must come together all the constraints derived from the intervalic structures involved. Thus, the bosons masses and intervalic structures should be:

1st.) in agreement with the distance between the particles involved (if such bosons are considered as virtual or intermediate states),

2nd.) in agreement with the intervalic structures allowed for that bosons derived from the intervalic symmetries for all subatomic particles, and

3rd.) in agreement with the proper intervalic structures of the particles which they intermediate, since if the changeless intervalic interaction is an exchange frequorce, it can be supposed that its bosons will be the own particles or a fraction of those particles, whenever it is allowed by the constraints of the intervalic structure.

Following these premises we can already go to study the changeless intervalic interaction among all massful particles at the diverse levels of the intervalic structure. Thus, depending on the subatomic particles involved in the interaction, we can talk about intervalinar interaction, dalinar interaction, gaudinar interaction, lisztinian interaction and, finally, monteverdic interaction, which are respectively the names of the same intervalic interaction when it takes place between intervalinos, dalinos, gaudinos, lisztinos (quarks) and monteverdinos (nucleons). If we think a moment about this result, we will conclude that it appears to be a necessary feature of any short ranged interaction, since each order of magnitude of the range of interaction needs its proper intermediate *massive* boson, while in long ranged interactions a unique *massless* boson serves for all ranges. This logic conclusion is now clear by means of the study on the intervalic interaction.

Please note carefully one of the most important features of the short ranged interaction which is lamentably misunderstanding by SM. As the intervalic energy equation shows, $I = c^{\pm 2} \hbar Q^{-2}$, the strength of the intervalic interaction does not rely on the *distance* in the same way as the long ranged ones do: it simply *does exist inside* its short range, determined by and derived from the intervalic energy and *does not exist outside* that short range (of course, the own short range is an intervalic or quantum magnitude but this is irrelevant compared with the classic long range features of fields). This *discrete* behaviour is the quintessence of Quantum Mechanics, in opposition to the *continuous* behaviour of Classic Mechanics. The quantum phenomena appears just and ever we go down along the microscopic scale as to break with the continuous behaviour of the macroscopic world, or to say the same with mathematical rigour, whenever the *intervalic quantum of length, ħ*, is involved. To pretend that the strength of a short ranged interaction decreases *continuously* according to the distance means a complete misunderstanding of the most elementary quantum principles —and *a fortiori*, of the foundations of the intervalic geometry—. This kind of gross mistake is the responsible of the postulation of the Yukawa potential. The “quantum” potential of a short ranged interaction can’t by no means be continuous like the “classic” potential of a long ranged one.

From now on, we will name as ‘meson’ to the particle that intermediate the changeless —strong— intervalic interaction between any particles disregarding its intervalic structure, that is to say, such intermediate mesons may or may not be composed by a pair of quarks.

CHANGELESS INTERVALIC INTERACTION AT MONTEVERDIC LEVEL: THE INTERMEDIATE MESON BETWEEN NUCLEONS

At monteverdic level we find the intervalic interaction among the constituent monteverdinos of the only three existing palestrinos: the nucleus of ^2H, ^3H and ^3He. Since it is experimentally known the distance between nucleons in such nucleus, $d_N \approx 1.9 \cdot 10^{-15}$ (m), which is close to the deuteron radius, r(^{2}H nucleus) = $1.963 \cdot 10^{-15}$ (m), the mass of the corresponding intermediate meson will be:

$$m \approx c^{-1}\hbar / d_N = 103.96109 \ (\mathrm{MeV}/c^2)$$

That meson can be *virtual*, as it is traditionally supposed. But we also could postulate an alternative more powerful constraint: such meson should be a part of the own intervalic structures which are interacting intervalically. Of course, that part must have its own independent intervalic structure according to the usual principles of the intervalic symmetries. If this was the case, such meson could be not only virtual but *real*, as its mass added to the fractioned particle sums the same value as the original particle before fractioning. What could be that particle which intermediates the changeless —strong— intervalic interaction between nucleons?

First of all we can remember the intervalic structure of some of those few existing palestrinos, for example, the deuteron:

^{2}H nucleus: $P_2 = 2\ M_3 = 6\ L_3 = 18\ G_6 = 108\ D_{45} = 4860\ \mathbf{I}$

We don't need to looking for further. Immediately it is clear that deuteron is composed by 2 nucleons M_3, each nucleon is composed by 3 quarks or fractional lisztinos L_3, each quark is composed by 3 gaudinos G_6, each gaudino is composed by 6 dalinos D_{45}, and each dalino is composed by 45 intervalinos **I**. As if the great architect of Nature would have prepared previously the picture, the mass of the gaudino 6, constituent of nucleons, matches exact and precisely with the required mass of the intermediate meson. This gaudino 6 is, at once, a degenerate fractional lisztino 1, that is to say, the light quark $L1D45^{(\frac{1}{3},\, \frac{2}{3})}$ which intervalic structure and mass are:

quark $L1D45^{(\frac{1}{3},\, \frac{2}{3})}$: $L_1 = 1\ G_6 = 6\ D_{45} = 270\ \mathbf{I} = 103.61263\ (\mathrm{MeV}/c^2)$

As it is intended that the changeless intervalic interaction between nucleons —which intervalic structure is, namely: $M_3 = 3\ L_3 = 9\ G_6 = 54\ D_{45} = 2430\ \mathbf{I}$— is taking place continuously, the intervalic exchange state of the constituent nucleons will be, at the lisztinian and gaudinar levels:

$3\ L_3 \leftrightarrow (\ 2\ L_3,\ 1\ L_2\ ) + 1\ L_1$
$9\ G_6 \leftrightarrow 8\ G_6 + 1\ G_6$

where $L_1 = G_6$ is the lisztino L1D45, which is the meson that intermediates the monteverdic interaction (see picture). Remembering the isocharge values of the three constituent gaudinos of quarks, namely:

$u^{+\frac{2}{3}} = L_3 = (G_6^{+\frac{2}{3}}, G_6^{-\frac{1}{3}}, G_6^{+\frac{1}{3}}) = 18\ D_{45} = 810\ \mathbf{I}$
$d^{-\frac{1}{3}} = L_3 = (G_6^{-\frac{1}{3}}, G_6^{+\frac{1}{3}}, G_6^{-\frac{1}{3}}) = 18\ D_{45} = 810\ \mathbf{I}$

it appears to be clear that the isocharge of meson could be: $L_1 = G_6^{+\frac{1}{3}}$, and the exchange state of nucleons should be:

$p^{+} \leftrightarrow [\ u^{+\frac{2}{3}} + d^{-\frac{1}{3}} + (G_6^{+\frac{2}{3}}, G_6^{-\frac{1}{3}})^{+\frac{1}{3}}\ ]^{+\frac{2}{3}} + G_6^{+\frac{1}{3}}$
$n^{0} \leftrightarrow [\ u^{+\frac{2}{3}} + d^{-\frac{1}{3}} + (G_6^{-\frac{1}{3}}, G_6^{-\frac{1}{3}})^{-\frac{2}{3}}\ ]^{-\frac{1}{3}} + G_6^{+\frac{1}{3}}$

It can be noted that no particle with zero charge is involved in the intervalic exchange state, as the neutron has been divided into a diminished monteverdino with -⅓ charge and the meson $L_1^{+\frac{1}{3}}$. Besides, the magnitudes of the charges of the three constituent quarks of nucleons in the intervalic exchange state are just interchanged between proton and neutron, so the sum of the magnitudes of the intervalic energy of both nucleons at the lisztinian level of compositeness remains constant.

$$p^{+} = (\tfrac{2}{3}, \tfrac{2}{3}, \tfrac{1}{3})^{5/3} \leftrightarrow (\tfrac{2}{3}, \tfrac{1}{3}, \tfrac{1}{3})^{4/3}$$
$$n^{0} = (\tfrac{2}{3}, \tfrac{1}{3}, \tfrac{1}{3})^{4/3} \leftrightarrow (\tfrac{2}{3}, \tfrac{1}{3}, \tfrac{2}{3})^{5/3}$$

This picture appears to be satisfactory. However we should discuss the meson isocharge values, as it appears to be allowed that an intermediate meson can have a fractional charge of the elementary one. If it would the elementary charge, such particle would be no other than the muon (!), which intervalic structure is identical to $\mathrm{L1D45}^{(\frac{1}{3}, \frac{2}{3})}$ with the only difference of the isocharge value. According to traditional view, if that muon was not a boson the intercharge should involve a muon and an antimuon; or if that was not the case yet, the intermediate meson should be a boson composed by the assembly of the quarks $\mathrm{L}\tfrac{1}{3}\mathrm{1D45}^{(\frac{1}{3})}$ and $\mathrm{L}\tfrac{2}{3}\mathrm{D45}^{(\frac{2}{3})}$ and its total charge would equally be ±1. But please note that when the intermediate gaudino $\mathrm{G}_{6}^{+\frac{1}{3}}$ leaves the quark, the two remaining gaudinos which compose now the quark make that the fractioned quark plays the role of boson and the conservation of spin is anyway preserved. This comment is applicable to the meson considered as real state; if it is considered only as a virtual state the intermediate mesons will simply be a boson in the traditional way.

CHANGELESS INTERVALIC INTERACTION AT LISZTINIAN LEVEL: THE INTERMEDIATE MESON BETWEEN QUARKS

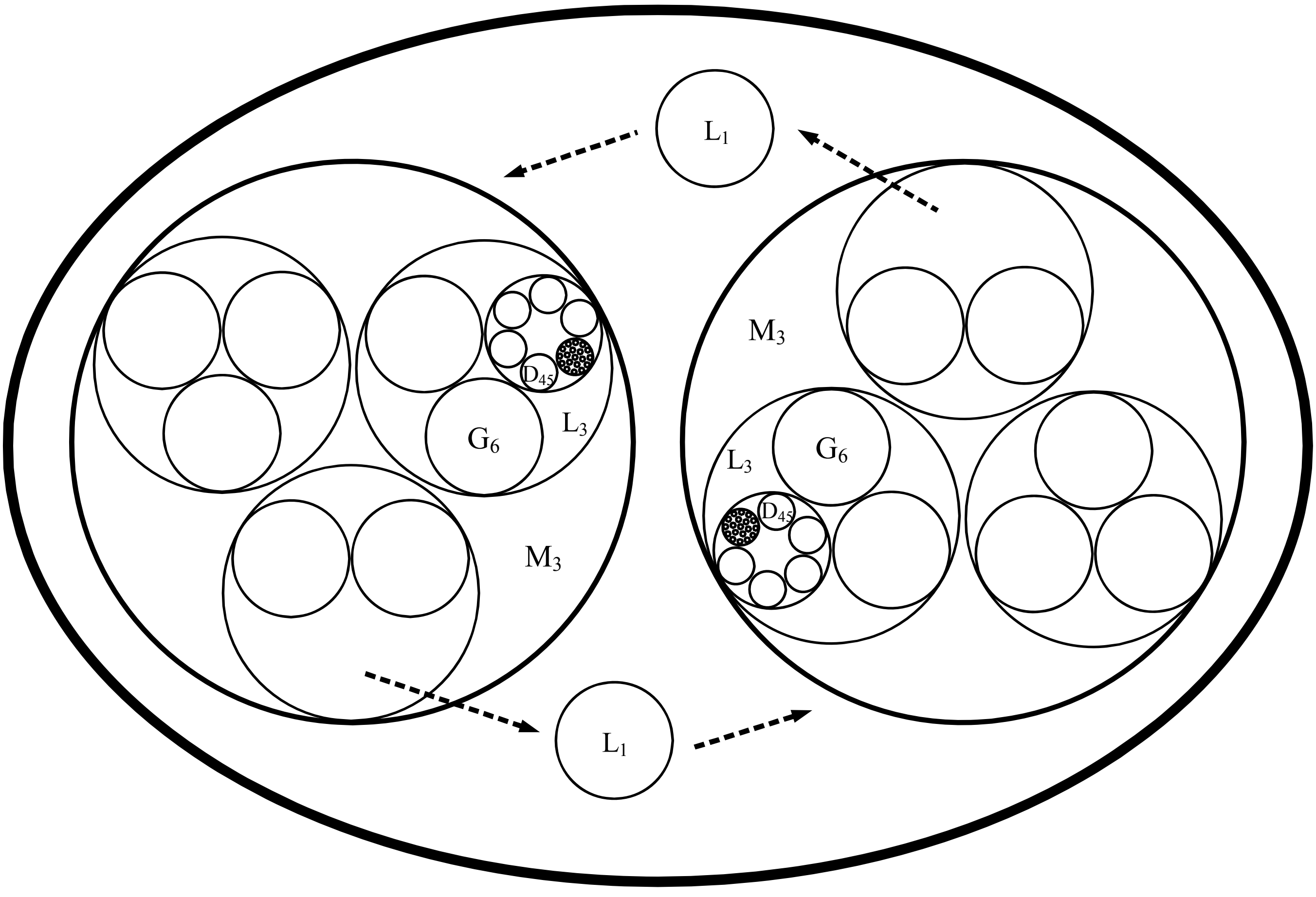
INTERMEDIATE MESON BETWEEN QUARKS INSIDE NUCLEON

At lisztinian level we find the changeless intervalic interaction among the constituent lisztinos of *baryons* and *mesons*. Obviously, we are going to focus principally our attention on *nucleons*.

We have seen that the distance among nucleons in the palestrinian nucleus is $\sim 1.9 \cdot 10^{-15}$ (m), which determine an intermediate boson of mass $m \approx c^{-1}\hbar / d_{N} = 103.96109$ (MeV/c^{2}). However the mass is enough greater than this one, and since all involved magnitudes appear to be well based, we are compelled to postulate that the changeless —strong— intervalic interaction intermediated by the π meson must take place in deeper levels of the intervalic structure, probably in the next one: the lisztinian level, that is to say, the intervalic interaction between quarks.

We already know experimentally the mass of the π meson = 139.57 (MeV/c^2). Considered as intermediate state, the range of the distance intermediated by the π meson is:

$$d_\pi = c^{-1}\hbar / m_\pi = 1.4152474 \cdot 10^{-15} \text{ (m)}$$



Figured intervalic exchange structure of deuteron showing the intermediate meson of the changeless —strong— intervalic interaction between its two constituent nucleons: L1D45 = 103.61263 (MeV/c^2)

If we would know a distance between intervalic structures similar to this one, it could be postulated that the π meson could be the meson which intermediates the changeless intervalic interaction between such particles. Of course we have introduced the π meson here because we already know with great exactness, by means of IT, which is the distance between quarks inside nucleons:

$$d_q = 1.37610877 \cdot 10^{-15}\ (\mathrm{m})$$

Therefore we have $d_\pi \approx d_q$, being d_π slightly greater than d_q, which is a superb confirmation about the involvement of the π meson in the changeless —strong— intervalic interaction between quarks inside nucleon, since the related mass derived from the distance intermediated between quarks is:

$$\mathrm{m} = \mathrm{c}^{-1}\hbar \,/\, d_q = 2.299758624 \cdot 10^{-11}\ (\mathrm{J}) = 143.5395809\ (\mathrm{MeV/c}^2)$$

Imagining for a moment that we would know nothing about the π meson. Then the corresponding allowed intervalic structures pertaining to the intervalic structure of nucleonic quark closer to that mass only can be the constituent gaudinos 6 of quarks, which at once are degenerate lisztinos, that is to say, light quarks of {D45} symmetry. They are, namely:

$L_{⅓} = ⅓\ G_6 = 2\ D_{45}$ = 34.537545—36.791934 → quark L⅓D45$^{(⅓)}$
$L_{⅔} = ⅔\ G_6 = 4\ D_{45}$ = 69.075090—73.583868 → quark L⅔D45$^{(⅓,\ ⅔)}$
$L_1 = 1\ G_6 = 6\ D_{45}$ = 103.61263—110.37580 → quark L1D45$^{(⅓,\ ⅔)}$
$L_2 = 2\ G_6 = 12\ D_{45}$ = 207.22526—220.75160 → quark L2D45$^{(⅓,\ ⅔)}$

If a meson has to fit with that mass, it can take only the some of the three following intervalic structures, which masses are in all cases 138.15018—147.16773 (MeV/c^2):

$4\ L_{⅓} = 4\ ⅓\ G_6 = 8\ D_{45}$
$2\ L_{⅔} = (4/3)\ G_6 = 8\ D_{45}$
$[L_1 = 1\ G_6 = 6\ D_{45}] + [L_{⅓} = ⅓\ G_6 = 2\ D_{45}] = 8\ D_{45}$

The difference among those structures lies only on the distinct way in which the eight constituent dalinos 45 of π meson are grouped. They are respectively:

$4\ L_{⅓} = 2\ D_{45} + 2\ D_{45} + 2\ D_{45} + 2\ D_{45}$
$2\ L_{⅔} = 4\ D_{45} + 4\ D_{45}$
$L_1 + L_{⅓} = 6\ D_{45} + 2\ D_{45}$

These intervalic structures are no other than the possible intervalic structures of the π meson (which involves up to three different lisztinos or quarks without any change in the dalinar structure, an astounding show of logical economy and elegance). Although for our purpose at this moment it is irrelevant to know the exact manner in which the constituent dalinos 45 of π meson are grouped, we will suppose it is $2\ L_{\frac{2}{3}} = 4\ D_{45} + 4\ D_{45}$. In practice the last two ways are equivalent (the intervalic structure of the $\pi^{\pm}$ and π^{0} mesons have been discussed and described with detail in other site). Thus, the previously known intervalic assembly of dalinos 45 inside nucleonic quark in groups of six, composing three gaudinos 6:

$$q = 6\ D_{45} + 6\ D_{45} + 6\ D_{45}$$

will be transformed when the intervalic interaction between quarks is involved through the π meson in the following intervalic exchange structure:

$$q = 8\ D_{45} + 4\ D_{45} + 6\ D_{45}$$

Therefore the π meson would not necessarily be a *virtual* particle but a *real* one, since it is incorporated into the intervalic structure of the nucleonic quarks, being a fraction of them.

Thus, the usual gaudinar structure of nucleonic quarks, namely:

$$u^{+\frac{2}{3}} \rightarrow L_3 = G_6^{+\frac{2}{3}} + G_6^{-\frac{1}{3}} + G_6^{+\frac{1}{3}} = 18\ D_{45} = 810\ \mathbf{I}$$
$$d^{-\frac{1}{3}} \rightarrow L_3 = G_6^{+\frac{1}{3}} + G_6^{-\frac{1}{3}} + G_6^{-\frac{1}{3}} = 18\ D_{45} = 810\ \mathbf{I}$$

is likewise converted into an intervalic exchange structure, which curiously is different for every quark when forming part of proton or of neutron:

$$u(p) = \left(\tfrac{2}{3}G_6^{+\frac{2}{3}} + \tfrac{2}{3}G_6^{+\frac{1}{3}} \right) + G_6^{-1} + \tfrac{2}{3}G_6^{+\frac{2}{3}} =$$
$$= \pi^{+} + G_6^{-1} + \tfrac{2}{3}G_6^{+\frac{2}{3}} = 18\ D_{45} = 810\ \mathbf{I}$$

$$d(p) = \left(\tfrac{2}{3}G_6^{+\frac{2}{3}} + \tfrac{2}{3}G_6^{+\frac{1}{3}} \right) + G_6^{-1} + \tfrac{2}{3}G_6^{-\frac{1}{3}} =$$
$$= \pi^{+} + G_6^{-1} + \tfrac{2}{3}G_6^{-\frac{1}{3}} = 18\ D_{45} = 810\ \mathbf{I}$$

$$u(n) = \left(\tfrac{2}{3}G_6^{-\frac{2}{3}} + \tfrac{2}{3}G_6^{-\frac{1}{3}} \right) + G_6^{+1} + \tfrac{2}{3}G_6^{+\frac{2}{3}} =$$
$$= \pi^{-} + G_6^{+1} + \tfrac{2}{3}G_6^{+\frac{2}{3}} = 18\ D_{45} = 810\ \mathbf{I}$$

$$d(n) = \left(\tfrac{2}{3}G_6^{-\frac{2}{3}} + \tfrac{2}{3}G_6^{-\frac{1}{3}} \right) + G_6^{+1} + \tfrac{2}{3}G_6^{-\frac{1}{3}} =$$
$$= \pi^{-} + G_6^{+1} + \tfrac{2}{3}G_6^{-\frac{1}{3}} = 18\ D_{45} = 810\ \mathbf{I}$$

The dalinar structure of $\pi^{\pm}$ meson is (please remember that dalino is a spin 0 boson with its 45 constituents intervalinos in a symmetric state under interchange, because of that all intervalinos inside any dalino must necessarily have *like* charges):

$$\pi^{+} = [(D_{45}^{+}, D_{45}^{+}, D_{45}^{+}, D_{45}^{+}), (D_{45}^{+}, D_{45}^{+}, D_{45}^{+}, D_{45}^{-})]$$
$$\pi^{-} = [(D_{45}^{-}, D_{45}^{-}, D_{45}^{-}, D_{45}^{-}), (D_{45}^{-}, D_{45}^{-}, D_{45}^{-}, D_{45}^{+})]$$

And the dalinar structure of the intervalic exchange structure of the nucleonic quarks will obviously be:

$$u^{+\frac{2}{3}}(p) = \pi^{+} + [(D_{45}^{-}, D_{45}^{-}, D_{45}^{-}, D_{45}^{-}, D_{45}^{-}, D_{45}^{-}), (D_{45}^{+}, D_{45}^{+}, D_{45}^{+}, D_{45}^{+})]^{-1/3}$$

$$d^{-\frac{1}{3}}(p) = \pi^{+} + [(D_{45}^{-}, D_{45}^{-}, D_{45}^{-}, D_{45}^{-}, D_{45}^{-}, D_{45}^{-}), (D_{45}^{-}, D_{45}^{-}, D_{45}^{-}, D_{45}^{+})]^{-4/3}$$

$$u^{+\frac{2}{3}}(n) = \pi^{-} + [(D_{45}^{+}, D_{45}^{+}, D_{45}^{+}, D_{45}^{+}, D_{45}^{+}, D_{45}^{+}), (D_{45}^{+}, D_{45}^{+}, D_{45}^{+}, D_{45}^{+})]^{+5/3}$$

$$d^{-\frac{1}{3}}(n) = \pi^{-} + [(D_{45}^{+}, D_{45}^{+}, D_{45}^{+}, D_{45}^{+}, D_{45}^{+}, D_{45}^{+}), (D_{45}^{-}, D_{45}^{-}, D_{45}^{-}, D_{45}^{+})]^{+2/3}$$

Showing only the like or unlike charges of the constituent dalinos, the compositeness will be:

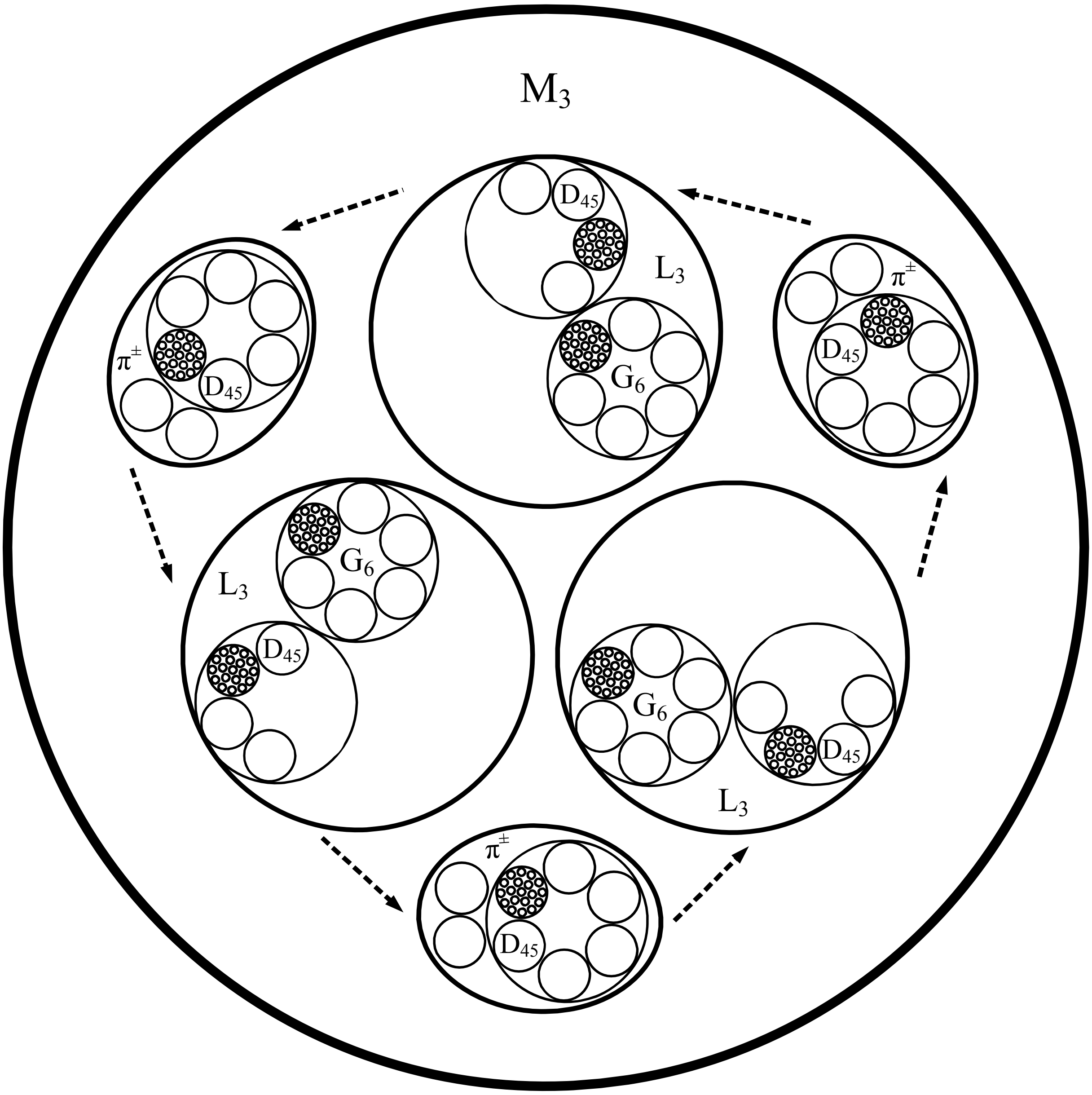
$$\pi^{+} = [(++++)^{+\frac{2}{3}}, (+++-)^{+\frac{1}{3}}]$$
$$\pi^{-} = [(----)^{-\frac{2}{3}}, (---+)^{-\frac{1}{3}}]$$
$$u^{+\frac{2}{3}}(p) = \pi^{+} + [(------), (++++)]^{-1/3}$$
$$d^{-\frac{1}{3}}(p) = \pi^{+} + [(------), (---+)]^{-4/3}$$
$$u^{+\frac{2}{3}}(n) = \pi^{-} + [(++++++), (++++)]^{+5/3}$$
$$d^{-\frac{1}{3}}(n) = \pi^{-} + [(++++++), (---+)]^{+2/3}$$

As can be easily seen in the picture, the intervalic structure of nucleonic quarks is a dynamic structurefulness which is continuously in the following exchange state:

$$L_3 = 3\ G_6 = 18\ D_{45} = 6\ D_{45} + 6\ D_{45} + 6\ D_{45} \leftrightarrow 8\ D_{45} + 4\ D_{45} + 6\ D_{45}$$

Heavier quarks of {D30}, {D18}, {D6}, {D5}, and so on dalinar families have, of course, their corresponding intermediate mesons of the changeless —strong— intervalic interaction, which masses and intervalic structures can be deduced in a similar way as we have done for the nucleonic quarks of {D45} symmetry.

Thus, we can see that the apparently quite matter is no other than an incessant movement, and not only at deep levels of the intervalic structure or at



Figured intervalic exchange structure of nucleon showing the intermediate meson of the changeless —strong— intervalic interaction between its constituent quarks: the π meson, $L\frac{2}{3}D45^{(\frac{1}{3},\,\frac{2}{3})}\,L\frac{2}{3}D45^{(\frac{1}{3},\,\frac{2}{3})} = 139.57$ *(*MeV/c^2*). In order to clarity of sight, the intervalic structure of π meson has been drawn as (*$6D_{45}$*,* $2D_{45}$*) instead of the equivalent one also mentioned (*$4D_{45}$*,* $4D_{45}$*).*

the root level of the intervalic string, but inclusive at the last levels. The own intervalic structure of at all and every levels in no other than an eternal changing movement. Once more we find in the core of the intervalic structure one of the purest examples of quantum paradigm regarding the indeterminacy of intervalic structures at quantum scale, but in a very different way than the traditional interpretation, as IT does not play dice.

INTERMEDIATE MESON BETWEEN QUARKS INSIDE NUCLEUS

According to IT all nucleus above ^{3}He may be composed by nucleonic gaudinos and we will describe its corresponding intermediate meson later. Nevertheless, it could be interesting to study what would happen if we would suppose that nucleus was composed by quarks, instead of gaudinos. Since it is experimentally know that the radius of nucleus follows the relation:

$$R = r_0\, A^{⅓}$$

where $r_0 \approx 1.2 \cdot 10^{-15}$ (m), we can deduce in an analogous way the average distance between the now supposed constituent lisztinos of nucleus:

$$d_{L3} \approx 1.9 \cdot 10^{-15} / 3^{⅓} = 2.740274184 \cdot 10^{-15} \text{ (m)}$$

The corresponding mass of the intermediate meson would be:

$$m(\mathit{L_3\ meson}) \approx c^{-1}\hbar / d_{L3} = 72.08259569 \text{ (MeV/c}^2\text{)}$$

And the most simple allowed allowed intervalic structure closer to that mass and pertaining to the same dalinar 45 symmetry of nucleus would be:

$$L⅔D45^{(⅓,\, ⅔)}\!: L_{⅔} = ⅔\ G_6 = 4\ D_{45} = 69.075090—73.583868 \text{ (MeV/c}^2\text{)}$$

This quark is just one of the two equal isoquarks which compose the π meson, so it is just a half of the π meson. Therefore, the intervalic exchange state of quarks inside nucleus in this case would be:

$$q = 4\ D_{45} + 6\ D_{45} + 8\ D_{45}$$

But this is just the same intervalic exchange structure of quarks inside nucleon (!) with the only difference that now the intermediate meson is 4 D_{45} instead of the π meson = 8 D_{45}, which stay as a remaining fraction incorporated to the source particle. Therefore the intervalic exchange structure of *nuclear* quarks at gaudinar and dalinar levels would be identical to the exchange structure of *nucleonic* quarks, described above, being the only difference the interchanged roles played by the π meson and its half one.

Once more we find with a result which may require that a meson have got a fractional charge of the elementary one, as the only allowed values of L⅔D45 are 0, ⅓ and ⅔. Even worst, this meson is not a boson but a spin ½ fermion, so such meson should always be made along with its corresponding antiparticle. Therefore, we will have the two identical possible pairs whose only difference lies in the isocharge value:

$L\tfrac{2}{3}D45^{(+\frac{1}{3})}\ L\tfrac{2}{3}D45^{(-\frac{1}{3})}$ or
$L\tfrac{2}{3}D45^{(+\frac{2}{3})}\ L\tfrac{2}{3}D45^{(-\frac{2}{3})}$

But this intervalic structure is identical to the intervalic structure of π meson, and concretely the last one is just no other than the intervalic structure of π^0 meson (!):

π^0 meson: $L\tfrac{2}{3}D45^{(\frac{2}{3})}\ L\tfrac{2}{3}D45^{(\frac{2}{3})}$

Obviously, we have not detected the two constituent lisztinos —particle and antiparticle— of π^0 meson because they have got fractional charges, which intervalic quantum numbers are not allowed to exist in isolated state. Therefore, we will detect the system particle-antiparticle before its annihilation. Fortunately, before to decay electromagnetically the pair have a “long” lifetime compared with the geometric time of annihilation of π^0 meson, which is around 10^6 times smaller than its actual lifetime.

If the intermediate meson has got elementary charge, its intervalic structure only can be composed by just a pair of the lightest quarks allowed by the intervalic symmetries of Nature:

$L\tfrac{1}{3}D45^{(\frac{1}{3})}$: $L_{\frac{1}{3}} = \tfrac{1}{3} G_6 = 2\ D_{45} = 34.537545$—$36.791934$ (MeV/c^2)

Therefore the corresponding meson, which can be named half-pion, must have zero electric charge:

½ π^0 meson: $L\tfrac{1}{3}D45^{(\frac{1}{3})}\ L\tfrac{1}{3}D45^{(\frac{1}{3})} = 69.075090$—$73.583868$ (MeV/c^2)

CHANGELESS INTERVALIC INTERACTION AT GAUDINAR LEVEL

INTERMEDIATE MESON BETWEEN GAUDINOS 6 INSIDE NUCLEUS

Now we are going to repeat just same reasoning applied to a nucleus composed by gaudinos.

It is experimentally know that the radius of nucleus follows the relation:

$$R = r_0\, A^{⅓}$$

where $r_0 \approx 1.2 \cdot 10^{-15}$ (m). Starting from here we can arrive to the average distance between the constituent gaudinos of nucleus (please remember that the assumption now is that all nuclei excepting those of ^{1}H, ^{2}H, ^{3}H and ^{3}He are not composed by monteverdinos or lisztinos but by gaudinos 6 —being composed each nucleon by nine gaudinos 6—):

$$d_{G6} \approx 1.9 \cdot 10^{-15} / 9^{⅓} = 9.13424728 \cdot 10^{-16} \text{ (m)}$$

The corresponding mass of the intermediate meson will be:

$$m(G_6\ meson) \approx c^{-1}\hbar / d_{G6} = 216.247787 \text{ (MeV/c}^2\text{)}$$

And the most simple allowed intervalic structure closer to that mass and pertaining to the same dalinar 45 symmetry of nucleus is:

$$L2D45^{(⅓,\ ⅔)}\text{: } L_2 = 2\ G_6 = 12\ D_{45} = 207.22526—220.75160 \text{ (MeV/c}^2\text{)}$$

This quark is simply the assembly of two nuclear gaudinos, so it can be said that the constituent gaudinos of nucleus are *themselves,* assembled by pairs, the corresponding meson for the intervalic —strong— interaction between gaudinos inside nucleus. The allowed isocharge values are:

$L2D45^{(+4/3)} = G_6^{+⅔} + G_6^{+⅔}$
$L2D45^{(+1)} = G_6^{+⅔} + G_6^{+⅓}$
$L2D45^{(+⅓)} = G_6^{+⅔} + G_6^{-⅓}$
$L2D45^{(+⅔)} = G_6^{+⅓} + G_6^{+⅓}$
$L2D45^{(0)} = G_6^{+⅓} + G_6^{-⅓}$
$L2D45^{(-⅔)} = G_6^{-⅓} + G_6^{-⅓}$

What of these mesons would be the chosen one? We can *predict* that the only one which will be able to be experimentally detected is just that one with the elementary charge because fractional charges are not allowed in isolated state by the intervalic quantum numbers:

$$L2D45^{(+1)} = G_6^{+⅔} + G_6^{+⅓}$$

However, this surprisingly does not mean that the other isomesons would not exist inside nucleus (with the exception of the zero charged one because it lacks of intervalic energy at its last structure level). Obviously, the actual ones will be those which realize the intervalic exchange structure of the interaction with the minimal energy and information, a question which only could be solved when we will understand the deep and last relation existing between *energy* and *symmetry* (or perhaps *information* and *form*). In the present state of our incomplete knowledge, we can suppose that all the above mesons may intervene in the changeless intervalic interaction inside nucleus, although only the elementary charged ones can be detected.

Of course, identical reasoning has to be applied to the intermediate meson between quarks inside nucleon. The π meson isocharge values could be likewise ⅓, ⅔ and 4/3, although only the elementary (or zero) charged ones can experimentally be detected, as it is just the case.

On the other hand, $L2D45^{(⅓, ⅔)}$ is no other than the particle which remains after dividing the nucleonic quark $L3D45^{(⅓, ⅔)}$ into two entire lisztinian parts: $L1D45^{(⅓, ⅔)}$ and $L2D45^{(⅓, ⅔)}$. In the intervalic interaction between nucleons of deuteron the degenerate lisztino $L1D45^{(⅓, ⅔)} = G_6$ was the intermediate meson while the lisztino $L2D45^{(⅓, ⅔)}$ was the fractioned part of the remaining quark, playing as source particle. Now we have got just the opposite case: the lisztino $L2D45^{(⅓, ⅔)} = 2\ G_6$ is the intermediate meson while the gaudino 6 —which is identical to the degenerate lisztino $L1D45^{(⅓, ⅔)} = G_6$— plays as source particle. In both cases Nature has shown a remarkable economy.

INTERMEDIATE MESON BETWEEN GAUDINOS INSIDE QUARKS

At gaudinar level of the intervalic structure we find the intervalic interaction between the constituent gaudinos of *quarks*. We will focus our attention on the nucleonic quarks composed by gaudinos 6. Supposing, as we have seen in other site, that the distance between the constituent quarkic gaudinos 6 of nucleon is $d_{G6}(q) = 1.659948039 \cdot 10^{-16}$ (m), the intermediate meson for the changeless intervalic interaction between gaudinos inside quarks of {D45} symmetry would have a mass:

$m(G_6(q)\ meson) = c^{-1}\hbar / d_{G6(q)} = 1{,}189.95337\ (MeV/c^2)$

The most simple allowed intervalic structures would be:

$3\ D_{10} = 30\ \mathbf{I} = 1{,}124.248896—1{,}249.16544\ (MeV/c^2)$
$7\ D_{15} = 105\ \mathbf{I} = 1{,}165.887765—1{,}295.43085\ (MeV/c^2)$
$10\ D_{18} = 180\ \mathbf{I} = 1{,}156.634694—1{,}285.14966\ (MeV/c^2)$

Therefore, gaudinos 6 inside nucleonic quark would be in some of the following virtual states due to the everlasting exchange intervalic interaction. Respectively:

$G_6 = 6\ D_{45} \leftrightarrow 5\ D_{45} + 3\ D_{10} + D_{15}$
$G_6 = 6\ D_{45} \leftrightarrow 3\ D_{45} + 7\ D_{15} + D_{30}$
$G_6 = 6\ D_{45} \leftrightarrow 2\ D_{45} + 10\ D_{18}$

It has to be noted that contrarily to the intermediate mesons between monteverdinos and lisztinos, which are real states, the meson between gaudinos is a virtual particle, as it will be the intermediate meson between dalinos. Another important detail to point out refers to the total number of intervalinos, which is exactly the same in the exchange intervalic structure than in the normal state of the structure. Thus, although the meson is virtual, the total number of intervalinos remains *constant*, as the only and unique change lies in the different manner in which the same constituent intervalinos are grouped in the assembly of the real and the virtual intervalic structures. So there is no any materialization or annihilation of intervalinos from vacuum, as SM is usually obliged to postulate in such states. This represents a remarkable advantage of logical economy of IT on the assumptions ad hoc abusively introduced by SM.

The physical features of the mesons between quarkic gaudinos pertaining to other symmetries —{D30}, {D18}, {D6}, {D5}, etc.— can be deduced in a similar way as with the {D45} symmetry.

CHANGELESS INTERVALIC INTERACTION AT DALINAR LEVEL: THE INTERMEDIATE MESON BETWEEN DALINOS

The same economy showed in the exterior levels is still founded in the intervalic interaction at the dalinar level. Dalinos are bosons with spin 0 (excepting electron), and therefore have a lot of common features with intervalinos, with the noticeable difference that the intervalic energies involved in dalinar interaction are much smaller than those ones of the intervalinar level.

INTERMEDIATE MESON BETWEEN DALINOS 45 INSIDE GAUDINOS

Starting from the approximate magnitude of the distance among constituent quarkic dalinos 45, $d_{D45}(q) \approx 1.566782749 \cdot 10^{-17}$ (m), the corresponding meson between dalinos 45 would have a mass:

$$m(D_{45}\ meson)_q = c^{-1}\hbar \ /\ d_{D45}(q) = 12{,}607.113\ (MeV/c^2)$$

The most simple allowed intervalic structure would be (the values of masses are comprised between: the first, the mass according to the electron's ratio between intervalic / electromagnetic energies ~ 5/4; and the second, the maximum mass allowed for that structure, which is usually near the spin 0 mesons actual masses, as I have explained in other site):

$8\ D_5 = 40\ \mathbf{I} = 11{,}920.5870—13{,}324.4310\ (MeV/c^2)$
$3\ D_3 = 9\ \mathbf{I} = 12{,}491.6548—13{,}879.6164\ (MeV/c^2)$

What does it means? The meson which intermediates the intervalic interaction between quarkic dalinos 45 would be a particle with intervalic structure $3\ D_3 = 9\ \mathbf{I}$. This particle can be *virtual*, but it does not need necessarily to be so; it can also be a *real* state because it has a dalinar structure which can be taken —to serve as intermediate state— from the dalino 45 in order to make the exchange interaction. Therefore, due to the permanent exchange intervalic interaction, the dalinos 45 inside quarkic gaudino 6 would be in the following intervalic exchange virtual state:

$D_{45} \leftrightarrow 8\ D_5 + D_5$
$D_{45} \leftrightarrow 3\ D_3 + D_{30} + D_6$
$D_{45} \leftrightarrow 3\ D_3 + D_{27} + D_9$
$D_{45} \leftrightarrow 3\ D_3 + 2\ D_{18}$

$D_{45} \leftrightarrow 3\ D_3 + D_{18} + D_{15} + D_3$
$D_{45} \leftrightarrow 3\ D_3 + 2\ D_{15} + D_6$

Please note that the sum of its constituent intervalinos is just 45 in all cases. Therefore, the constituent dalinos 45 are permanently interchange fragments —integrated by 40 or 9 intervalinos— of its own structure with themselves. Thus, no virtual particle is needed for holding the dalinar interaction, but it can be carried by the own dalinos. Once more, we find a remarkable beautiful simplicity in the developments of IT.

INTERMEDIATE MESON BETWEEN DALINOS 18 INSIDE TAU

Known approximately in IT the distance, $d(\tau)_{D18}$, between two near dalinos 18 in tau: $d(\tau)_{D18} \approx 5.5093881 \cdot 10^{-19}$ (m), the meson between tauonic dalinos D_{18} would be:

$$m(D_{18}\ meson)_\tau = c^{-1}\hbar\ /\ d_{D18} = 358{,}526.35\ (MeV/c^2)$$

The corresponding allowed intervalic structure would be:

$$18\ D_1 = 18\ \mathbf{I} = 374{,}749.632\ (MeV/c^2)$$

Therefore, the fifteen constituent dalinos 18 inside tau would ever be in the following intervalic exchange virtual state:

$$D_{18} \leftrightarrow 18\ D_1$$

CHANGELESS INTERVALIC INTERACTION AT INTERVALINAR LEVEL: THE INTERMEDIATE MESON BETWEEN INTERVALINOS INSIDE DALINOS

The intervalic energy between intervalinos yields the greatest interaction known in Nature. Actually, the intervalinar interaction is around $\sim 10^9$ greater than the electromagnetic interaction at the same level, as I have explained in other site. The intervalinar interaction holds the intervalic structure among intervalinos, which are the constituent of all dalinos. Among them we can point out the quarkic dalino 45 —constituent of stable quarks— and the dalino 270 —or electron—.

CHANGELESS INTERVALIC INTERACTION AT INTERVALINAR LEVEL INSIDE ELECTRON

The exchange frequorce of the intervalic interaction among intervalinos is proportional to the intervalic energy, I:

$$\varphi = I / \hbar$$

For example, the exchange frequorce between two paired intervalinos —a dalino 2— is:

$$\varphi(D_2) = I(D_2) / \hbar = c^{\pm 2} \hbar \, (2\mathbf{q}_\mathbf{I})^{-2} / \hbar = 7.8995978 \cdot 10^{24} \; (s^{-1})$$

If the intervalino, **I**, was considered a virtual particle, that is to say, an intermediate boson that can exist as a part of an intermediate state during a time T(**I**), its related frequorce would be:

$$\varphi(\mathbf{I}) = T(\mathbf{I})^{-1} = (c^{-1}\hbar / c \, m_\mathbf{I})^{-1} = c^{-1}\hbar^{-1} = 3.1598392 \cdot 10^{25} \; (s^{-1})$$

This magnitude relies only on the intervalino's *mass* —which has completely an intervalic origin—, and has the same value of the theoretical limit case on the exchange frequorce of an intervalino "within itself", a magnitude which relies only on the intervalino's *charge* —which is originated from spin—. Therefore we obtain an elegant result, $\varphi(\mathbf{I}) = \varphi(D_1)$:

$$\varphi(D_1) = I(D_1) / \hbar = c^{\pm 2} \hbar \, (1\mathbf{q}_\mathbf{I})^{-2} / \hbar = 3.1598392 \cdot 10^{25} \; (s^{-1})$$

If the intervalino was still considered as an intermediate state, its range of interaction would be, according to traditional quantum physics, being $m_\mathbf{I}$ the intervalino mass:

$$R(\mathbf{I}) = c^{-1}\hbar / m_\mathbf{I} = c^2 \hbar = 9.487585915 \cdot 10^{-18} \; (m)$$

This is ~7.3 times the distance among the constituent intervalinos in the dalino 45 (supposed an homogeneous distribution) and ~1.66 the dalino 45 diameter. Therefore, the constituent intervalinos of a dalino 45 can interact —as intermediate boson— with all themselves, a feature which could increase its stability. This global auto interaction is broken from the dalino 90 and onwards, which radius is $r(D_{90}) \approx 3.9433313 \cdot 10^{-17}$ (m). The dalino 54, with radius $r(D_{54}) \approx 5.1105576 \cdot 10^{-18}$ (m), still verifies this feature, but its general symmetries are obviously less powerful than those of the dalino 45. This feature could explain, in part and among any others much more powerful, why the dalino 45 is the principal constituent of the quarks instead the other 15 kinds of allowed dalinos.

On the contrary, R(**I**) is much smaller than the distance between intervalinos in electron, $d_{\mathbf{I}}(e)$. Being already known the average volume per intervalino in electron, $V(\mathbf{I}) = (4/3)\ \pi\ r_e^3 / 270 = 5.055566656 \cdot 10^{-46}$ (m^3), and the *intervalic electron radius,* $r_e = ½\ (1/4\pi\varepsilon_0)\ e^2 / U(e) = 3.194098699 \cdot 10^{-15}$ (m), we have for an homogeneous distribution:

$$d_{\mathbf{I}}(e) = 2\ [(3/4)V(\mathbf{I}) / \pi\ ]^{⅓} = 9.883795236 \cdot 10^{-16} \text{ (m)}$$

If the involved intervalinos inside electron were in a virtual state, the mass of the corresponding boson would be: $m = c^{-1}\hbar / d_{\mathbf{I}}(e) = 199.8484098$ (MeV/c^2).

If intervalinos were considered to be in a shell of the size of electron, the distance between them would be:

$$d_{\mathbf{I}}(e) = 2\ r_e\ 270^{-½} = 3.88773313 \cdot 10^{-16} \text{ (m)}$$

and the mass of the corresponding boson would likewise be: $m = c^{-1}\hbar / d_{\mathbf{I}}(e) = 508.075193$ (MeV/c^2).

If intervalinos formed a closed string-like, being distributed along a circumference of intervalic electron radius, the distance between intervalinos would be:

$$d_{\mathbf{I}}(e) = 2\pi\ r_e\ 270^{-1} = 7.433005191 \cdot 10^{-17} \text{ (m)}$$

which is ~7.8 R(**I**) yet. The mass of the corresponding boson would be: $m = c^{-1}\hbar / d_{\mathbf{I}}(e) = 2{,}657.418783$ (MeV/c^2).

And finally, if intervalinos formed an open string-like of length the intervalic electron diameter, the distance between intervalinos would be:

$$d_{\mathbf{I}}(e) = 2\ r_e\ 270^{-1} = 2.365999036 \cdot 10^{-17} \text{ (m)}$$

which is ~2.5 R(**I**) yet. The mass of the corresponding bosons would be: $m = c^{-1}\hbar / d_{\mathbf{I}}(e) = 8{,}348.527326$ (MeV/c^2).

Nevertheless, the fact is that the intervalino is not a *virtual* state but a *real* particle: the fundamental block of Nature, of which are composed all massive particles (excepting the intervalic neutrino which is intervalinoless, as I have explained opportunely).

Moreover, the magic of IT goes into scene at this step, as the intervalino is just a spin 0 boson. Hence, the intervalino —the genuine *source* particle which generates all subatomic particles of Nature— is not a fermion (as it would be poorly intended by SM regarding particles which are source of interaction) but a boson. Therefore, the last level of matter can be considered as a "simple" interchange of information where there is no source particles.

This is one of the most elegant results yielded in IT: the intervalino —the genuine particle of Nature from which are composed all the subatomic particles— is itself a boson, and not a fermion. Therefore, it can be said that dalinos are nothing but a continuous intervalic interaction, a bag of bosons interacting with themselves where it can't be distinguish which is the carrier particle and which is the particle source of interaction, since both are the same. This means that the interchange of information inside dalino is a lot of orders greater than it would be in any other usual quantum structure, since it is carried by *real* bosons instead of *virtual* intermediate bosons. This explains why it appears to be absolutely impossible to break any *dalino*, whatever it be, in a collision: they are so binding states that the energy interval —due to the difference between the intervalic energy of dalino and the total energy of its isolated constituent intervalinos— is so huge that can't be reached in our contemporary laboratories.

THE INTERVALIC STATES OF ELECTRON: THE EXCHANGING STRUCTURE OF ELECTRON

Up to here we have described the intervalinar interaction inside dalino carried by real bosons: the own intervalino. On the other hand, we can study what happens if the intermediate particle was a virtual state. In that case the 270 constituent intervalinos of electron would permanently be in a virtual exchange structure. The dalino with mass energy closest to the intervalinar boson mentioned above: $m = c^{-1}\hbar \ / \ d_{\mathbf{I}}(e) = 199.8484098 \ (\mathrm{MeV}/c^2)$, is the dalino 15:

$$m(D_{15}) = 2.6526240 \cdot 10^{-11} \ (\mathrm{J}) = 165.56370 \ (\mathrm{MeV}/c^2)$$

And the most simple allowed intervalinar structures near that mass which can be grouped inside electron are:

$$5 \ D_{30} = 150 \ \mathbf{I} = 206.95463 \ (\mathrm{MeV}/c^2)$$

$4\ D_{27} = 108\ \mathbf{I} = 204.39963\ (\mathrm{MeV/c^2})$
$2\ D_{18} = 36\ \mathbf{I} = 229.94960\ (\mathrm{MeV/c^2})$
$1\ D_{15} = 15\ \mathbf{I} = 165.56370\ (\mathrm{MeV/c^2})$

Therefore, the intervalic virtual exchange structure of intervalinos inside electron could be in any of the following states of dynamic compositeness:

$D_{270} \leftrightarrow 5\ D_{30} + 120\ \mathbf{I}$
$D_{270} \leftrightarrow 4\ D_{27} + 162\ \mathbf{I}$
$D_{270} \leftrightarrow 2\ D_{18} + 234\ \mathbf{I}$
$D_{270} \leftrightarrow 1\ D_{15} + 255\ \mathbf{I}$

The remaining intervalinos are not in an isolated state but forming part of the remaining diminished virtual dalino. And the number of constituent intervalinos of this diminished dalino should anyway be inside the set of values allowed by the intervalic symmetries of the elementary charge. Henceforth, that remaining intervalinos could only be grouped as forming part of any of those 16 allowed dalinos, and the possible main states are listed below. Astoundingly, the possible intervalic states in which an electron is, are the following ones:

$D_{270} \leftrightarrow 5\ D_{30} + (\ D_{90} + D_{30}\ )$
$D_{270} \leftrightarrow 5\ D_{30} + (\ 2\ D_{45} + D_{30}\ )$
$D_{270} \leftrightarrow 4\ D_{27} + (\ D_{135} + D_{27}\ )$
$D_{270} \leftrightarrow 4\ D_{27} + (\ D_{90} + D_{45} + D_{27}\ )$
$D_{270} \leftrightarrow 4\ D_{27} + (\ 3\ D_{54}\ )$
$D_{270} \leftrightarrow 4\ D_{27} + (\ 3\ D_{45} + D_{27}\ )$
$D_{270} \leftrightarrow 4\ D_{27} + (\ 3\ D_{30} + D_{45} + D_{27}\ )$
$D_{270} \leftrightarrow 2\ D_{18} + (\ D_{135} + D_{90} + D_{9}\ )$
$D_{270} \leftrightarrow 2\ D_{18} + (\ 2\ D_{90} + D_{54}\ )$
$D_{270} \leftrightarrow 2\ D_{18} + (\ D_{90} + D_{54} + 2\ D_{45}\ )$
$D_{270} \leftrightarrow 2\ D_{18} + (\ D_{90} + 3\ D_{45} + D_{9}\ )$
$D_{270} \leftrightarrow 2\ D_{18} + (\ D_{90} + 2\ D_{54} + D_{27} + D_{9}\ )$
$D_{270} \leftrightarrow 2\ D_{18} + (\ 3\ D_{54} + D_{45} + D_{27}\ )$
$D_{270} \leftrightarrow 2\ D_{18} + (\ 4\ D_{54} + D_{18}\ )$
$D_{270} \leftrightarrow 2\ D_{18} + (\ 5\ D_{45} + D_{9}\ )$
$D_{270} \leftrightarrow 1\ D_{15} + (\ D_{135} + D_{90} + D_{30}\ )$
$D_{270} \leftrightarrow 1\ D_{15} + (\ D_{135} + 2\ D_{45} + D_{30}\ )$
$D_{270} \leftrightarrow 1\ D_{15} + (\ D_{135} + 2\ D_{45} + D_{30}\ )$
$D_{270} \leftrightarrow 1\ D_{15} + (\ 2\ D_{90} + D_{45} + D_{30}\ )$
$D_{270} \leftrightarrow 1\ D_{15} + (\ D_{90} + 3\ D_{45} + D_{30}\ )$

$D_{270} \leftrightarrow 1\ D_{15} + (\ 2\ D_{54} + 2\ D_{45} + D_{30} + D_{27}\ )$
$D_{270} \leftrightarrow 1\ D_{15} + (\ 3\ D_{54} + D_{30} + 2\ D_{27} + D_{9}\ )$
$D_{270} \leftrightarrow 1\ D_{15} + (\ 4\ D_{54} + D_{30} + D_{9}\ )$

being the more probable state the following one in which there are involved exclusively those dalinar symmetries founded in subatomic particles at low energies, namely: {D270}, {D45}, {D30} and {D18}.

$D_{270} \leftrightarrow 2\ D_{45} + 6\ D_{30}$

Up to here we have considered that intervalinos are homogeneously placed inside electron's volume and have taken the corresponding intermediate boson according to the average distance between two intervalinos inside electron. However, we could also postulate that the range of the changeful interaction inside electron have just to be the intervalic electron radius. In that case the mass of the corresponding intermediate meson between intervalinos inside electron would be:

$m = c^{-1}\hbar\ /\ r_e = 61.84094314\ (\mathrm{MeV}/c^2)$

The most simple allowed intervalinar structures near that mass which can be found inside electron are:

$4\ D_{54} = 216\ \mathbf{I} = 51.099909\ (\mathrm{MeV}/c^2)$
$5\ D_{54} = 270\ \mathbf{I} = 63.874885\ (\mathrm{MeV}/c^2)$
$3\ D_{45} = 135\ \mathbf{I} = 55.187901\ (\mathrm{MeV}/c^2)$
$D_{27} = 27\ \mathbf{I} = 51.099909\ (\mathrm{MeV}/c^2)$

And the corresponding intervalic virtual exchange structures of intervalinos inside electron would be:

$D_{270} \leftrightarrow 4\ D_{54} + D_{54}$
$D_{270} \leftrightarrow 5\ D_{54}$
$D_{270} \leftrightarrow 3\ D_{45} + D_{135}$
$D_{270} \leftrightarrow 3\ D_{45} + D_{45} + D_{90}$
$D_{270} \leftrightarrow 3\ D_{45} + 3\ D_{45}$
$D_{270} \leftrightarrow 1\ D_{27} + 9\ D_{27}$
$D_{270} \leftrightarrow 1\ D_{27} + D_{135} + 2\ D_{54}$
$D_{270} \leftrightarrow 1\ D_{27} + 4\ D_{54} + D_{27}$
$D_{270} \leftrightarrow 1\ D_{27} + 5\ D_{45} + D_{18}$

It must be noted that three of these states are just no other thing than virtual elementary gaudinos:

$D_{270} \leftrightarrow 5\ D_{54} = G_5$
$D_{270} \leftrightarrow 6\ D_{45} = G_6$
$D_{270} \leftrightarrow 10\ D_{27} = G_{10}$

Then, in other words, the exchanging structure of electron would be in a state of virtual gaudino, a beautiful dynamic structurefulness:

$D_{270} = G_1 \leftrightarrow G_5 = 5\ D_{54}$
$D_{270} = G_1 \leftrightarrow G_6 = 6\ D_{45}$
$D_{270} = G_1 \leftrightarrow G_{10} = 10\ D_{27}$

As the elementary gaudino 6 is just the muon, $G_6^{\pm} \equiv \mu^{\pm}$, we can say that one of the intervalic states of electron would just be that of a virtual muon due to the inner changeless intervalic interaction between their constituent intervalinos. It is still a mystery whether the apparition of muon as an intervalic state of electron —when we have taken the range of the intervalic interaction as just the electron radius— has a meaningful relation with the magnitude of the electron radius. If this was the case, we probably would have found the clue to resolve a hard problem: the share between the electromagnetic and spin energies of subatomic particles, with whom all the balances of the structural energy ratios of the intervalic structures could finally be understood.

CHANGELESS INTERVALIC INTERACTION AT INTERVALINAR LEVEL INSIDE DALINO 45

On the assumption that the constituent intervalinos of dalino 45 are likewise in a shell composition, and being previously known the magnitude of the dalino 45 radius, $r(D_{45}) \approx 2.4645821 \cdot 10^{-18}$ (m), the mass of the intermediate meson of the changeless intervalic interaction between intervalinos inside dalino 45 will be:

$$m = c^{-1}\hbar / r(D_{45}) = 80{,}145.86978\ (\text{MeV}/c^2)$$

Needless to say that the mass of $W^{\pm}$ lepton-massive boson, $W^{\pm} = G_{54} = 54\ D_5 = 270\ \mathbf{I}$, is just very close to that value. On the other hand, the most simple allowed intervalinar structures near that mass which can be grouped inside dalino 45 are:

$9\ D_2 = 18\ \mathbf{I} = 83{,}816.6256\ (\mathrm{MeV/c^2})$
$4\ D_1 = 4\ \mathbf{I} = 83{,}277.696\ (\mathrm{MeV/c^2})$

And the corresponding intervalic virtual exchange structures of intervalinos inside dalino 45 would be:

$D_{45} \leftrightarrow 9\ D_2 + D_{27}$
$D_{45} \leftrightarrow 9\ D_2 + 3\ D_9$
$D_{45} \leftrightarrow 4\ D_1 + D_{30} + D_{10} + D_1$
$D_{45} \leftrightarrow 4\ D_1 + 2\ D_{18} + D_5$
$D_{45} \leftrightarrow 4\ D_1 + 4\ D_{10} + D_1$
$D_{45} \leftrightarrow 4\ D_1 + 4\ D_9 + D_5$

INTERVALINAR FREQUORCE INSIDE ELECTRON

The overall exchange frequorce due to intervalic interaction among intervalinos inside electron is determined by the intervalic energy:

$$\varphi(\mathbf{I})_e = \mathrm{I}(e) / \hbar = 4.334484487 \cdot 10^{20}\ (\mathrm{s^{-1}})$$

The related maximum linear velocity of intervalinos inside electron is:

$$\mathrm{v}(\mathbf{I})_e = 2\pi\ r_\mathrm{e}\ \varphi(\mathbf{I})_e = 8.698926337 \cdot 10^6\ (\mathrm{m\ s^{-1}}) = 0.029016494\ \mathrm{c}$$

The relation between the intervalic energy and the intervalic structure make an astonishing simple formulation of the potential well corresponding to the intervalic interaction. The difference between the intervalic energy of electron and the intervalic energy of its 270 constituent intervalinos in disassembled or isolated state yields the magnitude of the intervalic interaction among intervalinos inside electron. This concept is similar to the definition of the electromagnetic potential energy of a composite particle, although in a new way. In the case of electromagnetic energy (and *long ranged* interactions) ‘isolated’ means separate by an infinite length. However, in the case of intervalic interaction (and *short ranged* interactions) ‘isolated’ means *out* of the intervalic structure, an event which does not relies on the macroscopic distance of the separation as in the case of a long ranged interaction. Therefore, the electron intervalic potential is determined by the difference on the intervalic energy between electron and its constituent disassembled intervalinos:

$$\Delta\mathrm{I}(e) = \mathrm{I}(e) - 270\ \mathrm{I}(\mathbf{I}) = \mathrm{I}(270\mathbf{q}_\mathrm{I}) - 270\ \mathrm{I}(\mathbf{q}_\mathrm{I}) =$$
$$= [c^{\pm2}\hbar\ (270\ \mathbf{q}_\mathrm{I})^{-2}] - [270\ c^{\pm2}\hbar\ \mathbf{q}_\mathrm{I}{}^{-2}] = 270^{-2}c^{-1} - 270c^{-1} =$$
$$= -9.006230113 \cdot 10^{-7}\ (\mathrm{J}) = -5{,}621{,}244.256\ (\mathrm{MeV}/c^2)$$

And the intervalic potential well is:

$$\Phi(e) = \Delta\mathrm{I}(e) / m_e = -9.886754667 \cdot 10^{23}\ (\mathrm{m}^2\ \mathrm{s}^{-2})$$

Comparing it with the corresponding electromagnetic potential can give us an idea of the extreme strength of the intervalic interaction:

$$\mathrm{V}(e) = \Delta\mathrm{U}(e) / m_e = 3.964559695 \cdot 10^{16}\ (\mathrm{m}^2\ \mathrm{s}^{-2})$$

From here the features of the intervalinar interaction inside dalino 45 can be deduced in a similar way, only with care about to do not mix different levels of the intervalic structure.

INTERVALINAR FREQUORCE OUTSIDE ELECTRON

The traditional division of SM among leptons and hadrons, by which it is postulated that only the last ones feel the strong interaction is absolutely misleading. Leptons-massive bosons have got the same changeless —strong— intervalic interaction as any other intervalinoful particle. Moreover, changeless —strong— and changeful —weak— interactions are really the same intervalic interaction, which demonstrates the fallacy of the SM affirmations. The reason why leptons seems to do not interact strongly is only due to the intervalic constraints imposed by the elementary charge, which forbids the assembly of an intervalino by an electron to make a dalino different from D_{270}, for example, a dalino 271. But this is just the same as with quarks, which neither interact with an intervalino to incorporate it to its intervalic structure. It simply can't be made. On the contrary, quarks are fractional lisztinos which have to reach a state of lower energy, and therefore interact strongly to reach the elementary charge or the neutral charge. But electrons are already states of minimal energy which have already got the elementary charge and was converted into fermions long time ago. Only when converting into bosons, leptons interact via changeless interaction to make a Bose-Einstein condensed state and to reach a state of lower energy. In other words, if leptons were not constrained by the intervalic structure and its derived quantum numbers, they could interact strongly as like as hadrons. Both leptons-massive bosons and quarks are composed by *intervalinos*, and therefore they interact according to their intervalic structures. But all intervalinoful particles feel the intervalic interaction. In other case, the own electron could not be composed by intervalinos and could not exist.

INTERVALIC EXCHANGE FREQUORCE OF THE CHANGELESS INTERVALIC INTERACTION

A remarkable feature of the changeless intervalic interaction is the enormous strength of involved exchange frequorce which is however reached with much less intervalic energy that it would be expected. This almost magic feature can happen because of the subtle hierarchic architecture of intervalic structures and their corresponding potential wells which allows the intermediation of virtual exchange frequorces. For example, the intervalic energy involved at the monteverdic level of the intervalic structure of nucleon is:

$\mathrm{I}(p)_{\mathrm{M3}} = \mathrm{c}^{\pm 2}\,\hbar\, e^{-2} = 4.57563917 \cdot 10^{-14}\,(\mathrm{J}) = 0.285588809\,(\mathrm{MeV/c}^2)$
$\mathrm{I}(n)_{\mathrm{M3}} = 0$

This would correspond to a theoretical force between nucleonic quarks:

$\varphi = \mathrm{I}(p)_{\mathrm{M3}} / d_q = 32.33101979\,(\mathrm{N})$
$\varphi = \mathrm{I}(n)_{\mathrm{M3}} / d_q = 0$

However, the complex intervalic structure of nucleon makes that the magnitude of the virtual exchange frequorce due to changeless intervalic interaction between nucleonic quarks is determined by the intervalic structure of the involved meson, and therefore the magnitude of the virtual force will be:

$\varphi = \mathrm{c}^{\pm 2}\mathrm{m}_\pi / d_q = \mathrm{c}^3\hbar^{-1}\mathrm{m}_\pi^{\,2} = 15{,}800.48082\,(\mathrm{N})$

Such huge exchange force at microscopic scale is virtual and short ranged, and has nothing to do with the fantastic 8 gluon fields and with the classic properties of the theory of fields: real, long ranged, continuous and so on.

In a similar way, the magnitude of the intervalic exchange force between the constituent gaudinos inside nucleonic quarks will be:

$$\varphi = c^{\pm 2}m_{G6(q)} / d_{G6(q)} = c^3\hbar^{-1}m_{G6(q)}{}^2 = 1{,}148{,}539.756 \text{ (N)}$$

While the related theoretical force due to the intervalic energy of nucleonic quarks would "only" be:

$$\varphi = I(u)_{L3} / d_{G6(q)} = 620.2114357 \text{ (N)}$$
$$\varphi = I(d)_{L3} / d_{G6(q)} = 2{,}480.845743 \text{ (N)}$$

This explains the disconcerting fact that modern physicists can break in laboratories no one fundamental subatomic particle, whose mass energy is however ridiculous small in comparison with the much greater energies under they are bestially subdued inside colliders.

We are seeing that the differences between the changeless intervalic interaction and the traditional strong nuclear force and the dismal 8 gluon fields intended by SM are abysmal. It is awkward to make a comparison between both conceptions because —as Wolfgang Pauli would probably have said if he would have know IT—, SM is so absurd and inconsistent that "it is not false enough". It is hard to believe that someone was so fool to propose the existence of 8 long ranged gluon fields, whose existence is supposed to be as like any other classical real continuous field, coming from and acting on uncanny structureless particles which have a size of around 10^{18} Planck's length —to say it in its own degenerate units—. Nevertheless it will be opportunely found a brief comparative recapitulation at the final of the chapter on the intervalic spin energy.

INTERVALIC WAVEFUNCTION OF INTERVALIC STRUCTURES

Henceforth we reach to a beautiful result regarding the wavefunction of the own intervalic structure of electron, which will be applicable in a similar way to *all* subatomic particles. The wavefunction of electron is not equal to that one of the dalino 270, $\Psi(D_{270})$, but to the sum of all wavefunctions of the allowed 16 dalinos in which the 270 constituent intervalinos can be grouped inside electron:

$$\begin{aligned}\Psi(e) = {} & \Psi(D_{270}) + \Psi(D_{135}) + \Psi(D_{90}) + \Psi(D_{54}) + \Psi(D_{45}) + \\ & + \Psi(D_{30}) + \Psi(D_{27}) + \Psi(D_{18}) + \Psi(D_{15}) + \Psi(D_{10}) + \\ & + \Psi(D_{9}) + \Psi(D_{6}) + \Psi(D_{5}) + \Psi(D_{3}) + \Psi(D_{2}) + \Psi(D_{1})\end{aligned}$$

In the beginning of the Intervalic Primordial Aggregation (IPA) —when the temperature was between the *intervalic temperature* and the binding temperature of dalinos— we had a free assembly and disassembly among intervalinos to make any recombination between dalinos:

$|\Psi(D_{270})|^2 = 1/720$
$\Psi(D_{135})|^2 = 2/720$
$|\Psi(D_{90})|^2 = 3/720$
$|\Psi(D_{54})|^2 = 5/720$
$|\Psi(D_{45})|^2 = 6/720$
$|\Psi(D_{30})|^2 = 9/720$
$|\Psi(D_{27})|^2 = 10/720$
$|\Psi(D_{18})|^2 = 15/720$
$|\Psi(D_{15})|^2 = 18/720$
$|\Psi(D_{10})|^2 = 27/720$
$|\Psi(D_{9})|^2 = 30/720$
$|\Psi(D_{6})|^2 = 45/720$
$|\Psi(D_{5})|^2 = 54/720$
$|\Psi(D_{3})|^2 = 90/720$
$|\Psi(D_{2})|^2 = 135/720$
$|\Psi(D_{1})|^2 = 270/720$

However, below the *binding temperature* of dalinos the probability to find a dalino in one or another symmetry, represented by the wavefunction squared, was proportional to the intervalic energy of the dalino, or in other words, to the dalino's electric charge squared:

$|\Psi(D_{270})|^2 = 1^2/\sum^{16}Q_i^2 = 0.28558881/30,443.759$
$\Psi(D_{135})|^2 = 2^2/\sum^{16}Q_i^2 = 1.1423553/30,443.759$
$|\Psi(D_{90})|^2 = 3^2/\sum^{16}Q_i^2 = 2.5702993/30,443.759$
$|\Psi(D_{54})|^2 = 5^2/\sum^{16}Q_i^2 = 7.1397203/30,443.759$
$|\Psi(D_{45})|^2 = 6^2/\sum^{16}Q_i^2 = 10.281197/30,443.759$
$|\Psi(D_{30})|^2 = 9^2/\sum^{16}Q_i^2 = 23.132694/30,443.759$
$|\Psi(D_{27})|^2 = 10^2/\sum^{16}Q_i^2 = 28.558881/30,443.759$
$|\Psi(D_{18})|^2 = 15^2/\sum^{16}Q_i^2 = 64.257483/30,443.759$
$|\Psi(D_{15})|^2 = 18^2/\sum^{16}Q_i^2 = 92.530775/30,443.759$
$|\Psi(D_{10})|^2 = 27^2/\sum^{16}Q_i^2 = 208.19424/30,443.759$
$|\Psi(D_{9})|^2 = 30^2/\sum^{16}Q_i^2 = 257.02993/30,443.759$
$|\Psi(D_{6})|^2 = 45^2/\sum^{16}Q_i^2 = 578.31735/30,443.759$
$|\Psi(D_{5})|^2 = 54^2/\sum^{16}Q_i^2 = 832.77698/30,443.759$
$|\Psi(D_{3})|^2 = 90^2/\sum^{16}Q_i^2 = 2,313.2694/30,443.759$

$|\Psi(D_2)|^2 = 135^2/\sum^{16}Q_i^2 = 5{,}204.8561/30{,}443.759$
$|\Psi(D_1)|^2 = 270^2/\sum^{16}Q_i^2 = 20{,}819.424/30{,}443.759$

Nevertheless, below the *recombination temperature* of dalinos a dramatic symmetry breaking happened. This breaking of symmetry is unexplainable through the traditional concepts involved in modern Physics since the only stable dalinos which have lasted are D_{270} and D_{45}. Thus, today we have:

$|\Psi(D_{270})|^2 \rightarrow 1\ (\neq 1)$
$|\Psi(D_{45})|^2 \rightarrow 1\ (\neq 1)$
$|\Psi(D_{30})|^2 \rightarrow 0\ (\neq 0)$
$|\Psi(D_{18})|^2 \rightarrow 0\ (\neq 0)$
$|\Psi(D_6)|^2 \rightarrow 0\ (\neq 0)$
$|\Psi(D_5)|^2 \rightarrow 0\ (\neq 0)$

And it is predicted that:

$|\Psi(D_3)|^2 \rightarrow 0\ (\neq 0)$
$|\Psi(D_2)|^2 \rightarrow 0\ (\neq 0)$

On the other hand, the remaining allowed symmetries, which are just a half, are not make as *real states* below the threshold temperature as they have not got enough energy to be made:

$|\Psi(D_{135})|^2 \approx 0$
$|\Psi(D_{90})|^2 \approx 0$
$|\Psi(D_{54})|^2 \approx 0$
$|\Psi(D_{27})|^2 \approx 0$
$|\Psi(D_{15})|^2 \approx 0$
$|\Psi(D_{10})|^2 \approx 0$
$|\Psi(D_9)|^2 \approx 0$
$|\Psi(D_1)|^2 \approx 0$

For practical purposes these last ones can be equalized to zero because it is supposed that they only intervene in the intervalic interaction as *virtual states*, since these particles are never made as *real* states below the threshold temperature. Such symmetries played an important role at the Big Bang but at present cold temperatures they do not have enough energy to yield particles, although they add an elegant completeness and are absolutely necessary to understand and to develop the logical structure of the theory.

The probability to find any of those dalinar symmetries in a electron relies not only on the intervalic energy —from which derive the mass energy of all intervalic structures— but also on the temperature or kinetic energy of the particle. This feature explains with remarkable logical simplicity why we obtain several particles with heavier intervalic symmetries than {D270} when increasing the kinetic energy of electron in colliders. And this principle is valid for all subatomic particles. Please note that the extraordinary affirmation, now at last explained, that a subatomic particle uses its kinetic energy to induce a change in its own *intervalic structure* is a very surprising fact that never could have been made, by no means, if subatomic particles were really *structureless*, as SM postulates obstinately. If this false principle of SM was true, the kinetic energy of a particle only could increase its temperature or to induce an excited state without any possible change in its structure because it has been postulated that they are *structureless*. Therefore, there is an absurdity in SM which deals actually with "miraculous" particles which change one into another, being all of them structureless. According to this principle, there would be more than *one fundamental block* in Nature: there would be as many as detected structureless particles… Thus Nature would be a merging melting pot composed by several different blocks —every one structureless and made of different "substances"—, which would appear and disappear mysteriously relying on the kinetic energy (!). In my opinion, this model is much worst than the most fantastic medieval theories about Nature, and it is wonder that any truthful *scientific* have become blinded accepting uncritically such clumsy obscurantism.

In general, the intervalic wavefuncion of any subatomic particle will be the sum of the partial intervalic wavefunctions of all its constituent intervalic structures. Since the number of allowed intervalic symmetries of subatomic particles compounds a finite set for each family or structure level, namely: 16 dalinos, 40 gaudinos, 7 lisztinos, 5 monteverdinos and 3 palestrinos —including the value 1 as a degenerate one—:

$$\Psi\{D_n\} = \sum_1^{16}\Psi\{D_i\}$$
$$\Psi\{G_n\} = \sum_1^{40}\Psi\{G_i\}$$
$$\Psi\{L_n\} = \sum_1^{7}\Psi\{L_i\}$$
$$\Psi\{M_n\} = \sum_1^{5}\Psi\{M_i\}$$
$$\Psi\{P_n\} = \sum_1^{3}\Psi\{P_i\}$$

Thus, the intervalic wavefunction of any subatomic particle will simple be:

$$\Psi(x) = \sum_1^{16}\Psi\{D_i\} + \sum_1^{40}\Psi\{G_i\} + \sum_1^{7}\Psi\{L_i\} + \sum_1^{5}\Psi\{M_i\} + \sum_1^{3}\Psi\{P_i\}$$

And of course:

$$|\Psi(x)|^2 = \sum_1^{16}|\Psi\{D_i\}|^2 + \sum_1^{40}|\Psi\{G_i\}|^2 + \sum_1^{7}|\Psi\{L_i\}|^2 + \\ + \sum_1^{5}|\Psi\{M_i\}|^2 + \sum_1^{3}|\Psi\{P_i\}|^2 = 1$$

The inquisitive reader will note that the wavefunction of intervalino has not been included. This is due because the *isolated* intervalino can not be part, by no means, of any intervalic structure. One single intervalino may be in an intervalic structure only as a binding intervalino, but this is not an isolated intervalino but already a dalino 1, which is a very different particle: D_1 = 1 **I**. On the contrary, an *isolated* intervalino is *not* a dalino 1, but dark matter, as we have described opportunely in other site. By this reason the wavefunction of intervalino does not appear in the intervalic wavefunction of a subatomic particle.

Chapter 25

CHANGEFUL —WEAK— INTERVALIC INTERACTION

INTERVALIC INTERACTION: CHANGEFUL AND CHANGELESS

The intervalic interaction can be divided in two kinds regarding the change in the intervalic structure of the particles involved in the interaction. The *changeful* —formerly 'weak'— *intervalic interaction* can be interpreted or defined as the process of changing the intervalic structure of a subatomic particle, which is governed by the intervalic symmetries and by the physical laws derived from the intervalic energy. The changeless —formerly 'strong'— *intervalic interaction*, in a similar way, can be interpreted as the process of holding the dynamic structurefulness of subatomic particles.

Of course, both weak intervalic and strong interactions only can be understood after the postulation of the intervalic energy: $I = c^{\pm 2}\ \hbar\ Q^{-2}$, the most important equation in Physics, from which derive the four supposed frequorces of Nature, as I have explained in other sites.

Thus, we can say that the intervalic interaction is named *changeful* when there is a change in the intervalic structure of particles, and *changeless* when there is not. From here it is evident that the former weak and strong interactions are merely two zones of the full energy spectrum of the intervalic interaction, which is much more wide than it could be previously imagined, since the intervalic interaction does not finish with the strong interaction between nucleons and quarks, but it comprises the full range of levels of compositeness in the intervalic structure of subatomic particles, namely: monteverdinos, lisztinos, gaudinos, dalinos and intervalinos.

KINDS OF CHANGEFUL INTERVALIC INTERACTION

The changeful —weak— intervalic interaction goes into scene along with the fourth symmetry breaking at primordial times, when there have already been created a number of particles with enough complex intervalic structure as to allow the decay of a particle into another with less intervalic energy. Please note that dalinos are composed exclusively by intervalinos with like charges can not decay in any massful particle since they are already the particles with the minimal intervalic energy allowed by Nature. On the contrary, when going into the gaudinar level there appears two new features:

1) With the *same* number of constituent intervalinos, there are different kinds of gaudinos according to its constituent dalinos. We have particles composed by identical number of intervalinos which however have very different intervalic energies. Therefore, particles with great intervalic energy will look forward to decay into similar particles with lesser energy. This is the origin of the so named ‘purely leptonic’ processes. In IT they are named *structural* changeful intervalic interactions.
2) Gaudinos can have constituent dalinos with like or unlike charges in any proportion. This lead to the existence of a set of gaudinos with slightly different intervalic energy and identical intervalic structures (excepting the sign of the dalinos electric charges). Therefore, particles with slightly greater energy will decay into similar particles with lesser energy. This is the origin of the so named ‘semi leptonic’ and ‘non leptonic’ processes. In IT they are named *charged* or *isocharged* changeful intervalic interactions.

ENERGY INTERVAL AND THRESHOLD ENERGY

According to IT, all stable particles are the states of lowest energy among the 16 symmetries allowed by the intervalic structure of particles. The reason why all particles do not have reached a state of lowest energy is because they can’t change its intervalic structure without a great provision of energy to do that “work”. In other case, all particles of Nature would be electrons. To charge one intervalic structure into another is necessary: first, to decompose the original structure; second, to hold provisionally the constituent intervalinos coming from that structure; and third, recompose the intervalinos in the final structure of lower energy. If it can be so said, it is like to play a children game: to build a pretty house from a bigger one using the same pieces… and holding without spreading the pieces. The difference of energy between the original and the final intervalic structures is the difference of mass between the initial and final particles, and is called *energy interval*. The "work" needed to change one structure into another is the energy of the bosons involved in the reaction, and is called *threshold energy*. And the intervalic structure is like the plane when are written all possible planes of the initial and final houses, that is to say, all the masses and intervalic structures of subatomic particles (bosons included).

Thus, the intervalic *threshold energy* determines the minimal energy needed by the intermediate particle for realizing the interaction. On the other hand, the intervalic structure determine the allowed values for subatomic particles. Henceforth, it is clear that the mass of a intermediate particle will be the *next* allowed value allowed by the intervalic structure *above* the threshold energy. For example, the threshold energy in a charged changeful interaction, have to be comprised between the mass energy values of the $Z^{\pm}$ = 45 (D_6) —46,564.794 (MeV/c^2)— and the $W^{\pm}$ = 54 (D_5) bosons: $E(45\ (D_6)) < E_{th}(changeful^{\pm}) < E(54\ (D_5))$.

THE INTERMEDIATE MASSIVE BOSON FAMILY

SM does not have any basic link between leptons and intermediate bosons —unless a clumsy sum of Lagrangian densities is viewed as a basic link— although all of them are involved in the changeful intervalic interaction. According to IT, intermediate massive bosons pertain to the same intervalic set and have the same *dalinar* structure than the family of leptons. This fact can be now easily explained not as a new and perhaps strange family of particles, as it is showed in SM, but as an intermediate state involved in a *change in the structure* of lepton (in a leptonic process).

It is clear that the intervalic structure allows to do a lot of predictions about unknown subatomic particles. We can reasonably think that the minimal threshold energy for the changeful —weak— intervalic interaction is that corresponding to usual massive bosons, since in other case, lesser massive bosons would have been detected in laboratory. On the other hand, there is no reason to believe that it does not exists more massive bosons beyond the actually known. In this way, if they exist, they will necessary be the next allowed lisztinos 1 and 2 starting from the last known. The first of them is the already viewed W^0 boson: $L_2 = 2\ G_{54} = 2 \cdot (54\ D_5) = 160,927.93$ (MeV/ c^2). The next is the gaudino: $L_1 = G_{90} = 90\ D_3$ and its corresponding lisztino 2: $L_2 = 2\ G_{90} = 2 \cdot (90\ D_3)$, say respectively $Y^{\pm}$ and Y^0 bosons. And the following allowed massive bosons are only the two remaining intervalic structures to the end, say $X^{\pm}$ and X^0, and $I^{\pm}$ and I^0 bosons. This last pair of bosons is named *intervalon*, which is the most massive boson of the changeful intervalic interaction. Some of these bosons could be identified with the supersymmetric bosons postulated by SUSY: two charged Higgs scalars ($H^{\pm}$), two neutral scalars (H_1^0, H_2^0) and one neutral pseudoscalar (H_3^0), although according to IT the GWS model is partial or irrelevant. Recapitulating:

$L_1 = G_{45} = 45\ D_6 = 46,564.794 \rightarrow Z^{\pm}$ boson
$L_2 = 2\ G_{45} = 2 \cdot (45\ D_6) = 93,129.588 \rightarrow Z^0$ boson
$L_1 = G_{54} = 54\ D_5 = 80,463.964 \rightarrow W^{\pm}$ boson
$L_2 = 2\ G_{54} = 2 \cdot (54\ D_5) = 160,927.93 \rightarrow W^0$ boson
$L_1 = G_{90} = 90\ D_3 = 372,518.33 \rightarrow Y^{\pm}$ boson
$L_2 = 2\ G_{90} = 2 \cdot (90\ D_3) = 745,036.66 \rightarrow Y^0$ boson
$L_1 = G_{135} = 135\ D_2 = 1,257,249.4 \rightarrow X^{\pm}$ boson
$L_2 = 2\ G_{135} = 2 \cdot (135\ D_2) = 2,514,498.8 \rightarrow X^0$ boson
$L_1 = G_{270} = 270\ D_1 = 5,621,244.5 \rightarrow I^{\pm}$ boson
$L_2 = 2\ G_{270} = 2 \cdot (270\ D_1) = 11,242,489 \rightarrow I^0$ boson

As can be seem, to obtain a little bit of phenomenology in quantum field theory is a highly exceptional case (and in String Theory —or String Lucubration— appears to be forbidden); on the contrary, to obtain a lot of phenomenology in IT is the norm and a starting point, as it was supposed to be in any *scientific theory*.

RANGE OF THE CHANGEFUL INTERVALIC INTERACTION

Since all these intervalic bosons are intermediate states, their ranges of interaction are $d = c^{-1}\hbar\ m^{-1} = c\ \hbar\ E^{-1}$:

$d(Z^{\pm}) = 4.2419619 \cdot 10^{-18}$ (m)
$d(Z^0) = 2.1661507 \cdot 10^{-18}$ (m)
$d(W^{\pm}) = 2.4560894 \cdot 10^{-18}$ (m)
$d(W^0) = 1.2274195 \cdot 10^{-18}$ (m)
$d(Y^{\pm}) = 5.3024527 \cdot 10^{-19}$ (m)
$d(Y^0) = 2.6512263 \cdot 10^{-19}$ (m)

$d(\mathrm{X}^{\pm}) = 1.5710970 \cdot 10^{-19}$ (m)
$d(\mathrm{X}^{0}) = 7.8554852 \cdot 10^{-20}$ (m)
$d(\mathrm{I}^{\pm}) = 3.5139208 \cdot 10^{-20}$ (m)
$d(\mathrm{I}^{0}) = 1.7569604 \cdot 10^{-20}$ (m)

These values are in the middle of the scale of the dalinos radius, which go from the dalino 270 —electron— intervalic radius, $\mathrm{r}_e = \mathrm{r}(\mathrm{D}_{270}) = 3.194098699 \cdot 10^{-15}$ (m) to the dalino 1 radius, $\mathrm{r}(\mathrm{D}_1) = 6.0102597 \cdot 10^{-25}$ (m), as have been described in other site. In concrete, they are in the same order of the following dalinos radius:

$\mathrm{r}(\mathrm{D}_{54}) \approx 5.1105576 \cdot 10^{-18}$ (m)
$\mathrm{r}(\mathrm{D}_{45}) \approx 2.4645821 \cdot 10^{-18}$ (m)
$\mathrm{r}(\mathrm{D}_{30}) \approx 4.8683104 \cdot 10^{-19}$ (m)
$\mathrm{r}(\mathrm{D}_{27}) \approx 3.1940984 \cdot 10^{-19}$ (m)
$\mathrm{r}(\mathrm{D}_{18}) \approx 6.3093302 \cdot 10^{-20}$ (m)
$\mathrm{r}(\mathrm{D}_{15}) \approx 3.0426940 \cdot 10^{-20}$ (m)
$\mathrm{r}(\mathrm{D}_{10}) \approx 6.0102597 \cdot 10^{-21}$ (m)

Therefore it seems to be clear the existence of a relation between the massive bosons and the intervalic structures on which the changeful-weak intervalic interaction is made, being this result highly meaningful:

$d(\mathrm{Z}^{\pm}) \leftrightarrow \mathrm{r}(\mathrm{D}_{54})$
$d(\mathrm{Z}^{0}) \leftrightarrow \mathrm{r}(\mathrm{D}_{45})$
$d(\mathrm{W}^{\pm}) \leftrightarrow \mathrm{r}(\mathrm{D}_{45})$
$d(\mathrm{W}^{0}) \leftrightarrow$ between $\mathrm{r}(\mathrm{D}_{45})$ and $\mathrm{r}(\mathrm{D}_{30})$
$d(\mathrm{Y}^{\pm}) \leftrightarrow \mathrm{r}(\mathrm{D}_{30})$
$d(\mathrm{Y}^{0}) \leftrightarrow \mathrm{r}(\mathrm{D}_{27})$
$d(\mathrm{X}^{\pm}) \leftrightarrow$ between $\mathrm{r}(\mathrm{D}_{27})$ and $\mathrm{r}(\mathrm{D}_{18})$
$d(\mathrm{X}^{0}) \leftrightarrow \mathrm{r}(\mathrm{D}_{18})$
$d(\mathrm{I}^{\pm}) \leftrightarrow \mathrm{r}(\mathrm{D}_{15})$
$d(\mathrm{I}^{0}) \leftrightarrow$ between $\mathrm{r}(\mathrm{D}_{15})$ and $\mathrm{r}(\mathrm{D}_{10})$

Since muon and the stable quarks —which represents almost the whole part of the gaudinar matter— are composed from dalinos 45, the *distance* of interaction for making a change in the structure of those particles is necessarily related with its *corresponding* massive bosons (which can be seen in the preceding table!): they are just Z^0 and $\mathrm{W}^{\pm}$. This is in superb agreement with experimental data, since it fully explains why no other massive bosons have been detected yet.

PREDICTED HEAVY MASSIVE BOSONS

The heavier massive bosons will appear when a change in the intervalic structures of their corresponding particles is involved. For example, the constituent dalino 30 of the quark charm determine that its weak intervalic interaction is intermediated by the *corresponding* massive boson, which is:

$Y^{\pm} \rightarrow L_1 = G_{90} = 90\ D_3 = 372{,}518.33$ (MeV/c^2), being
$W^0 \rightarrow L_2 = 2\ G_{54} = 2 \cdot (54\ D_5) = 160{,}927.93$ (MeV/c^2) the next one boson near that magnitude.

Likewise, the constituent dalino 18 of the quark bottom and the dalino 18 of tau —which tauonic radius is $r_{\mathrm{D18}} = 15 \cdot ½\ (1/4\pi\varepsilon_0)\ (18\ \mathbf{q_I})^2\ /\ \mathrm{U}(\tau) = 5.9029158 \cdot 10^{-20}$ (m)—, determine that the changeful —weak— intervalic interaction of tau and of quark bottom is intermediated by the *corresponding* massive boson, which is:

$X^0 \rightarrow L_2 = 2\ G_{135} = 2 \cdot (135\ D_2) = 2{,}514{,}498.8$ (MeV/c^2), being
$X^{\pm} \rightarrow L_1 = G_{135} = 135\ D_2 = 1{,}257{,}249.4$ (MeV/c^2) the next one boson near that magnitude.

However, the only quarkic symmetries with *isocharge* doublet —electric charge degree of freedom— are {D45}, {D5}, {D3}, {D2} and {D1}. The usual changeful —weak— interaction which interchanges the two values of the isocharge doublet of a quark can unfortunately not be produced in quarks pertaining to {D30}, {D18} and {D6} symmetries. Therefore we only can be sure that these bosons will appear in 'purely leptonic' processes, but not in *isocharged* changeful —weak— intervalic interactions. This is a pity because energies for the production of an isocharged interaction between quarks of the next first symmetry, {D5}, are still far from present available energies. Nevertheless, it is expected that $Y^{\pm}$ and X^0 (or Y^0 and $X^{\pm}$), will appear in lepton-antilepton and quark-antiquark collisions.

Unfortunately, we have no way to determine yet whether leptons-massive bosons which are not involved in a changeful —weak— intervalic interaction can be made below the recombination temperature, that is to say, in our cold Universe. It is a pity because we can describe with great detail the physical features of the heaviest leptons-massive bosons *allowed* by the intervalic symmetries, but we can not assure yet whether such allowed particles will appear or not at the so low energies available in laboratories.

STRUCTURAL CHANGEFUL INTERVALIC INTERACTION

A clear example of change in the structure through changeful intervalic interaction is the muon decay. It will be no other than a change in its intervalic structure, intermediated by the W$^-$ boson, in order to reach a structure of lesser energy. Showing the gaudinar intervalic structure involved, according to the traditional interpretation:

$\mu^- \quad \rightarrow (\mathrm{W}^-) \rightarrow e^- + \underline{\nu}_e + \nu_\mu$
$\mathrm{G}_6 \quad \rightarrow (\mathrm{G}_{54}) \rightarrow \mathrm{G}_1 + \mathrm{spr}$ (spin residual particles)

This means that W$^-$ is not an strange particle or an additional particle which appear as virtual state along the interaction, but it is... an intermediate state *of the own muon, of the proper leptons* (!). If we have seen that all leptons are gaudinos, that is to say, an aggregation of 270 intervalinos with the only difference of its inner intervalic symmetry inside lepton, now we discover surprisingly that intermediate massive bosons are equally gaudinos, with the only difference of its greater intervalic energy due to its corresponding intervalic structures.

SM explains the muon decay as the transformation of a muon into a muonic neutrino through the emission of a pair electron and its corresponding electronic antineutrino, being this process intermediated by a massive boson, W$^-$. This explanation does not introduced any information about the conservation of the intrinsic angular momentum in which is involved the neutrino production process. On the contrary, in IT the muon beta decay is written as follows, showing gaudinar and dalinar structures:

$\mathrm{G}_6 \quad \rightarrow \mathrm{G}_{54} + \mathrm{spr} \quad \rightarrow \mathrm{G}_1 + \mathrm{spr}$
$6\ \mathrm{D}_{45} \rightarrow 54\ \mathrm{D}_5 + \mathrm{spr} \rightarrow \mathrm{D}_{270} + \mathrm{spr}$
$\mu^- \quad \rightarrow \mathrm{W}^- + \underline{\nu}_{\mathrm{W}} + \nu_\mu \rightarrow e^- + \underline{\nu}_e + \nu_{\mathrm{W}}$

We will explain the neutrino production later. Now, we can see the changes in the intervalic structure of the process. According to this the spin of W$^-$ could be ½ and therefore it may be a *fermion* (!). Please note that both leptons and charged massive bosons pertain to a unique family of particles according to IT, *leptons-massive bosons*, whose intervalic structure is the same: *elementary gaudinos*, which spin is economically postulated to be ½ for every one of them. Neglecting the theoretical assumption on spin of the disastrous GWS model for the intended electroweak interaction, it is clear that according to experimental data there is no evidence for such heavy gaudinos to follow Bose-Einstein statistics, but just on the contrary: they could be fermions with spin ½ as like as the three light gaudinos, the traditional leptons.

ELECTRIC CHARGED CHANGEFUL INTERVALIC INTERACTION

The most usual example of change in the electric charge sign through changeful intervalic interaction is shown in the nuclear beta decay.

The intervalic structure of nucleon and its constituent quarks and gaudinos 6 is:

$N = \mathrm{M}_3 = 3\ \mathrm{L}_3 = 9\ \mathrm{G}_6 = 54\ \mathrm{D}_{45} = 2430\ \mathbf{I}$
$u^{+2/3} = \mathrm{L}_3{}^{+2/3} = (\mathrm{G}_6{}^{+2/3}, \mathrm{G}_6{}^{-1/3}, \mathrm{G}_6{}^{+1/3}) = 18\ \mathrm{D}_{45} = 810\ \mathbf{I}$
$d^{-1/3} = \mathrm{L}_3{}^{-1/3} = (\mathrm{G}_6{}^{-1/3}, \mathrm{G}_6{}^{+1/3}, \mathrm{G}_6{}^{-1/3}) = 18\ \mathrm{D}_{45} = 810\ \mathbf{I}$
$\mathrm{G}_6{}^{+2/3} = (5\ \mathrm{D}_{+45}, \mathrm{D}_{-45}) = 270\ \mathbf{I}$
$\mathrm{G}_6{}^{-1/3} = (2\ \mathrm{D}_{+45}, 4\ \mathrm{D}_{-45}) = 270\ \mathbf{I}$

Then, the constituent gaudinos 6 of quarks have exactly the same intervalic structure of muon (!). The only difference is the charge sign of its constituent dalinos 45:

$\mu = \mathrm{G}_6{}^{-} = 6\ \mathrm{D}_{-45} = 270\ \mathbf{I}$

Therefore the change of the intervalic structure in a beta decay will be similar to the leptonic changeful —weak— intervalic interaction of muon described above (!). Showing the successive levels of the involved intervalic structures up to arrive to the *dalinar* level where the change really take place:

$n^{0} \rightarrow (\mathrm{W}^{+}) \rightarrow p^{+} + e^{-} + \underline{\nu}_e$
$\mathrm{L}^{-1/3} \rightarrow (\mathrm{L}^{1}) \rightarrow \mathrm{L}^{+2/3} + e^{-} + \underline{\nu}_e$
$\mathrm{G}_6{}^{-1/3} \rightarrow (\mathrm{G}_{54}{}^{+}) \rightarrow \mathrm{G}_6{}^{+2/3} + e^{-} + \underline{\nu}_e$
$3\ \mathrm{D}_{-45} + 3\ \mathrm{D}_{+45} \rightarrow (27\ \mathrm{D}_{+5}) \rightarrow 6\ \mathrm{D}_{+45} + \mathrm{D}_{-270} + \mathrm{spr}$

The threshold energy is represented by the massive boson (written between brackets) which makes through an intermediate state the change in the intervalic structure —the change in the charge sign of three dalinos 45—.

Showing the neutrino production according to IT, we find that it would be needed a new gaudinar 54 neutrino corresponding to W^{+}, $\nu_{\mathrm{W}} \equiv \nu_{\mathrm{G54}}$, and a gaudinar 6 neutrino ν_{G6} corresponding to the constituent gaudino 6 of quark down:

$$\mathrm{G}_6^{-1/3} \rightarrow \mathrm{G}_{54}^{+} + \mathrm{spr} \rightarrow \mathrm{G}_6^{+2/3} + e^{-} + \mathrm{spr}$$
$$n^{0} \rightarrow \mathrm{W}^{+} + \underline{\nu}_{\mathrm{W}} + \nu_{\mathrm{G6}} \rightarrow p^{+} + \underline{\nu}_{\mathrm{G6}} + \nu_{\mathrm{W}} + e^{-} + \underline{\nu}_{e}$$

Since $\mathrm{W}^{\pm}$ is supposed to be an intermediate state, its corresponding neutrino will be likewise a virtual state. Nevertheless, it does not mean that this Wnic neutrino may be forgotten.

NEUTRINO PRODUCTION IN CHANGEFUL INTERVALIC INTERACTIONS

According to IT there should be as many *neutrinos* families as *gaudinos* families. Therefore, the decay of the intermediate massive bosons will make its corresponding gaudinar neutrinos. This is an obvious conclusion due to the universality of the conservation law of the intrinsic angular momentum in *all* gaudinos, but not only in the *lightest* ones.

Thus, IT postulates the existence of the virtual *Wnic neutrino,* which is no other than the neutrino of the fermionic gaudino 54: $\nu_{\mathrm{W}} = \nu_{\mathrm{G54}}$. This is not in serious contradiction with Delphi because the experiment covers only neutrinos related with a mass < $\mathrm{Z}^0/2$, and obviously $\mathrm{W}^{\pm} > \mathrm{Z}^0/2$, and perhaps because that neutrino would be an intermediate state.

Besides IT postulates the existence at primordial times of 16 neutrinos corresponding to the 16 gaudinos. From this set there only remain in our cold Universe the particles with the most powerful intervalic symmetries and with the minimal energy: mainly those based on {D270}, {D45} and {D18} intervalic symmetries. Nevertheless, some other symmetries have already been detected, as the gaudinos with dalinar structure {D6} and {D5} —Z^0 and $\mathrm{W}^{\pm}$—, and it is clear that further particles with those intervalic symmetries will be detected in the future. Anyway, each fermionic gaudino must have its corresponding neutrino, at present as well as at primordial times. Thus, we have the following identities: $\nu_e = \nu_{\mathrm{G1}}$, $\nu_\mu = \nu_{\mathrm{G6}}$, $\nu_\tau = \nu_{\mathrm{G15}}$ and $\nu_{\mathrm{W}} = \nu_{\mathrm{G54}}$.

On the contrary, Z^0 is a lisztino 2 and therefore it is supposed to be a boson because there no exits any lisztino 2 which is a known fermion. Nevertheless, there is no reason to suppose that the conservation of the intrinsic angular momentum can be violated in the case of Z^0, which would have got its corresponding virtual *Znic neutrinos* pair.

Apart from the muon decay and beta decay, the neutrino production can be viewed in a more general way in the decay of the intermediate massive bosons of the changeful intervalic interaction. In these decays we can see the global neutrino production related with the gaudino's intervalic structure.

DECAY OF $W^{\pm}$

Although the logic rules of the intervalic decay will be described later, we can now see briefly in advance the decay of the lightest massive bosons.

According to IT and on the assumption of universality, $W^{\pm}$ will decay into lighter gaudinos —the three leptons— and into lighter fractional charged lisztinos —quarks—. The leptonic decay does not have any problem regarding the conservation of the electric charge since all gaudinos have the same charge. However, we find the virtual *Wnic neutrino*:

$$W^{\pm} \rightarrow l^{\pm} + \underline{\nu}_l + \nu_{\mathrm{W}}$$

On the contrary, the quarkic decay is terribly constricted by the allowed electric charges of the intervalic structures of quarks. Therefore, $W^{\pm}$ will only be able to decay into those lisztinos *which intervalic structures allow* the two fractional charges, both ⅔ and ⅓. In SM we assist to the spectacle of postulating the "mixing" of pairs of quarks with different flavours —now substituted by the intervalic structures— in order to yield the magnitude of the elementary charge needed for the conservation of the electric charge in the $W^{\pm}$ decay. Please note that, if we would develop systematically this absurd SM rule, leptons should also be mixed among them (!). On the contrary, IT does not consider that clumsy "mixing" which couples quarks with different intervalic structures. In IT this pairing only can be done between particles with the *same* intervalic structure. In other way, we would have random pairings of all kinds and conditions, as it may happen in a high energy collision, which evidently is not the case in a decay. Therefore, the only allowed quarks produced in the $W^{\pm}$ decay will be those lisztinos which intervalic structures allow both fractional charges, ⅔ and ⅓, that is to say, the *isoquarks*. They are:

$L_{2/3} = \frac{2}{3}\, G_6 = 4\, D_{45} = 69\ (\mathrm{MeV}/c^2) \rightarrow$ quark $\mathrm{L}\frac{2}{3}\mathrm{D45}^{(1/3,\ 2/3)}$
$L_1 = 1\, G_6 = 6\, D_{45} = 104\ (\mathrm{MeV}/c^2) \rightarrow$ quark $\mathrm{L1D45}^{(1/3,\ 2/3)}$
$L_2 = 2\, G_6 = 12\, D_{45} = 207\ (\mathrm{MeV}/c^2) \rightarrow$ quark $\mathrm{L2D45}^{(1/3,\ 2/3)}$
$L_3 = 3\, G_6 = 18\, D_{45} = 311\ (\mathrm{MeV}/c^2) \rightarrow$ quark $\mathrm{L3D45}^{(1/3,\ 2/3)}$
$L_4 = 4\, G_6 = 24\, D_{45} = 414\ (\mathrm{MeV}/c^2) \rightarrow$ quark $\mathrm{L4D45}^{(1/3,\ 2/3)}$
$L_5 = 5\, G_6 = 30\, D_{45} = 518\ (\mathrm{MeV}/c^2) \rightarrow$ quark $\mathrm{L5D45}^{(1/3,\ 2/3)}$

They are exactly 6 isoquarks pairs, along with the 3 leptons and its corresponding neutrinos. Please note that no neutrino is needed for the conservation of the angular momentum in quark production because they are made by *pairs*. In other case neutrino production would be needed, as in primordial times of the Universe when gaudinos was assembled. Thus, the decay of $W^{\pm}$ will make the following widths, in good agreement with experimental data:

$$\begin{aligned} W^{\pm} \rightarrow \quad & e^{\pm} + \underline{\nu}_e + \nu_W = 1/9 \\ & \mu^{\pm} + \underline{\nu}_{\mu} + \nu_W = 1/9 \\ & \tau^{\pm} + \underline{\nu}_{\tau} + \nu_W = 1/9 \\ & \text{quarks pair } L\tfrac{2}{3}D45^{(\pm 1/3)} + L\tfrac{2}{3}D45^{(\pm 2/3)} = 1/9 \\ & \text{quarks pair } L1D45^{(\pm 1/3)} + L1D45^{(\pm 2/3)} = 1/9 \\ & \text{quarks pair } L2D45^{(\pm 1/3)} + L2D45^{(\pm 2/3)} = 1/9 \\ & \text{quarks pair } L3D45^{(\pm 1/3)} + L3D45^{(\pm 2/3)} = 1/9 \\ & \text{quarks pair } L4D45^{(\pm 1/3)} + L4D45^{(\pm 2/3)} = 1/9 \\ & \text{quarks pair } L5D45^{(\pm 1/3)} + L5D45^{(\pm 2/3)} = 1/9 \end{aligned}$$

The mass of the *next* isoquark, namely $L_{2/3}\tfrac{2}{3}G_{54}36D_5^{(1/3,\, 2/3)}$ with 50,356 (MeV/c^2), is far from these masses and can not intervene in the decay.

DECAY OF Z^0

The basic principles regarding the number of lepton families in SM predict —*before* being adjusted *ad hoc* in the infamous GWS model— that the neutrinos widths should be equal to the leptons widths. On the contrary, experimental data shows that neutrinos width is double than leptons'. This is in close agreement with the predicted leptonic decay of Z^0 according to IT since the virtual *Znic neutrino,* $\nu_Z = \nu_{G45}$, have been postulated. If Z^0 was a spin 1 boson we will have:

$$Z^0 \rightarrow l^- l^+ + \nu_l \underline{\nu}_l + \nu_Z \nu_Z$$

And if Z^0 was a spin 0 boson, in clear disagreement with SM, it would be:

$$Z^0 \rightarrow l^- l^+ + \nu_l \underline{\nu}_l + \nu_Z \underline{\nu}_Z$$

In any case, according to the intervalic structures of fractional charged lisztinos there are just 21 quarks below the mass of $Z^0/2$ in the dalinar symmetries {D45}, {D30} and {D18}, seven quarks for each symmetry. Writing down those quarks pairs, the decay of Z^0 is:

$Z^0 \rightarrow$ $e^- e^+ + \nu_e \underline{\nu}_e + \nu_Z \underline{\nu}_Z = 1/30 + 1/30 + 1/30$
$\mu^- \mu^+ + \nu_\mu \underline{\nu}_\mu + \nu_Z \underline{\nu}_Z = 1/30 + 1/30 + 1/30$
$\tau^- \tau^+ + \nu_\tau \underline{\nu}_\tau + \nu_Z \underline{\nu}_Z = 1/30 + 1/30 + 1/30$

quarks pair L⅓D45$^{(\pm\frac{1}{3})}$ = 1/30
quarks pair L⅔D45$^{(\pm\frac{1}{3})}$ = 1/30
quarks pair L1D45$^{(\pm\frac{1}{3})}$ = 1/30
quarks pair L2D45$^{(\pm\frac{1}{3})}$ = 1/30
quarks pair L3D45$^{(\pm\frac{1}{3})}$ = 1/30
quarks pair L4D45$^{(\pm\frac{1}{3})}$ = 1/30
quarks pair L5D45$^{(\pm\frac{1}{3})}$ = 1/30

quarks pair L⅓D30$^{(\pm\frac{1}{3})}$ = 1/30
quarks pair L⅔D30$^{(\pm\frac{2}{3})}$ = 1/30
quarks pair L1D30$^{(\pm\frac{1}{3})}$ = 1/30
quarks pair L2D30$^{(\pm\frac{2}{3})}$ = 1/30
quarks pair L3D30$^{(\pm\frac{1}{3})}$ = 1/30
quarks pair L4D30$^{(\pm\frac{2}{3})}$ = 1/30
quarks pair L5D30$^{(\pm\frac{1}{3})}$ = 1/30

quarks pair L⅓D18$^{(\pm\frac{1}{3})}$ = 1/30
quarks pair L⅔D18$^{(\pm\frac{2}{3})}$ = 1/30
quarks pair L1D18$^{(\pm\frac{1}{3})}$ = 1/30
quarks pair L2D18$^{(\pm\frac{2}{3})}$ = 1/30
quarks pair L3D18$^{(\pm\frac{1}{3})}$ = 1/30
quarks pair L4D18$^{(\pm\frac{2}{3})}$ = 1/30
quarks pair L5D18$^{(\pm\frac{1}{3})}$ = 1/30

The total width of the 21 quarks pairs is 21/30, in splendorous agreement with experimental data. Please note that according to the universality assumption each symmetry has produced all its seven intervalic structures, that is to say, seven quarks, and no one intervalic structure can be made by duplicate. Therefore, the six last intervalic structures pertaining to the {D45} symmetry can not be made twice, regardless they have allowed both ⅓ and ⅔ charge. In this case, only the quarks with ⅓ charge are made in the decay, which is, besides, in very good agreement with the experimental data of the annihilation cross-section ratio e^+e^- → strongly interaction particles. This extremely precise prediction of IT regarding the decay of Z^0 will be able to be verified experimentally in a near future.

The intervalic decay of the heavier leptons-massive bosons will be discussed in the chapter on the Intervalic Decay.

INTERVALIC DECAY OF LEPTONS-CHARGED MASSIVE BOSONS

LEPTONS- -CH. MASSIVE BOSONS	decays into all above particles up to:	Decaying particles: leptons-massive bosons and isoquarks (quarks with two allowed charges: ⅓ and ⅔)	Mass (MeV/c²)	Accumulated decaying mass (MeV/c²)	Partial width of each one of the above particles
Muon, $\mu^{\pm}$ (105.7)	→	$e^{\pm} + \underline{\nu}_{e} + \nu_{\text{LCMB}}$	0.5	0.5	**1**
		$\mu^{\pm} + \underline{\nu}_{\mu} + \nu_{\text{LCMB}}$	105.7	106	1/2
		Quarks $L_{\frac{2}{3}}\frac{2}{3}G_{6}4D_{45}^{(\frac{1}{3})}$ $L_{\frac{2}{3}}\frac{2}{3}G_{6}4D_{45}^{(\frac{2}{3})}$ *constituent quarks of π meson*	138	244	1/3
		Quarks $L_{1}1G_{6}6D_{45}^{(\frac{1}{3})}$ $L_{1}1G_{6}6D_{45}^{(\frac{2}{3})}$	208	452	1/4
		Quarks $L_{2}2G_{6}12D_{45}^{(\frac{1}{3})}$ $L_{2}2G_{6}12D_{45}^{(\frac{2}{3})}$	414	866	1/5
Tau, $\tau^{\pm}$ (1,771)	→	Quarks $L_{3}3G_{6}18D_{45}^{(\frac{1}{3})}$ $L_{3}3G_{6}18D_{45}^{(\frac{2}{3})}$ *former quarks up, down*	622	1,488	**1/6**
		Quarks $L_{4}4G_{6}24D_{45}^{(\frac{1}{3})}$ $L_{4}4G_{6}24D_{45}^{(\frac{2}{3})}$	828	2,316	1/7
		Quarks $L_{5}5G_{6}30D_{45}^{(\frac{1}{3})}$ $L_{5}5G_{6}30D_{45}^{(\frac{2}{3})}$ *former quark strange*	1,036	3,352	1/8
$W^{\pm}$ boson (80,423)	→	$\tau^{\pm} + \underline{\nu}_{\tau} + \nu_{\text{LCMB}}$	1,771	5,123	**1/9**
		$W^{\pm}$ boson + $\underline{\nu}_{W} + \nu_{\text{LCMB}}$	80,423	85,546	1/10
		Quarks $L_{\frac{2}{3}}\frac{2}{3}G_{54}36D_{5}^{(\frac{1}{3})}$ $L_{\frac{2}{3}}\frac{2}{3}G_{54}36D_{5}^{(\frac{2}{3})}$	100,712	186,258	1/11
$Y^{\pm}$ boson (372,518)	→	Quarks $L_{1}1G_{54}54D_{5}^{(\frac{1}{3})}$ $L_{1}1G_{54}54D_{5}^{(\frac{2}{3})}$	151,068	337,326	**1/12**
		Quarks $L_{2}2G_{54}108D_{5}^{(\frac{1}{3})}$ $L_{2}2G_{54}108D_{5}^{(\frac{2}{3})}$	302,136	639,462	1/13
$X^{\pm}$ boson (1,257,249)	→	$Y^{\pm}$ boson + $\underline{\nu}_{Y} + \nu_{\text{LCMB}}$	372,518	1,011,980	**1/14**
		Quarks $L_{3}3G_{54}162D_{5}^{(\frac{1}{3})}$ $L_{3}3G_{54}162D_{5}^{(\frac{2}{3})}$	453,202	1,465,182	1/15
		Quarks $L_{\frac{2}{3}}\frac{2}{3}G_{90}60D_{3}^{(\frac{1}{3})}$ $L_{\frac{2}{3}}\frac{2}{3}G_{90}60D_{3}^{(\frac{2}{3})}$	466,256	1,931,438	1/16
		Quarks $L_{4}4G_{54}216D_{5}^{(\frac{1}{3})}$ $L_{4}4G_{54}216D_{5}^{(\frac{2}{3})}$	604,268	2,535,706	1/17
		Quarks $L_{1}1G_{90}90D_{3}^{(\frac{1}{3})}$ $L_{1}1G_{90}90D_{3}^{(\frac{2}{3})}$	699,386	3,235,092	1/18
		Quarks $L_{5}5G_{54}270D_{5}^{(\frac{1}{3})}$ $L_{5}5G_{54}270D_{5}^{(\frac{2}{3})}$	755,336	3,990,428	1/19
		$X^{\pm}$ boson + $\underline{\nu}_{X} + \nu_{\text{LCMB}}$	1,257,249	5,247,677	1/20
		Quarks $L_{2}2G_{90}180D_{3}^{(\frac{1}{3})}$ $L_{2}2G_{90}180D_{3}^{(\frac{2}{3})}$	1,398,768	6,646,445	1/21
		Quarks $L_{\frac{2}{3}}\frac{2}{3}G_{135}90D_{2}^{(\frac{1}{3})}$ $L_{\frac{2}{3}}\frac{2}{3}G_{135}90D_{2}^{(\frac{2}{3})}$	1,573,616	8,220,061	1/22
		Quarks $L_{3}3G_{90}270D_{3}^{(\frac{1}{3})}$ $L_{3}3G_{90}270D_{3}^{(\frac{2}{3})}$	2,098,156	10,318,217	1/23
		Quarks $L_{1}1G_{135}135D_{2}^{(\frac{1}{3})}$ $L_{1}1G_{135}135D_{2}^{(\frac{2}{3})}$	2,360,426	12,678,643	1/24
		Quarks $L_{4}4G_{90}360D_{3}^{(\frac{1}{3})}$ $L_{4}4G_{90}360D_{3}^{(\frac{2}{3})}$	2,797,542	15,476,185	1/25
		Quarks $L_{5}5G_{90}450D_{3}^{(\frac{1}{3})}$ $L_{5}5G_{90}450D_{3}^{(\frac{2}{3})}$	3,496,926	18,973,111	1/26
		Quarks $L_{2}2G_{135}270D_{2}^{(\frac{1}{3})}$ $L_{2}2G_{135}270D_{2}^{(\frac{2}{3})}$	4,720,848	23,693,959	1/27
		Quarks $L_{3}3G_{135}405D_{2}^{(\frac{1}{3})}$ $L_{3}3G_{135}405D_{2}^{(\frac{2}{3})}$	7,081,276	30,775,235	1/28
		Quarks $L_{4}4G_{135}540D_{2}^{(\frac{1}{3})}$ $L_{4}4G_{135}540D_{2}^{(\frac{2}{3})}$	9,441,700	40,216,935	1/29
		Quarks $L_{5}5G_{135}675D_{2}^{(\frac{1}{3})}$ $L_{5}5G_{135}675D_{2}^{(\frac{2}{3})}$	11,802,126	52,019,061	1/30

INTERVALIC DECAY OF BILEPTONS-ZERO CHARGED MASSIVE BOSONS

BILEPTONS--ZCMB	decays into all above particles up to:	Decaying particles: *pairs* of quarks, leptons-massive bosons and neutrinos	Mass (MeV/c²)	Accum. decaying mass (MeV/c²)	Partial width of each one of the above particles
		$e^- e^+ + \nu_e \underline{\nu}_e + \nu_{ZCMB} \underline{\nu}_{ZCMB}$	1	-	1/3
		Quarks $L_{1/3}1/3G_6 2D_{45}^{(1/3)}$ $L_{1/3}1/3G_6 2D_{45}^{(1/3)}$ *last radiant decay quark, c. q. π m.*	70	71	1/4
		Quarks $L_{2/3}2/3G_6 4D_{45}^{(1/3)}$ $L_{2/3}2/3G_6 4D_{45}^{(1/3)}$ *constituent quark of π meson*	138	209	1/5
		Quarks $L_1 1G_6 6D_{45}^{(1/3)}$ $L_1 1G_6 6D_{45}^{(1/3)}$	208	417	1/6
		$\mu^- \mu^+ + \nu_\mu \underline{\nu}_\mu + \nu_{ZCMB} \underline{\nu}_{ZCMB}$	210	627	1/9
		Quarks $L_{1/3}1/3G_9 3D_{30}^{(1/3)}$ $L_{1/3}1/3G_9 3D_{30}^{(1/3)}$	234	861	1/10
		Quarks $L_2 2G_6 12D_{45}^{(1/3)}$ $L_2 2G_6 12D_{45}^{(1/3)}$	414	1,275	1/11
		Quarks $L_{2/3}2/3G_9 6D_{30}^{(2/3)}$ $L_{2/3}2/3G_9 6D_{30}^{(2/3)}$	466	1,741	1/12
		Quarks $L_3 3G_6 18D_{45}^{(1/3)}$ $L_3 3G_6 18D_{45}^{(1/3)}$ *former quark down*	622	2,363	1/13
		Quarks $L_1 1G_9 9D_{30}^{(1/3)}$ $L_1 1G_9 9D_{30}^{(1/3)}$	700	3,063	1/14
		Quarks $L_4 4G_6 24D_{45}^{(1/3)}$ $L_4 4G_6 24D_{45}^{(1/3)}$	828	3,891	1/15
		Quarks $L_5 5G_6 30D_{45}^{(1/3)}$ $L_5 5G_6 30D_{45}^{(1/3)}$ *former quark strange*	1,036	4,927	1/16
		Quarks $L_{1/3}1/3G_{15} 5D_{18}^{(1/3)}$ $L_{1/3}1/3G_{15} 5D_{18}^{(1/3)}$	1,080	6,007	1/17
		Quarks $L_2 2G_9 18D_{30}^{(2/3)}$ $L_2 2G_9 18D_{30}^{(2/3)}$	1,398	7,405	1/18
		Quarks $L_3 3G_9 27D_{30}^{(1/3)}$ $L_3 3G_9 27D_{30}^{(1/3)}$	2,098	9,503	1/19
		Quarks $L_{2/3}2/3G_{15} 10D_{18}^{(2/3)}$ $L_{2/3}2/3G_{15} 10D_{18}^{(2/3)}$	2,158	11,661	1/20
		Quarks $L_4 4G_9 36D_{30}^{(2/3)}$ $L_4 4G_9 36D_{30}^{(2/3)}$ *former quark charm*	2,798	14,459	1/21
		Quarks $L_1 1G_{15} 15D_{18}^{(1/3)}$ $L_1 1G_{15} 15D_{18}^{(1/3)}$	3,238	17,697	1/22
		Quarks $L_5 5G_9 45D_{30}^{(1/3)}$ $L_5 5G_9 45D_{30}^{(1/3)}$	3,496	21,193	1/23
		$\tau^- \tau^+ + \nu_\tau \underline{\nu}_\tau + \nu_{ZCMB} \underline{\nu}_{ZCMB}$	3,554	24,747	1/26
		Quarks $L_2 2G_{15} 30D_{18}^{(2/3)}$ $L_2 2G_{15} 30D_{18}^{(2/3)}$	6,476	31,223	1/27
		Quarks $L_3 3G_{15} 45D_{18}^{(1/3)}$ $L_3 3G_{15} 45D_{18}^{(1/3)}$ *former quark bottom*	9,714	40,937	1/28
		Quarks $L_4 4G_{15} 60D_{18}^{(2/3)}$ $L_4 4G_{15} 60D_{18}^{(2/3)}$	12,952	53,889	1/29
Z^0 boson (91,188)	→	Quarks $L_5 5G_{15} 75D_{18}^{(1/3)}$ $L_5 5G_{15} 75D_{18}^{(1/3)}$	16,190	70,079	**1/30**
		Quarks $L_{1/3}1/3G_{45} 15D_6^{(1/3)}$ $L_{1/3}1/3G_{45} 15D_6^{(1/3)}$	29,142	99,221	1/31
W^0 boson (160,928)	→	Quarks $L_{1/3}1/3G_{54} 18D_5^{(1/3)}$ $L_{1/3}1/3G_{54} 18D_5^{(1/3)}$	50,356	149,577	**1/32**
		Quarks $L_{2/3}2/3G_{45} 30D_6^{(2/3)}$ $L_{2/3}2/3G_{45} 30D_6^{(2/3)}$	58,282	207,859	1/33
		Quarks $L_1 1G_{45} 45D_6^{(1/3)}$ $L_1 1G_{45} 45D_6^{(1/3)}$	87,424	295,283	1/34

BILEPTONS--ZCMB	decays into all above particles up to:	Decaying particles: *pairs* of quarks, leptons-massive bosons and neutrinos	Mass (MeV/c²)	Accumulated decaying mass (MeV/c²)	Partial width of each one of the above particles
		Z^0 boson + $\nu_Z \underline{\nu}_Z + \nu_{ZCMB} \underline{\nu}_{ZCMB}$	91,188	386,471	1/37
		Quarks $L_{2/3}2/3G_{54} 36D_5^{(1/3)}$ $L_{2/3}2/3G_{54} 36D_5^{(1/3)}$	100,712	487,183	1/38
Y^0 boson (745,037)	→	Quarks $L_1 1G_{54} 54D_5^{(1/3)}$ $L_1 1G_{54} 54D_5^{(1/3)}$	151,068	638,251	**1/39**
		$W^- W^+ + \nu_W \underline{\nu}_W + \nu_{ZCMB} \underline{\nu}_{ZCMB}$	160,846	799,097	1/42
		Quarks $L_2 2G_{45} 90D_6^{(2/3)}$ $L_2 2G_{45} 90D_6^{(2/3)}$	174,852	973,949	1/43
		Quarks $L_{1/3}1/3G_{90} 30D_3^{(1/3)}$ $L_{1/3}1/3G_{90} 30D_3^{(1/3)}$	233,128	1,207,077	1/44
		Quarks $L_3 3G_{45} 135D_6^{(1/3)}$ $L_3 3G_{45} 135D_6^{(1/3)}$	262,270	1,469,347	1/45
		Quarks $L_2 2G_{54} 108D_5^{(1/3)}$ $L_2 2G_{54} 108D_5^{(1/3)}$	302,136	1,771,483	1/46
X^0 boson (2,514,499)	→	Quarks $L_4 4G_{45} 180D_6^{(2/3)}$ $L_4 4G_{45} 180D_6^{(2/3)}$ *former quark top*	349,692	2,121,175	**1/47**
		Quarks $L_5 5G_{45} 225D_6^{(1/3)}$ $L_5 5G_{45} 225D_6^{(1/3)}$	437,116	2,558,291	1/48
		Quarks $L_3 3G_{54} 162D_5^{(1/3)}$ $L_3 3G_{54} 162D_5^{(1/3)}$	453,202	3,011,493	1/49
		Quarks $L_{2/3}2/3G_{90} 60D_3^{(1/3)}$ $L_{2/3}2/3G_{90} 60D_3^{(1/3)}$	466,256	3,477,749	1/50
		Quarks $L_4 4G_{54} 216D_5^{(1/3)}$ $L_4 4G_{54} 216D_5^{(1/3)}$	604,268	4,082,017	1/51
		Quarks $L_1 1G_{90} 90D_3^{(1/3)}$ $L_1 1G_{90} 90D_3^{(1/3)}$	699,386	4,781,403	1/52
		Y^0 boson + $\nu_Y \underline{\nu}_Y + \nu_{ZCMB} \underline{\nu}_{ZCMB}$	745,037	5,526,440	1/55
		Quarks $L_5 5G_{54} 270D_5^{(1/3)}$ $L_5 5G_{54} 270D_5^{(1/3)}$	755,336	6,281,776	1/56
		Quarks $L_{1/3}1/3G_{135} 45D_2^{(1/3)}$ $L_{1/3}1/3G_{135} 45D_2^{(1/3)}$	786,808	7,068,584	1/57
		Quarks $L_2 2G_{90} 180D_3^{(1/3)}$ $L_2 2G_{90} 180D_3^{(1/3)}$	1,398,768	8,467,352	1/58
		Quarks $L_{2/3}2/3G_{135} 90D_2^{(1/3)}$ $L_{2/3}2/3G_{135} 90D_2^{(1/3)}$	1,573,616	10,040,968	1/59
		Quarks $L_3 3G_{90} 270D_3^{(1/3)}$ $L_3 3G_{90} 270D_3^{(1/3)}$	2,098,156	12,139,124	1/60
		Quarks $L_1 1G_{135} 135D_2^{(1/3)}$ $L_1 1G_{135} 135D_2^{(1/3)}$	2,360,426	14,499,550	1/61
		$X^- X^+ + \nu_X \underline{\nu}_X + \nu_{ZCMB} \underline{\nu}_{ZCMB}$	2,514,499	17,014,049	1/64
		Quarks $L_4 4G_{90} 360D_3^{(1/3)}$ $L_4 4G_{90} 360D_3^{(1/3)}$	2,797,542	19,811,591	1/65
		Quarks $L_5 5G_{90} 450D_3^{(1/3)}$ $L_5 5G_{90} 450D_3^{(1/3)}$	3,496,926	23,308,517	1/66
		Quarks $L_2 2G_{135} 270D_2^{(1/3)}$ $L_2 2G_{135} 270D_2^{(1/3)}$	4,720,848	28,029,365	1/67
		Quarks $L_3 3G_{135} 405D_2^{(1/3)}$ $L_3 3G_{135} 405D_2^{(1/3)}$	7,081,276	35,110,641	1/68
		Quarks $L_4 4G_{135} 540D_2^{(1/3)}$ $L_4 4G_{135} 540D_2^{(1/3)}$	9,441,700	44,552,341	1/69
		Quarks $L_5 5G_{135} 675D_2^{(1/3)}$ $L_5 5G_{135} 675D_2^{(1/3)}$	11,802,126	56,354,467	1/70

Chapter 26

PARTICLES SHARE IN THE INTERVALIC PRIMORDIAL UNIVERSE

INTERVALIC SHARE OF PARTICLES ASSEMBLED AT THE INTERVALIC PRIMORDIAL SYNTHESIS

According to the *intervalic whole symmetry assumption*, every primordial synthesis must yield states which are both symmetric and antisymmetric under interchange. This elemental symmetry has however outstanding consequences for the share of particles assembled at IPS.

PHOTONS AND CHIS

Since the primordial assembly of intervalic strings made both photons and chis or bistrings, this means that the total energy of the primordial photons created must be the same as the total energy of the primordial chi or bistrings. As we have identified the vacuum as an *assembly of fermions*, that is to say, as an assembly of intervalic strings, such chis or bistrings could really be no other that the dark energy of vacuum, that is to say, of the own *spacetime* of the Universe. In this way, the total energy of primordial photons should be the same as the total energy of primordial spacetime:

Energy of primordial photons = energy of primordial spacetime

And we already know how is the energy of the intervalic string —whose formulation is similar to the Hamiltonian of the energy of vacuum according to SM—:

$E_{vacuum} = ½ ħ φ$

So we find the surprising result that we can deduce the total energy of the primordial photons assembled at the beginning of the Universe through only integrating the energy of the intervalic string along all frequorces of vacuum by means of their values are limited geometrically by the magnitude of the intervalic frequorce, $\boldsymbol{φ_I} = c\ ħ^{-1} = 2.839921837 \cdot 10^{42}\ (s^{-1})$:

$E_γ ≡ E_{vacuum} \rightarrow \int ½ ħ φ = ¼ ħ φ^2$

By intervalic dimensional analysis it is elemental to introduce the suited geometric conversion factor (of c and ħ) in the above equation to make it consistent under intervalic dimensions:

$E_γ ≡ E_{vacuum} = ¼\ c^3 ħ^2 φ^2$

And finally turning dimensionally the equation by 360º —$c^{\pm4}$ (1)— in the intervalic dimensional space, in order to match the adequate cycle of dimensional symmetry in the traditional not-singular units, we have:

$E_γ ≡ E_{vacuum} = ¼\ c^7 ħ^2 \boldsymbol{φ_I}^2 = ¼\ c^9 = 4.890196776 \cdot 10^{75}\ (J)$

Since the velenergy —both transversal as longitudinal— of everyone of the primordial photons was exactly the intervalic velenergy, $c = 2.99792458 \cdot 10^8$ (J), we inclusive can know with astonishing simplicity the *number of primordial photons* assembled from intervalic strings at the very beginning of the Universe:

$n_γ = E_γ / c = ¼\ c^8 = 1.631194063 \cdot 10^{67}$

The temperature of the Universe at the assembly of photons and chis or bistrings was necessarily determined by the geometric magnitudes of the Intervalic Space, that is to say, the *intervalic temperature,* $\mathbf{\Theta_I}$:

$\mathbf{\Theta_I} = c\ k_B^{-1} = 2.17138589 \cdot 10^{31}$ (K)

Therefore the corresponding energy of those primordial photons according to its temperature was, as might be expected:

$E = k_B\, \mathbf{\Theta_I} = c$

In resume, the intervalic share in the composition of the primordial Universe at this step was the following:

Photons: ½ = 50%
Chis: ½ = 50%

It must be pointed out that these photons and chi or bistrings only interacted intervalically, but did not interact neither electromagnetic nor gravitationally because the sources with their corresponding degrees of freedom introduced by those interaction —respectively dalinos and intervalinos— had not been created yet. By this reason these "photons" can preferably be named closed strings instead of photons yet. Therefore, the Universe at this step was not constituted exclusively by dark matter, but by some stuff which does not interact via gravitational interaction either; we can name it *ultra dark energy*.

THE TOTAL ENERGY OF THE UNIVERSE

Obviously, the total energy of the Universe is simply the double than the total energy of vacuum:

$E_{\text{Universe}} = 2\ E_\gamma = 2\ E_{\text{vacuum}} = ½\ c^9 = 9.780393553 \cdot 10^{75}$ (J)

As a consequence of the calculation of the energy of vacuum, we can obtain another surprising feature. We might have thought that to get a result consisting on that the energy of spacetime would rely only on the magnitudes of the *intervalic length*, ħ, and the *intervalic velocity*, c —which is the same as to say: in the very last genuine units of *real* space and of *imaginary* space, ħ (L) and c ($i^{\pm 1}$) respectively—, would be a result of a remarkable elegance and simplicity. In that case it could be said that the amount of the total energy of the Universe would rely on the geometric magnitudes of the *intervalic dimensions* (!): the intervalic quantum and limit of real and imaginary space respectively —the geometric heights of Nature—. However we have not obtained such result, but another one still more surprising: the total energy of the Universe depends exclusively on the magnitude of the imaginary dimension —the speed of light— regardless of the magnitude of the real dimensions (!).

For example, if the magnitude of the speed of light was double of the actual one, the total energy of the Universe would be 512 times greater:

$$E_{\text{Universe}} = ½\ (2c)^9 = 5.007561499 \cdot 10^{78}\ (J)$$

In other words, the total energy of the Universe relies of the magnitude of the speed of light raised to the power 9.

Of course, it is an intriguing fact that in the calculation of the energy of the Universe all the involved physical quantities vanish remaining only the speed of light. Unexpectedly, this means that for this calculation there must be used some non-singular units, that is to say, an intervalic dimensional system with $c \neq 1$. Now we are slightly touching some of the last of the very last foundations of Physics. It should exist some relation between the two dimensionful fundamental constants, c and ħ, and some dimensionless fundamental constant in order to point that suitable non-singular magnitude of c. We can not discuss this fascinating question here. Let's only say that the power number of the actual magnitude of c in SI units is curiously not very far from that value.

When we explained the intervalic dimensions and units we showed how the magnitudes of c and ħ have no influence on the phenomenology of the Universe because all the 40 physical quantities are just composed by simple dimensional combinations of c and ħ (!). Therefore, we have no way to measure the relative magnitudes of c and/or ħ because any variation would be invisibly incorporated to our measurements of the 40 physical quantities existing in a tetradimensional spacetime. Nevertheless, the result that the magnitude of the intervalic quantum of length, ħ, does not intervene in the value of the total energy of the Universe is in any case a surprising one which however makes a great sense afterwards. Really, if the magnitude of ħ was for example 10^{50} times greater than the actual one, all the 40 physical quantities would incorporate such modification into its own dimensions and we could not distinguish one Universe from another by no means. On the contrary, if the magnitude of the speed of light would vary, the 40 physical quantities would incorporate such modification in a similar way, but the difference now is that we could hardly distinguish such two Universes (of course, standing inside of them)… if we could measure the total energy of each Universe, because the total energy of any Universe is proportional to the ninth power of c.

Astoundingly, this involves that the speed of light can not be propagated at a distance —*i.e.* it can not be infinite— because in that case the total energy of the Universe must be likewise infinite. Such a Universe, if possible, may anyway be too much different for our possibilities of understanding. On the other end, a very low magnitude of c would yield a Universe containing a very small number of particles. Therefore, there must be a lower limit for the magnitude of the speed of light in order to create an interesting Universe likely to this one. For example, only with a magnitude of the speed light which was 1/5 than the actual one, the total energy of the Universe would be 1,953,125 times smaller, that is to say, the total matter of that hypothetical Universe would be around a half of the total matter of our observed Universe. Such a Universe could hardly curve into a fourth real spatial dimension, as it can be supposed to be the case of our actual Universe. Therefore, the magnitude of c has dramatic consequences for the development of any Universe because it modifies its total energy, although the measurements of the 40 physical magnitudes stay apparently unchanged. Shall we compelled to say once more that the Goddess likes harmony and beauty, and does not play dice?

INTERVALINOS AND GRAVITONS

Since intervalino and graviton are both made from the assembly of two photons in symmetric or antisymmetric state under interchange, we can deduce the total energy of the intervalinos and gravitons assembled at IPS. Once more we find a funny situation with photons as it can be supposed that *all* primordial photons were assembled in a symmetric or antisymmetric state under interchange to make respectively gravitons and intervalinos. Therefore at this step primordial photons disappeared completely in the Universe since all of them were assembled in gravitons or intervalinos. Indeed photons are not needed to carry any electromagnetic interaction at this step because neither its corresponding source —dalinos— nor any intervalic structure has not been assembled and there is no any electromagnetic interaction yet.

The application of the most elemental logic through the intervalic whole symmetry assumption to this step yields a beautiful result which had also be argued by traditional physics as mere hypotheses: the equality between the total energy of matter and the total energy of the gravitational field of the Universe. Now that important assumption is yielded through the most economic means. The total energy of the primordial intervalinos, $E_{\mathbf{I}}$, is identical to the primordial energy of gravitons, E_g:

Energy of primordial intervalinos = energy of primordial gravitons

$E_{\mathbf{I}} \equiv E_g = ½ E_\gamma = (1/8) c^9 = 2.445098388 \cdot 10^{75}$ (J)

Besides as we already know the intervalino energy, $E(\mathbf{I}) = c^{-1}$ (J), we can readily know with exactitude the number of primordial isolated intervalinos which were created originally at the beginning of IPS:

$n_{\mathbf{I}} = E_{\mathbf{I}} / E(\mathbf{I}) = (1/8) c^{10} = 7.330220558 \cdot 10^{83}$

The intervalic share in the composition of the primordial Universe at this step was:

Photons: 0
Chis: ½ = 50%
Intervalinos: ¼ = 25%
Gravitons: ¼ = 25%

INTERVALIC UNIVERSE SCHWARZSCHILD RADIUS AND INTERVALINO-SYNTHESIS TIMING

Although this book is not devoted to intervalic cosmology, it is almost impossible to do not comment very briefly some cosmologic features closely related with our subject.

Inasmuch as all the matter of the actual Universe is the result of further assemblies of such primordial isolated intervalinos, we can obtain an intervalic geometric limit for the total *intervalinar matter* of the Universe (which comprises both visible matter and dark matter) as it can not be greater than the total energy-mass of the primordial isolated intervalinos:

$m_{\text{matter}} \leq c^{\pm 2} E_{\mathbf{I}} = (1/8) c^7 = 2.720538859 \cdot 10^{58}$ (kg)

The Schwarzschild radius of the Universe will be:

$R_{\text{Schw}} = 2Gm_{\text{matter}}c^{\pm 2} = ¼ \pi\alpha c^8\hbar = 3.943640781 \cdot 10^{31}$ (m)

As the Universe as a whole is like a black hole, we can give for certain that the radius of the actual Universe must always be equal or smaller than its Schwarzschild radius.

On the other hand, the intervalic limit of poweleration —acceleration-power—, $\mathbf{W_I} = c^{\pm 2}\hbar^{-1} = 8.51387148 \cdot 10^{50}$ (W), give us the minimum size which could have got the Universe just when primordial intervalinos were assembled:

$$\mathbf{W_I} \geq G\ m_{matter} / R_{min}^{2}$$
$$R_{min} = [(1/8)\pi\alpha]^{½}\ c^{4}\ \hbar = 4.5623734 \cdot 10^{-2}\ (m)$$

At first sight this value seems to be near the middle between the Schwarzschild radius and the intervalic length —which is intended to be the size of the Universe before the beginning of any intervalic assembly, that is to say, when the Universe was composed uniquely by intervalic strings, just at the peak between the Big Crunch and the Big Bang—. Actually we have exactly got the simplest geometric average relation:

$$R_{min} = (\ \hbar\ R_{Schw}\ )^{½}$$

Therefore we can say that the intervalino-synthesis could not finish until the Universe had just increased a half of powers of length of its allowed maximum size.

Since we know both the size of the Universe at the zero point —ħ— and at the intervalino-synthesis, we can easily deduce the shorter allowed time for completing the assembly of primordial intervalinos. Supposing that the assembly of closed strings —photons and chis— started just at the zero point, we have got that the intervalino-synthesis could have been completely made after a time not smaller than:

$$\tau(\mathbf{I}) \geq c^{-1}\ R_{min} = [(1/8)\pi\alpha]^{½}\ c^{3}\ \hbar = 1.521843955 \cdot 10^{-10}\ (s)$$

Since the temperature of the Universe at the zero point must exactly be the intervalic temperature, $\mathbf{\Theta_I} = c\ k_B^{-1} = 2.17138589 \cdot 10^{31}$ (K), and as we know that the temperature of a photon gas in thermal equilibrium falls as the inverse square root of time, in concrete as: $\Theta = 1.074937438 \cdot 10^{10} / t^{½}$ (K), we can know the related temperature of the Universe at this time (it can be noted that in this formula there is a factor $2^{-½}$ which was erroneously missing in the traditional formulation of the temperature):

$$\Theta = 1.074937438 \cdot 10^{10} / \tau(\mathbf{I})^{½} = 8.713610179 \cdot 10^{14}\ (K)$$

On the other hand, we have seen that the threshold temperature of the intervalino's assembly is:

$$\Theta_t(\mathbf{I}) \geq c^{\pm 2} m_{\mathbf{I}} / k_B = 2.415992632 \cdot 10^{14}\ (K)$$

This means that the intervalino-synthesis must have finished at a time:

$\tau(\mathbf{I})_{\mathrm{max}} = [1.074937438 \cdot 10^{10} / \Theta_t(\mathbf{I})]^2 = 1.979589614 \cdot 10^{-9}$ (s)

Therefore it is time-limited by both ends:

$\tau(\mathbf{I}) \leq$ intervalino-synthesis $< \tau(\mathbf{I})_{\mathrm{max}}$
$1.521843955 \cdot 10^{-10}$ (s) $\leq$ intervalino-synthesis $< 1.979589614 \cdot 10^{-9}$ (s)

DALINOS AND BINTERVALINOS

IPS continued through the synthesis of intervalinos to make dalinos and bintervalinos (zero charged dalinos). Now we can inquiry whether there were assembled *all* the intervalinos or there remained some isolated intervalinos which stayed as dark matter at the everlasting. With a primordial Universe composed fifty-fifty by photons and spacetime energy and with an unique fundamental intervalic interaction related with an unique degree of freedom (spin), we have no difficulty to postulate a full efficiency in the synthesis of closed strings —primordial photons— to make intervalinos and gravitons. However, when to that Universe is added one more degree of freedom —mass— with its corresponding long ranged interaction —gravitational—, we may ask about the efficiency in that synthesis of intervalinos. Besides, the assembly of dalinos is not made exclusively from *two* genuine particles, as in the assembly of all fundamental particles till now, but from many genuine particles. So we may also ask whether the share between the assembly of dalinos and bintervalinos follows a balance between energies or between numbers of symmetric and antisymmetric states. These are pretty questions to be better answered within the models of chaos.

Anyway, if it is supposed a full efficiency and a share fifty-fifty according to the total energy of the assembled particles we obtain a geometric limit for the total *dalinar matter* of the Universe:

Energy of primordial dalinos = energy of primordial bintervalinos

$E_{D\pm} \equiv E_{D0} = ½\, E_{\mathbf{I}} = (1/16)\, c^9 = 1.222549194 \cdot 10^{75}$ (J)

$m_{\mathrm{dalinar\ matter}} \leq c^{\pm 2}\, E_{D\pm} = (1/16)\, c^7 = 1.360269429 \cdot 10^{58}$ (kg)

In this case the intervalic share in the composition of the primordial

Universe at this step would be:

Photons: 0
Chis: ½ = 50%
Intervalinos: 0
Gravitons: ¼ = 25%
Dalinos: 1/8 = 12.5%
Bintervalinos: 1/8 = 12.5%

Nevertheless, we will see when explaining the intervalic binding energy of intervalic structures that the assembly of dalinos released a great amount of binding energy. And *how* could dalinos released that huge energy? Emitting *photons,* which are just its corresponding carrier of the new interaction introduced by the own dalino: the electromagnetic one. Moreover, if we look at this step of the primordial Universe we can see that it may be composed only by a maximum of six particles (apart from the intervalic strings): photons, chis, intervalinos, gravitons, dalinos and bintervalinos. And among these six possible particles it is obvious that there are only two that pertain to the truck of the dalino: the intervalino and the photon. However, dalino can't by no means emit intervalinos because it would alter its own intervalic structure which is made from intervalinos. Then, it is clear that the only remaining particle is the photon, as it is just the case. The photons liberated in the assembly of dalinos is the origin of the so named Big Bang. The vast majority of such photons recombined to make new intervalinos and gravitons. However, when the temperature of the primordial Universe dropped below the threshold temperature of intervalinos the existing photons could not make further assemblies. These remaining photons have become cooler and cooler as the Universe expanded and have stayed till nowadays —since time does not elapse for photons—. They are just which constitute what today we name as *cosmic microwave background*.

According to this, the intervalic share in the composition of the primordial Universe at this step would now be:

Photons: > 0
Chis: ½ = 50%
Intervalinos: 0
Gravitons: ¼ = 25%
Dalinos: < 1/8 = 12.5%
Bintervalinos: < 1/8 = 12.5%

GAUDINOS AND BIDALINOS

We finally reach the assembly of the last particle of dark matter allowed by the intervalic symmetries of Nature, the bidalino. Postulating in a similar way that the intervalic share between gaudinos and bidalinos followed the total energy between symmetric and antisymmetric states and reached a full efficiency, we have:

Energy of primordial gaudinos = energy of primordial bidalinos

$E_{G\pm} \equiv E_{G0} = ½\, E_{D\pm} = (1/32)\, c^9 = 6.11274597 \cdot 10^{74}$ (J)

As there are no further assemblies of dark matter, the share of gaudinar matter can be interpreted as the share of the *visible matter* of the Universe:

$m_{\text{visible matter}} \leq c^{\pm 2}\, E_{D\pm} = (1/32)\, c^7 = 6.801347147 \cdot 10^{57}$ (kg)

As in previous steps, the intervalic share in the composition of the primordial Universe at this step would be:

Photons: > 0
Chis: ½ = 50%
Intervalinos: 0
Gravitons: ¼ = 25%
Dalinos: 0
Bintervalinos: < 1/8 = 12.5%
Gaudinos: < 1/16 = 6.25%
Bidalinos: < 1/16 = 6.25%

This means that according to IT the share of *visible matter* in the Universe must represent *less than* 6.25% of the total energy-matter, and this value may be still smaller if we admit the existence of a few isolated intervalinos as a constituent of dark matter, as it seems to be the most probable case.

LISZTINOS AND FRACTIONAL LISZTINOS

At this step both symmetric and antisymmetric assemblies make visible matter: lisztinos —zero charged massive bosons— and fractional lisztinos —quarks—. In a similar way we could postulate that the share of lisztinos and fractional lisztinos is:

$$E_{L(0)} \equiv E_{L(\pm⅓,\ \pm⅔)} = ½\ E_{G\pm} = (1/64)\ c^9 = 3.056372985 \cdot 10^{74}\ (J)$$

However, since the vast majority of the energy of zero charged lisztinos decayed finally into quarks, we can say that the total mass of quarks created at IPS is similar to the total mass of the visible matter described in the preceding paragraph.

$$m_{L(\pm⅓,\ \pm⅔)} \approx m_{\text{visible matter}} \leq c^{\pm2}\ E_{D\pm} = (1/32)\ c^7 = 6.801347147 \cdot 10^{57}\ (kg)$$

Inasmuch as the vast majority of primordial quarks decayed finally into the nucleonic isoquark $L3D45^{(⅓,\ ⅔)}$ —traditional quarks up and down—, we can deduce the maximum number of nucleonic isoquarks generated at the primordial Universe. Taking a rough mass value of 313 (MeV/c^2) we have:

$$n(q) \leq m_{L(\pm⅓,\ \pm⅔)} / m(q) = 1.218937472 \cdot 10^{85}$$

Obviously, the maximum number of nucleons created will be:

$$n(N) \leq ⅓\ n(q) = 4.063124907 \cdot 10^{84}$$

Since the baryon number of the observed Universe is supposed to be around 10^{78}, this means that the real size of the whole Universe would approximately be one million times the observed Universe.

On the contrary, according to the so named inflationary model —which among all the stupid assumptions of mankind, it is probably the most stupid one that can be ever made by a supposed intelligent person—, there are infinite parallel universes, and each one of them is some billions times greater than our observed Universe.

Recapitulating shares we have:

Photons: > 0
Chis: ½ = 50%
Intervalinos: 0
Gravitons: ¼ = 25%
Dalinos: 0
Bintervalinos: < 1/8 = 12.5%
Gaudinos: 0
Bidalinos: < 1/16 = 6.25%
Lisztinos (quarks): < 1/16 = 6.25%

In terms of darkness of matter it is:

Ultra dark energy: ½ = 50%
Dark matter: < 3/16 = 18.75%
Visible matter: < 1/16 = 6.25%
Gravitons: ¼ = 25%
Photons: > 0

Please note the fine match of the relations:

Dark matter + Visible matter = Gravitons
Dark matter + Visible matter + Gravitons = Ultra dark energy

Anyone who has red the ***Tao te King*** by Lao Tzu will be aware of the close relation which arises between the system of bifurcations in IPS which lead to a perfect balance between stuffs at every step, and the equally balanced principles of Tao: Yin and Yang, which are supposed to be the origin of all life and of the Universe.

We can see that all dark and visible matter vanish in front of gravitons, and all matter and gravitons vanish in front of ultra dark energy. In other words, all energy-matter of the Universe vanish within itself (!), being the only remaining stuff of the Universe the own dimensional basis of the intervalic dimensions: three real dimensions and one imaginary dimension. Nevertheless, we have demonstrated at the beginning of this book, when describing the intervalic dimensions, that the sum of all physical quantities derived from the intervalic dimensions of the Universe is just zero. This was named the *intervalic zero assumption*. Since the own dimensions of real and imaginary space are of course included in the 40 existing physical quantities, we see that the whole dimensional system vanish likewise within itself (!).

So the Intervalic Universe is literally made from no physical stuff, *ex nihilo*. This is one of the most satisfactory features of IT which no one other model, system or theory of primitive Physics can hardly reach by far. The extraordinary elegance and unbelievable simplicity of the logical yielding and the great wideness which is derived straightforwardly from IPS is an achievement which becomes still more apparent when compared with the clownish and artless models of all sorts and conditions made *ad hoc* in more or less relation with SM, which at last neither explains nothing nor helps to understand the composition of the Universe as a whole.

THE TOTAL ENERGY OF THE INTERVALIC UNIVERSE: SHARE OF PARTICLES AT THE INTERVALIC PRIMORDIAL ASSEMBLY

At each level of the Intervalic Primordial Assembly the two branches of particles assembled vanish between themselves (one branch is in symmetric state under interchange and the other is antisymmetric). This remarkable logical economy of the Intervalic Universe reminds the perfect Yin-Yang balance of Nature according to Lao Tzu's ***Tao te King***.

Particles share at the Intervalic Primordial Assembly:

- Photons: > 0
- Chi: ½ = 50%
- Intervalinos: ~ 0
- Gravitons: ¼ = 25%
- Dalinos: ~ 0
- Zero charged dalinos: < 1/8 = 12.5%
- Gaudinos: ~ 0
- Zero charged gaudinos: < 1/16 = 6.25%
- Lisztinos (quarks): < 1/16 = 6.25%

Grouping them in terms of the darkness of matter:

- Dark energy: ½ = 50%
- Dark matter: < 3/16 = 18.75%
- Visible matter: < 1/16 = 6.25%
- Gravitons: ¼ = 25%
- Photons: > 0

Please note the fine match of the relations:

- Dark matter + Visible matter = Gravitons
- Dark matter + Visible matter + Gravitons = Chi

MONTEVERDINOS: NEUTRON TO PROTON RATIO

IT gives us another simple but more accurate estimation of the ratio between the number of electrons, protons and neutrons assembled in the primordial Universe. As we already know, the full intervalic structure of nucleon and electron are, respectively:

$1\ M_3 = 3\ L_3 = 9\ G_6 = 54\ D_{45} = 2430\ \mathbf{I}$
$1\ M_1 = 1\ L_1 = 1\ G_1 = 1\ D_{270} = 270\ \mathbf{I}$

Of course the monteverdic, lisztinian and gaudinar structures of electron are redundant since electron is a dalino. It is supposed that there was created the same number of electrons as of protons to balance the total electric charge of the Universe to zero. However, it is clear, as we have seen, that electrons were established much *before* the assembly of protons, in the dalino-synthesis —regardless they were not converted into fermions yet—. Starting from the sure existence of equal number of electrons and protons at the final of IPS, we can postulate two ways: 1) the number of neutrons assembled was fixed at once in IPS, or 2) there was assembled *any* number of neutrons which later decayed into protons and electrons up to reach some balance. In both cases, the clue is to know what could be this *balance*. Thus, postulating:

$$n = p + e + \underline{\nu}_e$$

we have to find some balance between the number of particles created and their involved intervalic structures. Really we have a possible one which lies on the principle of the zero total electric charge of the Universe:

As the number of protons is exactly equal to the number of electrons, the sign of the electric charge of the constituent *intervalinos* of the second member of the balance is:

Electron: $270\ \mathbf{I}^-$
Proton: $1080\ \mathbf{I}^- + 1350\ \mathbf{I}^+ = 270\ \mathbf{I}^+$

Thus there are 1080 x 2 = 2160 intervalinos which constituent electric charges vanish inside proton and do not appear at the last level of the intervalic structure, and 270 x 2 = 540 intervalinos which charges do not vanish and appear at the corresponding last levels of the intervalic structures of both particles. I think it is natural to postulate that such 540 dissociated intervalinos was just covered by the same number of vanished intervalinos at the first member of the equation, making a perfect balance. This will give us directly the number of neutrons. The intervalinar composition of neutron according to the sign of their electric charge is:

Neutron: 1215 $\mathbf{I}^-$ + 1215 $\mathbf{I}^+$ = 0

Therefore, since all constituent electric charges of intervalinos vanish inside neutron, the balance is very simple:

540 vanished charges (*n*) = 540 dissociated charges ($p + e$)

Thus the total number of particles assembled at that balance is deduced from the number of their constituent intervalinos. The proportions are:

Electrons: 270/3240 = 1/12
Protons: 2430/3240 = 9/12
Neutrons: 540/3240 = 2/12

This means that 8.333333333% of the intervalinos of the visible matter of the Universe are assembled inside electron and the remaining 91.666666666% are assembled composing the nucleons.

Finally, the neutron to proton ratio derived from the intervalinar structure of nucleon is:

$R_{\mathbf{I}}(n/p) = 540 / 2{,}430 = 2 / 9 = 0.22222222 \approx 22.22\%$

This is an important result that modern cosmology can not obtain theoretically, but only after the usual *adjusting* through and starting from empirical means.

Henceforth, we can easily deduce the ratio between nucleonic quarks. The proportions of quarks up and down will be:

Quark *u*: 2(9/12) + 2/12 = 20/12
Quark *d*: 9/12 + 2(2/12) = 13/12

And the quark up to quark down ratio equally derived is:

$R_{\mathbf{I}}(u/d) = 20/13$

As we already know the intervalic structure of the constituent gaudinos of nucleonic quarks, we can deduce the ratio between those constituent gaudinos:

$u^{+2/3} \rightarrow L_3 = (G_6^{+2/3}, G_6^{-1/3}, G_6^{+1/3}) = 18\ D_{45} = 810\ \mathbf{I}$
$d^{-1/3} \rightarrow L_3 = (G_6^{-1/3}, G_6^{+1/3}, G_6^{-1/3}) = 18\ D_{45} = 810\ \mathbf{I}$

$G_6^{+2/3}$: 20/12
$G_6^{-1/3}$: (20/12) + 2(13/12) = 46/12
$G_6^{+1/3}$: (20/12) + (13/12) = 33/12

Therefore the $G_6^{+2/3}$ to $G_6^{\pm 1/3}$ ratio still derived from the intervalinar structure of nucleon will be:

$R_{\mathbf{I}}(G_6^{+2/3} / G_6^{\pm 1/3}) = 20 / (46+33) = 20/79$

We must compare this result with the other one, obtained though an independent way, from the primordial assembly of nucleonic gaudinos, which was: $G_6^{+2/3} / G_6^{\pm 1/3} = 1/4$. We have got a remarkable agreement between both results:

$20/79 = 25.3164557\% \approx 1/4$

Thus, by the only means of the intervalic structure we have deduced through two independent ways and in two different steps the ratio of protons to neutrons (among others) assembled in IPS.

SYMMETRY BREAKING IN THE INTERVALIC SYMMETRIES OF DALINOS AND THE PRIMORDIAL DECAY

Below the recombination temperature of dalinos there was a dramatic symmetry breaking which induce the *primordial decay* of all dalinos to only two stable symmetries: {D270} and {D45}, the symmetries which have lasted till today:

$D_1 \rightarrow D_2 \rightarrow D_3 \rightarrow D_5 \rightarrow D_6 \rightarrow D_9 \rightarrow D_{10} \rightarrow$
$\rightarrow D_{15} \rightarrow D_{18} \rightarrow D_{27} \rightarrow D_{30} \rightarrow \mathbf{D_{45}}$

$D_{54} \rightarrow D_{90} \rightarrow D_{135} \rightarrow \mathbf{D_{270}}$

Just before the beginning of the primordial decay the probability to find a dalino in one or another symmetry was proportional to the intervalic energy of the dalino, that is to say, to the dalino’s electric charge squared. In terms of dalino’s wavefunction squared:

$|\Psi(D_{270})|^2 = 1^2/\sum^{16}Q_i^2 = 0.28558881/30,443.759$
$\Psi(D_{135})|^2 = 2^2/\sum^{16}Q_i^2 = 1.1423553/30,443.759$
$|\Psi(D_{90})|^2 = 3^2/\sum^{16}Q_i^2 = 2.5702993/30,443.759$
$|\Psi(D_{54})|^2 = 5^2/\sum^{16}Q_i^2 = 7.1397203/30,443.759$
$|\Psi(D_{45})|^2 = 6^2/\sum^{16}Q_i^2 = 10.281197/30,443.759$
$|\Psi(D_{30})|^2 = 9^2/\sum^{16}Q_i^2 = 23.132694/30,443.759$
$|\Psi(D_{27})|^2 = 10^2/\sum^{16}Q_i^2 = 28.558881/30,443.759$
$|\Psi(D_{18})|^2 = 15^2/\sum^{16}Q_i^2 = 64.257483/30,443.759$
$|\Psi(D_{15})|^2 = 18^2/\sum^{16}Q_i^2 = 92.530775/30,443.759$
$|\Psi(D_{10})|^2 = 27^2/\sum^{16}Q_i^2 = 208.19424/30,443.759$
$|\Psi(D_9)|^2 = 30^2/\sum^{16}Q_i^2 = 257.02993/30,443.759$
$|\Psi(D_6)|^2 = 45^2/\sum^{16}Q_i^2 = 578.31735/30,443.759$
$|\Psi(D_5)|^2 = 54^2/\sum^{16}Q_i^2 = 832.77698/30,443.759$
$|\Psi(D_3)|^2 = 90^2/\sum^{16}Q_i^2 = 2,313.2694/30,443.759$
$|\Psi(D_2)|^2 = 135^2/\sum^{16}Q_i^2 = 5,204.8561/30,443.759$
$|\Psi(D_1)|^2 = 270^2/\sum^{16}Q_i^2 = 20,819.424/30,443.759$

If it is supposed full efficiency in the decay, the number of dalinos 270 and dalinos 45 which made the primordial decay was:

$$n(D_{45}) = \{ |\Psi(D_1)|^2 + |\Psi(D_2)|^2 + |\Psi(D_3)|^2 + |\Psi(D_5)|^2 + |\Psi(D_6)|^2 + \\ + |\Psi(D_9)|^2 + |\Psi(D_{10})|^2 + |\Psi(D_{15})|^2 + |\Psi(D_{18})|^2 + |\Psi(D_{27})|^2 + \\ + |\Psi(D_{30})|^2 + |\Psi(D_{45})|^2 \} / |\Psi(D_{45})|^2 = 2,957.317032$$

$$n(D_{270}) = \{ |\Psi(D_{54})|^2 + |\Psi(D_{90})|^2 + |\Psi(D_{135})|^2 + |\Psi(D_{270})|^2 \} / |\Psi(D_{270})|^2 = \\ = 39.00000042$$

Thus the ratio of dalinos 45 to dalinos 270 would be:

$$n(D_{45}) / n(D_{270}) = 75.82864104 \sim 76$$

If we substitute the intervalic energy of dalinos by their masses we will obtain another result as counterpoint to the previous one. Although we do not know yet the masses of isolated dalinos at IPS, we have a reliable approximation in the muon ratio $E(\mu)_{\text{mass}}/I(\mu) = 1.704916308$. Simplifying in terns of mass energy we have:

$$n(D_{45}) = \{ m(D_1) + m(D_2) + m(D_3) + m(D_5) + m(D_6) + \\ + m(D_9) + m(D_{10}) + m(D_{15}) + m(D_{18}) + m(D_{27}) + \\ + m(D_{30}) + m(D_{45}) \} / m(D_{45}) = 2,122.768615$$

$$n(D_{270}) = \{ m(D_{54}) + m(D_{90}) + m(D_{135}) + m(D_{270}) \} / m(D_{270}) = \\ = 39.00000042$$

And the ratio of dalinos 45 to dalinos 270 becomes:

$$= 54.42996389 \sim 54$$

This is a meaningful limit result because nucleon is just composed by 54 dalinos 45 (remember that the intervalic structure of nucleon is: $M_3 = 3\ L_3 = 9\ G_6 = 54\ D_{45} = 2430\ \mathbf{I}$). Therefore, the number of dalinos 45 to dalinos 270 assembled at IPS is geometrically determined between two values:

$$54 \leq n(D_{45})/n(D_{270}) \leq 76$$

This means that the *neutron to proton ratio* assembled from primordial dalinos must be comprised between the values:

$$0 \leq n(n)/n(p) \leq (76\text{-}54)/54 \sim 40.74\%$$

In other words, the primordial ratio between the number of neutrons to nucleons is:

$$0 \leq n(n)/n(N) \leq 22/76 \sim 28.95\%$$

Here we have the third independent deduction —based only on the intervalic symmetry of subatomic particles— of the number of neutron to proton ratio assembled at the primordial Universe.

MATTER AND ANTIMATTER

According to the deceitful SM, the existence of matter is “explained” through a process of annihilation-materialization. Thus, cosmologists affirms that there must happened a random deviation of about ($10^9 + 1$) by each 10^9 leptons and quarks, in order to it can be “explained” the existence of matter and the absence of antimatter in our observable Universe. Of course, this is by no means an ‘explanation’, as anything of the supposed deductions ad hoc of SM, but only a non-peer ‘witness’ —or a naïve ‘description’ in the better case—. Among all fantasies affirmed by SM this is perhaps one of the most inelegant ones. What about if such matter to antimatter ratio was different from just $(10^9 + 1) / 10^9$? We find once more the endless argument of God playing dice… but *He/She* —or better, *IT,* in order to avoid the genre of God— does not play dice, as Einstein cleverly said *ad nauseam* to some deaf and ungainly ears.

In IT we have got a very different picture. Neglecting zero charged particles which do no affect to the balance, the proportion of dalinos can be easily calculated. Supposing that there is one electron per proton —1 D_{270} per 54 D_{45}—, and postulating that the total electric charge of the Universe is therefore zero, which is of course the simplest logical assumption, we have the primordial proportion (in intervalic charge units):

$$30\ D_{45}{}^{+45} \text{ per } 24\ D_{45}{}^{-45} + 1\ D_{270}{}^{-270}$$

That is to say, we have 24 $D_{45}{}^{+45}$ balanced with 24 $D_{45}{}^{-45}$. Therefore, our actual subatomic particles are really composed, rigorously speaking, by matter and antimatter in 4/5 parts, and the only deviation is that one constituted by:

$$6\ D_{45}{}^{+45} \text{ per } 1\ D_{270}{}^{-270}$$

Thus, in the worst case we only should explain where is the corresponding antimatter of this 1/5 part: 6 $D_{45}{}^{-45}$ per 1 $D_{270}{}^{+270}$.

As we may remember, the threshold temperatures of such dalinos were:

$$\Theta_B\ (D_{270}) < E_B(D_{270}) / k_B = 6.523179514 \cdot 10^{16}\ (K)$$
$$\Theta_B\ (D_{45}) < E_B(D_{45}) / k_B = 1.087175336 \cdot 10^{16}\ (K)$$

This means that former electrons —being still bosons— were assembled before dalinos 45 at IPS. We also should remember that the degree of freedom named *electric charge* relies on *spin*. The isolated intervalino has not got such degree of freedom yet, but only when assembled with other intervalino in a symmetric state under interchange:

$$|\mathbf{I}\ \underline{\mathbf{I}}|_s = \{\ |\uparrow\uparrow|,\ 2^{-½}\ (\ |\uparrow\downarrow| + |\downarrow\uparrow|\ ),\ |\downarrow\downarrow|\ \}$$

According to the spin orientation we have got what is named as electric charge, a degree of freedom derived from spin which was born along with the assembly of dalinos at IPS:

$$|\uparrow\uparrow| = \{+\}$$
$$2^{-½}\ (\ |\uparrow\downarrow| + |\downarrow\uparrow|\ ) = \{0\}$$
$$|\downarrow\downarrow| = \{-\}$$

Now we have to question the following: how was the overall spin orientation of intervalinos in order to get a state of *minimal energy* before their assembly to making dalinos? Not obviously yet to modern Physics, a set of particles with an *uniform order* has *less information* —and therefore *less energy*— than the same set of particles with a random order. This important feature of Nature is beginning to be known as *spontaneous order*, and as we can see, it can be intuitively understood in terms of the everlasting tendency of Nature to reach a state of minimal energy. According to this, the vast majority of intervalinos would have like spin orientation and therefore the next assembly of particles —the dalino 270— would have got like charges.

In this way we see that the so named theory of chaos plays an important role at IPS: first, through this spontaneous order in the overall spin orientation of intervalinos; and second, in the own synthesis of intervalinos to make dalinos, since as we have already commented, the value of 270 intervalinos is like an *attractor* of minimal energy which imposes a main symmetry of Nature.

However, as soon as the first dalinos 270 were assembled, a huge amount of primordial binding energy was liberated by such assembly, and the spontaneous order —which is a weak feature because it deals with small amounts of energy or information— was quickly destroyed and substituted by a random order.

Henceforth, in the next assembly of intervalinos there must be balanced the total electric charge of all existing dalinos, since the scenario has changed from a spontaneous order to a random order. And this is just what happened at the assembly of dalinos 45. At the final of the recombination process there stayed 30 D_{45}^{+45} per 24 D_{45}^{-45}, as the resting 6 D_{45}^{+45} balanced the 1 D_{270}^{-270} previously assembled. In this subtle way, matter just cancel antimatter, and there is no a parallel undetected Universe made from antimatter. Matter and antimatter are already in the core of actual matter of the Universe, but in a manner that SM could never have imagined: hidden in the intervalic structure of subatomic particles.

THE INTERVALIC SHARE OF PARTICLES
ASSEMBLED AT THE INTERVALIC PRIMORDIAL AGGREGATION

<table>
<tr><td rowspan="8">INTER-
VALIC
STRING
Share = 1</td><td rowspan="7">PHOTON
Share = ½</td><td>GRAVITON
(DARK ENERGY)
Share = ¼</td><td colspan="5">Second symmetry breaking → GRAVITATIONAL INTERACTION</td></tr>
<tr><td rowspan="6">INTERVALINO
Share = ¼</td><td rowspan="5">16 DALINOS
(ELECTRON)
Share = 1/8</td><td rowspan="4">40 GAUDINOS
(MUON, TAU,
CHARGED
MASSIVE
BOSONS)
Share = 1/16</td><td>4 INTEGER
LISZTINOS
(ZERO CHARGED
MASSIVE BOSONS)
Share = 1/32</td><td colspan="2">Fifth symmetry breaking →
→ “ELEMENTARY
PSEUDO INTERACTION”</td></tr>
<tr><td rowspan="3">49 FRACTIONAL
LISZTINOS
(QUARKS)
Share = 1/32</td><td>MONTE-
VERDINOS
(MESONS)</td><td>Sixth symmetry
breaking
(despicable)</td></tr>
<tr><td rowspan="2">MONTE-
VERDINOS
(BARYONS)</td><td>-</td></tr>
<tr><td>PALESTRINOS</td></tr>
<tr><td>25 ZERO CHARGED
MASSIVE GAUDINOS
(DARK MATTER)
Share = 1/16</td><td colspan="3">Fourth symmetry breaking →
→ INTERVALIC CHANGEFUL INTERACTION</td></tr>
<tr><td>8 ZERO CHARGED
MASSIVE DALINOS
(DARK MATTER)
Share = 1/8</td><td colspan="4">Third symmetry breaking → ELECTROMAGNETIC INTERACTION</td></tr>
<tr><td>CHI
(DARK ENERGY)
Share = ½</td><td colspan="6">First symmetry breaking → INTERVALIC CHANGELESS INTERACTION</td></tr>
<tr><td>NOTHING
Share = 0</td><td colspan="7">Zero symmetry breaking → INFORMATIONAL INTERACTION</td></tr>
</table>

THE TOTAL ENERGY OF THE INTERVALIC UNIVERSE:

THE NUMBER OF PRIMORDIAL INTERVALIC STRINGS, PHOTONSD AND INTERVALINOS AND THE DETERMINATION OF THE MAGNITUDE OF THE SPEED OF LIGHT

Total energy of primordial photons
$\Sigma E(\gamma) = \frac{1}{4}\, c^7\, \hbar^2\, \boldsymbol{\varphi}_{\mathbf{I}}^{2} = \frac{1}{4}\, c^9 = 4.890196776 \cdot 10^{75}$ (J)

Since the energy of primordial photons
was exactly the intervalic velenergy, $c = 2.99792458 \cdot 10^8$ (J),
we can surprisingly know with astonishing simplicity
the *number of primordial photons* assembled
from intervalic strings at the beginning of the Universe:
$n(\gamma) = \Sigma E(\gamma) / c = \frac{1}{4}\, c^8 = 1.631194063 \cdot 10^{67}$

Number of intervalic strings
$n(S) = 4\, n(\gamma) = 4\ \frac{1}{4}\, c^8 = c^8$

The *magnitude of the speed of light*, c,
is therefore absolutely determined by
the number of intervalic strings assembled,
that is to say, by the total length of space in the Universe:
$c = n(S)^{1/8}$

Total energy of primordial intervalinos and gravitons
$\Sigma E(\mathbf{I}) \equiv \Sigma E(g) = \frac{1}{2}\, \Sigma E(\gamma) = (1/8)\, c^9 = 2.445098388 \cdot 10^{75}$ (J)

Number of primordial intervalinos assembled at the IPA
$n(\mathbf{I}) = \Sigma E(\mathbf{I}) / I(\mathbf{I}) = (1/8)\, c^{10} = 7.330220558 \cdot 10^{83}$

All dark and visible matter vanishes in front of gravitons,
and all matter and gravitons vanish in front of dark energy.
In other words, all energy-matter of the Universe vanishes within itself,
being the only remaining stuff of the Universe
the own mathematical dimensional basis of
the Intervalic System of Dimensions and Units: (L, *i*).

Chapter 27

INTERVALIC GLOBAL CANCELLATION OF ENERGIES

THE PERFECT YIN-TANG BALANCE OF A TAOIST UNIVERSE: GLOBAL CANCELLATION OF ENERGIES AT EVERY BIFURCATION IN THE INTERVALIC PRIMORDIAL SYNTHESIS

As we have already mentioned, in an oscillating Universe it is demonstrated that the energy of matter cancels out exactly the gravitational energy. On the other hand and independently of this result or theorem, we have obtained the same statement by different means: at the intervalic primordial synthesis the energy of matter equals the energy of gravitons:

Dark matter + Visible matter = Gravitons

This is a strong geometric statement derived from the global symmetry of the bifurcations at the intervalic primordial synthesis.

Nevertheless, this is only *one* among the several geometric cancellations that happens between each two branches of the successive bifurcations at every symmetry breaking. Insofar as every symmetry breaking is born from the introduction of a new degree of freedom in Nature, we can say that there exist so many cancellations as degrees of freedoms in the intervalic primordial synthesis. This is a surprising result because it was though that the unique global energy balance of the Universe is that matter cancelled gravitational energy. However, now we discover that every bifurcation related with a new degree of freedom has got its own global energy balance which cancels the energy of the two branches one another with respect to the new introduced degree of freedom. It is hard to imagine a more perfect Taoist Universe like this one, where Ying and Yang always cancel exactly at every and each step of the intervalic primordial synthesis. The total sum of the Universe is *zero*. The unique step in which there is no a cancellation regarding to the corresponding introduced degree of freedom is just the zero step of the intervalic primordial synthesis, where there is nothing but the *intervalic string* and its corresponding interaction: the *informational* one. Meaningfully, this is the only and exclusive *no-duality* state of the Universe, being all the remaining ones characterized a perfect an complete *duality*.

When we finally see so sophisticated prowess of elegance and fractal symmetry, we feel the small human minds rejoicefully surpassed by far by the paramount and incomparable wisdom of Nature. As we will understand immediately, the global energy of bifurcations at the intervalic primordial synthesis follows a fractal pattern. Let us go to see the energy balance at every symmetry breaking.

INFORMATION (ZERO SYMMETRY BREAKING)

The most elemental logic forces us to admit that somehow and somewhere there must be a very last fundamental particle which is not composed by an assembly of other particles, that is to say, the last *single* genuine particle of Nature. IT has postulated that this informational particle is the *intervalic string*, which can be assimilated to the own intervalic length, ħ (L). The particle paired with the intervalic string is no one, just the nothingness. By this reason we have named zero symmetry breaking to the symmetry breaking which stops the further assembly of nothing, then its name (see table). The first actual symmetry breaking will be the so named ‘first’.

The Universe at this step is an undifferentiated stuff composed exclusively by intervalic strings. This means a Universe composed only by *real space* —but not the usual continuum space, which has not been assembled yet— insofar as the *imaginary space* involves the introduction of time, movement or energy. These three concepts involve one another and can be represented by the introduction of the speed of light, c, that is to say, the imaginary space, ($i^{\pm 1}$).

This uncanny Universe may resemble the *chaos* in the original meaning of the word coined in Ancient Greece. The unique existing degree of freedom was *information* or *prespin*, which can be understood as the *position* of an intervalic string relative to the next one, as has been previously explained (by the way, it can be noted that neither frame of reference nor any Descartes axes has been introduced in the real space yet).

The energy of this undifferentiated nothingness is *zero*. This may not be surprising: it is rigorously irrelevant to speak about the *energy* of the *real* space since the imaginary dimensions has not been introduced yet, and the velenergy relies on the existence of *imaginary* dimensions, as well as any other physical quantity whose equation of dimensions has got any power of the *i* number, ($i^{\pm n}$). Therefore this state is *timeless* insofar as time involves the imaginary dimension in its equation of dimensions, (iL). Thus, the energy of vacuum of *real* space is irrelevant, inexistent, because there is no vacuum yet, the is no continuum space yet, but only a rigorous chaos of intervalic strings. This genuine chaos has not to be confounded with the usual vacuum, that is to say, the vacuum composed by spacetime, which energy is far from zero.

We may wonder about *how* the beauty-full Goddess introduced, by the only means of *information*, the imaginary dimension of the imaginary space in the primordial chaotic nothingness. Perhaps the solely *existence* of the mathematical logic was sufficient to initiate the intervalic primordial synthesis of intervalic strings. Perhaps the mere consciousness of the concept was the true act of creation. This might be good news for that Oriental wisdom who hold that the essence of the Universe is some kind of consciousness: now it leave to be esoteric metaphysics to become real physical facts demonstrated rigorously by Particle Physics; and vice versa: the Standard Model of structureless particles surely leaves to be science and becomes fantastic occultism. In any case this lead to one of the most intriguing fields of research: the deep and last relation between information, logic and consciousness. What is sure is that the usual meanings of ‘information’ and ‘consciousness’ need to be redefined much more accurately when referring to this step of the intervalic primordial synthesis. Really, it is possible that the genuine essence of information and consciousness only will be understood at once with the process of synthesis of the intervalic strings.

This is the only state of *no-duality* in the history of the Universe. All the next steps will be governed by the perfect balance between its cancelling energies and are *duality* states. Once more, it is ultimately meaningful that the corresponding degree of freedom of this unique no-duality state was just *information*. The consequences of this result in relation with the precise models of the Buddhist and Vedanta cosmology —described nowadays marvellously by Osho and Sesha, among others— are awesome. The no-dual kind of knowledge reached by the great Oriental masters, whose awesome insights —who perceived cleverly by some kind of straight intuition— is closely related with this no-dual state of information. It can be said that normal and abnormal persons perceive only by electromagnetic and gravitational interactions, whilst supranormal persons, like lamas, yogis, bhagwans and illuminated beings, conserve the skill to perceive —and inclusive to handle— the informational interaction, which acts at a distance since it propagates only through the *real* space, but not through the *imaginary* space —that is to say, it is *timeless*—. Although in our contemporary civilization this is viewed as an extraordinary skill, it should not be so in an advanced civilization (or in a true civilization) in as much as a lot of animals feel the informational interaction, as Jorge Carvajal and Rupert Sheldrake have demonstrated beyond doubt. Proteins seems also to "feel" the informational interaction, as he also has pointed out for desperation of the vast majority of Physics community. And after the experiments of Masaru Emoto about the memory of water, we inclusive can affirm that water interacts informationally. Really, it can be said that anybody feels information, including not only animals and plants but minerals as well, and according to IT, all particles existing in the Universe are interacting informationally, from stars and galaxies to atoms and subatomic particles (up to photons, chi (or bistring)s and intervalic strings).

SPIN ENERGY BALANCE (FIRST SYMMETRY BREAKING)

Once the imaginary space has been introduced we have got the Intervalic Space with its usual intervalic geometry involving real and imaginary spaces, that is to say, we have got the formerly named spacetime. This allows the beginning of the successive assemblies —both in symmetric and antisymmetric states under interchange— of every particle generated along any step of the intervalic primordial synthesis.

The energy of photon, like the energy of any closed string, is due to the *transversal* energy. We have already explained in other site that it is, being J the spin and φ the frequorce:

$$E(\gamma) = 2\pi J\varphi$$

This energy is supposed to be positive regarding spin. Therefore the unlike energy of chi (or bistring) —the dark energy of vacuum— must be supposed to be negative regarding spin.

$$E_{vacuum} = \frac{1}{4}\, c^3\, \hbar^2\, \varphi^2$$

We have already seen that the total energy of primordial photons was:

$E_\gamma = ¼\, c^7\, ħ^2\, \boldsymbol{\varphi_I}^2 = ¼\, c^9 = 4.890196776 \cdot 10^{75}$ (J)

And this magnitude must be equal to the total energy of primordial bisitrings, E_{BS}, also referred as energy of vacuum:

$E_{BS} \equiv E_{vacuum} = ¼\, c^3\, ħ^2\, \varphi^2 = E_\gamma$

Since the frequorce related to vacuum can not be smaller that the inverse of the intervalic frequorce: $\varphi_{min} = c^{-1}ħ$, we can deduce the *maximum* number of chi (or bistring)s allowed by the intervalic geometry:

n(chis or bistrings) $\cdot E_{vacuum}(\varphi_{min}) \leq E_\gamma$
n(chis or bistrings) $\leq c^6\, ħ^{-4} = 5.846109617 \cdot 10^{186}$

Here 'maximum' means that the actual amount may be smaller, and not that the maximum amount is or will be actually reached.

UNIVERSE MAXIMUM RADIUS

Insofar as chi (or bistring)s could be identified with an assembly of intervalic strings —fermions—, that is to say, with the own real space of vacuum, this result would give us the *maximum* volume which can reach the Universe:

$V_{max} \leq$ n(chis or bistrings) $\cdot\, ħ^3 = c^6\, ħ^{-1} = 6.877172245 \cdot 10^{84}$ (m^3)

The corresponding *maximum radius* is:

$R_{max} = [(3/4\pi)V_{max}]^{⅓} = 1.179705935 \cdot 10^{28}$ (m)

This is $1.246950157 \cdot 10^{12}$ light-years. If the observed Universe is supposed to be around 12,000 million light-years, that is to say $\sim 1.25 \cdot 10^{10}$ light-years, the maximum radius of the Universe would be one hundred times greater than the radius of the observed Universe. This means that its volume would be around one million times the volume of the observed Universe. This result just coincides with the other one, deduced in other site, through the baryon number of the Universe, which yielded an equal size of the whole Universe: one million times the observed Universe.

MASS ENERGY BALANCE (SECOND SYMMETRY BREAKING)

At this step intervalino and graviton are assembled. The mass energy of intervalino —and of all intervalinar matter— is by convention positive:

$E = c^{\pm 2} m$

On the other hand, the energy of graviton with respect mass —the gravitational potential energy of matter— is by convention negative or unlike to the mass energy of matter:

$U(m) = G\, m^2 / r$

According to traditional Physics, both magnitudes are equal *only if* the model of the Universe as a whole is an *oscillating* one.

Now it has to be pointed out that IT postulated such equality in an independent way: as a deduction of the intervalic primordial synthesis. Inasmuch as such equality is a geometric result, we can conclude that the model of the Universe must be an oscillating one, just as it is postulated by IT.

ELECTRIC CHARGE ENERGY BALANCE (THIRD SYMMETRY BREAKING)

The particles assembled at this step are dalinos and zero charged dalinos. In a similar way we can postulate that the sum of their total electric charge energies must be zero.

Since the zero charged dalinos are zero charged particles that have reached the electric charge energy balance by themselves.

On the other hand we have the dalino, which therefore will have to reach a similar balance by itself.

The energy regarding electric charge of dalino is determined by the thoroughly used intervalic energy —the equivalent energy of the electric charge according to the intervalic principles of equivalence between electric charge, energy and matter— and its inverse, the electromagnetic energy:

$I = c^{\pm 2}\, \hbar\, Q^{-2}$
$U = c^{\pm 2}\, Q^2 / r$

By convention it has been agreed that the equivalent energy of positive charges carries a plus sign —is repulsive— and the equivalent energy of negative charges carries a minus sign —is attractive—. Therefore the total electric charge energy of all electric charges of the Universe must be zero insofar as we suppose that the strongest probability laws did run at the intervalic primordial synthesis for a set compounded by $n_I = 7.330220558 \cdot 10^{83}$ intervalinos, as it is clearly our case. To suppose, as the standard model does, that there is a certain deviation in the laws of probability with a set of such magnitude is completely absurd.

Besides it can not be affirmed that the deviations from the probability laws are the same at quantum scale and at microscopic scale. It is clear that the quantum would and the intervalic chaos are much more efficient and precise than the macroscopic world. I really don't understand how could be affirmed by the laughable inflationary model that a deviation of 1/300,000 in a supposed fifty-fifty event is admissible. If it is admitted, that *ad hoc* Universe must likewise have got a net electric charge of 1/300,000 of the total number of existing elementary charges, whilst it is however supposed that the total charge of the Universe is zero. Why this inconsequence? Of course, this is the clownish way that the Standard Model of Structureless Particles has found to explain the creation of matter over antimatter, which is one of the most stupid assumptions which can be ever made by any monkey or donkey. I am afraid that the fifty-fifty probability of the like-unlike charges of intervalino is much stronger by far than the fifty-fifty probability of the two sides of a coin. In concrete, if we say that the binding energy involved in intervalino is, for example, 10^{20} or 10^{60} times greater and more precise that the dynamic energy involved in a the fall of a coin, the deviation in the fifty-fifty probability of intervalino's charge sign should be likewise 10^{20} or 10^{60} times smaller than the deviation of the coin's sides. In resume, we can take for certain that the net electric charge of the Universe is just zero.

Moreover, the *universality assumption* assures that a fifty-fifty share between symmetric and antysimmetric states, and also between plus sign or positive and minus sign or negative charges, is made in the intervalic primordial assembly. Therefore it is not possible to postulate a deviation in ant of that shares without violating the universality assumption. This is a gross inconsistency —another one— of quantum mechanics.

INTERVALIC STRUCTURE ENERGY BALANCE (FOURTH SYMMETRY BREAKING)

We have arrived at the last symmetry breaking born from the apparition of dark matter in one of the two bifurcations of the intervalic primordial synthesis. The starting particles assembled at this step are gaudino and zero charged gaudino, and we should postulate in a similar mode that the sum of their total intervalic structure energy must be zero. This energy must be derived from its corresponding interaction: the changeful intervalic one. This interaction changes the intervalic structure of a particle by the next allowed intervalic structure of lesser energy. However, since the intervalic structure energy of gaudino is by convention positive, this implies that the intervalic structure energy of zero charged gaudino should be negative. This surprisingly would mean that the changeful intervalic interaction changes the intervalic structure of zero charged gaudino by a particle(s) which have got greater energy than zero charged gaudino. In other words, the intervalic structure of the decaying particles of zero charged gaudino should have got strangely more mass than the own zero charged gaudino. But we know that this is just the extraordinary case of zero charged gaudino. Indeed, the bidalino, G_2^0, only can decay into its two constituent dalinos 1 and it would take a high cost of energy:

$m(G_2^0) = 1.193680797 \cdot 10^{-8}$ (J) = 74,503.66292 (MeV/c^2)
$m(D_1) = 8.60116697 \cdot 10^{-9}$ (J) = 53,684.238 (MeV/c^2)

This prevent the decay of bidalino, which therefore will last as dark matter in the Universe for a long time, up to the beginning of the Big Crunch, where there will be enough energy available to make it to decay.

<table>
<tr><th colspan="7">THE PERFECT YIN-YANG BALANCE OF A TAOIST UNIVERSE:
GLOBAL CANCELLATION OF ENERGIES BETWEEN ASSEMBLED PARTICLES
AT EVERY STEP OF THE INTERVALIC PRIMORDIAL AGGREGATION</th></tr>
<tr><td>DUALITY VS. NO-DUALITY</td><td>No-Duality state</td><td colspan="5">Duality states</td></tr>
<tr><td>DEGREE OF FREEDOM</td><td><i>Information</i></td><td><i>Spin</i></td><td><i>Mass</i></td><td><i>Electric charge</i></td><td><i>Intervalic structure</i></td><td>-</td></tr>
<tr><td rowspan="7">GLOBAL LIKE AND UNLIKE ENERGIES AT THE INTERVALIC BIFURCATIONS AND SYMMETRY BREAKINGS</td><td rowspan="6">INTERVALIC STRING</td><td rowspan="5">PHOTON
Positive
spin energy</td><td>GRAVITON
Negative
mass energy</td><td colspan="3">Second symmetry breaking → GRAVITATIONAL INTERACTION</td></tr>
<tr><td rowspan="4">INTERVALINO
Positive
mass energy</td><td rowspan="3">16 DALINOS
(ELECTRON)
Positive-negative electric charge energy</td><td rowspan="2">40 GAUDINOS
(MUON, TAU, CHARGED MASSIVE BOSONS)
Positive intervalic structure energy</td><td>4 INTEGER LISZTINOS
(ZERO CHARGED MASSIVE BOSONS)</td></tr>
<tr><td>49 FRACTIONAL LISZTINOS
(QUARKS)</td></tr>
<tr><td>25 ZCM GAUDINOS
(DARK MATTER)
Negative intervalic structure energy</td><td>Fourth symmetry breaking →
INTERVALIC CHANGEFUL INTERACTION</td></tr>
<tr><td>8 ZCM DALINOS
(DARK MATTER)
Neutral electric charge energy</td><td colspan="2">Third symmetry breaking →
→ ELECTROMAGNETIC INTERACTION</td></tr>
<tr><td>CHI
(DARK ENERGY)
Negative
spin energy</td><td colspan="4">First symmetry breaking → INTERVALIC CHANGELESS INTERACTION</td></tr>
<tr><td>NOTHING</td><td colspan="5">Zero symmetry breaking → INFORMATIONAL INTERACTION</td></tr>
</table>

Chapter 28

INTERVALIC DECAY

RECOMBINATION *VERSUS* DECAY

We have seen that at every step the particles assembled are in a permanent state of *recombination*. When the temperature of the primordial egg is greater than the recombination temperature for each set of intervalic structures, all particles are in a thermodynamic equilibrium which maintain unaltered the number of constituent *intervalinos* at both sides of the reaction between the recombined particles. Writing down the number of intervalinos of the recombinations, we would have:

- Dalino-synthesis, 270 constituent intervalinos:

$\leftrightarrow D_{270} \leftrightarrow 2\ D_{135} \leftrightarrow 3\ D_{90} \leftrightarrow 5\ D_{54} \leftrightarrow$
$\leftrightarrow 6\ D_{45} \leftrightarrow 9\ D_{30} \leftrightarrow 10\ D_{27} \leftrightarrow 15\ D_{18} \leftrightarrow$
$\leftrightarrow 18\ D_{15} \leftrightarrow 27\ D_{10} \leftrightarrow 30\ D_9 \leftrightarrow 45\ D_6 \leftrightarrow$
$\leftrightarrow 54\ D_5 \leftrightarrow 90\ D_3 \leftrightarrow 180\ D_2 \leftrightarrow 270\ D_1 \leftrightarrow$

- Gaudino-synthesis, 90 intervalinos:

$\leftrightarrow ⅓\ G_3 \leftrightarrow ⅓\ G_6 \leftrightarrow ⅓\ G_9 \leftrightarrow ⅓\ G_{15} \leftrightarrow$
$\leftrightarrow ⅓\ G_{18} \leftrightarrow ⅓\ G_{27} \leftrightarrow ⅓\ G_{30} \leftrightarrow ⅓\ G_{45} \leftrightarrow$
$\leftrightarrow ⅓\ G_{54} \leftrightarrow ⅓\ G_{90} \leftrightarrow ⅓\ G_{135} \leftrightarrow ⅓\ G_{270} \leftrightarrow$

- Gaudino-synthesis, 180 intervalinos:

$\leftrightarrow \tfrac{2}{3}\,G_3 \leftrightarrow \tfrac{2}{3}\,G_6 \leftrightarrow \tfrac{2}{3}\,G_9 \leftrightarrow \tfrac{2}{3}\,G_{15} \leftrightarrow$
$\leftrightarrow \tfrac{2}{3}\,G_{18} \leftrightarrow \tfrac{2}{3}\,G_{27} \leftrightarrow \tfrac{2}{3}\,G_{30} \leftrightarrow \tfrac{2}{3}\,G_{45} \leftrightarrow$
$\leftrightarrow \tfrac{2}{3}\,G_{54} \leftrightarrow \tfrac{2}{3}\,G_{90} \leftrightarrow \tfrac{2}{3}\,G_{135} \leftrightarrow \tfrac{2}{3}\,G_{270} \leftrightarrow$

- Gaudino-synthesis, 270 intervalinos:
$\leftrightarrow G_1 \leftrightarrow G_2 \leftrightarrow G_3 \leftrightarrow G_5 \leftrightarrow$
$\leftrightarrow G_6 \leftrightarrow G_9 \leftrightarrow G_{10} \leftrightarrow G_{15} \leftrightarrow$
$\leftrightarrow G_{18} \leftrightarrow G_{27} \leftrightarrow G_{30} \leftrightarrow G_{45} \leftrightarrow$
$\leftrightarrow G_{54} \leftrightarrow G_{90} \leftrightarrow G_{135} \leftrightarrow G_{270} \leftrightarrow$

- Lisztino-synthesis, 16200 intervalinos:
$\leftrightarrow 180\ L_{1/3} \leftrightarrow 90\ L_{2/3} \leftrightarrow 60\ L_1 \leftrightarrow 30\ L_2 \leftrightarrow 20\ L_3 \leftrightarrow 15\ L_4 \leftrightarrow 12\ L_5 \leftrightarrow$

Of course, here are not indicated the effective share of the particles created in the Universe, which was already commented in the gaudino-synthesis, but only the production line of recombination.

However, if the temperature drops below the recombination temperature, the recombination chain will not be enough energy to stay, and the involved particles will begin to *decay* into other particles with smaller mass. There are at least five important differences between recombination and decay of particles in the primordial Universe: 1) decay occurs *below* the recombination temperature, 2) decay does not maintain the number of the constituent *intervalinos*, 3) decay may involve not only different intervalic *symmetries* —the 16 ones—, as the recombination does, but also different intervalic *structures*—dalino, gaudino, lisztino, etc.—, a process which never can be made by recombination, 4) decay is an irreversible reaction whilst recombination is reversible, and 5) decay may involve *neutrino* production, whilst recombination may not.

Please note that apart from the traditional dropping of temperature to mark the beginning of the assembly of a particle in the primordial Universe, we have another powerful constraint: the increasing in the complexity of the intervalic structures produced. Until gaudino it is clear that recombination goes in an easy and simple way. However, lisztinos need the concurrence of 16200 intervalinos —instead of 90, 180 or 270— to make possible the recombination. It makes sense to think that a recombination which involves so complex intervalic structures a so great number of intervalinos is difficult to be made. So difficult as to think that lisztinos could not recombined, but only decayed. Then, the beginning of the decay era and the finishing of the recombination era would be marked not only or not principally by a *thermodynamic* feature like the temperature, but by a *symmetric* feature: the *intervalic structure* of the particles involved. This represents another great difference between the traditional Big Bang model and the intervalic one.

Universality is another important feature showed both by recombination and decay. The principal difference between *universality* and *recombination* in that processes is as follows: *at the recombination, universality is made regardless the mass energy of the involved particles*, because all needed energy is available for the recombination —by definition, recombination occurs *above* recombination temperature—. Therefore, all the sets of allowed intervalic symmetries are made in full at the recombination.

On the contrary, in the decay there is no an unlimited energy available to make all the intervalic symmetries, but only can be made particles with less mass energy than the initial particles —since, also by definition, decay occurs *below* the recombination temperature—. Moreover, only some sets of the total allowed intervalic symmetries will be made in the decay: just those intervalic symmetries chosen by Nature's fingers, which are precisely those ones with *highest order* and *lowest energy*, since "God does not play dice".

With the help of these principles and the traditional rules of the conservation of quantum numbers we should already be in condition to predict the particles made in the decay of a lot of particles.

DECAY OF PRIMORDIAL GAUDINOS

As the temperature drops, the particles have not enough energy to recombine and begin to decay, starting by the most massive particles and being followed by order according to their masses and "binding energies". Thus the decay involves both the conversion of primordial bosons into fermions and its corresponding primordial production of neutrinos, since neutrinos were created as a consequence of the conservation of the intrinsic angular momentum in the decay of particles, staying up to nowadays as a cosmic neutrino background.

An important question is to find *when* the strong constraints of order imposed by the intervalic symmetries were realized, making to stay only the most rich dalinar symmetries —270, 45, and later 30, 18, 6, 5, 3, 2—. The inexistence at low energies of gaudinos with poor symmetries: $G2D135^{\pm}$, $G3D90^{\pm}$, $G5D54^{\pm}$, $G9D30^{\pm}$, $G10D27^{\pm}$, $G18D15^{\pm}$ and $G45D6^{\pm}$ in the state of *fermions*, lead us to believe that they exist only as *bosons*. Therefore, these gaudinos did not *decay* making their corresponding fermions, but they were *recombining* as usually into other gaudinos. At once, the gaudinos with richest symmetries $G1D270^{\pm}$, $G6D45^{\pm}$ and $G15D18^{\pm}$ decayed into their corresponding fermions. In this way all 16 primordial spin 0 gaudinos achieved a state of lesser energy as a few kinds of fermions —just those leptons-massive bosons with the most powerful internal symmetry in their intervalic structures—.

$270\,\mathbf{I} \leftrightarrow 1\,D_{270} \leftrightarrow G_1 \rightarrow e + \underline{\nu}_e$
$270\,\mathbf{I} \leftrightarrow 2\,D_{135} \leftrightarrow G_2 \leftrightarrow G_1$
$270\,\mathbf{I} \leftrightarrow 3\,D_{90} \leftrightarrow G_3 \leftrightarrow G_2 \leftrightarrow G_1$
$270\,\mathbf{I} \leftrightarrow 5\,D_{54} \leftrightarrow G_5 \leftrightarrow G_3 \leftrightarrow G_2 \leftrightarrow G_1$
$270\,\mathbf{I} \leftrightarrow 6\,D_{45} \leftrightarrow G_6 \rightarrow \mu + \underline{\nu}_\mu$
$270\,\mathbf{I} \leftrightarrow 9\,D_{30} \leftrightarrow G_9 \leftrightarrow G_6$
$270\,\mathbf{I} \leftrightarrow 10\,D_{27} \leftrightarrow G_{10} \leftrightarrow G_9 \leftrightarrow G_6$
$270\,\mathbf{I} \leftrightarrow 15\,D_{18} \leftrightarrow G_{15} \rightarrow \tau + \underline{\nu}_\tau$
$270\,\mathbf{I} \leftrightarrow 18\,D_{15} \leftrightarrow G_{18} \leftrightarrow G_{15}$
$270\,\mathbf{I} \leftrightarrow 27\,D_{10} \leftrightarrow G_{27} \leftrightarrow G_{18} \leftrightarrow G_{15}$
$270\,\mathbf{I} \leftrightarrow 30\,D_9 \leftrightarrow G_{30} \leftrightarrow G_{27} \leftrightarrow G_{18} \leftrightarrow G_{15}$
$270\,\mathbf{I} \leftrightarrow 45\,D_6 \leftrightarrow G_{45} \leftrightarrow G_{30} \leftrightarrow G_{27} \leftrightarrow G_{18} \leftrightarrow G_{15}$ or
$270\,\mathbf{I} \leftrightarrow 45\,D_6 \leftrightarrow G_{45} \rightarrow Z^{\pm} + \underline{\nu}_Z$ (?)
$270\,\mathbf{I} \leftrightarrow 54\,D_5 \leftrightarrow G_{54} \rightarrow W^{\pm} + \underline{\nu}_W$
$270\,\mathbf{I} \leftrightarrow 90\,D_3 \leftrightarrow G_{90} \rightarrow Y^{\pm} + \underline{\nu}_Y$ (?)
$270\,\mathbf{I} \leftrightarrow 135\,D_2 \leftrightarrow G_{135} \rightarrow X^{\pm} + \underline{\nu}_X$ (?)
$270\,\mathbf{I} \leftrightarrow 270\,D_1 \leftrightarrow G_{270} \rightarrow I^{\pm} + \underline{\nu}_I$

The recombination and decay of gaudinos listed in the above table explains why at low temperatures available in our laboratories are not produced all the 16 leptons-massive bosons allowed by the intervalic symmetries of compositeness. Of course, it remains unexplained to our miserable minds why Nature has apparently decided not to produce as fermions —that is to say, at low temperatures— the primordial gaudinos G9D30$^{\pm}$ (373) and G45D6$^{\pm}$ (46,565) = Z$^{\pm}$, since their respective dalinar symmetries, {D30} and {D6}, have been detected in quarks. (As I do not discard completely the detection of Z$^{\pm}$ I have written in the list the two possibilities of its primordial gaudino: recombination and decay). In my personal opinion this may be related with deep features or properties of the intervalic symmetry which we do not know yet: by some unknown reason, such symmetries are suitable as lisztinian structures but are not as gaudinar structures at low temperatures.

DECAY OF LEPTONS-CHARGED MASSIVE BOSONS

The only leptons-massive bosons which are able to decay are just those gaudinos that decayed and were converted into fermions. Today they are those that can be made at energies below the recombination temperature.

The rules of the intervalic decay are very simple: any particle decays into the *next allowed intervalic structure* with the closest *mass* and conserving the total electric charge. The consecutive and systematic application of this rule has been traditionally named *universality assumption*, which real foundations can be now understood. Actually, this assumption can now be easily viewed as a corolary or simple rule derived from the knowledge of the *intervalic structure* of subatomic particles.

Before reaching that rule there have had a discussion on the question about whether the mass of decaying particles predominates or not over the order of the dalinar symmetries of quark's families. In other words, it could also been supposed that the first quark of every dalinar symmetry is not made until there have been made all the quarks of the preceding family. However, empirical data of decay shows that mass prevail over the order of the dalinar symmetry.

Now let's go to explain how is the decay of leptons-charged massive bosons according to the intervalic *universality*.

Decay of muon

Experimentally we have got: $\mu^- \rightarrow e^- + \underline{\nu}_e + \nu_\mu$

Theoretically we can deduce that muon, $G_6 = 6\ D_{45} = 270\ \mathbf{I}$, decays into the next allowed intervalic structure, which at first sight it would be the isoquark $\text{L⅔D45}^{(⅓,\ ⅔)}$. However, the mass of the corresponding pair is ~138 (MeV/c^2), a value greater that the mass of muon. Therefore that decay is not allowed. The next intervalic structure is the quark $\underline{\text{L⅓D45}}^{(⅓)}$, whose corresponding pair would have a mass of ~69 (MeV/c^2). However, this quark is not a isoquark —it is not $\underline{\text{L⅓D45}}^{(⅓,\ ⅔)}$—, and therefore that decay is neither allowed because the electric charge would not be conserved, since the only allowed values for that coupled pair would be 0 or ⅔. And the quark $\underline{\text{L⅓D45}}$ $^{(⅓)}$ is the lightest and the last quark existing in Nature according to IT. This surprisingly means that muon can not decay into any quark pair. Henceforth, the only remaining particle to decay is just the lightest intervalinoful particle: the electron, $G_1 = D_{270} = 270\ \mathbf{I}$.

$G_6 \rightarrow G_1 + \underline{\nu}_e + \nu_\mu$

It can be noted that this decay probes that quarks of {D90} symmetry are not made by Nature below the threshold temperature. In other way, the muon would decay into these {D90} quarks which are the lightest ones allowed by the intervalic symmetries.

Decay of tau

According to the same decay rules, tau, G_{15} = 15 D_{18} = 270 **I**, could decay into the lighter leptons plus the following allowed intervalic structures of isoquarks, which are all the lightest isoquarks:

L⅔D45$^{(\frac{1}{3},\, \frac{2}{3})}$ (69)
L1D45$^{(\frac{1}{3},\, \frac{2}{3})}$ (104)
L2D45$^{(\frac{1}{3},\, \frac{2}{3})}$ (207)
L3D45$^{(\frac{1}{3},\, \frac{2}{3})}$ (311)

Therefore, the total decay is:

$\tau^{\pm} \rightarrow$	$e^{\pm} + \underline{\nu}_e + \nu_\tau$	(0.5) = 1/6
	$\mu^{\pm} + \underline{\nu}_\mu + \nu_\tau$	(105) = 1/6
	L⅔D45$^{(\frac{1}{3})}$ L⅔D45$^{(\frac{2}{3})}$	(138) = 1/6
	L1D45$^{(\frac{1}{3})}$ L1D45$^{(\frac{2}{3})}$	(208) = 1/6
	L2D45$^{(\frac{1}{3})}$ L2D45$^{(\frac{2}{3})}$	(414) = 1/6
	L3D45$^{(\frac{1}{3})}$ L3D45$^{(\frac{2}{3})}$	(622) = 1/6

The sum of the masses involved in the decay is 1488 (MeV/c^2), going the remaining energy to the neutrino production. The partial width of the decaying particles is just 1/6 for every one.

Both muon and the four quark pairs decay at once according to the intervalic decay rules, which makes a looking of dirt decay which is hard to detect experimentally.

Please note that tau can not decay into the lightest quarks of the next dalinar symmetry, {D30} —L⅓D30$^{(\frac{1}{3})}$ and L⅔D30$^{(\frac{2}{3})}$— because they are not isoquarks (isocharge is not allowed by the own composition of these intervalic structures) and the electric charge could not be conserved in the corresponding pairs, although their masses are much below half of tau.

This simple prediction about the decay of tau introduces another great difference with the poverty of SM, which can not make any prediction about this decay, remaining totally unexplained inclusive after having got experimental data.

Decay of W$^{\pm}$

In a similar way, the decay of W$^{\pm}$ (80,423 MeV/c^2): G_{54} = 54 D_5 = 270 **I**, will be:

$W^{\pm} \rightarrow$	$e^{\pm} + \underline{\nu}_e + \nu_{\mathrm{W}}$	(0.5) = 1/9
	$\mu^{\pm} + \underline{\nu}_{\mu} + \nu_{\mathrm{W}}$	(105) = 1/9
	$\mathrm{L}⅔\mathrm{D}45^{(⅓)}\ \mathrm{L}⅔\mathrm{D}45^{(⅔)}$	(138) = 1/9
	$\mathrm{L1D}45^{(⅓)}\ \mathrm{L1D}45^{(⅔)}$	(208) = 1/9
	$\mathrm{L2D}45^{(⅓)}\ \mathrm{L2D}45^{(⅔)}$	(414) = 1/9
	$\mathrm{L3D}45^{(⅓)}\ \mathrm{L3D}45^{(⅔)}$	(622) = 1/9
	$\mathrm{L4D}45^{(⅓)}\ \mathrm{L4D}45^{(⅔)}$	(828) = 1/9
	$\mathrm{L5D}45^{(⅓)}\ \mathrm{L5D}45^{(⅔)}$	(1,036) = 1/9
	$\tau^{\pm} + \underline{\nu}_{\tau} + \nu_{\mathrm{W}}$	(1,771) = 1/9

The sum of the masses of the decaying particles is only 5123 (MeV/c^2). This strange feature happens because the next isoquark to quark L5D45$^{(⅓, ⅔)}$ is already the isoquark L⅔D5$^{(⅓, ⅔)}$, pertaining to the {D5} symmetry, and which mass is 50,356 (MeV/c^2), being the mass of the corresponding pair the double of that amount. There is a large desert between the masses of isoquarks between these intervalic structures, since the symmetries {D30}, {D18} and {D6} can not make any isoquark, but only quarks. It is a rare characteristic which is derived logical and unavoidably from the intervalic structure, and we only can witness and certificate it —and of course, now also predict it—.

It can be noted that every lepton-massive bosons has its *corresponding* neutrino in order to the conservation of the angular momentum. Thus, in the decay of W± appears the Wnic neutrino in a similar way as in the decay of tau appeared the taunic neutrino.

Needless to say that the above intervalic decays are in paramount agreement with actual experimental data, and introduce a great challenge to identify with more precision the intervalic structures of the isoquarks predicted by IT.

Decay of Y±

Although the Y± boson, $G_{90} = 90\ D_3 = 270\ \mathbf{I}$, with mass 372,518 (MeV/c^2), as well as the remaining allowed heavier massive bosons has not been detected yet, we can deduce precisely its intervalic decay with every partial width:

$Y^{\pm} \rightarrow$	$e^{\pm} + \underline{\nu}_e + \nu_{\mathrm{Y}}$	(0.5) = 1/12
	$\mu^{\pm} + \underline{\nu}_{\mu} + \nu_{\mathrm{Y}}$	(105) = 1/12
	$\mathrm{L}⅔\mathrm{D}45^{(⅓)}\ \mathrm{L}⅔\mathrm{D}45^{(⅔)}$	(138) = 1/12
	$\mathrm{L1D}45^{(⅓)}\ \mathrm{L1D}45^{(⅔)}$	(208) = 1/12
	$\mathrm{L2D}45^{(⅓)}\ \mathrm{L2D}45^{(⅔)}$	(414) = 1/12

$\mathrm{L3D45}^{(\frac{1}{3})}\,\mathrm{L3D45}^{(\frac{2}{3})}$	(622) = 1/12
$\mathrm{L4D45}^{(\frac{1}{3})}\,\mathrm{L4D45}^{(\frac{2}{3})}$	(828) = 1/12
$\mathrm{L5D45}^{(\frac{1}{3})}\,\mathrm{L5D45}^{(\frac{2}{3})}$	(1,036) = 1/12
$\tau^{\pm} + \underline{\nu}_{\tau} + \nu_{\mathrm{Y}}$	(1,771) = 1/12
$\mathrm{W}^{\pm} + \underline{\nu}_{\mathrm{W}} + \nu_{\mathrm{Y}}$	(80,423) = 1/12
$\mathrm{L}\frac{2}{3}\mathrm{D5}^{(\frac{1}{3})}\,\mathrm{L}\frac{2}{3}\mathrm{D5}^{(\frac{2}{3})}$	(100,712) = 1/12
$\mathrm{L1D5}^{(\frac{1}{3})}\,\mathrm{L1D5}^{(\frac{2}{3})}$	(151,068) = 1/12

It can be easily viewed that the $\mathrm{Y}^{\pm}$ boson has not enough mass to decay into the next isoquark pair, $\mathrm{L2D5}^{(\frac{1}{3})}\,\mathrm{L2D5}^{(\frac{2}{3})}$, which mass is 302,136 (MeV/ c^2).

Decay of $\mathrm{X}^{\pm}$

In a similar way, the decay of $\mathrm{X}^{\pm}$ boson, $G_{135} = 135\ D_2 = 270$ **I**, 1,257,249 (MeV/c^2), will be:

$\mathrm{X}^{\pm} \rightarrow$	$e^{\pm} + \underline{\nu}_{e} + \nu_{\mathrm{X}}$	(0.5) = 1/14
	$\mu^{\pm} + \underline{\nu}_{\mu} + \nu_{\mathrm{X}}$	(105) = 1/14
	$\mathrm{L}\frac{2}{3}\mathrm{D45}^{(\frac{1}{3})}\,\mathrm{L}\frac{2}{3}\mathrm{D45}^{(\frac{2}{3})}$	(138) = 1/14
	$\mathrm{L1D45}^{(\frac{1}{3})}\,\mathrm{L1D45}^{(\frac{2}{3})}$	(208) = 1/14
	$\mathrm{L2D45}^{(\frac{1}{3})}\,\mathrm{L2D45}^{(\frac{2}{3})}$	(414) = 1/14
	$\mathrm{L3D45}^{(\frac{1}{3})}\,\mathrm{L3D45}^{(\frac{2}{3})}$	(622) = 1/14
	$\mathrm{L4D45}^{(\frac{1}{3})}\,\mathrm{L4D45}^{(\frac{2}{3})}$	(828) = 1/14
	$\mathrm{L5D45}^{(\frac{1}{3})}\,\mathrm{L5D45}^{(\frac{2}{3})}$	(1,036) = 1/14
	$\tau^{\pm} + \underline{\nu}_{\tau} + \nu_{\mathrm{X}}$	(1,771) = 1/14
	$\mathrm{W}^{\pm} + \underline{\nu}_{\mathrm{W}} + \nu_{\mathrm{X}}$	(80,423) = 1/14
	$\mathrm{L}\frac{2}{3}\mathrm{D5}^{(\frac{1}{3})}\,\mathrm{L}\frac{2}{3}\mathrm{D5}^{(\frac{2}{3})}$	(100,712) = 1/14
	$\mathrm{L1D5}^{(\frac{1}{3})}\,\mathrm{L1D5}^{(\frac{2}{3})}$	(151,068) = 1/14
	$\mathrm{L2D5}^{(\frac{1}{3})}\,\mathrm{L2D5}^{(\frac{2}{3})}$	(302,136) = 1/14
	$\mathrm{Y}^{\pm} + \underline{\nu}_{\mathrm{Y}} + \nu_{\mathrm{X}}$	(372,518) = 1/14

The sum of the masses of the decaying particles is 1,011,980 (MeV/c^2). There is likewise no enough mass energy to decay into the next pair of isoquarks $\mathrm{L3D5}^{(\frac{1}{3})}\,\mathrm{L3D5}^{(\frac{2}{3})}$ with mass 453,202 (MeV/c^2).

DECAY OF ZERO CHARGED MASSIVE BOSONS

The decay of zero charged massive bosons is not constrained by the isocharge quantum number since every quark can be coupled with its corresponding antiquark giving a particle with zero charge.

According to the universality assumption, each particle decays into the next allowed *intervalic structure*. Since isoquarks have *identical* intervalic structures —being the isocharge their unique difference—, this means that isoquarks will be produced in a decay with only one isocharge value. In other case, the would have two identical intervalic structures repeated, which is in contradiction with the intervalic universality assumption. What of the two allowed values of the isocharge are made: ⅓ or ⅔? Although the answer may be obtained via empirical data in a near future, we think that only the ⅓ isocharge is produced in a decay. But what is most important is the fact that only one isocharge is produced, but not the two ones.

Decay of Z^0

According to the intervalic decay rules, we have immediately the following decaying particles with their partial widths for the intervalic decay of Z^0: L_2 = 2 G_{45} = 90 D_6 = 540 **I**:

$Z^0 \rightarrow$	$e^- e^+ + \nu_e \underline{\nu}_e + \nu_Z \underline{\nu}_Z$	(1) = 3/30
	L⅓D45$^{(⅓)}$ L⅓D45$^{(⅓)}$	(70) = 1/30
	L⅔D45$^{(⅓)}$ L⅔D45$^{(⅓)}$	(138) = 1/30
	$\mu^- \mu^+ + \nu_\mu \underline{\nu}_\mu + \nu_Z \underline{\nu}_Z$	(210) = 3/30
	L1D45$^{(⅓)}$ L1D45$^{(⅓)}$	(208) = 1/30
	L⅓D30$^{(⅓)}$ L⅓D30$^{(⅓)}$	(234) = 1/30
	L2D45$^{(⅓)}$ L2D45$^{(⅓)}$	(414) = 1/30
	L⅔D30$^{(⅔)}$ L⅔D30$^{(⅔)}$	(466) = 1/30
	L3D45$^{(⅓)}$ L3D45$^{(⅓)}$	(622) = 1/30
	L1D30$^{(⅓)}$ L1D30$^{(⅓)}$	(700) = 1/30
	L4D45$^{(⅓)}$ L4D45$^{(⅓)}$	(828) = 1/30
	L5D45$^{(⅓)}$ L5D45$^{(⅓)}$	(1,036) = 1/30
	L⅓D18$^{(⅓)}$ L⅓D18$^{(⅓)}$	(1,080) = 1/30
	L2D30$^{(⅔)}$ L2D30$^{(⅔)}$	(1,398) = 1/30
	L3D30$^{(⅓)}$ L3D30$^{(⅓)}$	(2,098) = 1/30
	L⅔D18$^{(⅔)}$ L⅔D18$^{(⅔)}$	(2,158) = 1/30
	L4D30$^{(⅔)}$ L4D30$^{(⅔)}$	(2,798) = 1/30
	L1D18$^{(⅓)}$ L1D18$^{(⅓)}$	(3,238) = 1/30
	L5D30$^{(⅓)}$ L5D30$^{(⅓)}$	(3,496) = 1/30
	$\tau^- \tau^+ + \nu_\tau \underline{\nu}_\tau + \nu_Z \underline{\nu}_Z$	(3,554) = 3/30
	L2D18$^{(⅔)}$ L2D18$^{(⅔)}$	(6,476) = 1/30
	L3D18$^{(⅓)}$ L3D18$^{(⅓)}$	(9,714) = 1/30

L4D18$^{(⅔)}$ L4D18$^{(⅔)}$ (12,952) = 1/30
L5D18$^{(⅓)}$ L5D18$^{(⅓)}$ (16,190) = 1/30

The sum of the masses of the decaying particles is 70,079 (MeV/c^2). It can be viewed that Z^0 has no enough mass energy to decay into the next quark pair, L⅓D6$^{(⅓)}$ L⅓D6$^{(⅓)}$, with 29,142 (MeV/c^2).

It has to be noted that the actual mass is slightly greater because the mass energy corresponding to the last structure level of quarks —which is responsible of the difference of mass between isoquarks— is not included in the tables. By this reason we have placed the quark-antiquark pair L1D45$^{(⅓)}$ L1D45$^{(⅓)}$ below the muon-antimuon pair, because its mass is a few MeV/c^2 greater than muon, although in the table appears to be the contrary by the explained reason.

Once more, needless to say that the deduction of the intervalic decay is in astonishing agreement with experimental data and besides makes a lot of further detailed predictions of the decaying particles involved.

Decay of W^0

Now we are going to describe the decay of the heaviest zero charged massive bosons. Unfortunately, we do not know yet whether such bosons can be made or not below the recombination temperature available in our primitive laboratories. Anyway, the theoretical possibility to predict with full accuracy such decays only can be viewed as an achievement of the theory.

Let us remember the intervalic structure and mass of this boson:

W^0 boson: $L_2 = 2\ G_{54} = 108\ D_5 = 540\ \mathbf{I}$ = 160,928 (MeV/c^2).

W^0 → the same decay particles of Z^0 (70,079) = 30/32
L⅓D6$^{(⅓)}$ L⅓D6$^{(⅓)}$ (29,142) = 1/32
L⅓D5$^{(⅓)}$ L⅓D5$^{(⅓)}$ (50,356) = 1/32

The sum of the masses of the decaying particles is 149,577 (MeV/c^2).

Decay of Y^0

Its intervalic structure and mass is:

Y^0 boson: $L_2 = 2\ G_{90} = 180\ D_3 = 540\ \mathbf{I}$ = 745,037 (MeV/c^2).

$Y^0 \rightarrow$	the same decay particles of W^0	(149,577) = 32/37
	L⅔D6$^{(⅔)}$ L⅔D6$^{(⅔)}$	(58,282) = 1/37
	L1D6$^{(⅓)}$ L1D6$^{(⅓)}$	(87,424) = 1/37
	$Z^0 + \nu_Z\ \underline{\nu}_Z + \nu_Y\ \underline{\nu}_Y$	(91,188) = 1/37
	L⅔D5$^{(⅓)}$ L⅔D5$^{(⅓)}$	(100,712) = 1/37
	L1D5$^{(⅓)}$ L1D5$^{(⅓)}$	(151,068) = 1/37

The sum of the masses of the decaying particles is 638,251 (MeV/c^2).

Decay of X^0

Remembering likewise its intervalic structure and mass:

X^0 boson: $L_2 = 2\ G_{135} = 270\ D_2 = 540\ \mathbf{I} = 2{,}514{,}499$ (MeV/c^2).

$X^0 \rightarrow$	the same decay particles of Y^0	(638,251) = 37/43
	$W^- W^+ + \nu_W\ \underline{\nu}_W + \nu_Y\ \underline{\nu}_Y$	(160,846) = 1/43
	L2D6$^{(⅔)}$ L2D6$^{(⅔)}$	(174,852) = 1/43
	L⅓D3$^{(⅓)}$ L⅓D3$^{(⅓)}$	(233,128) = 1/43
	L3D6$^{(⅓)}$ L3D6$^{(⅓)}$	(262,270) = 1/43
	L2D5$^{(⅓)}$ L2D5$^{(⅓)}$	(302,136) = 1/43
	L4D6$^{(⅔)}$ L4D6$^{(⅔)}$	(349,692) = 1/43

The sum of the masses of the decaying particles is 2,121,175 (MeV/c^2).

Decay of hypothetical quarkless lisztinos 2

We have seen in other site that some quarkoniums —mesons composed by a pair quark-antiquark— have masses near the values of the masses of zero charged lisztinos 2. *If* those quarkoniums would really be quarkless lisztinos 2, instead of quarkful monteverdinos, their decays should follow just the same rules as the decay of zero charged massive bosons. Therefore we can deduce their intervalic structure through their decaying modes. Hypothetical quarkless lisztinos 2 would decay in the following way:

(1020) $\rightarrow$	$e^- e^+ + \nu_e\ \underline{\nu}_e + \nu_Z\ \underline{\nu}_Z$	(1) = 1/6
	L⅓D45$^{(⅓)}$ L⅓D45$^{(⅓)}$	(70) = 1/6
	L⅔D45$^{(⅓)}$ L⅔D45$^{(⅓)}$	(138) = 1/6
	$\mu^- \mu^+ + \nu_\mu\ \underline{\nu}_\mu + \nu_Z\ \underline{\nu}_Z$	(210) = 1/6

L1D45$^{(⅓)}$ L1D45$^{(⅓)}$	(208) = 1/6
L⅓D30$^{(⅓)}$ L⅓D30$^{(⅓)}$	(234) = 1/6

(3097) → $e^- e^+ + \nu_e \underline{\nu_e} + \nu_Z \underline{\nu_Z}$	(1) = 2/15
L⅓D45$^{(⅓)}$ L⅓D45$^{(⅓)}$	(70) = 2/15
L⅔D45$^{(⅔)}$ L⅔D45$^{(⅔)}$	(138) = 1/15
$\mu^- \mu^+ + \nu_\mu \underline{\nu_\mu} + \nu_Z \underline{\nu_Z}$	(210) = 2/15
L1D45$^{(⅔)}$ L1D45$^{(⅔)}$	(208) = 1/15
L⅓D30$^{(⅓)}$ L⅓D30$^{(⅓)}$	(234) = 2/15
L2D45$^{(⅔)}$ L2D45$^{(⅔)}$	(414) = 1/15
L⅔D30$^{(⅔)}$ L⅔D30$^{(⅔)}$	(466) = 1/15
L3D45$^{(⅔)}$ L3D45$^{(⅔)}$	(622) = 1/15
L1D30$^{(⅓)}$ L1D30$^{(⅓)}$	(700) = 2/15

(9460) → $e^- e^+ + \nu_e \underline{\nu_e} + \nu_Z \underline{\nu_Z}$	(1) = 1/13
L⅓D45$^{(⅓)}$ L⅓D45$^{(⅓)}$	(70) = 1/13
L⅔D45$^{(⅓)}$ L⅔D45$^{(⅓)}$	(138) = 1/13
$\mu^- \mu^+ + \nu_\mu \underline{\nu_\mu} + \nu_Z \underline{\nu_Z}$	(210) = 1/13
L1D45$^{(⅓)}$ L1D45$^{(⅓)}$	(208) = 1/13
L⅓D30$^{(⅓)}$ L⅓D30$^{(⅓)}$	(234) = 1/13
L2D45$^{(⅓)}$ L2D45$^{(⅓)}$	(414) = 1/13
L⅔D30$^{(⅔)}$ L⅔D30$^{(⅔)}$	(466) = ½/13
L3D45$^{(⅓)}$ L3D45$^{(⅓)}$	(622) = 1/13
L1D30$^{(⅓)}$ L1D30$^{(⅓)}$	(700) = 1/13
L4D45$^{(⅓)}$ L4D45$^{(⅓)}$	(828) = 1/13
L5D45$^{(⅓)}$ L5D45$^{(⅓)}$	(1,036) = 1/13
L⅓D18$^{(⅓)}$ L⅓D18$^{(⅓)}$	(1,080) = 1/13
L2D30$^{(⅔)}$ L2D30$^{(⅔)}$	(1,398) = ½/13

If such particles do not decay experimentally in this way we can give for certain that their intervalic structure is quarkful.

THEORETICAL DECAY OF ISOLATED FRACTIONAL LISZTINOS (IMAGINARY CASE)

Although quarks do not decay as isolated particles but with another quarks composing mesons or baryons, in order to achieve a better understanding of their decay we are going to deduce the theoretical decay of some fractional lisztinos as it is allowed regarding the intervalic symmetries. Please note that when assembled with another quarks the decay may be neutrinoless, whilst in a theoretical decay of an isolated quark the decay must have neutrino production.

Note also that the masses of quarks listed do not include the energy mass at the last intervalic structure level, that is to say, the intervalic energy and electromagnetic energy at the own lisztinian level which represent a few MeV/c^2, as we already know. It is clear that any quark can decay into its constituent gaudinos because the sum of their masses is slightly greater than the mass of the quark because the intervalic and electromagnetic energies per gaudino decreases progressively as the number of constituent gaudinos increases —due to the binding energy—. For example, the intervalic energy per gaudino at the lisztinian level of the quarks with electric charge ⅓ pertaining to the {D30} symmetry is:

$$\mathrm{I}(\mathrm{L}⅓\mathrm{D30}^{(⅓)})_{\mathrm{L}}/\mathrm{G_n} = c^{\pm 2}\,\hbar\,(90\,\mathbf{q_I})^{-2} / ⅓ = 3 \cdot 2.5702993\ (\mathrm{MeV}/c^2)$$
$$\mathrm{I}(\mathrm{L1D30}^{(⅓)})_{\mathrm{L}}/\mathrm{G_n} = c^{\pm 2}\,\hbar\,(90\,\mathbf{q_I})^{-2} / 1 = 1 \cdot 2.5702993\ (\mathrm{MeV}/c^2)$$
$$\mathrm{I}(\mathrm{L3D30}^{(⅓)})_{\mathrm{L}}/\mathrm{G_n} = c^{\pm 2}\,\hbar\,(90\,\mathbf{q_I})^{-2} / 3 = (1/3) \cdot 2.5702993\ (\mathrm{MeV}/c^2)$$
$$\mathrm{I}(\mathrm{L5D30}^{(⅓)})_{\mathrm{L}}/\mathrm{G_n} = c^{\pm 2}\,\hbar\,(90\,\mathbf{q_I})^{-2} / 5 = (1/5) \cdot 2.5702993\ (\mathrm{MeV}/c^2)$$

We are going to write only the imaginary decay of a few quarks of symmetries {D45}, {D30} and {D18}. Once more please note that the following single decays do not happen in Nature because quarks do not exist in isolated state.

$\mathrm{L}⅓\mathrm{D45}^{(⅓)}$ (35) → not allowed (decays electromagnetically)
$\mathrm{L}⅔\mathrm{D45}^{(⅓)}$ (69) → $\mathrm{L}⅓\mathrm{D45}^{(⅓)} + \nu_\mu + \underline{\nu}_\mu$
$\mathrm{L}⅔\mathrm{D45}^{(⅔)}$ (69) → not allowed (decays electromagnetically)
$\mathrm{L1D45}^{(⅓,\,⅔)}$ (104) → $\mathrm{L}⅔\mathrm{D45}^{(⅓,\,⅔)} + \nu_\mu + \underline{\nu}_\mu$
$\mathrm{L}⅓\mathrm{D30}^{(⅓)}$ (117) → $\mathrm{L1D45}^{(⅓)} + \nu_{\mathrm{D30}} + \underline{\nu}_\mu$
$\mathrm{L}⅔\mathrm{D30}^{(⅔)}$ (233) → $\mathrm{L2D45}^{(⅔)} + \nu_{\mathrm{D30}} + \underline{\nu}_\mu$
$\mathrm{L1D30}^{(⅓)}$ (350) → $\mathrm{L3D45}^{(⅓)} + \nu_{\mathrm{D30}} + \underline{\nu}_\mu$
$\mathrm{L}⅓\mathrm{D18}^{(⅓)}$ (540) → $\mathrm{L5D45}^{(⅓)} + \nu_\tau + \underline{\nu}_\mu$

We have written only the imaginary theoretical decay of the lightest quarks of each symmetry, which decay would be unique. On the contrary, as more complex is the lisztinian structure, the decaying particles are not unique due to the intervalic structure, which allows different groupings of a same number of gaudinos, as can be easily understood viewing the alternative intervalic structures of baryons and mesons listed in their corresponding chapters.

RADIANT DECAY OF QUARKS

An important point to be aware is that the isolated decay of the lighest quarks L⅓D45$^{(1/3)}$ and L⅔D45$^{(2/3)}$ is not allowed because there is no lighter quark to decay into. This feature explains the electromagnetic decay of some mesons and baryons, such as π^0 meson and Σ^0 baryon:

$\pi^0 \rightarrow \gamma\gamma$
$\Sigma^0 \rightarrow \Lambda\gamma$

The dalinar composition of such quarks is:

L⅓D45$^{(1/3)}$ = 2 D$_{45}$
L⅔D45$^{(2/3)}$ = 4 D$_{45}$

These two quarks are just the lightest "remaining particles" which appear in the decay of a lot of mesons and baryons into other less massive particles allowed by the intervalic structure. As these lightest quarks are the *final* allowed quarks which can be made in any hadronic decay of any intervalic symmetry, the final total decay of monteverdinos will partially be a *radiant* one in the vast majority of cases, as it has been checked experimentally.

Thus, for example, in the mentioned radiant decay of Σ^0, we have got a difference of two dalinos 45 between the constituent dalinar structures of Σ^0 and Λ^0. The first baryon is composed by 66 D$_{45}$, whereas Λ^0 is composed by 64 D$_{45}$:

Σ^0 (1192.6) = (L3D45$^{(2/3)}$ L4D45$^{(1/3)}$ L4D45$^{(1/3)}$) = 66 D$_{45}$
Λ^0 (1115.7) = (L⅔D45$^{(2/3)}$ L5D45$^{(1/3)}$ L5D45$^{(1/3)}$) = 64 D$_{45}$

The two unlike remaining dalinos 45 annihilates electromagnetically instead to make a quark L⅓D45$^{(1/3)}$ (35) because it is forbidden due to the conservation of the electric charge.

It can be said that whenever there is an intervalic structure to decay into, the vast majority of mesons and baryons decay through the lost of two or four of its constituent dalinos, which leaves a particle pertaining to the same dalinar symmetry with slight less mass and similar intervalic structure. That is to say, some constituent quark decays loosing a pair of dalinos. For example, constituent quarks of monteverdinos of {D45} symmetry will decay in general as follows:

L1D45 L⅓D45 → L⅔D45 L⅓D45

L1D45 L⅔D45 → L1D45 L⅓D45 or
→ L⅔D45 L⅔D45
L1D45 L1D45 → L1D45 L⅔D45
L2D45 L⅓D45 → L1D45 L1D45
L2D45 L⅔D45 → L2D45 L⅓D45
L2D45 L1D45 → L2D45 L⅔D45
L3D45 L⅓D45 → L2D45 L1D45
L3D45 L⅔D45 → L3D45 L⅓D45
L3D45 L1D45 → L3D45 L⅔D45
...

In every case the lost pair of dalinos 45 decay electromagnetically by annihilation:

$$D_{45}^{+} D_{45}^{-} \rightarrow \gamma\gamma$$

These dalinos have not been detected because its time of annihilation is very small. To calculate it we start from the structural energies of dalinos, previously known:

$$I(D_{45}) = c^{\pm 2}\ \hbar\ (45\ \mathbf{q_I})^{-2} = 1.6472301 \cdot 10^{-12}\ (J) = 10.281197\ (MeV/c^2)$$

The average electromagnetic energy of isoquarkic dalinos 45 is:

$$U(D_{45}) = 1.0225658 \cdot 10^{-12}\ (J) = 6.3823512\ (MeV/c^2)$$

And the spin energy will be:

$$E(D_{45})_J = I(D_{45}) - U(D_{45}) = 6.2466426 \cdot 10^{-13}\ (J) = 3.8988460\ (MeV/c^2)$$

Remembering some dynamical physical quantities related with the spin energy we have:

$$E(D_{45})_J\ = m_{D45}\ r_{D45}^2\ \omega_{D45}^2$$

Since we already known the magnitude of the isoquarkic dalino 45 radius:

$$r_{D45} = ½\ (1/4\pi\varepsilon_0)\ (45\ \mathbf{q_I})^2 / U(D_{45}) = 3.13362065 \cdot 10^{-18}\ (m)$$

and being $m_{D45} = I(D_{45}) + U(D_{45}) = 16.6635482\ (MeV/c^2)$, we can deduce easily the spinning time of the isoquarkic dalino 45:

$$t(D_{45})_J = (E(D_{45})_J \ / \ m_{D45} \ r_{D45}^{2})^{-½} = 2.16093359 \cdot 10^{-26} \text{ (s)}$$

Since the annihilation time of intervalino is much smaller, namely:

$$t(\mathbf{I})_J = r_{\mathbf{I}} \ / \ c = 2.0048068 \cdot 10^{-33} \text{ (s)}$$

the geometric time of annihilation of this quarkic dalino 45 can be taken simply as:

$$T(D_{45})_J = t(D_{45})_J + t(\mathbf{I})_J \approx t(D_{45})_J$$

Such small lifetimes explains (among other reasons) why those pairs of annihilating dalinos, $D_{45}^{+}D_{45}^{-} \rightarrow \gamma\gamma$, which are responsible of the *radiant* decay of a lot of monteverdinos, have not been detected in laboratory yet. Of course, the process is similar for the quarks pertaining to the other symmetries, {D30}, {D18}, {D6}, etc., which are still harder to detect.

INTERVALIC DECAY OF LEPTONS-CHARGED MASSIVE BOSONS

LEPTONS- -CH. MASSIVE BOSONS	decays into all above particles up to:	Decaying particles: leptons-massive bosons and isoquarks (quarks with two allowed charges: ⅓ and ⅔)	Mass (MeV/c²)	Accumulated decaying mass (MeV/c²)	Partial width of each one of the above particles
Muon, $\mu^{\pm}$ (105.7)	→	$e^{\pm} + \underline{\nu}_e + \nu_{\mathrm{LCMB}}$	0.5	0.5	**1**
		$\mu^{\pm} + \underline{\nu}_\mu + \nu_{\mathrm{LCMB}}$	105.7	106	1/2
		Quarks $L_{2/3}\frac{2}{3}G_{6}4D_{45}^{(1/3)}$ $L_{2/3}\frac{2}{3}G_{6}4D_{45}^{(2/3)}$ *constituent quarks of π meson*	138	244	1/3
		Quarks $L_{1}1G_{6}6D_{45}^{(1/3)}$ $L_{1}1G_{6}6D_{45}^{(2/3)}$	208	452	1/4
		Quarks $L_{2}2G_{6}12D_{45}^{(1/3)}$ $L_{2}2G_{6}12D_{45}^{(2/3)}$	414	866	1/5
Tau, $\tau^{\pm}$ (1,771)	→	Quarks $L_{3}3G_{6}18D_{45}^{(1/3)}$ $L_{3}3G_{6}18D_{45}^{(2/3)}$ *former quarks up, down*	622	1,488	**1/6**
		Quarks $L_{4}4G_{6}24D_{45}^{(1/3)}$ $L_{4}4G_{6}24D_{45}^{(2/3)}$	828	2,316	1/7
		Quarks $L_{5}5G_{6}30D_{45}^{(1/3)}$ $L_{5}5G_{6}30D_{45}^{(2/3)}$ *former quark strange*	1,036	3,352	1/8
W± boson (80,423)	→	$\tau^{\pm} + \underline{\nu}_\tau + \nu_{\mathrm{LCMB}}$	1,771	5,123	**1/9**
		W± boson + $\underline{\nu}_{\mathrm{W}} + \nu_{\mathrm{LCMB}}$	80,423	85,546	1/10
		Quarks $L_{2/3}\frac{2}{3}G_{54}36D_{5}^{(1/3)}$ $L_{2/3}\frac{2}{3}G_{54}36D_{5}^{(2/3)}$	100,712	186,258	1/11
Y± boson (372,518)	→	Quarks $L_{1}1G_{54}54D_{5}^{(1/3)}$ $L_{1}1G_{54}54D_{5}^{(2/3)}$	151,068	337,326	**1/12**
		Quarks $L_{2}2G_{54}108D_{5}^{(1/3)}$ $L_{2}2G_{54}108D_{5}^{(2/3)}$	302,136	639,462	1/13
X± boson (1,257,249)	→	Y± boson + $\underline{\nu}_{\mathrm{Y}} + \nu_{\mathrm{LCMB}}$	372,518	1,011,980	**1/14**
		Quarks $L_{3}3G_{54}162D_{5}^{(1/3)}$ $L_{3}3G_{54}162D_{5}^{(2/3)}$	453,202	1,465,182	1/15
		Quarks $L_{2/3}\frac{2}{3}G_{90}60D_{3}^{(1/3)}$ $L_{2/3}\frac{2}{3}G_{90}60D_{3}^{(2/3)}$	466,256	1,931,438	1/16
		Quarks $L_{4}4G_{54}216D_{5}^{(1/3)}$ $L_{4}4G_{54}216D_{5}^{(2/3)}$	604,268	2,535,706	1/17
		Quarks $L_{1}1G_{90}90D_{3}^{(1/3)}$ $L_{1}1G_{90}90D_{3}^{(2/3)}$	699,386	3,235,092	1/18
		Quarks $L_{5}5G_{54}270D_{5}^{(1/3)}$ $L_{5}5G_{54}270D_{5}^{(2/3)}$	755,336	3,990,428	1/19
		X± boson + $\underline{\nu}_{\mathrm{X}} + \nu_{\mathrm{LCMB}}$	1,257,249	5,247,677	1/20
		Quarks $L_{2}2G_{90}180D_{3}^{(1/3)}$ $L_{2}2G_{90}180D_{3}^{(2/3)}$	1,398,768	6,646,445	1/21
		Quarks $L_{2/3}\frac{2}{3}G_{135}90D_{2}^{(1/3)}$ $L_{2/3}\frac{2}{3}G_{135}90D_{2}^{(2/3)}$	1,573,616	8,220,061	1/22
		Quarks $L_{3}3G_{90}270D_{3}^{(1/3)}$ $L_{3}3G_{90}270D_{3}^{(2/3)}$	2,098,156	10,318,217	1/23
		Quarks $L_{1}1G_{135}135D_{2}^{(1/3)}$ $L_{1}1G_{135}135D_{2}^{(2/3)}$	2,360,426	12,678,643	1/24
		Quarks $L_{4}4G_{90}360D_{3}^{(1/3)}$ $L_{4}4G_{90}360D_{3}^{(2/3)}$	2,797,542	15,476,185	1/25
		Quarks $L_{5}5G_{90}450D_{3}^{(1/3)}$ $L_{5}5G_{90}450D_{3}^{(2/3)}$	3,496,926	18,973,111	1/26
		Quarks $L_{2}2G_{135}270D_{2}^{(1/3)}$ $L_{2}2G_{135}270D_{2}^{(2/3)}$	4,720,848	23,693,959	1/27
		Quarks $L_{3}3G_{135}405D_{2}^{(1/3)}$ $L_{3}3G_{135}405D_{2}^{(2/3)}$	7,081,276	30,775,235	1/28
		Quarks $L_{4}4G_{135}540D_{2}^{(1/3)}$ $L_{4}4G_{135}540D_{2}^{(2/3)}$	9,441,700	40,216,935	1/29
		Quarks $L_{5}5G_{135}675D_{2}^{(1/3)}$ $L_{5}5G_{135}675D_{2}^{(2/3)}$	11,802,126	52,019,061	1/30

INTERVALIC DECAY OF BILEPTONS-ZERO CHARGED MASSIVE BOSONS

BILEPTONS-ZCMB	decays into all above particles up to:	Decaying particles: *pairs* of quarks, leptons-massive bosons and neutrinos	Mass (MeV/c²)	Accum. decaying mass (MeV/c²)	Partial width of each one of the above particles	BILEPTONS-ZCMB	decays into all above particles up to:	Decaying particles: *pairs* of quarks, leptons-massive bosons and neutrinos	Mass (MeV/c²)	Accumulated decaying mass (MeV/c²)	Partial width of each one of the above particles
		$e^- e^+ + \nu_e \underline{\nu}_e + \nu_{ZCMB} \underline{\nu}_{ZCMB}$	1	-	1/3			Z^0 boson + $\nu_Z \underline{\nu}_Z + \nu_{ZCMB} \underline{\nu}_{ZCMB}$	91,188	386,471	1/37
		Quarks $L_{\frac{1}{3}}\tfrac{1}{3}G_6 2D_{45}^{(\frac{1}{3})}$ $L_{\frac{1}{3}}\tfrac{1}{3}G_6 2D_{45}^{(\frac{1}{3})}$ *last radiant decay quark, c. q. π m.*	70	71	1/4			Quarks $L_{\frac{2}{3}}\tfrac{2}{3}G_{54} 36D_5^{(\frac{1}{3})}$ $L_{\frac{2}{3}}\tfrac{2}{3}G_{54} 36D_5^{(\frac{1}{3})}$	100,712	487,183	1/38
		Quarks $L_{\frac{2}{3}}\tfrac{2}{3}G_6 4D_{45}^{(\frac{1}{3})}$ $L_{\frac{2}{3}}\tfrac{2}{3}G_6 4D_{45}^{(\frac{1}{3})}$ *constituent quark of π meson*	138	209	1/5	**Y^0 boson (745,037)**	→	Quarks $L_1 1G_{54} 54D_5^{(\frac{1}{3})}$ $L_1 1G_{54} 54D_5^{(\frac{1}{3})}$	151,068	638,251	**1/39**
		Quarks $L_1 1G_6 6D_{45}^{(\frac{1}{3})}$ $L_1 1G_6 6D_{45}^{(\frac{1}{3})}$	208	417	1/6			$W^- W^+ + \nu_W \underline{\nu}_W + \nu_{ZCMB} \underline{\nu}_{ZCMB}$	160,846	799,097	1/42
		$\mu^- \mu^+ + \nu_\mu \underline{\nu}_\mu + \nu_{ZCMB} \underline{\nu}_{ZCMB}$	210	627	1/9			Quarks $L_2 2G_{45} 90D_6^{(\frac{2}{3})}$ $L_2 2G_{45} 90D_6^{(\frac{2}{3})}$	174,852	973,949	1/43
		Quarks $L_{\frac{1}{3}}\tfrac{1}{3}G_9 3D_{30}^{(\frac{1}{3})}$ $L_{\frac{1}{3}}\tfrac{1}{3}G_9 3D_{30}^{(\frac{1}{3})}$	234	861	1/10			Quarks $L_{\frac{1}{3}}\tfrac{1}{3}G_{90} 30D_3^{(\frac{1}{3})}$ $L_{\frac{1}{3}}\tfrac{1}{3}G_{90} 30D_3^{(\frac{1}{3})}$	233,128	1,207,077	1/44
		Quarks $L_2 2G_6 12D_{45}^{(\frac{1}{3})}$ $L_2 2G_6 12D_{45}^{(\frac{1}{3})}$	414	1,275	1/11			Quarks $L_3 3G_{45} 135D_6^{(\frac{1}{3})}$ $L_3 3G_{45} 135D_6^{(\frac{1}{3})}$	262,270	1,469,347	1/45
		Quarks $L_{\frac{2}{3}}\tfrac{2}{3}G_9 6D_{30}^{(\frac{2}{3})}$ $L_{\frac{2}{3}}\tfrac{2}{3}G_9 6D_{30}^{(\frac{2}{3})}$	466	1,741	1/12			Quarks $L_2 2G_{54} 108D_5^{(\frac{1}{3})}$ $L_2 2G_{54} 108D_5^{(\frac{1}{3})}$	302,136	1,771,483	1/46
		Quarks $L_3 3G_6 18D_{45}^{(\frac{1}{3})}$ $L_3 3G_6 18D_{45}^{(\frac{1}{3})}$ *former quark down*	622	2,363	1/13	X^0 boson (2,514,499)	→	Quarks $L_4 4G_{45} 180D_6^{(\frac{2}{3})}$ $L_4 4G_{45} 180D_6^{(\frac{2}{3})}$ *former quark top*	349,692	2,121,175	**1/47**
		Quarks $L_1 1G_9 9D_{30}^{(\frac{1}{3})}$ $L_1 1G_9 9D_{30}^{(\frac{1}{3})}$	700	3,063	1/14			Quarks $L_5 5G_{45} 225D_6^{(\frac{1}{3})}$ $L_5 5G_{45} 225D_6^{(\frac{1}{3})}$	437,116	2,558,291	1/48
		Quarks $L_4 4G_6 24D_{45}^{(\frac{1}{3})}$ $L_4 4G_6 24D_{45}^{(\frac{1}{3})}$	828	3,891	1/15			Quarks $L_3 3G_{54} 162D_5^{(\frac{1}{3})}$ $L_3 3G_{54} 162D_5^{(\frac{1}{3})}$	453,202	3,011,493	1/49
		Quarks $L_5 5G_6 30D_{45}^{(\frac{1}{3})}$ $L_5 5G_6 30D_{45}^{(\frac{1}{3})}$ *former quark strange*	1,036	4,927	1/16			Quarks $L_{\frac{2}{3}}\tfrac{2}{3}G_{90} 60D_3^{(\frac{1}{3})}$ $L_{\frac{2}{3}}\tfrac{2}{3}G_{90} 60D_3^{(\frac{1}{3})}$	466,256	3,477,749	1/50
		Quarks $L_{\frac{1}{3}}\tfrac{1}{3}G_{15} 5D_{18}^{(\frac{1}{3})}$ $L_{\frac{1}{3}}\tfrac{1}{3}G_{15} 5D_{18}^{(\frac{1}{3})}$	1,080	6,007	1/17			Quarks $L_4 4G_{54} 216D_5^{(\frac{1}{3})}$ $L_4 4G_{54} 216D_5^{(\frac{1}{3})}$	604,268	4,082,017	1/51
		Quarks $L_2 2G_9 18D_{30}^{(\frac{2}{3})}$ $L_2 2G_9 18D_{30}^{(\frac{2}{3})}$	1,398	7,405	1/18			Quarks $L_1 1G_{90} 90D_3^{(\frac{1}{3})}$ $L_1 1G_{90} 90D_3^{(\frac{1}{3})}$	699,386	4,781,403	1/52
		Quarks $L_3 3G_9 27D_{30}^{(\frac{1}{3})}$ $L_3 3G_9 27D_{30}^{(\frac{1}{3})}$	2,098	9,503	1/19			Y^0 boson + $\nu_Y \underline{\nu}_Y + \nu_{ZCMB} \underline{\nu}_{ZCMB}$	745,037	5,526,440	1/55
		Quarks $L_{\frac{2}{3}}\tfrac{2}{3}G_{15} 10D_{18}^{(\frac{2}{3})}$ $L_{\frac{2}{3}}\tfrac{2}{3}G_{15} 10D_{18}^{(\frac{2}{3})}$	2,158	11,661	1/20			Quarks $L_5 5G_{54} 270D_5^{(\frac{1}{3})}$ $L_5 5G_{54} 270D_5^{(\frac{1}{3})}$	755,336	6,281,776	1/56
		Quarks $L_4 4G_9 36D_{30}^{(\frac{2}{3})}$ $L_4 4G_9 36D_{30}^{(\frac{2}{3})}$ *former quark charm*	2,798	14,459	1/21			Quarks $L_{\frac{1}{3}}\tfrac{1}{3}G_{135} 45D_2^{(\frac{1}{3})}$ $L_{\frac{1}{3}}\tfrac{1}{3}G_{135} 45D_2^{(\frac{1}{3})}$	786,808	7,068,584	1/57
		Quarks $L_1 1G_{15} 15D_{18}^{(\frac{1}{3})}$ $L_1 1G_{15} 15D_{18}^{(\frac{1}{3})}$	3,238	17,697	1/22			Quarks $L_2 2G_{90} 180D_3^{(\frac{1}{3})}$ $L_2 2G_{90} 180D_3^{(\frac{1}{3})}$	1,398,768	8,467,352	1/58
		Quarks $L_5 5G_9 45D_{30}^{(\frac{1}{3})}$ $L_5 5G_9 45D_{30}^{(\frac{1}{3})}$	3,496	21,193	1/23			Quarks $L_{\frac{2}{3}}\tfrac{2}{3}G_{135} 90D_2^{(\frac{1}{3})}$ $L_{\frac{2}{3}}\tfrac{2}{3}G_{135} 90D_2^{(\frac{1}{3})}$	1,573,616	10,040,968	1/59
		$\tau^- \tau^+ + \nu_\tau \underline{\nu}_\tau + \nu_{ZCMB} \underline{\nu}_{ZCMB}$	3,554	24,747	1/26			Quarks $L_3 3G_{90} 270D_3^{(\frac{1}{3})}$ $L_3 3G_{90} 270D_3^{(\frac{1}{3})}$	2,098,156	12,139,124	1/60
		Quarks $L_2 2G_{15} 30D_{18}^{(\frac{2}{3})}$ $L_2 2G_{15} 30D_{18}^{(\frac{2}{3})}$	6,476	31,223	1/27			Quarks $L_1 1G_{135} 135D_2^{(\frac{1}{3})}$ $L_1 1G_{135} 135D_2^{(\frac{1}{3})}$	2,360,426	14,499,550	1/61
		Quarks $L_3 3G_{15} 45D_{18}^{(\frac{1}{3})}$ $L_3 3G_{15} 45D_{18}^{(\frac{1}{3})}$ *former quark bottom*	9,714	40,937	1/28			$X^- X^+ + \nu_X \underline{\nu}_X + \nu_{ZCMB} \underline{\nu}_{ZCMB}$	2,514,499	17,014,049	1/64
		Quarks $L_4 4G_{15} 60D_{18}^{(\frac{2}{3})}$ $L_4 4G_{15} 60D_{18}^{(\frac{2}{3})}$	12,952	53,889	1/29			Quarks $L_4 4G_{90} 360D_3^{(\frac{1}{3})}$ $L_4 4G_{90} 360D_3^{(\frac{1}{3})}$	2,797,542	19,811,591	1/65
Z^0 boson (91,188)	→	Quarks $L_5 5G_{15} 75D_{18}^{(\frac{1}{3})}$ $L_5 5G_{15} 75D_{18}^{(\frac{1}{3})}$	16,190	70,079	**1/30**			Quarks $L_5 5G_{90} 450D_3^{(\frac{1}{3})}$ $L_5 5G_{90} 450D_3^{(\frac{1}{3})}$	3,496,926	23,308,517	1/66
		Quarks $L_{\frac{1}{3}}\tfrac{1}{3}G_{45} 15D_6^{(\frac{1}{3})}$ $L_{\frac{1}{3}}\tfrac{1}{3}G_{45} 15D_6^{(\frac{1}{3})}$	29,142	99,221	1/31			Quarks $L_2 2G_{135} 270D_2^{(\frac{1}{3})}$ $L_2 2G_{135} 270D_2^{(\frac{1}{3})}$	4,720,848	28,029,365	1/67
W^0 boson (160,928)	→	Quarks $L_{\frac{1}{3}}\tfrac{1}{3}G_{54} 18D_5^{(\frac{1}{3})}$ $L_{\frac{1}{3}}\tfrac{1}{3}G_{54} 18D_5^{(\frac{1}{3})}$	50,356	149,577	**1/32**			Quarks $L_3 3G_{135} 405D_2^{(\frac{1}{3})}$ $L_3 3G_{135} 405D_2^{(\frac{1}{3})}$	7,081,276	35,110,641	1/68
		Quarks $L_{\frac{2}{3}}\tfrac{2}{3}G_{45} 30D_6^{(\frac{2}{3})}$ $L_{\frac{2}{3}}\tfrac{2}{3}G_{45} 30D_6^{(\frac{2}{3})}$	58,282	207,859	1/33			Quarks $L_4 4G_{135} 540D_2^{(\frac{1}{3})}$ $L_4 4G_{135} 540D_2^{(\frac{1}{3})}$	9,441,700	44,552,341	1/69
		Quarks $L_1 1G_{45} 45D_6^{(\frac{1}{3})}$ $L_1 1G_{45} 45D_6^{(\frac{1}{3})}$	87,424	295,283	1/34			Quarks $L_5 5G_{135} 675D_2^{(\frac{1}{3})}$ $L_5 5G_{135} 675D_2^{(\frac{1}{3})}$	11,802,126	56,354,467	1/70

Chapter 29

INTERVALIC DARK MATTER

> Hardly anyone who truly understands it will be able to escape the charm of this theory.
>
> ALBERT EINSTEIN
> *Field Equations of Gravitation, November 1915*

The Intervalic Theory explains completely and, most important, in a reliable fundamental way, all the subatomic particles of *visible* matter, which may represent less than a 10% of the mass of the Universe. With such a Universe composed with a minimum of 90% by *dark matter*, needless to say that a faultless theory must explain not only the visible matter, but also that kind of evasive matter which share the vast majority of the massive particles of Nature.

I am afraid that a theory which does not yield dark matter from the very beginning of the Universe will be a failed theory because nobody can reasonably believe that the vast majority of the matter of the Universe was produced *ad hoc* after the making of visible matter. Moreover, dark matter would be necessarily derived from the primordial Universe in the same way as visible particles do. I think that any theory, like SM, which does not yield dark matter as a logical necessity, can not be a reliable theory. In this way, the explanation of the origin, structure and share of dark matter can be considered as one of the most important and surprising achievements of IT.

Although the exact empirical share of the matter of the Universe is not under agreement yet, we can surprisingly postulate through the most economic logic means the share of dark matter and visible matter created at the primordial Universe which last till today.

INTERVALIC DARK MATTER PARTICLES

THE UNAVOIDABLE RELATION BETWEEN DARK MATTER AND THE BEGINNING OF THE INTERVALIC PRIMORDIAL SYNTHESIS

The dark matter in IT is yielded from the Intervalic Primordial Synthesis (IPS). As every primordial assembly of particles —namely, intervalino, dalino, gaudino, etc.—, generated its corresponding *interaction*, there is an astonishing correspondence between each particle assembled and the specific interaction generated by the apparition of that particle. In this way, there is a logical necessity the existence of strange particles which was created *before* the apparition of some interactions, in the first steps of IPS. Therefore, such particles only interact with a few frequorces: just those ones generated up to that moments by the existing intervalic structures assembled. “God does not play dice”.

For example, when intervalino and graviton appeared at once in the primordial Universe, the only existing interactions was the previous exchange frequorce of the changeless —strong— intervalic interaction and the related interaction generated in that step: the gravitational one. Therefore, both particles only interact through changeless intervalic and gravitational interactions and may be candidates for the so named dark matter.

In the next step we have the assembly of the dalino with its corresponding interaction, the electromagnetic one. Therefore, charged dalinos can not already be candidates for dark matter. In the case of zero charged dalinos there is an exceptional particle, the bintervalino, which is the last particle that can be dark matter, as we are going to see immediately.

Each symmetry breaking at IPS is due to the assembly of a particle which is dark matter, and therefore does not make further assemblies making a stop in that branch of IPS. Therefore, looking at the symmetry breakings we can deduce *a priori* which and how many are the particles of dark matter in the intervalic Universe. They are at first sight, by order: chi, graviton, bintervalino and bidalino. The last two ones are unimaginable from SM, to whom it has to be added a possible number of intervalinos which remain isolated after IPS. Graviton is a so obvious particle of dark matter, however it is never mentioned playing that role in traditional books of Physics. And finally we have got chi, which someone could assimilate to the dark energy of vacuum.

CHI (or BISTRING)

The logical deduction of chi from the framework of IT can be considered as a highly satisfactory achievement of the theory. Please remember that IPS starts exclusively from the intervalic string, that is to say, from the mere existence or definition of the intervalic quantum of length, ħ (L). No other dimensions, neither spacetime nor other physical quantities existed at that very first step.

The assembly of intervalic strings in symmetric and antisymmetric state under interchange made respectively both *photon* and *chi*. This logical yielding introduces an incomparable distinction between IT and all the remaining conceptions, models and theories of Physics. Really, SM maintains the maladroit idea that spacetime is like an *scenario* where Physics happens. As scenario its existence does not need to be explained because it is supposed or given *a priori*. Please note that what we are talking about is on a concept which is far beyond the difference between the physical features of the space of Newton or Einstein (absolute versus relative, etc.). Both Newton and Einstein postulated an spacetime with different phenomenology, but whose *existence* is always beyond Physics. In this sense there is no difference between both conceptions. That sort of spacetime is, as Newton said, a *sensorium Dei*, and the fact that it may be Newtonian or Einsteinian is irrelevant to the subject since it does not alter that condition: a sort of primordial *ether* whose existence is placed *before* —or *beyond*— Physics. Someone may be thinking that Einstein postulated that matter acts on spacetime, but to *curve* spacetime is far different to *create* spacetime. Gravitons may curve spacetime, but the own spacetime is not made from an assembly of gravitons by no means. Thus, although SM would like to be able to deduce the creation of spacetime from the physics equations, the fact is that it can not do it and therefore it maintain the subliminal concept of a pre-existing ether: the spacetime —regardless its apparent features may be Newtonian, Einsteinian or others—. It is quite hilarious that from the only two apparent main stuffs of the Universe, space-time and energy-matter, SM can explain neither the origin nor the existence of no one of them. Due to great achievements like this one, the graceless SM has gained so high and immaculate reputation in some places.

On the contrary, both energy-matter and space-time are fully explained in IT in the most powerful and economic way. IT not only yields all subatomic particles and describes their intervalic structures, degrees of freedom, interactions, etc., but also yields the own spacetime of the Universe, which does not pre-exist from immemorial times, as it has been explained in other sites.

INTERVALINO

As we already know, all the intervalino's mass comes from its intervalic energy, being the unique massive particle of Nature which has no electromagnetic energy:

$$\mathrm{I}(\mathbf{I}) = c^{\pm 2}\,\hbar\,\mathbf{q_I}^{-2} = c^{\pm 2}\,\hbar\,[\sqrt{}-(c^{-1}h)]^{-2} = c^{-1} = 3.3356409 \cdot 10^{-9}\,(\mathrm{J}) =$$
$$= 20{,}819.424\,(\mathrm{MeV}/c^{2})$$

Its radius, $r_{\mathbf{I}}$, is determined by two constraints, namely, the intervalic frequorce, $\varphi_{\mathbf{I}}$, and the postulated radius of the dalino 1, $r(D_1)$, which is another name for the own intervalino:

$$c^{-1}\varphi_{\mathbf{I}} = \hbar = 1.0556363 \cdot 10^{-34}\,(\mathrm{m}) \leq r_{\mathbf{I}} \leq r(D_1) \approx 6.0102597 \cdot 10^{-25}\,(\mathrm{m})$$

The intervalino only can interact with visible matter via gravitational interaction. Nevertheless, due to the weakness of the gravitational interaction and to the extreme smallness of intervalino, it can easily lay across matter without shocking with any particle. Besides, although a surely soft shock was produced at random with, for example, a nucleus, the intervalino could not interact with it in a detectable way by our instruments.

The intervalino only can interact with that kind of dark matter composed by other intervalinos, to make a dalino via intervalic changeless —strong— interaction, being the own intervalino the boson of that short ranged interaction, which is an exchange frequorce. However, since the recombination era of dalinos is gone and the temperature of the Universe is much below the threshold energy of dalinos, the only dalino which could be produced below that temperature is the dalino 270, namely, the electron. To make this possible, a number of 270 intervalinos should be packed inside a sphere with radius equal or lesser of the range of the intervalinar interaction, which according to traditional quantum physics it is a very small one:

$$R(\mathbf{I}) = c^{-1}\hbar / m_{\mathbf{I}} = c^{2}\,\hbar = 9.487585915 \cdot 10^{-18}\,(\mathrm{m})$$

What was the efficiency in the primordial synthesis of intervalinos. What proportion of them remain alone? An Hydrogen atom is compounded by a proton with 2430 intervalinos and an electron with 270, in total 2700 intervalinos. If it is supposed that 1 among 2700 intervalinos remain disaggregated after the Big Bang, the ratio between (visible matter / dark matter) in the Universe would be simply the relation between the Hydrogen atom's and the intervalino's masses:

$$m(H) / m(\mathbf{I}) = 0.045096841$$

This means that a ~95.68% of the total matter of the Universe would be dark matter composed by intervalinos. If it is supposed an efficiency in the primordial synthesis of intervalinos of 5400/5401 = 0.999814849, that is to say, 1 remaining intervalino per 5400 (or 2 Hydrogen atoms), the dark matter of intervalinar origin would have a share of ~91.73%. An efficiency of, for example, 27,000/27,001 (1 remaining intervalino per 10 Hydrogen atoms) gives a share of intervalinar dark matter of ~68.92%. And if it was supposed that there remain disassembled just 270 intervalinos per each electron, the ratio would be 2700/270 = 10/1, and the share of intervalinar dark matter would be ~99.98%.

Please note that this process is entirely different from that one of annihilation-materialization reactions between mater-antimatter and radiation —in which is very difficult to admit any small deviation from an exact fifty-fifty—. However here it is difficult to decide what efficiency would be acceptable, as a value of for example 1.0000000000 could likewise be admitted for any process which involves auto organization with a clear symmetry. In that case, the proportion of intervalinar dark matter would be much smaller than previously shown.

Finally, at cosmological scale, every galaxy would be enveloped in a cloud of dark matter, as a great atmosphere around the galaxy. This picture is perfectly consistent with what is postulated by the present models regarding the distribution of dark matter in the Universe. A very exciting challenge would be the detection of single intervalinos, a difficult task since they can only be detected by very sophisticated gravitational devices.

ZERO CHARGED DALINOS

The assembly of intervalinos in an antisymmetric state under interchange made the zero charged massive dalinos. Among them it can be comment briefly one particle: the zero charged dalino 2, also named *bintervalino*, **BI** = D_2^0, which is an important constituent of dark matter.

The physical features of bintervalino can not be more simple, and remembers those ones of black holes. The intervalic energy is zero:

$$I(D_2^0) = c^{\pm 2}\,\hbar\, 0^{-2} = 0$$

This is an amazing result because the intervalic energy of the dalino 2 is, as we know:

$$I(D_2^{\pm}) = c^{\pm 2}\,\hbar\,(2\,\mathbf{q_I})^{-2} = c^{\pm 2}\,\hbar\,[2\,\surd\text{-}(c^{-1}h)]^{-2} = 2^{-2}\,c^{-1} = \\ = 8.3391023 \cdot 10^{-10}\,(J) = 5{,}204.8561\ (MeV/c^2)$$

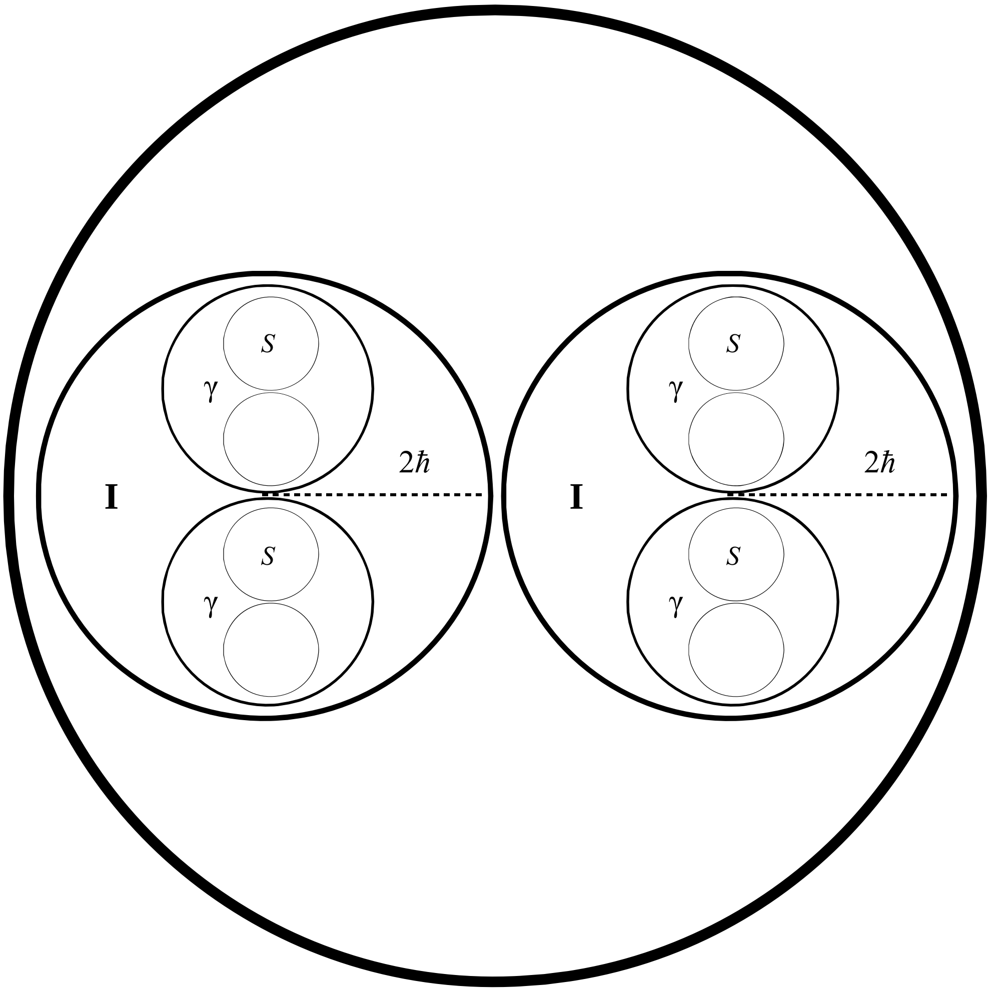
Although we have not commented yet because it is enough obvious, this may be a good moment to concrete further an implicit rule used for the calculating of intervalic energies of intervalic structures. The intervalic energy of any structure level ever adds its contribution to the energy of the *preceding* intervalic structure level. This rule goes for all structure level with the only exception of dalino, because there is no intervalic structure below dalino, but only *isolated* intervalinos. This explains why the mass energy of isolated intervalinos is not conserved when assembled to make a dalino, liberating in this way the greatest amount of energy ever imagined, today usually named Big Bang. Please note that in other case the intervalic energy of bintervalino would simply be the sum of every one of its two constituent intervalinos, as the intervalic energy at the dalinar level is in any case zero. However, as we have seen that the total intervalic energy of bintervalino is zero, $I(D_2^0) = c^{\pm 2}\,\hbar\,0^{-2} = 0$, the total mass energy of bintervalino comes only from the electromagnetic energy, and the intervalic principle of energy balance for subatomic particles, $I - U - E(J) = 0$, now becomes: $U - E(J) = 0$. As in dalino, the spin energy of bintervalino is, by the Virial theorem applied to a system of two bodies (being $\mathbf{I_{BI}}$ the moment of inertia of bintervalino):

$$E_J(\mathbf{BI}) = ½\,\mathbf{I_{BI}}\,\omega_J^2 = m_{\mathbf{BI}}\,r_{\mathbf{BI}}^2\,\omega_J^2$$

As $U(\mathbf{BI}) = c^{\pm 2} m_{\mathbf{BI}}$, the spin energy must be equal to the mass energy of the own bintervalino:

$$c^{\pm 2}\,m_{\mathbf{BI}} = m_{\mathbf{BI}}\,r_{\mathbf{BI}}^2\,\omega_J^2$$

Therefore the linear velocity on bintervalino's surface is just the speed of light:



Intervalic structure of zero charged dalino D_2^0:
$D_2^0 = 2\,\mathbf{I} = 4\,\gamma = 8\,S$

$v_{\mathbf{BI}} = r_{\mathbf{BI}}\, \omega_J = c$

Supposed that the zero charged dalino 2 radius is similar to the charged dalino 2 one, $r(D_2) \approx 9.6164154 \cdot 10^{-24}$ (m), the bintervalino angular velocity would be:

$\omega_{\mathbf{BI}} = v_{\mathbf{BI}} / r_{\mathbf{BI}} = c\ r_{\mathbf{BI}}^{-1} = 3.1175074 \cdot 10^{31}\ (s^{-1})$

In this case the bintervalino's mass will be:

$$m_{\mathbf{BI}} = c^{\pm 2}\ U(\mathbf{BI}) = c^{\pm 2}\ ½\ (1/4\pi\varepsilon_0)\ (2\mathbf{q_I})^2 / r_{BI} = 1.83084001 \cdot 10^{-27}\ (kg) = \\ = 1{,}027.0255\ (MeV/c^2)$$

Compared with the mass of the charged dalino 2, $m(D_2) = 9{,}312.9584$ (MeV/c^2), the bintervalino mass is around nine times smaller.

The family of the 16 charged dalinos sums up a total of 720 intervalinos, and the family of the 8 zero charged dalinos sums up 480 intervalinos. Remembering that charged dalino is an assembly of intervalinos in a *symmetric* state under interchange, it can be supposed that the probability to get a synthesis of intervalinos in an *antisymmetric* state under interchange should be the same because the degree of freedom of the symmetry relies on the electric charge of the intervalino —which at once relies on spin, being this derivation an elegant result of IT—. As the like or unlike sign of the electric charge of an intervalino is set at random when meeting with another isolated intervalino, we obtain that the number of intervalinos in IPS of the Universe (which caused the Big Bang) should be fifty-fifty *symmetric* and *antisymmetric*.

If, by mere example, the bintervalino were the only existing zero charged dalino, this would mean that a 99.74% of the mass in the Universe would be dark matter (!) composed by bintervalinos and a 0.26% would be visible matter —charged dalinos which continued the synthesis process to make the next intervalic structures: gaudinos, lisztinos and monteverdinos—. Nevertheless, according to the *universality assumption* it is intended that the number of each one of the kinds of dalinos assembled was exactly the same. One of the next logical assumptions which can be made consists on postulating *universality* in the assembly of dalinos of all kinds, including in the same set both symmetric and antisymmetric states. In this case, the number of dalinos assembled will be the same for each kind. The ratios between the constituent intervalinos of all dalinos and the total number of intervalinos in the primordial synthesis would be as follows, supposing as mere example likewise that the unique zero charged dalino assembled was the bintervalino:

$D_{270} = 270/722$
$D_{135} = 135/722$
$D_{90} = 90/722$
$D_{54} = 54/722$
$D_{45} = 45/722$
$D_{30} = 30/722$
$D_{27} = 27/722$
$D_{18} = 18/722$
$D_{15} = 15/722$
$D_{10} = 10/722$
$D_9 = 9/722$
$D_6 = 6/722$
$D_5 = 5/722$
$D_3 = 3/722$
$D_2 = 2/722$
$D_1 = 1/722$
BI $\equiv D_2^0 = 2/722$

Supposing that all the 720 intervalinos of symmetric dalinos were recombined to make gaudinos and further intervalic structures with total efficiency, we will have an Universe composed by *one* bintervalino per 720 intervalinos of visible matter. In other words, we will have at present a ratio of 15 bintervalinos per 4 Hydrogen atoms (or 10,800 intervalinos). This means that the mass of that dark matter composed only by bintervalinos would be slightly greater than the visible matter in roughly 1027/939 ~ 1.09 (which would represent around a 52.15% of the total mass of the Universe if no other kind of dark matter would exist, which is not the case as we already know).

Finishing that hypothetical example, please note that the 16 charged dalinos are the unique ones composed by intervalinos in a *symmetric* state under interchange, and in a similar way, zero charged dalinos are composed by intervalinos in an *antisymmetric* state under interchange. There may be imagined at the dalino-synthesis lot of dalinos in a *mixed* symmetry states, but all those states are intended to be unstable and therefore, if they could have been really or virtually assembled, they immediately decayed or its constituent intervalinos recombined to make any of the allowed preceding dalinos. Thus, when an intervalino met with another one or with a group with like charges, they made a dalino and continued the synthesis process; if, i.e., in a group of three of more intervalinos, anyone of them have unlike charges, they formed an unstable state and recombined; and if a number of intervalinos allowed by the intervalic symmetries with unlike charges met, they composed a zero charged dalino and the primordial synthesis process stoped because the intervalic energy vanished completely at that particle. Therefore, the destiny of dalinos according to its intervalinar interchange symmetry would be:

- Symmetric intervalinos → 16 charged dalinos
- Antisymmetric intervalinos → 8 zero charged dalinos
- Mixed symmetry intervalinos with net charge → recombination

The 8 zero charged dalinos only can be those with an *even* number of constituent intervalinos. As there are just 8 even and 8 odd dalinos, the *zero charged dalinos* allowed by the intervalic symmetries can only be:

$D_{270}{}^{0}$, $D_{90}{}^{0}$, $D_{54}{}^{0}$, $D_{30}{}^{0}$, $D_{18}{}^{0}$, $D_{10}{}^{0}$, $D_{6}{}^{0}$, $D_{2}{}^{0}$

The next logical model for the share of dark matter postulates the equality of the total energy of the particles assembled —that is to say, the *universality assumption* regarding energy—, both in symmetric as well as in antisymmetric state, *at every bifurcation of the intervalic primordial assembly,* which is perhaps the strongest logical model that has been already described in the chapter titled “Particles share in the Intervalic Primordial Universe”.

THE UNIVERSALITY ASSUMPTION IN THE ASSEMBLY AND DISASSEMBLY OF SUBATOMIC PARTICLES

The *universality assumption* is a necessary principle for the logical economy of any theory. The only difficulty about universality is the parameter to which it must be applied to in any *assembly* of subatomic particles. The only logical possibilities to postulate the universality in a phase of the intervalic primordial asssembly are regarding to the following parameters:

- Class of symmetric or antisymmetric states under interchange
- Number of symmetric or antisymmetric states under interchange
- Number of constituent particles
- Number of assembled particles
- Energy of constituent particles
- Energy of assembled particles

The discussion of this interesting question affect to the total share of particles composing the Universe, a question that pertains to Intervalic Cosmology. For the sake of simplicity we have taken the first parameter in this book, although it is immediate to take anyone of the remaining parameters.

On the other hand, in the *disassembly* or decay of subatomic particles only one of the above parameters is applicable: the *number of disassembled particles* in which the initial particle decays.

BEHAVIOUR OF BINTERVALINO AS DARK MATTER

Finally, we can comment another eventual possibility on the behaviour of bintervalino as dark matter, which can not be demonstrated but only suggested. Someone could say that bintervalino is not only dark matter, but it could be similar to a black hole. (I am not going to use the Hawing idea on the possible radiation of black holes because, among other reasons, I find enough difficult to understand why can a macroscopic magnitude —the Schwarzschild radius, $r = 2G_Nm/c^2$— can have got a quantum behaviour with microscopic precision. In a black hole of, for example, 1 meter of Schwarzschild radius, I don't understand how can know a photon whether or not it is placed just at 1 meter of the centre of the black hole with quantum scale precision. Besides, the intervalic global geometry make relativistic singularities become not allowed in IT by the own system of units, which intervalic geometry is just what really makes the Lorentz-Einstein transformations. And finally, if it was not sufficient, the intervalic symmetries of gravitation yield a new model for the gravitational interaction much more advanced than the earlier ones).

For example, the Schwarzschild radius of the bintervalino would be: $r = 2G_Nm(\mathbf{BI})/c^2 = 2.7185256 \cdot 10^{-54}$ (m). Since this magnitude is much smaller than the intervalic length, $\hbar = 1.0556363 \cdot 10^{-34}$ (m), we only can say of the claim for the application of the Schwarzschild radius at quantum scale that it is seriously wrong in its actual formulation.

According to IT the intervalic interaction was born when two or more intervalinos was assembled in a symmetric state under interchange. That is to say, any particle which has any charged dalino in any level of its intervalic structure interacts electromagnetically. Actually, all visible matter does verify this easy condition. However, bintervalino does not for obvious reasons as it is a zero charged dalino, and it has only one deeper structure level composed by two separated intervalinos. Therefore, bintervalino has no way to be a source of photons: neither can be the dalinar structure because it is *zero charged* nor can be the constituent intervalinos because, by definition, *intervalino* does not interacts electromagnetically by no means.

Nevertheless, its two constituent intervalinos remain assembled paradoxically by electromagnetic interaction, whose energy is strongly related with the magnitude of its radius. This suggests the enigmatic proposition that bintervalino could absorb photons but it could not emit them. As more photons are absorbed, the bintervalino radius will become smaller. This process may last indefinitely till bintervalino acquires enough mass energy to decay into two isolated intervalinos. In other words, bintervalino would not also behaviour as dark matter, but as a pseudo black hole which decays in isolated intervalinos.

The strange physical features of zero charged dalinos may explain, perhaps better than the speculative existence of a supposed interstellar gas —mysterious and unexplainably "dark"—, the diminution of the expected intensity of radiation coming from galaxies, as it is observed from the Earth.

ZERO CHARGED GAUDINOS

Since gaudino is composed, by definition, by dalinos —which interact electromagnetically—, it seems that no further particles from gaudino and onwards is suitable to be a candidate as dark matter. The 25 zero charged gaudinos are the last dark matter particles assembled, whose intervalic structures are allowed by the intervalic symmetries of Nature are the following ones:

G_2^0, G_6^0, G_{10}^0, G_{18}^0, G_{30}^0, G_{54}^0, G_{90}^0, G_{270}^0,
$\frac{1}{3} G_6^0$, $\frac{1}{3} G_{18}^0$, $\frac{1}{3} G_{30}^0$, $\frac{1}{3} G_{54}^0$, $\frac{1}{3} G_{90}^0$, $\frac{1}{3} G_{270}^0$,
$\frac{2}{3} G_6^0$, $\frac{2}{3} G_9^0$, $\frac{2}{3} G_{15}^0$, $\frac{2}{3} G_{18}^0$, $\frac{2}{3} G_{27}^0$, $\frac{2}{3} G_{30}^0$,
$\frac{2}{3} G_{45}^0$, $\frac{2}{3} G_{54}^0$, $\frac{2}{3} G_{90}^0$, $\frac{2}{3} G_{135}^0$, $\frac{2}{3} G_{270}^0$

After the intervalic structure of charged dalinos the physical features of each and every one of these zero charged dalinos may be straightforwardly deduced.

INTERVALIC NEUTRINO

To conclude this introduction to some intervalic dark matter particles, we can comment briefly why neutrino has some of the physical features attributed to dark matter. As we have explained in other site, the mass energy of neutrino comes completely from the gravitational energy, being its intervalic and electromagnetic energies zero. Henceforth the only long range interaction of neutrino would be the gravitational one, and it would be another suitable candidate to be dark matter.

By the way, it can be noted that neutrino should interact as an exchange particle via short ranged intervalic interaction, both with neutrinos as with visible matter. IT postulates the existence of a cosmic microwave background of antineutrinos, and since it is intended, as we are going to see, that neutrino is an intervalic string came to light, it is postulated that the assembly of two intervalic strings or neutrinos in a symmetric state under interchange makes a photon:

$$\nu_{Dn} + \nu_{Dn} \rightarrow \gamma$$

And in the case of an antisymmetric assembly of neutrinos, a spin 0 chi would be made, in a similar way as in the antisymmetric assembly of two intervalic strings:

$$\nu_{Dn} + \underline{\nu}_{Dn} \rightarrow \text{chi}$$

As chis are dark energy, this would appear as like neutrinos vanish.

It can be noted the identity of both reactions with the primordial assembly of intervalic strings via short ranged intervalic interaction to make photons and chis:

$$IS + IS \rightarrow \text{photon}$$
$$IS + \underline{IS} \rightarrow \text{chi}$$

Inside the overall picture of IPS it could seem that there is no place for neutrino because the system of whole bifurcations of IPS is complete in itself and admits no addenda *ad hoc*. If we admit such possibility, and we fully agree with, the neutrino must be identified with some of the fundamental particles existing in the primordial Universe *before* the dalino-synthesis, namely: intervalic string, photon, chi, intervalino and graviton. Inasmuch as intervalic neutrino must be intervalinoless, the remaining possible particles are only: intervalic string, photon, chi and graviton, whose spins are ½, 1, 0 and 2 respectively. Due to the conservation of the intrinsic angular momentum the spin of such neutrino-like particle must be ½. Thus, that uncanny particle only can be the *intervalic string*.

Therefore the neutrino would be no other than an intervalic string came to light. As we have seen, the intervalic string "lives" in a primordial space where the only existing dimensions are the *real* ones because the *imaginary* dimension was not introduced yet. However, neutrino "lives" in a space where the imaginary dimension already exist. In other words: intervalic string was born in *space* but neutrino lives in *spacetime*. Henceforth, intervalic neutrino must have the same physical features regarding movement than photon and chi: all of them have got a *geometric* velocity intimately derived from the introduction of the imaginary dimension in the real space: the speed of light —the *intervalic velocity*—. Actually, we have explained that the speed of light and the imaginary dimension can really be interpreted as the same underlying think, as it is apparent in its own symbols: c and ($i^{\pm 1}$), which are really interchangeable one for another in most physical equations. In the chapter devoted to the intervalic neutrino we have demonstrated that neutrino must have an intrinsic structural velocity and have deduced that it is just the speed of light with practically no deviation from that value. In this extraordinary way, the neutrino is simply an intervalic string came to light, that is to say, an intervalic string inside spacetime.

This fully explains in an astonishing economic mode the different physical features of the intervalic string and the neutrino. Most important, there is a simple and powerful explanation for the final destiny of the neutrino at the Big Crunch, since if it was a strange particle which would not pertain to the global symmetries of IPS, it would be everlasting passing over the Big Crunch and the Big Bang and the oscillating Universe would no regenerate completely in every Big Crunch. As we have seen, this is not the case because the unique uncanny particle —the neutrino— which strangely did not appeared as an assembled particle in any bifurcation of IPS, is really no other than an intervalic string. Therefore, the Intervalic Universe regenerates completely in every oscillation. Of course, needless to say that "God does not play dice".

Chapter 30

INTERVALIC BINDING ENERGY

STRUCTURAL ENERGY RATIOS OF SUBATOMIC PARTICLES

In the description of the features of all constituent particles of nucleon we have considered the magnitude of their masses *inside* nucleon. It seems almost impossible to know the values of those masses in *isolated* state, as it existed only at the very beginning of the Universe and there is no way to reproduce such conditions in our laboratories yet. Nevertheless the magic of IT appears to be endless and we are going to see how can we reach this knowledge. Along with the value of those masses in isolated state we will obtain their corresponding threshold temperatures of assembly at the Intervalic Primordial Assembly (IPA), which completes an important point of the picture of the creation of matter.

According to the important *intervalic principle of energy balance* for subatomic particles, thoroughly applied along this book, the total structural energy of a subatomic particle is given by the equation:

$$I - U - E(J) = 0$$

where the mass energy of the particle is $m = I + U$, being $E(J)$ the spin energy which is not manifested as mass. For every particle we have defined with precision the ratios between their corresponding structural energies, which are the three following ones:

I / U
$I / (I + U) = I / c^{\pm 2}m$
$U / (I + U) = U / c^{\pm 2}m$

Till now such precision has not been used in a calculus and we don’t know what could be the utility of that magnitudes. But at this moment the magic of IT is going to appear in scene once more.

If subatomic particles would not have spin energy, we would have I = U and the mass energy would be: m = 2 I or m = 2 U. But all subatomic particle have got spin energy and then I > U because the spin energy is entirely balanced on the side of the electromagnetic energy. This surprising fact can not be in other way due to the extraordinary features of the intervalic energy, which magnitude remains constant regardless of the energy ratios of the particle. Really, the intervalic energy relies exclusively on the symmetries of the intervalic structure, and such symmetries are totally independent of the radius of the particle —which affect to the magnitude of the electromagnetic energy—. Thus, we found the highly remarkable feature that the intervalic energy of any subatomic particle is invariant regardless of the magnitudes of its electromagnetic and spin energies; it is a geometric magnitude of Nature. To say it with an unfortunate parallelism, the intervalic energy would be like the skeleton, and the electromagnetic energy would be the meat.

It is experimentally found that the ratio U/I becomes smaller as the intervalic structure of particles gets more levels and the particle becomes more complex. But since the intervalic energy of any intervalic structure is invariant, it is clear that the particle is loosing electromagnetic energy as it incorporates more structure levels. That lost of electromagnetic mass at each level of the intervalic structure is, of course, what we usually knew as the *binding energy*, which now can be calculated for every level of the intervalic structure. And since the assembly of intervalinos, dalinos, gaudinos and lisztinos happened in IPA which generates the actual Universe, we can surprisingly deduce the binding energy liberated at the Big Bang with great detail (!) —really, the existence of the own Big Bang is the result of such binding energy liberated in IPA, as we are going to see—.

Moreover, apart from the binding energy of every intervalic structure assembled, we can deduce through the energy ratios of subatomic particles the original mass of all particles in *isolated* state, that is to say, *before* every level of assembly. Thus, we will be able to calculate, for example, the mass of *isolated* quarks at the primordial Universe, *before* their assembly to compose nucleons. Such kind of theoretical achievement has never be reached by

SM, whose fantastic assumptions on the free masses of quarks is better not to remember in order to be charitable.

DALINO BINDING ENERGY

At the dalinar level, intervalic energy, interaction and symmetry are closely related. It is surprising that we could have so detailed knowledge of those fundamental particles whose intervalic structures goes along a scale from the intervalic electron radius, $r(D_{270}) = r_e = 3.1940984 \cdot 10^{-15}$ (m), up to the dalino 1 radius, $r(D_1) = r_{\mathbf{I}} = 6.0102597 \cdot 10^{-25}$ (m), that is to say, around 10^{12} orders beyond the latest scale experimentally available at laboratories. This is due to the fortunate fact that the electron is a *dalino* —really the only stable one in an isolated state—. Extrapolating the known electron's ratio between its intervalic and electromagnetic energies to the remaining dalinos, we can deduce the binding energies of all dalinos. As we have, unexpectedly, further knowledge of the next intervalic structure, the gaudino, which particles have ratios similar to the electron's one, we can be sure that all the dalino's ratios were really close to that of the electron at IPA. Therefore the following magnitudes of the binding energy of the 16 dalinos have enough reliability to be postulated.

$E_B(D_{270}) = m(270\ \mathbf{I}) - m(D_{270}) = 270\ I(\mathbf{I}) - m_e =$
$= 9.006229921 \cdot 10^{-7}$ (J) = 5,621,244.136 (MeV/c^2)
$E_B(D_{135}) = m(135\ \mathbf{I}) - m(D_{135}) = 135\ I(\mathbf{I}) - m_{D135} =$
$= 4.50311201 \cdot 10^{-7}$ (J) = 2,810,620.227 (MeV/c^2)
$E_B(D_{90}) = m(90\ \mathbf{I}) - m(D_{90}) = 90\ I(\mathbf{I}) - m_{D90} =$
$= 3.002069488 \cdot 10^{-7}$ (J) = 1,873,743.581 (MeV/c^2)
$E_B(D_{54}) = m(54\ \mathbf{I}) - m(D_{54}) = 54\ I(\mathbf{I}) - m_{D54} =$
$= 1.801225646 \cdot 10^{-7}$ (J) = 1,124,236.133 (MeV/c^2)
$E_B(D_{45}) = m(45\ \mathbf{I}) - m(D_{45}) = 45\ I(\mathbf{I}) - m_{D45} =$
$= 1.501008954 \cdot 10^{-7}$ (J) = 936,855.694 (MeV/c^2)
$E_B(D_{30}) = m(30\ \mathbf{I}) - m(D_{30}) = 30\ I(\mathbf{I}) - m_{D30} =$
$= 1.00062597 \cdot 10^{-7}$ (J) = 624,541.3359 (MeV/c^2)
$E_B(D_{27}) = m(27\ \mathbf{I}) - m(D_{27}) = 27\ I(\mathbf{I}) - m_{D27} =$
$= 9.005411859 \cdot 10^{-8}$ (J) = 562,073,3542 (MeV/c^2)
$E_B(D_{18}) = m(18\ \mathbf{I}) - m(D_{18}) = 18\ I(\mathbf{I}) - m_{D18} =$
$= 6.002311614 \cdot 10^{-8}$ (J) = 374,634.6613 (MeV/c^2)
$E_B(D_{15}) = m(15\ \mathbf{I}) - m(D_{15}) = 15\ I(\mathbf{I}) - m_{D15} =$
$= 5.000808804 \cdot 10^{-8}$ (J) = 312,125.7997 (MeV/c^2)

$E_B(D_{10}) = m(10\ \mathbf{I}) - m(D_{10}) = 10\ I(\mathbf{I}) - m_{D10} =$
$= 3.329672548 \cdot 10^{-8}\ (J) = 207{,}821.7239\ (MeV/c^2)$
$E_B(D_9) = m(9\ \mathbf{I}) - m(D_9) = 9\ I(\mathbf{I}) - m_{D9} =$
$= 2.994708456 \cdot 10^{-8}\ (J) = 186{,}914.9189\ (MeV/c^2)$
$E_B(D_6) = m(6\ \mathbf{I}) - m(D_6) = 6\ I(\mathbf{I}) - m_{D6} =$
$= 1.98480567 \cdot 10^{-8}\ (J) = 123{,}881.7722\ (MeV/c^2)$
$E_B(D_5) = m(5\ \mathbf{I}) - m(D_5) = 5\ I(\mathbf{I}) - m_{D5} =$
$= 1.643946857 \cdot 10^{-8}\ (J) = 102{,}607.0477\ (MeV/c^2)$
$E_B(D_3) = m(3\ \mathbf{I}) - m(D_3) = 3\ I(\mathbf{I}) - m_{D3} =$
$= 9.343766836 \cdot 10^{-9}\ (J) = 58{,}319.18016\ (MeV/c^2)$
$E_B(D_2) = m(2\ \mathbf{I}) - m(D_2) = 2\ I(\mathbf{I}) - m_{D2} =$
$= 5.179180804 \cdot 10^{-9}\ (J) = 32{,}325.88994\ (MeV/c^2)$
$E_B(D_1) = m(1\ \mathbf{I}) - m(D_1) = 1\ I(\mathbf{I}) - m_{D1} = 0\ (MeV/c^2)$

In this table there are at least two important magnitudes: the binding energies of electron and of dalino 45 —the dalinar constituent of nucleons—:

$E_B(e) \equiv E_B(D_{270}) = 5{,}621{,}244.136\ (MeV/c^2)$
$E_B(D_{45}) = 936{,}855.694\ (MeV/c^2)$

The theoretical binding energy per intervalino in each case would be:

$E_B(D_{270}) / n_{\mathbf{I}} = 20{,}819.42273\ (MeV/c^2)$
$E_B(D_{45}) / n_{\mathbf{I}} = 20{,}819.01542\ (MeV/c^2)$

Please note that these magnitudes can not be interpreted in the traditional misleading way as the energy needed to take away an intervalino from a dalino because the intervalic symmetries do not allow in general the intervalic quantum numbers of every resulting particle, which would not be divisors of the elementary charge.

The binding energy of muon at the dalinar level of its intervalic structure is simply the sum of the binding energy of its six constituent dalinos 45:

$E_B(\mu)_D = 6\ E_B(D_{45}) = 5{,}621{,}134.164\ (MeV/c^2)$

And the enormous binding energy of nucleon at its dalinar level is (remembering that nucleon are composed by fifty four dalinos 45: $N \rightarrow M_3 = 3\ L_3 = 9\ G_6 = 54\ D_{45} = 2430\ \mathbf{I}$):

$E_B(N)_D = 54\ E_B(D_{45}) = 50{,}590{,}207.48\ (MeV/c^2)$

Thus the binding energy of nucleon at the dalinar level is ~ 9 times the binding energy of electron.

In order electron or dalino 45 to stay assembled and stop the recombination among the remaining dalinos, the temperature of the primordial Universe must drop below their related binding energies:

$\Theta_B\ (D_{270}) < E_B(D_{270})\ /\ k_B = 6.523179514 \cdot 10^{16}$ (K)
$\Theta_B\ (D_{45}) < E_B(D_{45})\ /\ k_B = 1.087175336 \cdot 10^{16}$ (K)

As we have seen in other site, the aggregation of intervalinos to make dalinos liberated the most enormous amount of binding energy in form of radiant energy ever happened in the Universe, which is the origin of the so named Big Bang.

It can be noted that the ratio between intervalic to electromagnetic mass energies written in the table for all the above dalinos is already the electron's one —the only dalino which have lasted in isolated state—:

$I(e)/U(e) = 1.266973485$
$I(e)/E(e)_{mass} = 0.558883239$
$U(e)/E(e)_{mass} = 0.44111676$

Nevertheless, it seems to be logic that this relation was reached as an energetic dynamical balance starting from $I(e)/U(e) = 1$. In other words, the magnitudes of the binding energy of dalinos postulated are intended to be the minimal values, but it would be greater if the ratio I/U of dalinos was greater than electron's. If the energy ratios of all subatomic particles were been reached starting from an initial state with low spin energy, that is to say, near to the limit values:

$I\ /\ U = 1$
$I\ /\ E_{mass} = 0.5$
$U\ /\ E_{mass} = 0.5$

the binding energy of dalinos should have to be increased with the following amount (which anyway is despicable in comparison with the above value):

$$\Delta E_B(D_n) = [\ ½\ /\ U(D_n)/E(D_n)_{mass}\ )\ E(D_n)_{mass}\ ]\ -\ E(D_n)_{mass}$$

In the case of dalinos 270 and 45 it would be:

$\Delta E_B(D_{270}) = 1.092870867 \cdot 10^{-14}$ (J) = 0.068211604 (MeV/c^2)
$\Delta E_B(D_{45}) = 3.934335069 \cdot 10^{-13}$ (J) = 2.455617737 (MeV/c^2)

As we have no way to decide yet the share of the spin energy at the primordial aggregation of intervalinos, we will take the electron's ratio as a staring point to calculate the minimal binding energy of gaudinos, but it have to be remarked that the binding energy of gaudinos always can be greater than the amount obtained though the electron's ratio. Really we are going to see that this is just the case with tau (!) so that possibility is not only a theoretical assumption but it has been made in Nature.

It can also be commented at this point that the spin energy seems to be the pristine energy of the Universe as the energy of photon comes completely from its *transversal* energy, which in a certain way in no other that the first manifestation of the energy due to the intrinsic angular momentum of a particle. In the next step of IPA we have got the graviton, which energy is equally transversal like the photon's one, and the intervalino, which spin energy is just a half of its total structural energy. And in the next steps we have got the dalinos, which spin energy shares around 1/10 of the structural energy of the particle, and finally the nucleon which shares around 1/6. In other words, the ratio spin energy to total structural energy of the fundamental particles of Nature is:

$E(\gamma)_J / E(\gamma)_{\text{struct}} = 1$
$E(g)_J / E(g)_{\text{struct}} = 1$
$E(\mathbf{I})_J / E(\mathbf{I})_{\text{struct}} = 1/2$
$E(D, G, L, M, P)_J / E(D, G, L, M, P)_{\text{struct}} \sim 1/6$ to $1/10$

As can be seen, the intervalino's spin energy ratio is in the crossroad between the ratios of visible matter and massless particles.

GAUDINO BINDING ENERGY

It would be very interesting to know the binding energy of gaudinos. Although it appears to be impossible to reach that feature, the magic of IT is revealed to us once more: we can calculate theoretically the minimal binding energy of gaudinos as the difference between the mass of isolated dalinos and the mass of constituent dalinos of gaudinos. As the ratio between the intervalic and electromagnetic energies of dalinos is intended to be similar to the electron's one, and we already known the energy ratio of leptons-massive bosons and quarks, the difference between both ratios is a former *mass energy* which was lost in the aggregation process, that is to say, it can't be not other energy than just the *binding energy* of gaudinos (!). Recapitulating the ratios between the involved structural mass energies of those leptons-massive bosons which are gaudinos, we have:

$I(\mu)/U(\mu) = 1.418608126$
$I(\mu)/E(\mu)_{\mathrm{mass}} = 0.586539055$
$U(\mu)/E(\mu)_{\mathrm{mass}} = 0.413460944$

$I(\tau)/U(\tau) = 1.186129344$
$I(\tau)/E(\tau)_{\mathrm{mass}} = 0.542570524$
$U(\tau)/E(\tau)_{\mathrm{mass}} = 0.457429475$

$I(W^{\pm})/U(W^{\pm}) = 1.268$
$I(W^{\pm})/E(W^{\pm})_{\mathrm{mass}} = 0.559$
$U(W^{\pm})/E(W^{\pm})_{\mathrm{mass}} = 0.441$

The binding energy of muon will be, as a minimum, the subtraction between the mass energy of the gaudino 6 (calculating their constituent dalinos 45 according to the dalino 270's ratio —electron's ratio—), and the experimental mass energy of muon, $E(u)_{\mathrm{mass}}$:

$$E_B(\mu)_G \geq \{[(U(e)/E(e)_{\mathrm{mass}})/(U(\mu)/E(\mu)_{\mathrm{mass}})]\ E(\mu)_{\mathrm{mass}}\} - E(\mu)_{\mathrm{mass}} =$$
$$= 1.132312188 \cdot 10^{-12}\ (\mathrm{J}) = 7.067333725\ (\mathrm{MeV/c^2})$$

And the maximum binding energy of muon is limited by the energy ratios of an imaginary spinless particle:

$$E_B(\mu)_G < \{[\ (½)\ /\ (U(\mu)/E(\mu)_{\mathrm{mass}})\ ]\ E(\mu)_{\mathrm{mass}}\} - E(\mu)_{\mathrm{mass}} =$$
$$= 3.543171945 \cdot 10^{-12}\ (\mathrm{J}) = 22.11473024\ (\mathrm{MeV/c^2})$$

As tau's ratio is lesser than the electron's one, the calculation of the minimal binding energy of tau by this way gives us no information:

$$E_B(\tau)_G \geq \{[(U(e)/E(e)_{\mathrm{mass}})/(U(\tau)/E(\tau)_{\mathrm{mass}})]\ E(\tau)_{\mathrm{mass}}\} - E(\tau)_{\mathrm{mass}} =$$
$$= -1.015313389 \cdot 10^{-11}\ (\mathrm{J}) = -63.3708498\ (\mathrm{MeV/c^2})$$

Tau is the unique subatomic particle which ratio is clearly greater than electron's. However we can obtain the maximum binding energy of tau from the energy ratios of a imaginary spinless particle:

$E_B(\tau)_G < \{[\ (½)\ /\ (U(\tau)/E(\tau)_{mass})\ ]\ E(\tau)_{mass}\} - E(\tau)_{mass} =$
$= 2.649615593 \cdot 10^{-11}$ (J) = 165.3759258 (MeV/c^2)

It is a little disconcerting that tau's ratio is greater than electron's. The own lepton-massive bosons' ratios are rather different whilst a high homogeneity among them could have been expected:

$U(\mu)/E(\mu)_{mass} = 0.413460944$
$U(\tau)/E(\tau)_{mass} = 0.457429475$
$U(W^{\pm})/E(W^{\pm})_{mass} = 0.441$

Perhaps we could have taken the greatest ratio —that one of tau— instead of the electron's one for calculating the minimal binding energy of gaudinos. In that case the magnitudes would be greater than the ones obtained through the electron ratio. For example, the minimal binding energy of muon would be now:

$E_B(\mu)_G \geq \{[(U(\tau)/E(\tau)_{mass})/(U(\mu)/E(\mu)_{mass})]\ E(\mu)_{mass}\} - E(\mu)_{mass} =$
$= 1.80020528 \cdot 10^{-12}$ (J) = 11.23599271 (MeV/c^2)

The binding energy of $W^{\pm}$ boson will be comprised between the two following values:

$E_B(W^{\pm})_G \geq \{[(U(e)/E(e)_{mass})/(U(W^{\pm})/E(W^{\pm})_{mass})]\ E(W^{\pm})_{mass}\} - E(W^{\pm})_{mass}$
$= 3.411507585 \cdot 10^{-12}$ (J) = 21.2929463 (MeV/c^2) or

$E_B(W^{\pm})_G \geq \{[(U(\tau)/E(\tau)_{mass})/(U(W^{\pm})/E(W^{\pm})_{mass})]\ E(W^{\pm})_{mass}\} - E(W^{\pm})_{mass}$
$= 4.800383654 \cdot 10^{-10}$ (J) = 2,996.162512 (MeV/c^2) and

$E_B(W^{\pm})_G < \{[\ (½)\ /\ (U(W^{\pm})/E(W^{\pm})_{mass})\ ]\ E(W^{\pm})_{mass}\} - E(W^{\pm})_{mass}$
$= 1.723869056 \cdot 10^{-9}$ (J) = 10,759.53968 (MeV/c^2)

Taking a look at this value it seems very probable that our assumption based on tau's ratio was right.

Adding the minimal values to the binding energy of their constituent dalinos, the total binding energy of the leptons-charged massive bosons at all their structure levels will be:

$E_B(e)_D = 1\ E_B(D_{270}) = 5{,}621{,}244.136$ (MeV/c^2)
$E_B(\mu)_{D,G} = 6\ E_B(D_{45}) + E_B(\mu)_G = 5{,}621{,}145.340$ (MeV/c^2)
$E_B(\tau)_{D,G} = 15\ E_B(D_{18}) + E_B(\tau)_G = 5{,}619{,}456.549$ (MeV/c^2)
$E_B(W^{\pm})_{D,G} = 54\ E_B(D_5) + E_B(W^{\pm})_G = 5{,}543{,}776.739$ (MeV/c^2)

These are extremely huge magnitudes which explain the origin of the energy liberated at the Big Bang, and the failure in the breaking of leptons at present available energies and temperatures.

Although at first sight it may seems impossible to known the energy ratios of gaudinos 6, the constituent of nucleons and nucleus, which masses inside nucleon are:

$m(G_6^{\pm 1/3}) = 1.702255648 \cdot 10^{-11}$ (J) = 106.2463946 (MeV/c^2)
$m(G_6^{\pm 2/3}) = 1.63018933 \cdot 10^{-11}$ (J) = 101.7483708 (MeV/c^2)

the fact is that we can make an enough reliable deduction based on the fortunate coincidence that the intervalic structure of nucleonic gaudino is identical to the muon's one, with the only difference of the like or unlike charge of their six constituent dalinos 45. This means that the only difference between the muon and gaudino masses should be due to the value of the electric charge at the gaudinar level, since the intervalic and electromagnetic energies at the dalinar level are identical. The isocharge of gaudino determines the following possible magnitudes for the intervalic mass:

$I(G_6^0)_G = 0$
$I(G_6^{\pm 1/3})_G = c^{\pm 2}\,\hbar\,(1/3\,e)^{-2} = 90^{-2}\,c^{-1} = 2.5702993$ (MeV/c^2)
$I(G_6^{\pm 2/3})_G = c^{\pm 2}\,\hbar\,(2/3\,e)^{-2} = 180^{-2}\,c^{-1} = 0.64257482$ (MeV/c^2)
$I(G_6^{\pm 1})_G \equiv I(\mu)_G = c^{\pm 2}\,\hbar\,e^{-2} = 270^{-2}\,c^{-1} = 0.28558881$ (MeV/c^2)

Please note that the isocharge of gaudino does not affect to the electromagnetic mass at the gaudinar level since this energy is manifested as electromagnetic field instead of mass in an isolated gaudino. Therefore, known experimentally the mass of the elementary gaudino —the muon—, the masses of the remaining allowed isogaudinos in isolated state should be:

$m(G_6^0) = 105.3728002$ (MeV/c^2)
$m(G_6^{\pm 1/3}) = 107.9430995$ (MeV/c^2)
$m(G_6^{\pm 2/3}) = 106.015375$ (MeV/c^2)
$m(G_6^{\pm 1}) \equiv m(\mu) = 105.658389$ (MeV/c^2)

As the intervalic energy of all isogaudinos at the dalinar level is:

$$I(G_6)_D = 6 \cdot c^{\pm 2}\,\hbar\,(45\,\mathbf{q_I})^{-2} = 6 \cdot c^{\pm 2}\,\hbar\,[45\,\sqrt{}\text{-}(c^{-1}h)]^{-2} = 6 \cdot 45^{-2}\,c^{-1} =$$
$$= 9.8833806 \cdot 10^{-12}\ \text{(J)} = 61.687184\ \text{(MeV/}c^2\text{)}$$

the total electromagnetic mass will be:

$U(G_6) = 43.6856162\ (\mathrm{MeV/c^2})$

And the energy ratios of isolated isogaudinos would be:

$I(G_6^{\pm 1/3})/U(G_6^{\pm 1/3}) = 1.470907106$
$I(G_6^{\pm 1/3})/E(G_6^{\pm 1/3})_{mass} = 0.595290329$
$U(G_6^{\pm 1/3})/E(G_6^{\pm 1/3})_{mass} = 0.40470967$

$I(G_6^{\pm 2/3})/U(G_6^{\pm 2/3}) = 1.426779893$
$I(G_6^{\pm 2/3})/E(G_6^{\pm 2/3})_{mass} = 0.587931314$
$U(G_6^{\pm 2/3})/E(G_6^{\pm 2/3})_{mass} = 0.412068685$

Please note that these ratios are far different from the ratios of fractional gaudinos inside nucleus described opportunely in the corresponding site. Therefore the maximum and minimal binding energies of these nucleonic gaudinos 6 will be in a similar way:

$E_B(G_6^{\pm 1/3})_G \geq \{ [(U(e)/E(e)_{mass}) / (U(G_6^{\pm 1/3})/E(G_6^{\pm 1/3})_{mass})]\ E(G_6^{\pm 1/3})_{mass}\}$ -
$- E(G_6^{\pm 1/3})_{mass} = 1.555779534 \cdot 10^{-12}\ (J) = 9.710407858\ (\mathrm{MeV/c^2})$ or

$E_B(G_6^{\pm 1/3})_G \geq \{ [(U(\tau)/E(\tau)_{mass}) / (U(G_6^{\pm 1/3})/E(G_6^{\pm 1/3})_{mass})]\ E(G_6^{\pm 1/3})_{mass}\}$ -
$- E(G_6^{\pm 1/3})_{mass} = 2.252867659 \cdot 10^{-12}\ (J) = 14.06128783\ (\mathrm{MeV/c^2})$ and

$E_B(G_6^{\pm 1/3})_G < \{ [\ (1/2) / (U(G_6^{\pm 1/3})/E(G_6^{\pm 1/3})_{mass}\ )\ ]\ E(G_6^{\pm 1/3})_{mass}\}$ -
$- E(G_6^{\pm 1/3})_{mass} = 4.072027631 \cdot 10^{-12}\ (J) = 25.41558637\ (\mathrm{MeV/c^2})$

And for the gaudino with isocharge ⅔:

$E_B(G_6^{\pm 2/3})_G \geq \{ [(U(e)/E(e)_{mass}) / (U(G_6^{\pm 2/3})/E(G_6^{\pm 2/3})_{mass})]\ E(G_6^{\pm 2/3})_{mass}\}$ -
$- E(G_6^{\pm 2/3})_{mass} = 1.197366717 \cdot 10^{-12}\ (J) = 7.47337198\ (\mathrm{MeV/c^2})$ or

$E_B(G_6^{\pm 2/3})_G \geq \{ [(U(\tau)/E(\tau)_{mass}) / (U(G_6^{\pm 2/3})/E(G_6^{\pm 2/3})_{mass})]\ E(G_6^{\pm 2/3})_{mass}\}$ -
$- E(G_6^{\pm 2/3})_{mass} = 1.869779673 \cdot 10^{-12}\ (J) = 11.67024173\ (\mathrm{MeV/c^2})$ and

$E_B(G_6^{\pm 2/3})_G < \{ [\ (1/2) / (U(G_6^{\pm 2/3})/E(G_6^{\pm 2/3})_{mass})\ ]\ E(G_6^{\pm 2/3})_{mass}\}$ -
$- E(G_6^{\pm 2/3})_{mass} = 3.624544136 \cdot 10^{-12}\ (J) = 22.62261529\ (\mathrm{MeV/c^2})$

LISZTINO BINDING ENERGY

To calculate the binding energy of a lisztino we need to know the mass and energy ratios in isolated state of both lisztino and its constituent gaudinos. The energy ratios of nucleonic quarks inside nucleon do not serve for this purpose by no means, as they describe the structural energy of quarks inside nucleon, but not in an isolated state, being the binding energy just the difference of mass between both states. Fortunately, once more IT is in "direct line with Heaven", to say it poetically, and we have got empirical data of a lisztino which energy ratios must be not only similar, but identical to those of nucleonic quarks. This particle is the *π* meson, which is really a lisztino instead of a monteverdino because their gaudinar and lisztinian levels are merged or degenerated into an unique gaudinar-lisztinian level. Besides, the eight dalinos 45 which compose the *π* meson are identical to those that compose the nucleonic quarks since *π* meson is the intermediate meson of the changeless —strong— intervalic interaction between quarks inside nucleon, being the own *π* meson a part of the nucleonic quarks which is in an intervalic exchange structure along with the remaining constituent gaudinos of quarks. By these reasons we can affirm that the energy ratios of *π* meson are not similar but identical to those ones which would have nucleonic quarks in isolated state. The structural energy ratios of $\pi^{\pm}$ meson are:

$I(\pi^{\pm}) / U(\pi^{\pm}) = 1.593179444$
$I(\pi^{\pm}) / E(\pi^{\pm})_{\text{mass}} = 0.614373003$
$U(\pi^{\pm}) / E(\pi^{\pm})_{\text{mass}} = 0.385626996$

According to these ratios the mass of nucleonic quarks would be:

$m(q) = 5.0313575 \cdot 10^{-11}\ (\text{J}) = 314.032500\ (\text{MeV/c}^2)$

Making a similar operation as in gaudinos, the difference of masses between quarks up and down in isolated state should only be due to the value of the electric charge at the lisztinian level, that is to say:

$I(L_3^{\pm 1})_L = c^{\pm 2}\ \hbar\ e^{-2} = 270^{-2}\ c^{-1} = 0.28558881\ (\text{MeV/c}^2)$
$I(L_3^{\pm 2/3})_L = c^{\pm 2}\ \hbar\ (\tfrac{2}{3}\ e)^{-2} = 180^{-2}\ c^{-1} = 0.64257482\ (\text{MeV/c}^2)$
$I(L_3^{\pm 1/3})_L = c^{\pm 2}\ \hbar\ (\tfrac{1}{3}\ e)^{-2} = 90^{-2}\ c^{-1} = 2.5702993\ (\text{MeV/c}^2)$
$I(L_3^{0})_L = 0$

Therefore the masses of the isolisztinos in isolated state should be:

$m(L_3^{\pm 1}) = 314.032500$ (MeV/c^2)
$m(L_3^{\pm ⅔}) = m(u) = 314.389486$ (MeV/c^2)
$m(L_3^{\pm ⅓}) = m(d) = 316.3172105$ (MeV/c^2)

As the total intervalic energy of nucleonic quarks remains constant because there is no change in the intervalic structure, being simply the sum of the intervalic energy at all levels of its intervalic structure, namely:

$I(u)_t = I(L_3^{+⅔}) + I(G_6^{+⅔}) + 2I(G_6^{\pm ⅓}) + 18I(D_{45}) = 191.4872982$ (MeV/c^2)
$I(d)_t = I(L_3^{-⅓}) + I(G_6^{-⅓}) + 2I(G_6^{\pm ⅓}) + 18I(D_{45}) = 195.3427472$ (MeV/c^2)

the total electromagnetic mass is:

$U(u)_t = 122.9021878$ (MeV/c^2)
$U(d)_t = 120.9744633$ (MeV/c^2)

And the energy ratios of these isolated isolisztinos would be:

$I(u)/U(u) = 1.558046294$
$I(u)/E(u)_{\mathrm{mass}} = 0.60907666$
$U(u)/E(u)_{\mathrm{mass}} = 0.390923339$

$I(d)/U(d) = 1.614743656$
$I(d)/E(d)_{\mathrm{mass}} = 0.617553331$
$U(d)/E(d)_{\mathrm{mass}} = 0.382446668$

In order to calculate their binding energies we need to introduce the energy ratio of their constituent gaudinos, as they have different energy ratios. Thus the average ratio will be:

$$\langle U_u(G_6)/E_u(G_6)_{\mathrm{mass}} \rangle = \\ = ⅓ \left[(U(G_6^{\pm ⅔})/E(G_6^{\pm ⅔})_{\mathrm{mass}}) + 2\,(U(G_6^{\pm ⅓})/E(G_6^{\pm ⅓})_{\mathrm{mass}}) \right] = \\ = 0.407162675$$

$$\langle U_d(G_6)/E_d(G_6)_{\mathrm{mass}} \rangle = ⅓ \cdot 3\,[U(G_6^{\pm ⅓})/E(G_6^{\pm ⅓})_{\mathrm{mass}})] = \\ = 0.40470967$$

And the minimal binding energy of nucleonic quarks will finally be:

$E_B(u)_L \geq \{ [\langle U_u(G_6)/E_u(G_6)_{mass}\rangle / (U(u)/E(u)_{mass})] E(u)_{mass}\} - E(u)_{mass} =$
$= 2.092450843 \cdot 10^{-12}$ (J) $= 13.06004525$ (MeV/c^2)

$E_B(d)_L \geq \{ [\langle U_d(G_6)/E_d(G_6)_{mass}\rangle / (U(d)/E(d)_{mass})] E(d)_{mass}\} - E(d)_{mass} =$
$= 2.950164605 \cdot 10^{-12}$ (J) $= 18.41347116$ (MeV/c^2)

Apart from the π meson, the other lisztino about we have empirical data is the Z^0 boson. However, in this case it can not be supposed that the binding energy at the gaudinar level of zero charged massive bosons is similar to the leptons-charged massive bosons because and we don't know the mass of the lepton-charged massive boson pertaining to the same {D6} dalinar symmetry of Z^0, namely, $G_{45} = 45\ D_6 = 270\ \mathbf{I}$, and the energy ratios of leptons-massive bosons of different symmetries vary considerably. Therefore, we can not separate —based on empirical data— the binding energy at the gaudinar and lisztinian levels of zero charged massive bosons yet, and by this reason we will not know the share of the binding energy between both levels. The Z^0 boson ratios are, as we have described in the corresponding site:

$I(Z^0)/U(Z^0) = 1.330$
$I(Z^0)/E(Z^0)_{mass} = 0.571$
$U(Z^0)/E(Z^0)_{mass} = 0.429$

The minimal binding energy of Z^0 boson at gaudinar and lisztinian levels will be comprised between the following values:

$E_B(Z^0)_{G,L} \geq \{[(U(e)/E(e)_{mass})/(U(Z^0)/E(Z^0)_{mass})] E(Z^0)_{mass}\} - E(Z^0)_{mass} =$
$= 4.126440444 \cdot 10^{-10}$ (J) $= 2,575.520429$ (MeV/c^2) or

$E_B(Z^0)_{G,L} \geq \{[(U(\tau)/E(\tau)_{mass})/(U(Z^0)/E(Z^0)_{mass})] E(Z^0)_{mass}\} - E(Z^0)_{mass} =$
$= 9.681840315 \cdot 10^{-10}$ (J) $= 6,042.926793$ (MeV/c^2)

and the maximum binding energy will be:

$E_B(Z^0)_{G,L} < \{[(½) / (U(Z^0)/E(Z^0)_{mass})] E(Z^0)_{mass}\} - E(Z^0)_{mass} =$
$= 2.417950604 \cdot 10^{-9}$ (J) $= 15,091.65408$ (MeV/c^2)

MONTEVERDINO BINDING ENERGY

Since nucleon is the best known monteverdino, we are going to calculate its binding energy. We already have got full precise ratios between the intervalic and electromagnetic energies of nucleon:

$I(p)/U(p) = 1.60871148$
$I(p)/E(p)_{\text{mass}} = 0.616668452$
$U(p)/E(p)_{\text{mass}} = 0.383330671$

$I(n)/U(n) = 1.628947324$
$I(n)/E(n)_{\text{mass}} = 0.61961908$
$U(n)/E(n)_{\text{mass}} = 0.38038006$

It is clear that these ratios applies to the nucleon as a whole. To obtain the minimal binding energy at the monteverdic level we have to take firstly the average energy ratio of their constituent quarks, which data we have been calculated above:

$$\langle U_p(q)/E_p(q)_{\text{mass}}\rangle = \tfrac{1}{3}\,[\,2(U(u)/E(u)_{\text{mass}}) + (U(d)/E(d)_{\text{mass}}\,)] = $$
$$= 0.388097782$$
$$\langle U_n(q)/E_n(q)_{\text{mass}}\rangle = \tfrac{1}{3}\,[\,(U(u)/E(u)_{\text{mass}}) + 2(U(d)/E(d)_{\text{mass}}\,)] = $$
$$= 0.385272225$$

Thus, the nucleon binding energy at the monteverdic level, due to the assembly of its constituent quarks is:

$$E_B(p)_M \geq \{[\langle U_p(q)/E_p(q)_{\text{mass}}\rangle \,/\, (U(p)/E(p)_{\text{mass}})]\, E(p)_{\text{mass}}\} - E(p)_{\text{mass}} = $$
$$= 1.869481523 \cdot 10^{-12}\ (J) = 11.66838082\ (MeV/c^2)$$

$$E_B(n)_M \geq \{[\langle U_n(q)/E_n(q)_{\text{mass}}\rangle \,/\, (U(n)/E(n)_{\text{mass}})]\, E(n)_{\text{mass}}\} - E(n)_{\text{mass}} = $$
$$= 1.93607001 \cdot 10^{-12}\ (J) = 12.08399329\ (MeV/c^2)$$

Of course, we can not separate a quark from a nucleon through neither at that energy nor at any other next energy available because the fractional charges of the elementary one are intervalic quantum numbers not allowed in an isolated state —unless we would reach the threshold temperature corresponding to the binding energy of the monteverdic structure of nucleon—.

Henceforth, the masses of isolated nucleonic quarks can be deduced easily adding the corresponding binding energies to the already known magnitudes of their mass energies inside nucleon:

$2\Delta u + \Delta d = \mathrm{E_B}(p)_\mathrm{M}$
$\Delta u + 2\Delta d = \mathrm{E_B}(n)_\mathrm{M}$

$\Delta u = 3.750922783\ (\mathrm{MeV/c^2})$
$\Delta d = 4.166535253\ (\mathrm{MeV/c^2})$

$\mathrm{m}(u)_\mathrm{isol} = \mathrm{m}(u) + \Delta u = 315.8868530\ (\mathrm{MeV/c^2})$
$\mathrm{m}(d)_\mathrm{isol} = \mathrm{m}(d) + \Delta d = 317.8813888\ (\mathrm{MeV/c^2})$

NUCLEON TOTAL BINDING ENERGY

Recapitulating results, we can obtain the total binding energy of nucleon summing the binding energies of every level of its intervalic structure. At the gaudinar level we will take the magnitudes based on tau's ratio as it is comprised between the electron's ratio and the imaginary spinless particle's one and appears to be the value closer to the truthful picture.

The binding energy of nucleon at the dalinar level, due to the assembly of intervalinos, is simply the sum of the binding energy of its fifty four dalinos 45, already known by means of its intervalic structure, namely, $\mathrm{M}_3 = 3\ \mathrm{L}_3 = 9\ \mathrm{G}_6 = 54\ \mathrm{D}_{45} = 2430\ \mathbf{I}$. This magnitude is identical for both proton and neutron:

$$\mathrm{E_B}(p)_\mathrm{D} \equiv \mathrm{E_B}(n)_\mathrm{D} = 54\ \mathrm{E_B}(\mathrm{D}_{45}) = 54\ [\mathrm{m}(45\ \mathbf{I}) - \mathrm{m}(\mathrm{D}_{45})] =$$
$$= 8.105448354 \cdot 10^{-6}\ (\mathrm{J}) = 50{,}590{,}207.48\ (\mathrm{MeV/c^2})$$

To obtain the binding energy of nucleon at the gaudinar level, due to the assembly of dalinos, we can remember the number of its constituent isogaudinos:

$$p = u + u + d = 2\ \mathrm{G}_6^{+2/3} + 3\ \mathrm{G}_6^{+1/3} + 3\ \mathrm{G}_6^{-1/3} = 2\ \mathrm{G}_6^{\pm 2/3} + 7\ \mathrm{G}_6^{\pm 1/3}$$
$$n = u + d + d = 1\ \mathrm{G}_6^{+2/3} + 3\ \mathrm{G}_6^{+1/3} + 5\ \mathrm{G}_6^{-1/3} = 1\ \mathrm{G}_6^{\pm 2/3} + 8\ \mathrm{G}_6^{\pm 1/3}$$

Therefore:

$$\mathrm{E_B}(p)_\mathrm{G} \geq 2\ \mathrm{E_B}(\mathrm{G}_6^{\pm 2/3})_\mathrm{G} + 7\ \mathrm{E_B}(\mathrm{G}_6^{\pm 1/3})_\mathrm{G} = 121.7694983\ (\mathrm{MeV/c^2})$$
$$\mathrm{E_B}(n)_\mathrm{G} \geq 1\ \mathrm{E_B}(\mathrm{G}_6^{\pm 2/3})_\mathrm{G} + 8\ \mathrm{E_B}(\mathrm{G}_6^{\pm 1/3})_\mathrm{G} = 124.1605444\ (\mathrm{MeV/c^2})$$

The nucleon binding energy at the lisztinian level, due to the assembly of its constituent gaudinos is:

$E_B(p)_L \geq 2\ E_B(u)_L + E_B(d)_L = 44.53356166\ (MeV/c^2)$
$E_B(n)_L \geq E_B(u)_L + 2\ E_B(d)_L = 49.88698757\ (MeV/c^2)$

And finally, the nucleon binding energy at the monteverdic level, due to the assembly of its constituent lisztinos is:

$E_B(p)_M \geq 1.869481523 \cdot 10^{-12}\ (J) = 11.66838082\ (MeV/c^2)$
$E_B(n)_M \geq 1.93607001 \cdot 10^{-12}\ (J) = 12.08399329\ (MeV/c^2)$

Thus, the total binding energy of nucleon is:

$E_B(p)_{D,G,L,M} \geq 50{,}590{,}385.4514408\ (MeV/c^2)$
$E_B(n)_{D,G,L,M} \geq 50{,}590{,}393.6115253\ (MeV/c^2)$

The minimal binding energy of their three last levels as a whole is:

$E_B(p)_{G,L,M} \geq 177.9714408\ (MeV/c^2)$
$E_B(n)_{G,L,M} \geq 186.1315253\ (MeV/c^2)$

And its related maximum binding energy is:

$E_B(p)_{G,L,M} < \{[\ (½) / (U(p)/E(p)_{mass})\ ]\ E(p)_{mass}\} - E(p)_{mass} =$
$= 4.575331996 \cdot 10^{-11}\ (J) = 285.5696377\ (MeV/c^2)$
$E_B(n)_{G,L,M} < \{[\ (½) / (U(n)/E(n)_{mass})\ ]\ E(n)_{mass}\} - E(n)_{mass} =$
$= 4.733948638 \cdot 10^{-11}\ (J) = 295.4697054\ (MeV/c^2)$

BINDING TEMPERATURE

Taking rough average magnitudes between proton and neutron we have got the following binding energies along the assembly process of nucleon made at IPA:

$E_B(N)_D \sim 50{,}590{,}207.5\ (MeV/c^2)$
$E_B(N)_G \sim 123.0\ (MeV/c^2)$
$E_B(N)_L \sim 47.2\ (MeV/c^2)$
$E_B(N)_M \sim 11.9\ (MeV/c^2)$

It is clear that the binding energy at any level of the intervalic structure is necessarily smaller than the binding energy of the previous one, and greater than the next one. According to this, the related binding temperatures at which every one of the constituent intervalic structures of nucleon were assembled in the primordial Universe are the following:

$\Theta_B\ (N_D) < E_B(N)_D / k_B = 5.8707 \cdot 10^{17}$ (K)
$\Theta_B\ (N_G) < E_B(N)_G / k_B = 1.4274 \cdot 10^{12}$ (K)
$\Theta_B\ (N_L) < E_B(N)_L / k_B = 5.4773 \cdot 10^{11}$ (K)
$\Theta_B\ (N_M) < E_B(N)_M / k_B = 1.3809 \cdot 10^{11}$ (K)

The last magnitudes are still around a thousand greater than the threshold temperature of the nuclear fusion of Hydrogen.

As can be seen, the temperature of the intervalic primordial Universe was dropping following a parabolic figure along time and in close relation with each and every assembly of new intervalic structures.

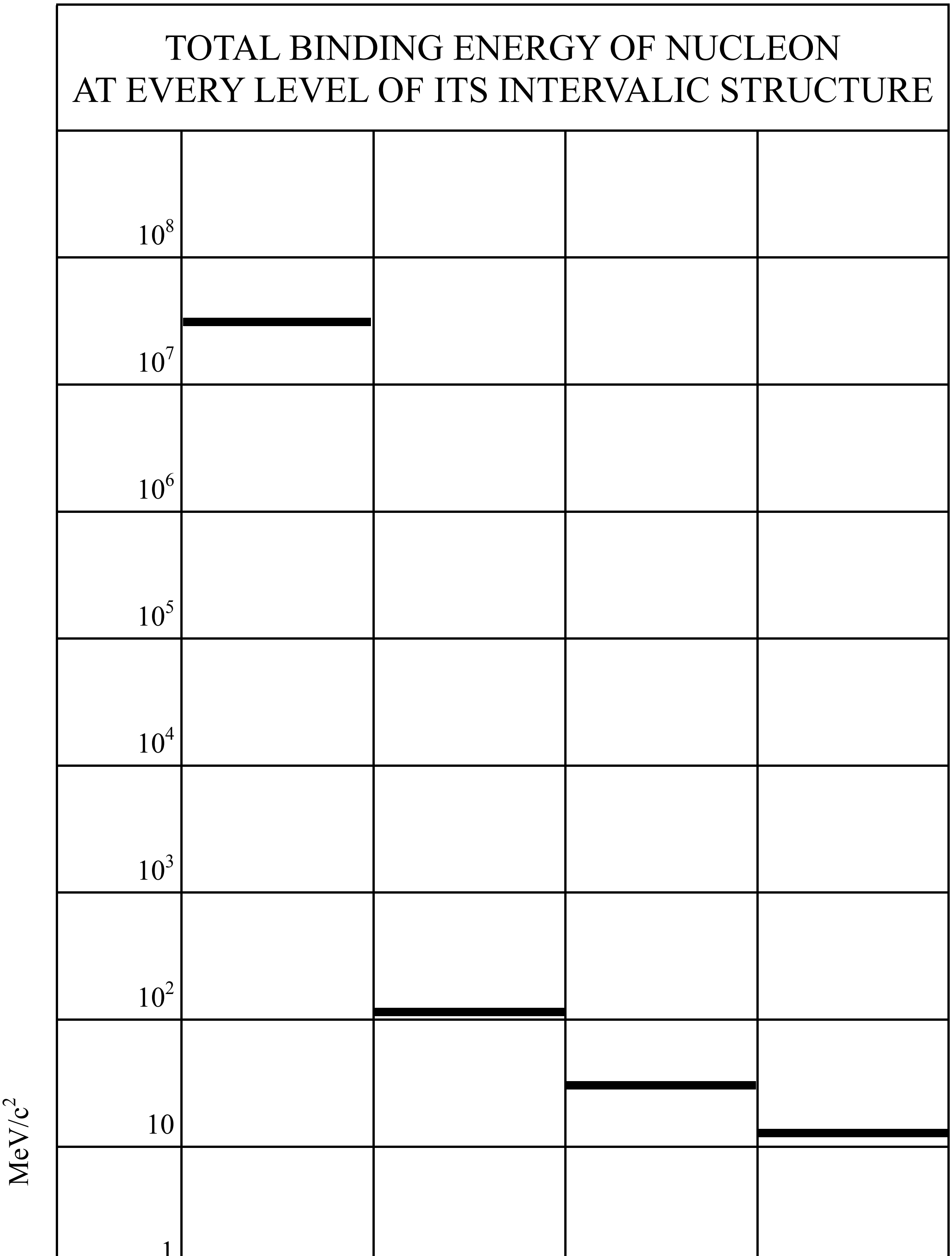
An alternative —but less clear— way in which this unavoidable law may become apparent can be seen in the energy ratios of the intervalic structures assembled. As the binding energy is subtracted entirely from the electromagnetic mass, the electromagnetic energy to mass ratio only can decrease progressively along with every level of the intervalic structure: any particle assembled must have a ratio smaller than the average ratio of their constituent subparticles. Listing by chronological order the ratios for all the intervalic structures involved in the nucleon synthesis we have:

- Dalinar level:
Limit ratio = 0.500000000
$U(\tau)/E(\tau)_{\mathrm{mass}} = 0.457429475$
$U(e)/E(e)_{\mathrm{mass}} = 0.44111676$

- Gaudinar level:
$U(\mu)/E(\mu)_{\mathrm{mass}} = 0.413460944$
$U(G_6^{\pm 2/3})/E(G_6^{\pm 2/3})_{\mathrm{mass}} = 0.412068685$
$U(G_6^{\pm 1/3})/E(G_6^{\pm 1/3})_{\mathrm{mass}} = 0.40470967$

- Lisztinian level:
$U(\pi^{\pm}) / E(\pi^{\pm})_{\mathrm{mass}} = 0.385626996$
$U(u)/E(u)_{\mathrm{mass}} = 0.390923339$
$U(d)/E(d)_{\mathrm{mass}} = 0.382446668$

- Monteverdic level:
$U(p)/E(p)_{\mathrm{mass}} = 0.383330671$
$U(n)/E(n)_{\mathrm{mass}} = 0.38038006$


TOTAL BINDING ENERGY OF NUCLEON
AT EVERY LEVEL OF ITS INTERVALIC STRUCTURE
10^8
10^7
10^6
10^5
10^4
10^3
10^2
10
1
MeV/c^2
DALINO SYNTHESIS
GAUDINO SYNTHESIS
LISZTINO SYNTHESIS
MONTE-VERDINO SYNTHESIS

NUCLEON BINDING ENERGY PER CONSTITUENT PARTICLE

We can express the nucleon binding energy per constituent particle at every level of the intervalic structure, being the number of their constituent intervalinos, dalinos, gaudinos and lisztinos: $n_{\mathbf{I}} = 45$, $n_D = 6$, $n_G = 3$ and $n_q = 3$. I am afraid that the following magnitudes are not very useful in IT, but we will write them not as an irrelevant tribute to SM, but in order to show a trouble.

The binding energy of dalino per intervalino is:

$E_B(D_{45})_D / n_{\mathbf{I}} = 3.335575454 \cdot 10^{-9}$ (J) = 20,819.01542 (MeV/c^2)

The binding energy of gaudino per dalino is:

$E_B(G_{6(p)})_G / n_D \geq 2.214198361 \cdot 10^{-12}$ (J) = 20.29491638 (MeV/c^2)
$E_B(G_{6(n)})_G / n_D \geq 2.273933831 \cdot 10^{-12}$ (J) = 20.69342407 (MeV/c^2)

The binding energy of quark per gaudino is:

$E_B(⅓\, uud)_L / n_G \geq 2.378355431 \cdot 10^{-12}$ (J) = 14.84452055 (MeV/c^2)
$E_B(⅓\, udd)_L / n_G \geq 2.664260018 \cdot 10^{-12}$ (J) = 16.62899586 (MeV/c^2)

The binding energy of nucleon per quark is:

$E_B(p)_M / n_q \geq 6.231605076 \cdot 10^{-13}$ (J) = 3.889460273 (MeV/c^2)
$E_B(n)_M / n_q \geq 6.453566702 \cdot 10^{-13}$ (J) = 4.027997763 (MeV/c^2)

And finally, according to SM, the binding energy of nucleus, *K*, per nucleon would be:

$E_B(K)_P / n_N \approx 8$ (MeV/c^2)

Have you become aware of the trouble? We are going to explain it immediately.

SOME QUESTIONS ON THE BINDING ENERGY OF NUCLEUS

Please let us go to write down once more the approximate values of the binding energy for all the nucleon's assembly steps, remembering that such values must verify rigorously $E_B(N)_M < E_B(N)_L < E_B(N)_G < E_B(N)_D$:

$E_B(N)_D \sim 50{,}590{,}207.5$ (MeV/c^2)
$E_B(N)_G \sim 123.0$ (MeV/c^2)
$E_B(N)_L \sim 47.2$ (MeV/c^2)
$E_B(N)_M \sim 11.9$ (MeV/c^2)

Therefore, whatever particle —palestrino— which could be assembled through the merging of nucleons —monteverdinos— should have a binding energy at the palestrinian level smaller than ~ 11.9 (MeV/c^2).

Here are the well known experimental binding energies of some nucleus:

$E_B(^2H)_P \sim 2.2$ (MeV/c^2)
$E_B(^3H)_P \sim 8.1$ (MeV/c^2)
$E_B(^3He)_P \sim 7.1$ (MeV/c^2)
$E_B(^4He)_P \sim 28.3$ (MeV/c^2)
$E_B(^7Li)_P \sim 40.2$ (MeV/c^2)
$E_B(^9Be)_P \sim 58.1$ (MeV/c^2)
$E_B(^{56}Fe)_P \sim 492.2$ (MeV/c^2)
$E_B(^{107}Ag)_P \sim 915.2$ (MeV/c^2)
$E_B(^{206}Pb)_P \sim 1622.3$ (MeV/c^2)
$E_B(^{238}U)_P \sim 1801.6$ (MeV/c^2)

It is clear that the only nuclei with a binding energy at the palestrinian level *lesser* than ~ 11.9 (MeV/c^2) are ^{2}H, ^{3}H and ^{3}He. Therefore, when the temperature of the primordial Universe dropped below the binding temperature of nucleon, $\Theta_B (N_M) < E_B(N)_M / k_B = 1.3809 \cdot 10^{11}$ (K), *the only nuclei which could be assembled* were just those ones whose binding energies were below that value: ^{2}H, ^{3}H and ^{3}He. *These nuclei, and only these ones, may be composed by nucleons,* that is to say, they may be *palestrinos*, and really this is just the way postulated by IT. This involves that *the remaining nuclei can not be palestrinos* (!). So what is the matter with all the nuclei whose mass number is greater than 3? First of all, they could not be made by no means in the same way as the other subatomic particles were assembled at IPA. And if they can not be palestrinos, what could they be? The must necessarily be composed by a preceding intervalic structure, so they can only be composed by lisztinos (quarks) or gaudinos.

Of course, the traditional model of nucleus as composed by nucleons is still consistent with IT from a logical point of view. But we really expect that Nature is not only consistent —it is a *fait accompli*— but also marvellously economic and elegant in all its makings. And this probably would not be satisfied if nucleus starting from A > 3 were composed by nucleons. The ungrounded SM can not explain a lot of features of nucleus, for example:

- Why there is a *large "desert"* between the binding energies of nucleus with $A \leq 3$ and $A > 3$?
- Why the binding energy per nucleon is approximately *the same* in all nucleus (~ 8 MeV/c^2) with independence of the mass number?
- Why nuclei were not assembled at the primordial Universe, next to the assembly of nucleons and *before* the formation of atoms?
- Why the aggregation process finishes just with palestrinos and does not continue indefinitely making assemblies of palestrinos, assemblies of assemblies of palestrinos, and so on?
- Why the assembly of *atomic* particles (principally Hydrogen and Helium atoms) to make heavier ones should follow just the same rules of assembly than *subatomic* particles?

Moreover, we have demonstrated along this book that some traditional concepts needed for the "explanation" of nucleus in SM, like isospin and the Yukawa potential, have become irrelevant in IT or are completely erroneous in its original formulation.

Finally, the outline of nucleus is cloudy, as well as the distribution of its electric charge. No one nucleon has been ever seen as forming part of a nucleus in laboratory. In other words, there is no experimental direct evidence for supporting that nucleus are composed by nucleons. With such precedents we are not going to affirm by no means that nucleus are composed by nucleons before making a thorough discussion on the subject.

NUCLEUS BINDING ENERGY

According to SM the average mass of the intended constituent nucleons of nucleus with A > 3 would roughly be:

$$\langle \mathrm{m}(N)_K \rangle \sim 930.0 \ (\mathrm{MeV/c^2})$$

Since the intervalic energy of the supposed constituent nucleons of nucleus is invariant because it only relies on its intervalic structure, which is independent of the binding energy and of any other physical quantity related with the radius or distance between particles, we could calculate, if desired, the supposed structural energy ratios of nucleus. Let's go to do it supposing that nucleus are *palestrinos*.

Remembering firstly the structural mass energies of isolated nucleons:

$$\mathrm{I}(p)_{\mathrm{tot}} = \mathrm{I}(\mathrm{M}_3{}^{+}) + 2\ \mathrm{I}(\mathrm{L}_3{}^{+2/3}) + \mathrm{I}(\mathrm{L}_3{}^{-1/3}) + 2\ \mathrm{I}(u)_{\mathrm{G6}} + \mathrm{I}(d)_{\mathrm{G6}} + 54\ \mathrm{I}(\mathrm{D}_{45}) =$$
$$= 9.270245023 \cdot 10^{-11}\ (\mathrm{J}) = 578.602933\ (\mathrm{MeV/c^2})$$
$$\mathrm{I}(n)_{\mathrm{tot}} = \mathrm{I}(\mathrm{M}_3{}^{0}) + \mathrm{I}(\mathrm{L}_3{}^{+2/3}) + 2\ \mathrm{I}(\mathrm{L}_3{}^{-1/3}) + \mathrm{I}(u)_{\mathrm{G6}} + 2\ \mathrm{I}(d)_{\mathrm{G6}} + 54\ \mathrm{I}(\mathrm{D}_{45}) =$$
$$= 9.327440495 \cdot 10^{-11}\ (\mathrm{J}) = 582.172792\ (\mathrm{MeV/c^2})$$

$$\mathrm{U}(p)_{\mathrm{t}} = \mathrm{c}^{\pm 2}\mathrm{m}(p) - \mathrm{I}(p)_{\mathrm{t}} = 5.762528048 \cdot 10^{-11}\ (\mathrm{J}) = 359.6685548\ (\mathrm{MeV/c^2})$$
$$\mathrm{U}(n)_{\mathrm{t}} = \mathrm{c}^{\pm 2}\mathrm{m}(n) - \mathrm{I}(n)_{\mathrm{t}} = 5.726054096 \cdot 10^{-11}\ (\mathrm{J}) = 357.3920307\ (\mathrm{MeV/c^2})$$

The total intervalic energy of a palestrino is simply the sum of the intervalic energy up to the monteverdic level —which remains constant inside palestrino— plus the intervalic energy at the palestrinian level, which is a despicable magnitude in terms of mass for nucleus with A > 3:

$$\mathrm{Z} = 2 \rightarrow \mathrm{I}(K)_{\mathrm{P}} = \mathrm{c}^{\pm 2}\,\hbar\ (2e)^{-2} = 0.071397202\ (\mathrm{MeV/c^2})$$
$$\mathrm{Z} = 3 \rightarrow \mathrm{I}(K)_{\mathrm{P}} = \mathrm{c}^{\pm 2}\,\hbar\ (3e)^{-2} = 0.031732089\ (\mathrm{MeV/c^2})$$
$$\mathrm{Z} = 4 \rightarrow \mathrm{I}(K)_{\mathrm{P}} = \mathrm{c}^{\pm 2}\,\hbar\ (4e)^{-2} = 0.017849300\ (\mathrm{MeV/c^2})$$
$$\mathrm{Z} = 5 \rightarrow \mathrm{I}(K)_{\mathrm{P}} = \mathrm{c}^{\pm 2}\,\hbar\ (5e)^{-2} = 0.011423552\ (\mathrm{MeV/c^2})$$
...

As the supposed number of protons and neutrons which compose nucleus is different we can take as rough average value of the intervalic energy of nucleons inside nucleus the middle between both ones, $\langle\, \mathrm{I}(N)_K \,\rangle \sim 580.4$ (MeV/c^2). And since the binding energy is entirely taken from the electromagnetic energy, the average electromagnetic mass of the supposed nucleons inside nucleus would be:

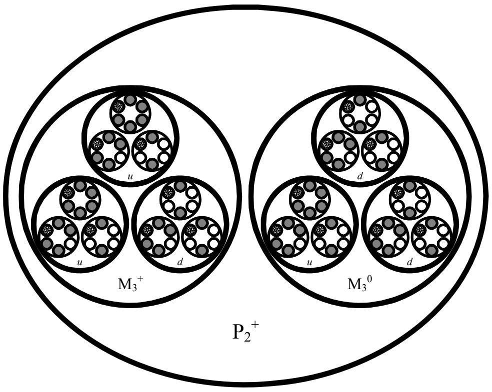
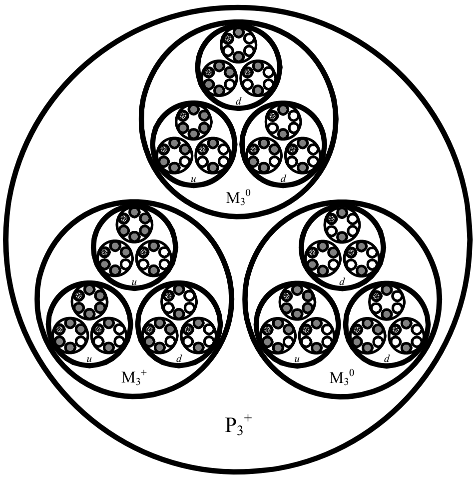
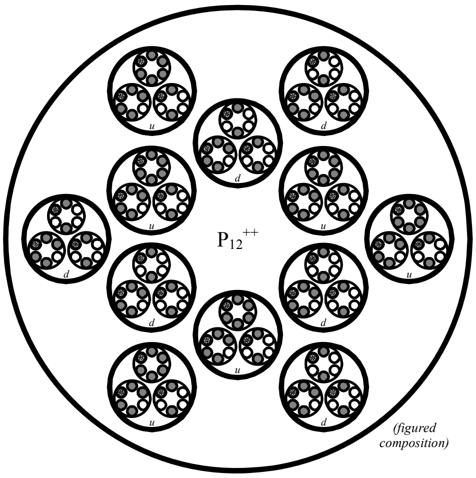
$$\langle\, \mathrm{U}(N)_K \,\rangle = \langle\, \mathrm{m}(N)_K \,\rangle - \langle\, \mathrm{I}(N)_K \,\rangle = 349.6\ (\mathrm{MeV/c^2})$$

The energy ratios of nucleus would by in that way:

$$\langle\, \mathrm{I}(K) \,\rangle / \langle\, \mathrm{U}(K) \,\rangle \approx 1.6602$$
$$\langle\, \mathrm{I}(K) \,\rangle / \langle\, \mathrm{E}(K)_{\mathrm{mass}} \,\rangle \approx 0.6241$$
$$\langle\, \mathrm{U}(K) \,\rangle / \langle\, \mathrm{E}(K)_{\mathrm{mass}} \,\rangle \approx 0.3759$$

We already have got such nuclear ratios but the fact is that this result explains no one of the questions mentioned above about the binding energy of nucleus. In other words, we can make a brilliant model *ad hoc* perfectly suited to the experimental data available at laboratories based on the assumption that nucleus is composed by nucleons, and adjusting by hand some constants introduced to “explain” the phenomena. But this inelegant SM behaviour does not *explains* the phenomena; it only *describes* an apparent phenomena in a superficial way which may be simply false because it is not based on the fundamental principles and symmetries of Nature, which remains unknown for SM. Therefore, we are not going to follow that injurious way; we are going to propose (in the corresponding chapter) a different and perhaps surprising model for the intervalic structure of nucleus which, at least, explains all the questions previously quoted. This is, in the worst case, much better than it can be said about the virtues of the traditional model.

INTERVALIC NUCLEON & NUCLEI

<table>
<tr><th colspan="2">NUCLEI with mass number: $1 < A \leq 3$
PALESTRINOS (interalic structure made by 8 levels)</th><th>NUCLEI with mass number: $A > 3$
PSEUDOPALESTRINOS (intervalic struct. made by 7 levels)
—they lack the monteverdic level of the intervalic structure—</th></tr>
<tr><td>DEUTERON ^{2}H</td><td>NUCLEUS OF TRITIUM ^{3}H and HELIUM ^{3}He</td><td><i>i.e.:</i> NUCLEUS OF HELIUM ^{4}He</td></tr>
<tr><td>$^{2}H = P_2 = 2\ M_3 = 6\ L_3 = 18\ G_6 = 108\ D_{45} = 4860\ \mathrm{I} = 9720\ \gamma = 19440\ S$</td><td>$^{3}H = P_3 = 3\ M_3 = 9\ L_3 = 27\ G_6 = 162\ D_{45} = 7290\ \mathrm{I} = 14580\ \gamma = 29160\ S$</td><td>$^{4}He = P_{12} = 12\ L_3 = 36\ G_6 = 216\ D_{45} = 9720\ \mathrm{I} = 19440\ \gamma = 38880\ S$</td></tr>
<tr><td> </td><td> </td><td>
(figured composition)</td></tr>
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NUCLEON ARMING ENERGY

All nuclei with $A > 3$ are not composed by nucleons but by quarks. The traditionally named *binding energy per nucleon* is the energy needed to take out three quarks of a nucleus and to assemble them making the last 7th. level of the intervalic structure of nucleon, namely the monteverdic level (of which all quarks inside a nucleus do lack). In other words, it is the energy needed to “arm” a nucleon starting from the quarks inside a nucleus.

By this reason this *nucleon arming energy,* or binding energy per nucleon, ~8 (MeV/c^{2}), is similar for all nuclei with $A > 3$ disregarding its mass number. When deuterons are fused to make Helium nuclei, the last level of the intervalic structure of their constituent nucleons (the monteverdic level) vanishes completely and its energy is released. Only nuclei with $A \leq 3$ are composed by nucleons.

Chapter 31

INTERVALIC NUCLEUS
Intervalic Origin of the Binding Energy in Nucleus and the Intervalic Resonance Frequorce of Nucleus

THE FUNDAMENTAL BLOCKS OF NATURE

According to IT, all particles and interactions of Nature are the result of a primordial aggregation of intervalic strings. There was produced up to five successive assemblies of massive particles, every of them made a new kind of particles (with its corresponding frequorces), being the full symmetries of the process governed only by the spin-statistics theorem. The features of all these particles are completely defined by its *intervalic structure*, which are, by order: intervalic string, closed string, intervalino, dalino, gaudino, lisztino, monteverdino and palestrino, as it have been explained in other sites. However, monteverdino can be considered as the last intervalic structure level of subatomic particles for practical purposes since the next one, the palestrinian level is an extraordinary one which can be intended to be only reached by three particles: deuteron, tritium and the ^{3}He nucleus.

All massive bosons and fermions of Nature are composed by aggregations of intervalinos conforming an intervalic structure. That primordial aggregations which creates the present bosons and fermions was hugely exothermic and made the so named Big Bang. The rules for that primordial aggregation was led by extremely powerful and simple physical principles in IT. Actually it can be said that the creation of matter can be explained starting only from the *intervalic units* and the *intervalic energy* —the principle of equivalence between energy and electric charge: $I = c^{\pm 2}\ \hbar\ Q^{-2}$—, which can be considered as the most important equation in Physics since all the four supposed forces of Nature derive from it.

Obviously, the aggregation of intervalinos is ever a symmetric state under interchange of two intervalinos, which therefore are bosons. The attraction frequorce between two intervalinos is around $\sim 10^9$ orders greater than the supposed strength of the former strong force. The intervalic aggregation at random of intervalinos stops when is reached an accurate balance between the short ranged intervalic and the long ranged electromagnetic interactions, being the last just the *inverse* of the first in intervalic units:

$$U \equiv I^{-1} = c^{\pm 2}\,(n\hbar)^{-1}\,Q^2 = c^{\pm 2}\,Q^2\,/\,r$$

In SI units it has to be added to the equation the permeability of vacuum factor, which was conventionally set by definition as $\mu_0/4\pi = 10^{-7}\,(-1)$, instead of 1 (-1) as in intervalic units. Thus, subatomic particles are the final *balance* reached between two inverse equations, a relation of paramount elegance (E(J) is the third guest to the party, the spin energy):

$$I - I^{-1} - E(J) = 0$$

The intervalic and electromagnetic energies are manifested as *mass* energy, while spin energy is manifested as *kinetic* energy. Therefore, the mass of all subatomic particles is:

$$c^{\pm 2}m = I - I^{-1} = I - U$$

What are those primordial balance values of I and I^{-1}? It is clear that they are fully determined by the *number* of the intervalinos which *structureless* aggregation reaches that perfect balance. Since $I - I^{-1}$ are manifested as *mass* energy in subatomic particles, we are lucky because billions and billions of electrons in our world demonstrate us that this magic number is precisely 270:

$$I(270\ \mathbf{q_I}) = c^{\pm 2}\ \hbar\ e^{-2} = c^{\pm 2}\ \hbar\ (270\ \mathbf{q_I})^{-2} = c^{\pm 2}\ \hbar\ [270\ \sqrt{}\text{-}(c^{-1}h)]^{-2} = 270^{-2}\ c^{-1} = \\ = 4.575639166 \cdot 10^{-14}\ (\mathrm{J}) = 0.285588809\ (\mathrm{MeV}/c^2)$$

$$U(270\ \mathbf{q_I}) = c^{\pm 2}m(e) - I(270\ \mathbf{q_I}) = 3.611471925 \cdot 10^{-14}\ (\mathrm{J}) = \\ = 0.22541025\ (\mathrm{MeV}/c^2)$$

The total charge of that primordial balanced aggregation will be named *elementary charge*, which is *defined* in IT as:

$$e = 270\ \mathbf{q_I}$$

The elementary charge is a powerful *state of minimal energy* which marks a reference for all possible aggregations of intervalinos. Therefore, it can be said that it plays the role of an *attractor* for the aggregations of electric charges. It is almost compelling to think that this state of minimal energy establishes a so named *spontaneous order* through all the Universe. In any case, what is clear it that the resultant charge in any subparticle will have to be able to aggregate with other subparticles in order to reach just that state of minimal energy —the value of elementary charge—. Therefore, the only allowed resultant charges for all particles are fully determined, being all the possible *divisors* of the elementary charge, $e = 270\ \mathbf{q_I}$, which are just the following 16 values (in intervalic units, that is to say, these number are all multiple of the intervalic charge, $\mathbf{q_I}$):

1, 2, 3, 5, 6, 9, 10, 15, 18, 27, 30, 45, 54, 90, 135, 270

From here, the apparently chaotic process of aggregation of intervalinos from primordial times to present is completely and unavoidably determined introducing no other physical principles than the ones already mentioned: the *intervalic interaction* and the *intervalic symmetries* derived from the *intervalic units*. Therefore, the intervalic units yields, unexpected but inevitably, an entire model of Particle Physics (!). If that model does not has correspondence with the actual particles of Nature, we would have "only" a much more reliable and universal system of units and dimensions for expressing Physics, apart from a lot of new important equations and symmetries previously unknown. But on the contrary, if it has got correspondence —as it is the case— we can say that we are crossing the doorstep of the greatest advance ever known in Physics research.

THE LAST LEVEL OF NUCLEUS INTERVALIC STRUCTURE

We have seen that there is no serious objection to suppose that nuclei with $A \leq 3$ are composed by nucleons. Therefore nuclei of ^2H, ^3H and ^3He will be *palestrinos.* Their whole intervalic structures are respectively:

$$P_2 = 2\ M_3 = 6\ L_3 = 18\ G_6 = 108\ D_{45} = 4860\ \mathbf{I}$$
$$P_3 = 3\ M_3 = 9\ L_3 = 27\ G_6 = 162\ D_{45} = 7290\ \mathbf{I}$$

On the contrary, it is not clear whether nuclei with A > 3 are or not palestrinos since that traditional assumption does not explains a lot of physical features of nucleus we have commented at the final of the chapter on the intervalic binding energy. The question is if it can be made an alternative model for nucleus which could explain such features in a satisfactory way — or perhaps if it only can explain them, since SM talks a lot but really explains faithfully nothing—.

The processes of assembly of intervalic structures involve drastic changes in the structural energy ratios of the constituent particles and, as a result, a great amount of binding energy is liberated and the same amount of electromagnetic mass is lost. This process appears to arrive or should arrive to an end when a *stable* particle is made. 'Stable' means that it has been reached a *state of minimal energy* which is much stronger than all the remaining ones. By definition, such state can't be go towards a state of lesser energy, because in that case the first one will not be a state of minimal energy. But the empirical fact is that the only known stable particles are just electron and nucleon. If both are states of minimal energy —and there is no reason to think in other way—, how can nucleon still fall into a state of lesser energy inside nucleus? Why the other stable particle, the electron, has not been assembled in a similar way, making aggregation of electrons to compose the corresponding "nucleus of electrons" which would have an intervalic structure of gaudino?

Moreover, should not be converted into nuclei all nucleons existing in the early Universe during the Intervalic Primordial Aggregation (IPA)? The answer is: of course, yes, all nucleons should have been assembled into nuclei; and ever worst, Hydrogen could not represent by no means the vast majority of mass in the actual Universe. As the binding energy liberated in the assembly of nucleons to make heavier nuclei is far greater than the diminution of the electromagnetic potential energy fixed in the coupling of electrons to nucleons to make Hydrogen atoms, the assembly of heavier nuclei should have happened much *before* the formation of atoms, when the Coulomb's barrier did not exist yet.

Besides, why do not apparently exist any assembly of palestrinos to make further intervalic structures?

It is clear that, as a minimum, something anomalous happened with the nucleus. In any case, I think these reasons are already sufficient to consider doubtful the affirmation of nucleus to have the intervalic structure of palestrino. In the best case, that nuclei with A > 3 to be palestrinos will be an assumption. But we can not discard other assumptions before a thorough discussion and perhaps new and specific experimental data.

The allowed numbers of constituent particles which can be assembled at every level of the intervalic structure of subatomic particles are determined by the intervalic symmetries and they are, as we know (including only as palestrinos those nuclei with A ≤ 3):

- Dalino:
1, 2, 3, 5, 6, 9, 10, 15, 18, 27, 30, 45, 54, 90, 135 or 270 intervalinos

- Elementary gaudino:
1, 2, 3, 5, 6, 9, 10, 15, 18, 27, 30, 45, 54, 90, 135 or 270 dalinos

- ⅔ fractional gaudino:
2, 4, 6, 10, 12, 18, 20, 30, 36, 60, 90 or 180 dalinos

- ⅓ fractional gaudino:
1, 2, 3, 5, 6, 9, 10, 15, 18, 30, 45 or 90 dalinos

- Lisztino:
1, 2, 3, 4 or 5 gaudinos

- Monteverdino:
2 or 3 lisztinos

- Palestrino:
2 or 3 monteverdinos

If nuclei with A > 3 were composed by nucleons, the below line which shows the allowed number of constituent particles of palestrinos would show around three hundred monteverdinos. Why would happen such skip after lisztinos and monteverdinos, which can only be composed by a maximum of 5 or 3 particles respectively? Besides, why the decreasing tendency in the allowed number of constituent particles of the intervalic structures should change dramatically when arriving to palestrino? We do not find any logic in the picture which is derived from the traditional assumption of a palestrinian nucleus composed by nucleons.

Inclusive, recalling only on contrasted experimental data, why there is a *large "desert"* between the binding energies of nucleus with A ≤ 3 and A > 3? And why the binding energy per nucleon is approximately *the same* in all nucleus (~ 8 MeV/c^2) with independence of the mass number? Acting as devil's advocate in favour of SM, we could answer that the large desert is due to the skip between the nucleons assembled into a plane (A ≤ 3) and the nucleons assembled in a volume (A > 3). By the way, this may lead to the assumption that nuclei with A > 3 were assemblies of palestrinos —which could be named *satinos* in honour of the composer Erik Satie (1866-1925), although we are not going to consider it—. But either the devil's advocate has no answer to the second question.

THE INTERMEDIATE MESON BETWEEN THE CONSTITUENT PARTICLES OF NUCLEUS

It have to be noted that there is no direct evidence which lead us to think about nucleus as composed by nucleons. On the contrary, if this was the fact, we must have had detected long time ago the meson of the changeless —strong— interaction among *nucleons* inside nuclei, which mass should be —supposed an average distance among nucleons in the nucleus $\sim 1.9 \cdot 10^{-15}$ (m)—: $m \sim c^{-1}\hbar / d_N = 103.96$ (MeV/c^2). But this have not been the case since the mass of the π meson is far from this value, being its mass just the one corresponding to changeless intervalic interaction between *quarks* inside nucleons. Therefore, there is no experimental evidence in the meson's masses for the existence of *nucleons* inside nucleus.

The meson's masses in the three possible scenarios are the following:

- For nucleus which was composed by *monteverdinos —nucleons—*, the corresponding meson would be:

quark L1D45: $L_1 = 1\ G_6 = 6\ D_{45} = 270\ \mathbf{I} = 103.61263$ (MeV/c^2)

This quark is just a third part of the nucleonic quark L3D45.

- For nucleus which was composed by *lisztinos —quarks—*, the corresponding mesons would be:

quark L⅔D45: $L_{2/3} = 2/3\ G_6 = 4\ D_{45} = 69.075090$—$73.583868$ (MeV/c^2)

This quark is just one of the two equal isoquarks which compose the π meson, so it is just a half of the π meson.

- For nucleus which was composed by *gaudinos*, the corresponding meson would be:

quark L2D45: $L_2 = 2\ G_6 = 12\ D_{45} = 207.22526$ (MeV/c^2)

This quark is just a two third parts of the nucleonic quark L3D45.

Very unfortunately, the existence of all of these mesons may be possible since all of them are just parts of the nucleonic quarks which compose the nucleon. Nevertheless, it can be argued that only the second case, the intermediate meson for the changeless intervalic interaction between quarks inside nucleus, have been experimentally detected as it is just a half of π meson. In resume, this test is not conclusive, but gives a slight advantage to the assumption of nucleus composed by quarks.

WHY THE TRADITIONAL INTERPRETATION OF THE BINDING ENERGY MAY BE A MISLEADING CONCEPT IN I.T.

According to SM nuclei loose around ~8 (MeV/c^2) per nucleon due to the assembly of its constituent nucleons. That is to say, nuclei *loose mass* because it is consumed by the bonds between nucleons.

On the contrary, in IT this concept may be absolutely erroneous because any binding energy between constituent subparticles only can *add, but never subtract, mass energy to the particle*. Really, the intervalic interaction is the main contribution to the mass of subatomic particles, which is named *intervalic mass* and does not rely on the radius of the particle but only on its intervalic structure, being this "detail" a very important difference between the intervalic energy and the long ranged interactions. The other contribution to mass comes from the electromagnetic energy, which relies on the radius (or distance between) of the constituent particles, and is named *electromagnetic mass*.

The gross mistake of SM has its origin on its absurd aim which states that subatomic particles are *structureless*. Starting from here the binding energy is taken from the mass of subatomic particles, which loose mass in any assembly in order to reach a more binding state. On the contrary, the truth is that any assembly between intervalic structures adds a new intervalic structure level with its corresponding structural mass. In spite of this increase of the mass, any assembly is exoenergetic because in other way it would not lead to a state of lesser energy. And the important point to remark is that *every* assembly realized between particles is made with the *greatest* radius allowed in order to reach the state of minimal energy. This means that any assembly is a *lesser* binding state than the previous one, in fragrant contradiction with the assumption of the SM which supposes that any assembly goes to a *more* binding state. As a consequence of the increasing of the radius, the electromagnetic energy —and it corresponding mass— *decreases*, and this is the origin of the so named 'binding energy'. And this energy is liberated against the *increasing* of the structural mass of the particle due to the addition of a new intervalic structure level, with its corresponding new intervalic and electromagnetic masses.

PALESTRINIAN NUCLEUS: NUCLEUS AS AN ASSEMBLY OF NUCLEONS

The structural mass of palestrininan nucleus can be straightforwardly deduced starting from the intervalic principles mentioned. We already known the intervalic and electromagnetic masses of nucleons, which are:

$$\mathrm{I}(p) = \mathrm{I}(\mathrm{M}_3{}^{+}) + 2\ \mathrm{I}(\mathrm{L}_3{}^{+2/3}) + \mathrm{I}(\mathrm{L}_3{}^{-1/3}) + 2\ \mathrm{I}(u)_{\mathrm{G}6} + \mathrm{I}(d)_{\mathrm{G}6} + 54\ \mathrm{I}(\mathrm{D}_{45}) =$$
$$= 9.270245023 \cdot 10^{-11}\ (\mathrm{J}) = 578.602933\ (\mathrm{MeV/c^2})$$
$$\mathrm{I}(n) = \mathrm{I}(\mathrm{M}_3{}^{0}) + \mathrm{I}(\mathrm{L}_3{}^{+2/3}) + 2\ \mathrm{I}(\mathrm{L}_3{}^{-1/3}) + \mathrm{I}(u)_{\mathrm{G}6} + 2\ \mathrm{I}(d)_{\mathrm{G}6} + 54\ \mathrm{I}(\mathrm{D}_{45}) =$$
$$= 9.327440495 \cdot 10^{-11}\ (\mathrm{J}) = 582.172792\ (\mathrm{MeV/c^2})$$

$$\mathrm{U}(p) = \mathrm{c}^{\pm 2}\mathrm{m}(p) - \mathrm{I}(p) = 5.762528048 \cdot 10^{-11}\ (\mathrm{J}) = 359.6685548\ (\mathrm{MeV/c^2})$$
$$\mathrm{U}(n) = \mathrm{c}^{\pm 2}\mathrm{m}(n) - \mathrm{I}(n) = 5.726054096 \cdot 10^{-11}\ (\mathrm{J}) = 357.3920307\ (\mathrm{MeV/c^2})$$

If it was postulated a nucleus composed by nucleons we would have to add to these structural energy the one corresponding to the new palestrininan level, which is, being Z the atomic number and A the mass number:

$$\mathrm{I}(\mathrm{P}_{\mathrm{A}}{}^{+\mathrm{Z}}) = \mathrm{c}^{\pm 2}\ \hbar\ (\mathrm{Z}\ e)^{-2}$$

The electromagnetic mass at the palestrininan level is zero because that energy is manifested as field energy instead of mass energy:

$$\mathrm{U}(\mathrm{P}_{\mathrm{A}}{}^{+\mathrm{Z}}) = 0$$

But its has to be added the electromagnetic energy at the monteverdic level, which before the assembly was field energy but now is manifested as mass energy, as we have explained with detail in other site:

$$\mathrm{U}(\mathrm{M}_3{}^{+}) = \mathrm{U}(p)_{\mathrm{M}3} = \tfrac{1}{2}\ (1/4\pi\varepsilon_0)\ (270\ \mathbf{q}_{\mathbf{I}})^2 / r_N = 0.58535170\ (\mathrm{MeV/c^2})$$
$$\mathrm{U}(\mathrm{M}_3{}^{0}) = \mathrm{U}(n)_{\mathrm{M}3} = 0$$

And against these increases of mass we finally have a binding energy of around ~8 (MeV/c^2), which means that the global decreasing in the total electromagnetic energy due to the "relaxation" of electromagnetic bonds between the constituent particles is roughly ~8.6 (MeV/c^2).

As the binding energy comes exclusively from the electromagnetic energy, the intervalic energy is not affected and the electromagnetic mass per nucleon inside a nucleus will be roughly:

$U(p)_{nucl}/A = U(p) - 8 = 351.7\ (MeV/c^2)$
$U(n)_{nucl}/A = U(n) - 8 = 349.4\ (MeV/c^2)$

This traditional model does not explain two important features: the large skip or "desert" in the binding energy between A=3 and A=4, and the fact that the binding energy per nucleon is practically constant regardless of the mass number of the nucleus.

To these difficulties it has to be added another one: since nucleon is a *stable* state of matter, how is it possible that it still goes to a less binding state? Of course, from a rigorous point of view there is no logical objection, but it is not the impeccable elegance that we always expect and have found in Nature —the greatest artist of the Universe—. And at these heights of Physics elegance and logical simplicity have become to be as important epistemological criteria as the traditional first ones of consistence, etc.

MONTEVERDIC NUCLEUS: NUCLEUS AS AN ASSEMBLY OF QUARKS

The second possible assumption on the intervalic structure of nucleus is that it is a monteverdino composed by fractional lisztinos —quarks—.

In this case the binding energy of nucleus at monteverdic level will be the sum of the binding energy of nucleon at IPA plus the binding energy of the assembly of the constituent quarks of nucleons to make the nucleus. As the first magnitude is known, the total monteverdic binding energy of a nucleus, X, "per nucleon" would roughly be:

$E_B(X)_M/A \sim 11.9 + 8 = 19.9\ (MeV/c^2)$

And the average binding energy per quark would be:

$E_B(X)_M/n(q) \sim ⅓\ E_B(X)_M/A = 6.6\ (MeV/c^2)$

This model explains why there is a large skip between A = 3 and A = 4 in the binding energy of nucleus in the traditional Aston curve: as nuclei with A > 3 are composed by quarks, there is needed about 8 (MeV/c^2) to assemble three quarks of the nucleus in order they can leave it as a nucleon, that is to say, it takes 8 (MeV/c^2) to make the monteverdic structure of nucleon starting from the quarks existing inside nucleus. As quarks can not leave nucleus in isolated state, they need to be “armed” into a nucleon to be able to leave nucleus. On the contrary, nuclei with A ≤ 3 are composed by nucleons and therefore its constituent nucleons do not need such extra amount of structural energy to leave the nucleus.

Moreover, the magnitude of the energy needed to make the intervalic structure of nucleon at the monteverdic level is, obviously, *equal* for any nucleus. This is an important point which explains the surprising feature, unexplained in SM yet, that the binding energy per nucleon is practically *constant* and does not rely on the mass number of nucleus. The slight deviation in less than 1 (MeV/c^2) in the vast majority of cases on the value of the binding energy for all nuclei with A > 3 is now easily explained through small differences in the intervalic and electromagnetic energy of nuclei.

This model seems to be the most satisfactory one and we will postulate it in first place.

LISZTINIAN NUCLEUS: NUCLEUS AS AN ASSEMBLY OF GAUDINOS

The third possible model postulates that nucleus is a lisztino composed by gaudinos 6. Although at first sight this assumption may look improbable, there is no reason to discard it before to realize a thorough study about it. Actually, this model explains in a similar way that the second one the two principal problems of nucleus: the large skip in the Aston curve and the great similarity in the binding energy per nucleon in all nuclei from A > 3.

The binding energy at the lisztinian level of nuclei will be the sum of the primordial binding energy of quarks, previously known, plus the binding energy of nucleus “per nucleon”:

$$E_B(X)_L/A \sim 47.2 + 8 = 55.2 \text{ (MeV/}c^2\text{)}$$

And the average binding energy per gaudino 6 would be:

$E_B(X)_L/n(G_6) \sim (1/9)\ E_B(X)_L/A = 6.1\ (MeV/c^2)$

Now the binding energy per nucleon is the amount of energy which is needed to make the lisztinian and monteverdic structures of nucleons starting from the gaudinos inside nucleus. Obviously, this structural energy is independent of the number of constituent gaudinos of the nucleus —or its mass number to say it *avant la lettre*—.

The first and second models involve considerable changes in the energy ratio of the constituent particles of nucleus —whatever they be— due to the binding energy of nucleus, which is taken exclusively from the electromagnetic mass of such constituent particles at all levels of the intervalic structure, as we have already mentioned. On the contrary, this model involves scarcely changes in that energy ratio since the majority of the binding energy is taken from the monteverdic and palestrinian levels, which completely disappear in nucleus with A > 3. This means that the energy ratio of dalinos and gaudinos reached inside *nucleon* are a very strong state of minimal energy, as further assemblies of such particles do not achieve to reduce their energy ratios. This feature makes sense because it is clear that there is a limit in the binding energy that can be liberated in further assemblies by any particle, as the electromagnetic energy of the constituent particles —from which is taken the binding energy— can not decrease indefinitely because the radius and the spin energy would increase proportionally and the particle will become unstable. To be a *stable* particle implies to be a final state of minimal energy; being proton a stable particle it can be questioned if it could liberate those considerable ~8 (MeV/c^2) when assembled with other nucleons.

As this model can not probably be comprehended without a detailed explanation, we are going to write it down. We are going to describe straight away the structural mass energy of nucleus —as a lisztino composed by gaudinos 6— at every level of the intervalic structure. (In order to a better understanding, in the following paragraphs —and only there— we will name the intervalic structure levels according to its fixed names in nucleon. Thus we will say that a nucleus is a palestrino which lacks of monteverdic and lisztinian levels of the intervalic structure. To see how is the energy of these levels we have firstly to describe it as if nucleus was composed by nucleons. Therefore, we will deal now with the traditional model of nucleus as composed by nucleons).

NUCLEUS MASS ENERGY

MASS ENERGY AT PALESTRINIAN LEVEL

The intervalic energy at the palestrinian level becomes very small and finally despicable as the atomic number increases. For example, in the case of Helium, Iron, Gold and Uranium nuclei it is:

$I(P_4^{+2}) = I(He)_P = c^{\pm 2}\,\hbar\,(2\,e)^{-2} = 0.071397202\ (MeV/c^2)$
$I(P_{56}^{+26}) = I(Fe)_P = c^{\pm 2}\,\hbar\,(26\,e)^{-2} = 0.42246865\ (KeV/c^2)$
$I(P_{197}^{+79}) = I(Au)_P = c^{\pm 2}\,\hbar\,(79\,e)^{-2} = 45.76010399\ (eV/c^2)$
$I(P_{238}^{+92}) = I(U)_P = c^{\pm 2}\,\hbar\,(92\,e)^{-2} = 33.74158905\ (eV/c^2)$

As the electromagnetic energy of the last structure level is manifested as *field* energy, the electromagnetic *mass* of nucleus at this level is zero:

$U(P) = 0$

MASS ENERGY AT MONTEVERDIC LEVEL

The intervalic energy of nucleons at the monteverdic level is already known:

$$I(M_3^+) = I(p)_{M3} = c^{\pm 2}\,\hbar\,e^{-2} = c^{\pm 2}\,\hbar\,(270\,\mathbf{q_I})^{-2} = c^{\pm 2}\,\hbar\,[270\,\sqrt{-}(c^{-1}h)]^{-2} =$$
$$= 270^{-2}\,c^{-1} = 4.57563917 \cdot 10^{-14}\,(J) = 0.285588809\ (MeV/c^2)$$

$I(M_3^0) = I(n)_{M3} = 0$

Some one may think that the electromagnetic mass of nucleons inside nucleus would be:

$U(M_3^+) = U(p)_{M3} = ½\,(1/4\pi\varepsilon_0)\,(270\,\mathbf{q_I})^2\,/\,r_N = 0.58535170\ (MeV/c^2)$

$U(M_3^0) = U(n)_{M3} = 0$

But please note that the electromagnetic mass of nucleon can not be greater than its intervalic mass by no means. Therefore, in that model the radius of nucleons inside nucleus must be greater than:

$r_N > ½\ (1/4\pi\varepsilon_0)\ (270\ \mathbf{q_I})^2\ /\ \mathrm{I}(p)_{\mathrm{M3}} = 2.521046216 \cdot 10^{-15}$ (m)

This result clearly shows that the traditional model of nucleus as composed by nucleons is not viable. However, if we would not know the intervalic compositeness of nucleus (as we already know), now we would be going to pass over such result in the only way we could do it: supposing as working assumption the electromagnetic energy at the monteverdic level of the constituent nucleons inside nucleus is manifested only as field energy, and does not contribute to mass energy.

MASS ENERGY AT LISZTINIAN LEVEL

The intervalic and electromagnetic energies of nucleons at lisztinian level are due to the aggregation of quarks:

$\mathrm{I}(p)_{\mathrm{L3}} = \mathrm{I}(u{+}u{+}d)_{\mathrm{L3}} = ((9/4) + (9/4) + 9)\ \mathrm{c}^{-2}\,\hbar\, e^{-2} =$
$= (27/2)\ 270^{-2}\mathrm{c}^{-1} = 6.1771128 \cdot 10^{-13}$ (J) = 3.8554490 (MeV/c^2)
$\mathrm{I}(n)_{\mathrm{L3}} = \mathrm{I}(u{+}d{+}d)_{\mathrm{L3}} = ((9/4) + 9 + 9)\ \mathrm{c}^{-2}\,\hbar\, e^{-2} =$
$= (81/4)\ 270^{-2}\mathrm{c}^{-1} = 9.2656692 \cdot 10^{-13}$ (J) = 5.7831734 (MeV/c^2)

Being already known it IT the magnitude of the nucleonic quark radius with exactness, $r_q = 6.88054386 \cdot 10^{-16}$ (m), we have:

$\mathrm{U}(p)_{\mathrm{L3}} = \mathrm{U}(u{+}u{+}d)_{\mathrm{L3}} = (180^2{+}180^2{+}90^2)\ ½\ (1/4\pi\varepsilon_0)\ \mathbf{q_I}^2 / r_q =$
$= 1.67652406 \cdot 10^{-13}$ (J) = 1.04640356 (MeV/c^2)
$\mathrm{U}(n)_{\mathrm{L3}} = \mathrm{U}(u{+}d{+}d)_{\mathrm{L3}} = (180^2{+}90^2{+}90^2)\ ½\ (1/4\pi\varepsilon_0)\ \mathbf{q_I}^2 / r_q =$
$= 1.11768271 \cdot 10^{-13}$ (J) = 0.697602374 (MeV/c^2)

We can see that the total mass energy per nucleon at the lisztinian level, which is *lacked* in all nuclei with atomic number > 3, is:

$\mathrm{m}(p)_{\mathrm{L3}} = \mathrm{I}(p)_{\mathrm{L3}} + \mathrm{U}(p)_{\mathrm{L3}} = 4.901852560$ (MeV/c^2)
$\mathrm{m}(n)_{\mathrm{L3}} = \mathrm{I}(n)_{\mathrm{L3}} + \mathrm{U}(n)_{\mathrm{L3}} = 6.480775774$ (MeV/c^2)

MASS ENERGY AT GAUDINAR LEVEL

The gaudinos 6 that compose all nuclei have a rather complex structure which I have described with detail in other sites. The sum of its intervalic energy and per gaudino 6, per quark and per nucleon is:

$$\mathrm{I}(\mathrm{G}_6^{\pm\frac{1}{3}})_{\mathrm{G6}} = \mathrm{c}^{\pm 2}\, \hbar\, (90\, \mathbf{q_I})^{-2} = 2.5702993\ (\mathrm{MeV/c}^2)$$
$$\mathrm{I}(\mathrm{G}_6^{\pm\frac{2}{3}})_{\mathrm{G6}} = \mathrm{c}^{\pm 2}\, \hbar\, (180\, \mathbf{q_I})^{-2} = 0.64257482\ (\mathrm{MeV/c}^2)$$

$$\mathrm{I}(u)_{\mathrm{G6}} = \mathrm{I}(\mathrm{G}_6^{+\frac{2}{3}}) + 2\ \mathrm{I}(\mathrm{G}_6^{\pm\frac{1}{3}}) = 5.78317342\ (\mathrm{MeV/c}^2)$$
$$\mathrm{I}(d)_{\mathrm{G6}} = \mathrm{I}(\mathrm{G}_6^{-\frac{1}{3}}) + 2\ \mathrm{I}(\mathrm{G}_6^{\pm\frac{1}{3}}) = 7.71089790\ (\mathrm{MeV/c}^2)$$

$$\mathrm{I}(p)_{\mathrm{G6}} = 2\ \mathrm{I}(u)_{\mathrm{G6}} + \mathrm{I}(d)_{\mathrm{G6}} = 19.27724474\ (\mathrm{MeV/c}^2)$$
$$\mathrm{I}(n)_{\mathrm{G6}} = \mathrm{I}(u)_{\mathrm{G6}} + 2\ \mathrm{I}(d)_{\mathrm{G6}} = 21.20496922\ (\mathrm{MeV/c}^2)$$

This energy is fully conserved in nucleus and there is no difference about it with respect to nucleons.

On the other hand, the electromagnetic energy of nucleons at gaudinar level is, likewise per gaudino 6, per quark and per nucleon, being already known with exactness in IT the magnitude of the quarkic gaudino 6:

$$\mathrm{U}(\mathrm{G}_6^{\frac{2}{3}}) = \tfrac{1}{2}\ (1/4\pi\varepsilon_0)\ (180\, \mathbf{q_I})^2 / r_{\mathrm{G6}} = 3.85544898\ (\mathrm{MeV/c}^2)$$
$$\mathrm{U}(\mathrm{G}_6^{\frac{1}{3}}) = \tfrac{1}{2}\ (1/4\pi\varepsilon_0)\ (90\, \mathbf{q_I})^2 / r_{\mathrm{G6}} = 0.963862244\ (\mathrm{MeV/c}^2)$$

$$\mathrm{U}(u)_{\mathrm{G6}} = \mathrm{U}(\mathrm{G}_6^{\frac{2}{3}}) + 2\ \mathrm{U}(\mathrm{G}_6^{\frac{1}{3}}) = 5.783173468\ (\mathrm{MeV/c}^2)$$
$$\mathrm{U}(d)_{\mathrm{G6}} = 3\ \mathrm{U}(\mathrm{G}_6^{\frac{1}{3}}) = 2.891586735\ (\mathrm{MeV/c}^2)$$

$$\mathrm{U}(p)_{\mathrm{G6}} = 2\ \mathrm{U}(u)_{\mathrm{G6}} + \mathrm{U}(d)_{\mathrm{G6}} = 14.45793367\ (\mathrm{MeV/c}^2)$$
$$\mathrm{U}(n)_{\mathrm{G6}} = \mathrm{U}(u)_{\mathrm{G6}} + 2\ \mathrm{U}(d)_{\mathrm{G6}} = 11.56634694\ (\mathrm{MeV/c}^2)$$

This energy is different in the case of nucleus because the distance among gaudinos —or alternatively the gaudino 6 radius— is slightly *greater* in nucleus than in nucleons. In the case of nucleons we could have postulated, according to traditional view, that the difference between quarks masses at the gaudinar level of the intervalic structure is due to the electromagnetic interaction between quarks:

$$\mathrm{U}(u)_{\mathrm{G6}} - \mathrm{U}(d)_{\mathrm{G6}} = 1.927724562\ (\mathrm{MeV/c}^2) = 3.088556592 \cdot 10^{-13}\ (\mathrm{J}) =$$
$$= \mathrm{E_q}(\mathrm{G}_6^{+\frac{2}{3}}\mathrm{G}_6^{+\frac{1}{3}}\mathrm{G}_6^{-\frac{1}{3}}) - \mathrm{E_q}(\mathrm{G}_6^{-\frac{1}{3}}\mathrm{G}_6^{+\frac{1}{3}}\mathrm{G}_6^{-\frac{1}{3}}) = \{[(\tfrac{2}{3} \cdot \tfrac{1}{3}) + (\tfrac{2}{3} \cdot \tfrac{1}{3}) + (\tfrac{1}{3})^2] -$$
$$- [(\tfrac{1}{3})^2 + (\tfrac{1}{3})^2 + (\tfrac{1}{3})^2]\}\ (1/4\pi\varepsilon_0)\ e^2 / d_{\mathrm{G6}} = (2/9)\ (1/4\pi\varepsilon_0)\ e^2 / d_{\mathrm{G6}}$$

From here we could have deduced the distance between gaudinos 6 inside quark:

$$d_{\mathrm{G6}} = 1.659948039 \cdot 10^{-16}\ (\mathrm{m})$$

Nevertheless, nucleons are high binding states and the distance among its constituent gaudinos is *smaller* than the distance among them when aggregating into a nucleus. This is the last level of the intervalic structure, where there is a difference in the contribution to mass between nucleons and nucleus.

MASS ENERGY AT DALINAR LEVEL

The dalinar level is the last level of the intervalic structure since the next level is already the intervalinar one. The mass energy at this level does not vary between nucleons and nucleus. Besides, both quarks have identical dalinar structures —regardless of the charge sign— and therefore its intervalic energies are the same. The dalinar energy per quark and per nucleon is:

$$\mathrm{I}(u)_{\mathrm{D45}} = \mathrm{I}(d)_{\mathrm{D45}} = \mathrm{I}(\mathrm{L}_3)_{\mathrm{D45}} = 3\ \mathrm{I}(\mathrm{G}_6) = 18\ \mathrm{I}(\mathrm{D}_{45}) = 18\ \mathrm{c}^{\pm 2}\ \hbar\ (45\ \mathbf{q_I})^{-2} =$$
$$= 18\ \mathrm{c}^{\pm 2}\ \hbar\ [45\ \sqrt{}\text{-}(\mathrm{c}^{-1}\mathrm{h})]^{-2} = 18 \cdot 45^{-2}\ \mathrm{c}^{-1} = 185.06155\ (\mathrm{MeV/c}^2)$$

$$\mathrm{I}(N)_{\mathrm{D45}} = \mathrm{I}(\mathrm{M}_3)_{\mathrm{D45}} = 3\ \mathrm{I}(\mathrm{L}_3)_{\mathrm{D45}} = 555.184650\ (\mathrm{MeV/c}^2)$$

We can suppose without appreciable risk for our purpose that the electromagnetic energy at dalinar level has no difference between nucleons and nucleus. Under this assumption, the electromagnetic energy per quark and per nucleon is, since we already know the electromagnetic potential energy at all the preceding energy levels of the intervalic structure:

$$\mathrm{U}(u)_{\mathrm{D45}} = \mathrm{U}(u)_{\mathrm{tot}} - \mathrm{U}(u)_{\mathrm{L3}} - \mathrm{U}(u)_{\mathrm{G6}} = 114.4003903\ (\mathrm{MeV/c}^2)$$
$$\mathrm{U}(d)_{\mathrm{D45}} = \mathrm{U}(d)_{\mathrm{tot}} - \mathrm{U}(d)_{\mathrm{L3}} - \mathrm{U}(d)_{\mathrm{G6}} = 115.3642525\ (\mathrm{MeV/c}^2)$$

$$\mathrm{U}(p)_{\mathrm{D45}} = 2\ \mathrm{U}(u)_{\mathrm{D45}} + \mathrm{U}(d)_{\mathrm{D45}} = 344.1650331\ (\mathrm{MeV/c}^2)$$
$$\mathrm{U}(n)_{\mathrm{D45}} = \mathrm{U}(u)_{\mathrm{D45}} + 2\ \mathrm{U}(d)_{\mathrm{D45}} = 345.1288953\ (\mathrm{MeV/c}^2)$$

COMMON NUCLEAR MASS PER NUCLEON

If we sum all common and identical contributions of the intervalic and electromagnetic energies to mass of both nucleons and nucleus, we will obtain a *common nuclear mass per nucleon*:

$$\mathrm{I}(p)_{\mathrm{com}} = \mathrm{I}(p)_{\mathrm{G6}} + \mathrm{I}(N)_{\mathrm{D45}} + \mathrm{U}(p)_{\mathrm{D45}} = 918.6269278\ (\mathrm{MeV/c}^2)$$

$I(n)_{com} = I(n)_{G6} + I(N)_{D45} + U(n)_{D45} = 921.5185145\ (MeV/c^2)$

To this mass energy only have to be added, in the case of *nucleus*, the electromagnetic energy at gaudinar level an the intervalic energy at monteverdic level —which is despicable for nuclei with atomic number > 5—. We already know that the resultant magnitude must be ~931 ± 0.5 (MeV/c^2) for the majority of nuclei (with binding energies between 7.5 and 8.5 per nucleon). Lets go to see what is obtained if we add the corresponding gaudinar energy of *nucleons* to the common nuclear mass. It is clear that we will obtain a magnitude slightly greater than expected:

$I(p)_{com} + U(p)_{G6} = 933.0848615\ (MeV/c^2)$
$I(n)_{com} + U(n)_{G6} = 933.0848614\ (MeV/c^2)$

But this is just the magnitude of the intervalic nucleon common mass (!): 933.0848614 (MeV/c^2), defined in our papers on the intervalic nucleon:

$m(N)_{com} = m(p) - [I(p)_{M3+L3} + U(p)_{M3+L3}] = m(n) - [I(n)_{M3+L3} + U(n)_{M3+L3}]$

There is a difference of 933.0848614 - (~931±0.5) = ~2 ± 0.5 (MeV/c^2) between the electromagnetic energy at gaudinar level in *nucleons* and in *nucleus*.

The average value of the electromagnetic energy at gaudinar level of proton an neutron is:

$\langle U(N)_{G6}\rangle = 13.01214031\ (MeV/c^2)$

And the same energy per nucleon in the case of nucleus is: ~11 ± 0.5 (MeV/c^2). This means that the distance between gaudinos —or alternatively, its radius— in *nucleus* is slightly greater than the same distance —or radius— in *nucleons*, because nucleons are more binding states, as expected.

WHY THE BINDING ENERGY PER NUCLEON IS THE SAME IN ALL NUCLEI

IT easily explains one of the most disconcerting features of nucleus: the fact that the binding energy per nucleon is almost the same for all nuclei, disregarding its mass or atomic number. This strange feature can't be understood according to traditional concepts of force and potential of an interaction. However, the second and third models postulated by IT can explain it with astounding simplicity. The binding energy per nucleon is the same because that it is just the energy that is needed to make the last *intervalic structures* of nucleon, of which gaudinos and quarks inside nucleus lack. In the case of the third model of nucleus there have to be "armed" the full monteverdic and the full lisztinian structures of nucleons, plus an increasing of the electromagnetic energy at the gaudinar structure level. The share among these energies in this model is, as we have already seen above (and depending if the nucleon is, respectively, a proton or a neutron):

- Palestrininan structure level: despicable
- Monteverdic structure level: from 0.3 to 0 (MeV/c^2)
- Lisztinian structure level: from 4.9 to 6.5 (MeV/c^2)
- Gaudinar structure level: from ~2.8 to ~1.5 ± 0.5 (MeV/c^2)

Thus, the traditional graphic of the binding energy per nucleon should be substituted by the *inverted* graphic of the *structural mass energy per nucleon*, which shows for each element the mass energy of the involved intervalic structure per nucleon. The large "desert" between ^{1}H, ^{2}H, ^{3}H, ^{3}He and all the remaining nuclei with A > 3 is the evidence of the constituent structural energy which clearly separates the first four nuclei composed by nucleons from all the remaining ones composed by gaudinos or quarks. Really it was unexpected that such elusive question could be explained through the direct application of a radically new physical principle: the intervalic compositeness of subatomic particles. Please note that the potential of the changeless —strong— intervalic interaction does not intervene directly in the explanation of this feature (as SM does), but only the *intervalic structures* of the involved particles.

PROTON DECAY

The intervalic structure of nucleus has a bizarre or surprising consequence on the possible proton decay postulated by SUSY. Its last estimations of proton lifetime are roughly 10^{35} years.

The intervalic pseudo-limit of time: $\mathbf{t_I}^{-1} = c\hbar^{-1} = 2.8399227 \cdot 10^{42}$ (s) ≈ $8.9991693 \cdot 10^{34}$ years is intended to be the greatest magnitude of time existing in the Universe. We say pseudo-limit instead of limit because time is not geometrically *limited* in the Intervalic Geometry, but it is *quantized*. However $\mathbf{t_I}^{-1}$ is the inverse period of the intervalic frequency, which is the largest oscillation geometrically allowed in the Intervalic Space.

Therefore, any magnitude of time, and in concrete, proton lifetime, can not be by no means greater than the period of the Universe: $\tau_p \leq 8.9991693 \cdot 10^{34}$ years. So I am afraid that SUSY has calculated a magnitude slightly greater than the biggest magnitude of time expected in the intervalic Universe.

In any case, let's suppose that proton effectively decays and its long lifetime is a magnitude of that order. Arriving at 10^{35} years after the Big Bang, it can be supposed that the vast majority of Hydrogen atoms will have been converted into Helium and other heavier atoms. But since all atoms from ^{4}He and onwards are really composed by quarks or by gaudinos —instead of nucleons as early supposed—, the proton decay will not affect any nucleus heavier than ^{3}He. This means that stars will stay *after* the proton decay (!). Of course, life probably will not because the Hydrogen atom form part of H_20 and other organic molecules, but it is an unexpected result that all molecules without Hydrogen inside its composition do stay after the proton decay.

By the way, this means that the experiments to detect the proton decay in water have a probability *five times greater* than the early calculated value because water molecule has only 2 protons —those of Hydrogen— instead of 2+8 = 10, since Oxygen nucleus is not composed by nucleons but by quarks or gaudinos.

INTERVALIC OVERALL FREQUORCE OF NUCLEUS

We have seen that the overall exchange frequorce due to intervalic interaction among the constituent particles of every intervalic structure level of any subatomic particle is determined by the intervalic energy:

$$I(\mathit{nucleus}) = c^{\pm 2}\, \hbar\, Q^{-2}$$

In concrete, the intervalic energy of the last level of the intervalic structure of any particle define what we can name simply as its *intervalic overall frequorce* because the inner levels of the intervalic structure usually do not intervene in the phenomenological features of the particle which becomes apparent in atomic and molecular physics.

Thus in this insulting simple way, we see that every nucleus has a determine and characteristic intervalic overall frequency. For example, in the case of Hydrogen and Helium nucleus, whose intervalic energy at the last structure level is:

$I(H) = c^{\pm 2}\hbar\ (e)^{-2} = 4.575638918 \cdot 10^{-14}\ (J) = 0.2855888794\ (MeV/c^2)$
$I(He) = c^{\pm 2}\hbar\ (2e)^{-2} = 1.143909729 \cdot 10^{-14}\ (J) = 0.071397198\ (MeV/c^2)$
$I(O) = c^{\pm 2}\hbar\ (8e)^{-2} = 7.149435809 \cdot 10^{-16}\ (J) = 0.00446232491\ (MeV/c^2)$

The intervalic overall frequorce will be:

$\varphi(H) = I(H) / \hbar = c^{\pm 2}\ (e)^{-2} = 4.334484251 \cdot 10^{20}\ (s^{-1})$
$\varphi(He) = I(He) / \hbar = c^{\pm 2}\ (2e)^{-2} = 1.083621063 \cdot 10^{20}\ (s^{-1})$
$\varphi(O) = I(O) / \hbar = c^{\pm 2}\ (8e)^{-2} = 6.772631643 \cdot 10^{18}\ (s^{-1})$

In spite of that astounding simplicity, it is clear that such frequency is a high specific characteristic feature of each nucleus and should act as a *resonance frequency* under certain circumstances. What has to be empirically checked is whether the radiation of that overall frequency on its corresponding nucleus makes a stronger stability or a instability of nucleus. In the last case the radiated frequency could provoke the breaking of the last level of the intervalic structure of the radiated nucleus. In the first case, the radiation of such frequency on other suited particles could induce the making of the intervalic structure of the corresponding nucleus. Both possible procedures are ready to be tested and developed by technologic means.

In concrete, it can be expected that the intervalic overall frequency of Helium radiated on deuterium would play as a resonance frequency inducing the aggregation of deuterium nuclei to make the last level of the intervalic structure of Helium nucleus, regardless of temperature. Moreover, the same frequency could induce the coupling of electrons forming pairs like in a Bose-Einstein condensed state. In that case the Coulomb barrier would be severely weakened allowing a much easier assembly of deuterium nuclei. The theoretic knowledge of the magnitude of these intervalic frequencies may be of greatest importance to reach at last the control of nuclear fusion energy at low temperatures which could help mankind to leave out the present energetic crisis, typical of a very primitive and quite stupid civilization.

The equivalent *resonance temperature* that corresponds to the Helium nucleus overall frequency, $\Theta(He)$, is, by means of the geometric features of the intervalic units and limits, being $\boldsymbol{\Theta_I} = c\ k_B^{-1}$ the intervalic temperature:

$\Theta(He) / \boldsymbol{\Theta_I} = \varphi(He) / \boldsymbol{\varphi_I} = 3.815672139 \cdot 10^{-23}\ (1)$
$\Theta(He) = \hbar / (4c^2 e^2 k_B) = 8.285250434 \cdot 10^{8}\ (K)$

This value is intended to be the theoretical temperature at which the intervalic nuclear fusion process to make the intervalic structure of Helium nucleus would reach the greatest efficiency (in absence of induced radiation).

It must be noted that according to usual —and dramatically wrong— quantum conversion factors, such temperature would be ~5.2 · 10^9 (K), in clear disagreement with our calculus. Here we find another example of the extraordinary elegance and fruitfulness of the intervalic units, which makes the only and natural reliable conversion factors between different physical quantities, relying solely on its intervalic quanta or limits, which at once define the magnitudes of the own intervalic units.

Chapter 32

INTERVALIC SPIN ENERGY

INTERVALIC PRINCIPLE OF DYNAMIC ENERGY BALANCE FOR SUBATOMIC PARTICLES WITH UNLIKE CHARGES

> As a scientist, I believe that nature is a perfect structure, seen form the standpoint of reason and logical analysis.
>
> ALBERT EINSTEIN
> *To Raymond Benenson, 31.01.1946*

We already know the important intervalic principle of energy balance for subatomic particles, thoroughly applied along this book. Nevertheless this principle have to be slightly modified when dealing with complex intervalic structures which have got unlike charges. In this case we have to calculate the result of the dynamic contribution of the electromagnetic energy, E_q, to the dynamic balance of the particle, and the original equation: $I - I^{-1} - E(J) = 0$ will have to be substituted by:

$$I - E_q - E(J) = 0$$

Please note that now we have $U \neq E_q$ and the mass of the particle is not yet: $m = I + E_q$ but it remains to be: $m = I + U$. This means that the total structural energy of the particle, A, also stays as: $A = I + U + E(J)$, but when the dynamic electromagnetic interaction between unlike charges is introduced we will have got: $A > I + E_q + E(J)$, being the equality the limit case valid when every level of the intervalic structure is composed only by like charges (*i.e.* leptons-charged massive bosons).

The determination of the intervalic structures involved in the spin energy of a complex particle with unlike charges may be troublesome at first sight because each constituent intervalic structure level has its own spin energy. The determination of the intervalic energy involved in every structure level is immediate because it is composed exclusively by the corresponding intervalic structures of that level. On the contrary, the determination of the dynamic electromagnetic energy is different from the electromagnetic potential energy and relies on the interaction between the intervalic structures of the next internal level of the subatomic particle. Thus, for example, the dynamic electromagnetic energy of a subatomic particle at monteverdic level relies on the interaction between the constituent intervalic structures with unlike charges at lisztinian level, the dynamic electromagnetic energy at lisztinian level relies on the interaction between the constituent intervalic structures with unlike charges at gaudinar level, and the dynamic electromagnetic energy at gaudinar level relies on the interaction between the constituent intervalic structures with unlike charges at dalinar level. Finally, the dynamic electromagnetic energy at the dalinar level is best calculated through the electromagnetic potential energy of the own constituent dalinos because all dalinos are, by definition, composed only by intervalinos with *like* charges, as they are in a symmetric state under interchange, and the calculus of the dynamic electromagnetic interaction between 45, 30 or 18 intervalinos may be an awkward task. Of course, the dalino is the *last composite* intervalic structure, which means that it is the last intervalic structure which have got electromagnetic potential energy. As we know, the electromagnetic potential energy of isolated intervalinos must necessarily be zero because they are *single* particles. Besides, isolated intervalinos do not interact electromagnetically, but only through gravitational and changeless —strong— intervalic interactions.

NUCLEON SPIN ENERGY

The total spin energy of nucleon is the sum of the spin energies at all constituent levels of the intervalic structure which yield *composite* particles: monteverdic, lisztinian, gaudinar and dalinar. Let us go to see them.

NUCLEONIC MONTEVERDINOS SPIN ENERGY

According to IT, there is a perfect energy *balance* between all the involved energies that conforms a particle in each one of the levels of its intervalic structure. The intervalic energy of proton and neutron at this structure level is:

$$I(p)_M = c^{\pm 2}\,\hbar\, e^{-2} = c^{\pm 2}\,\hbar\,(270\ \mathbf{q_I})^{-2} = c^{\pm 2}\,\hbar\,[270\ \sqrt{-}(c^{-1}\hbar)]^{-2} = 270^{-2}\ c^{-1} =$$
$$= 4.575639166 \cdot 10^{-14}\ (J) = 0.285588809\ (MeV/c^2)$$
$$I(n)_M = 0$$

As can be seen the intervalic energy of neutron at monteverdic level is just zero.

And the dynamic electromagnetic energy can not be calculated through the potential energy at monteverdic level because of the constituent unlike charges, but through the dynamic electromagnetic interaction between quarks, which is (where the minus or plus sign of the magnitude only indicates the way —attraction or repulsion— of the related frequorce according to conventional use):

$$E_q(p)_M = E_q(uud)_L = [(+⅔)^2 + (-⅓ \cdot ⅔) + (-⅓ \cdot ⅔)]\ (1/4\pi\varepsilon_0)\ e^2 / d_q = 0$$
$$E_q(n)_M = E_q(udd)_L = [(-⅓)^2 + (-⅓ \cdot ⅔) + (-⅓ \cdot ⅔)]\ (1/4\pi\varepsilon_0)\ e^2 / d_q =$$
$$= -⅓\ (1/4\pi\varepsilon_0)\ e^2 / d_q = -5.58841376 \cdot 10^{-14}\ (J) = -0.34880120\ (MeV/c^2)$$

Remarkably, the dynamic electromagnetic energy of proton at monteverdic level is zero, whilst neutron is not.

Those intervalic and electromagnetic interactions are both attractive frequorces —the spin 0 intervalic interaction is always attractive while the spin 1 electromagnetic one may be attractive or repulsive— which are just balanced through the nucleon *spin energy*, E(*J*), according to the intervalic principle of dynamic structural energy balance for subatomic particles with unlike charges: $I - E_q - E(J) = 0$. In the case of proton and neutron we have:

$$E_J(p)_M = I(p)_M - 0 = 4.5756390 \cdot 10^{-14}\ (J) = 0.285588809\ (MeV/c^2)$$

$$E_J(n)_M = 0 - E_q(n)_M = 5.58841376 \cdot 10^{-14}\ (J) = 0.34880120\ (MeV/c^2)$$

From here it can be deduced some dynamic features of proton and neutron by means of the already well known equation $E(J) = m\ r^2\ \omega^2$, deduced previously from the Virial theorem, where ω is the angular velocity and v the linear velocity on surface:

$$\omega_p = (E(J_p) / r_p^2\ m_p)^{½} = 4.252280621 \cdot 10^{21}\ (s^{-1})$$
$$\omega_n = (E(J_n) / r_n^2\ m_n)^{½} = 4.696141808 \cdot 10^{21}\ (s^{-1})$$

$$v_p = \omega_p\ r_N = 5.230305164 \cdot 10^6\ (m\ s^{-1}) = 0.01744642\ c$$
$$v_n = \omega_n\ r_N = 5.776254424 \cdot 10^6\ (m\ s^{-1}) = 0.01926751\ c$$

They are rather low magnitudes compared with the velocities of leptons-charged massive bosons, as it can be expected since now we are dealing only with the last structure level of nucleons.

The acceleration on nucleon's surface is:

$$a_p = v_p^2 / r_p = 2.224072529 \cdot 10^{28}\ (m\ s^{-2})$$
$$a_n = v_n^2 / r_n = 2.71261099 \cdot 10^{28}\ (m\ s^{-2})$$

NUCLEONIC LISZTINOS —QUARKS— SPIN ENERGY

The intervalic energy of nucleonic quarks at their own lisztinian structure level is:

$$I(u)_L = c^{\pm 2}\ \hbar\ (180\ \mathbf{q_I})^{-2} = c^{-1}\ 180^{-2} = 1.0295188 \cdot 10^{-13}\ (J) =$$
$$= 0.64257482\ (MeV/c^2)$$

$$I(d)_L = c^{\pm 2}\ \hbar\ (90\ \mathbf{q_I})^{-2} = c^{-1}\ 90^{-2} = 4.1180752 \cdot 10^{-13}\ (J) =$$
$$= 2.5702993\ (MeV/c^2)$$

The dynamic electromagnetic energy is due to the electromagnetic interaction between the constituent gaudinos, which have got unlike charges:

$$E_q(u)_L = E_q(G_6^{+2/3} G_6^{+1/3} G_6^{-1/3})_G = [(2/3 \cdot 1/3) - (2/3 \cdot 1/3) - (1/3)^2]\ (1/4\pi\varepsilon_0)\ e^2 / d_{G6} =$$
$$= -(1/9)\ (1/4\pi\varepsilon_0)\ e^2 / d_{G6} = -1.544278296 \cdot 10^{-13}\ (J) = -0.96386228\ (MeV/c^2)$$

$$E_q(d)_L = E_q(G_6^{-1/3} G_6^{+1/3} G_6^{-1/3})_G = [-(1/3)^2 + (1/3)^2 - (1/3)^2]\ (1/4\pi\varepsilon_0)\ e^2 / d_{G6} =$$
$$= -(1/9)\ (1/4\pi\varepsilon_0)\ e^2 / d_{G6} = -1.544278296 \cdot 10^{-13}\ (J) = -0.96386228\ (MeV/c^2)$$

Once more we have got a remarkable result: a perfect equality between the values of the dynamic electromagnetic interaction of nucleonic quarks, in spite of the different isocharge values of their constituent gaudinos.

Henceforth, the spin energy of nucleonic quarks is:

$E_{\mathcal{J}}(u)_L = I(u)_L - E_q(u)_L = 2.573797104 \cdot 10^{-13}$ (J) $= 1.60643710$ (MeV/c^2)
$E_{\mathcal{J}}(d)_L = I(d)_L - E_q(d)_L = 5.662353564 \cdot 10^{-13}$ (J) $= 3.53416158$ (MeV/c^2)

Hence, being ω_q the intrinsic angular velocity and v_q the linear velocity on quark's surface, we have:

$E_{\mathcal{J}}(q) = m_q\, r_q^2\, \omega_q^2$

As we already know with precision the magnitudes of the quarks masses inside nucleon, $m(u) = 5.000971112 \cdot 10^{-11}$ (J) $= 312.1359302$ (MeV/c^2), $m(d) = 5.026268264 \cdot 10^{-11}$ (J) $= 313.7148535$ (MeV/c^2), and the nucleonic quark radius $r_q = 6.88054386 \cdot 10^{-16}$ (m), we have that the linear velocity on quark's surface is:

$v_u = (E_{\mathcal{J}}(u) / m_u)^{½} = 2.150704204 \cdot 10^7$ (m s^{-1}) $= 0.07173977$ c
$v_d = (E_{\mathcal{J}}(d) / m_d)^{½} = 3.181972066 \cdot 10^7$ (m s^{-1}) $= 0.106139163$ c

The intrinsic angular velocity due to spin is:

$\omega_u = v_u / r_u = 3.125776462 \cdot 10^{22}$ (s^{-1})
$\omega_d = v_d / r_d = 4.624593827 \cdot 10^{22}$ (s^{-1})

And the acceleration on quark's surface:

$a_u = v_u^2 / r_u = 6.722620577 \cdot 10^{29}$ (m s^{-2})
$a_d = v_d^2 / r_d = 1.471532837 \cdot 10^{30}$ (m s^{-2})

It must be remembered that we have calculated the spin energy for the principal gaudinar structure of quark postulated by IT, but we also have got two possible alternative structures of nucleonic quarks, namely:

$u^{+⅔} \rightarrow L_3 = (G_6^{+⅓}, G_6^{0}, G_6^{+⅓}) = 18\, D_{45} = 810\, \mathbf{I}$
$d^{-⅓} \rightarrow L_3 = (G_6^{-⅓}, G_6^{+⅓}, G_6^{-⅓}) = 18\, D_{45} = 810\, \mathbf{I}$

and

$u^{+\frac{2}{3}} \rightarrow L_3 = (G_6^{+\frac{1}{3}}, G_6^{0}, G_6^{+\frac{1}{3}}) = 18\ D_{45} = 810\ \mathbf{I}$
$d^{-\frac{1}{3}} \rightarrow L_3 = (G_6^{0}, G_6^{-\frac{1}{3}}, G_6^{0}) = 18\ D_{45} = 810\ \mathbf{I}$

NUCLEONIC GAUDINOS SPIN ENERGY

The intervalic energy of all the three possible nucleonic isogaudinos at their own gaudinar structure level is:

$I(G_6^{0})_G = 0$
$I(G_6^{\pm\frac{1}{3}})_G = c^{\pm 2}\,\hbar\,(90\ \mathbf{q_I})^{-2} = c^{-1}\,90^{-2} = 4.1180752 \cdot 10^{-13}\ (J) =$
$= 2.5702993\ (MeV/c^2)$
$I(G_6^{\pm\frac{2}{3}})_G = c^{\pm 2}\,\hbar\,(180\ \mathbf{q_I})^{-2} = c^{-1}\,180^{-2} = 1.0295188 \cdot 10^{-13}\ (J) =$
$= 0.64257482\ (MeV/c^2)$

The dynamic electromagnetic energy is due to the electromagnetic interaction between the six constituent dalinos with unlike charges, which give us fifteen interactions dalino-to-dalino. The isocharge of nucleonic gaudinos is determined by the composition of the unlike charges of dalinos:

$G_6^{0} = 3\ (D_{+45}) + 3\ (D_{-45})$
$G_6^{\pm\frac{1}{3}} = 4\ (D_{\pm 45}) + 2\ (D_{\pm 45})$
$G_6^{\pm\frac{2}{3}} = 5\ (D_{\pm 45}) + 1\ (D_{\pm 45})$

Supposing that the average distance between like and unlike dalinos inside all gaudinos would be the same we have:

$E_q(G_6^{0})_G = E_q(3D_{+45}\,3D_{-45}\,)_D = +6\ E_q(2D_{45}) - 9\ E_q(2D_{45}) =$
$= [6(1/6)^2 - 9(1/6)^2]\ (1/4\pi\varepsilon_0)\ e^2\ /\ d_{D45} = -(1/12)\ (1/4\pi\varepsilon_0)\ e^2\ /\ d_{D45} =$
$= -1.232227935 \cdot 10^{-12}\ (J) = -7.690958499\ (MeV/c^2)$

$E_q(G_6^{\pm\frac{1}{3}})_G = E_q(4D_{\pm 45}\,2D_{\pm 45}\,)_D = +7\ E_q(2D_{45}) - 8\ E_q(2D_{45}) =$
$= [7(1/6)^2 - 8(1/6)^2]\ (1/4\pi\varepsilon_0)\ e^2\ /\ d_{D45} = -(1/36)\ (1/4\pi\varepsilon_0)\ e^2\ /\ d_{D45} =$
$= -4.107426451 \cdot 10^{-13}\ (J) = -2.563652833\ (MeV/c^2)$

$E_q(G_6^{\pm\frac{2}{3}})_G = E_q(5D_{+45}\,1D_{-45}\,)_D = +10\ E_q(2D_{45}) - 5\ E_q(2D_{45}) =$
$= [10(1/6)^2 - 5(1/6)^2]\ (1/4\pi\varepsilon_0)\ e^2\ /\ d_{D45} = +(5/36)\ (1/4\pi\varepsilon_0)\ e^2\ /\ d_{D45} =$
$= +2.002237232 \cdot 10^{-12}\ (J) = +12.49697642\ (MeV/c^2)$

This would mean that the only possible gaudinar structures of nucleonic quarks would be those which do not include the gaudino $G_6^{\pm\frac{2}{3}}$. The ones with less energy are, as we have seen in a previous chapter when studying the fractional gaudino:

$u^{+\frac{2}{3}} \rightarrow L_3 = (G_6^{+\frac{1}{3}}, G_6^{0}, G_6^{+\frac{1}{3}}) = 18\ D_{45} = 810\ \mathbf{I}$
$u^{+\frac{2}{3}} \rightarrow L_3 = (G_6^{0}, G_6^{+\frac{2}{3}}, G_6^{0}) = 18\ D_{45} = 810\ \mathbf{I}$

$d^{-\frac{1}{3}} \rightarrow L_3 = (G_6^{-\frac{1}{3}}, G_6^{+\frac{1}{3}}, G_6^{-\frac{1}{3}}) = 18\ D_{45} = 810\ \mathbf{I}$
$d^{-\frac{1}{3}} \rightarrow L_3 = (G_6^{+\frac{1}{3}}, G_6^{0}, G_6^{-\frac{2}{3}}) = 18\ D_{45} = 810\ \mathbf{I}$
$d^{-\frac{1}{3}} \rightarrow L_3 = (G_6^{0}, G_6^{-\frac{1}{3}}, G_6^{0}) = 18\ D_{45} = 810\ \mathbf{I}$

The spin energy of nucleonic gaudinos would be:

$E\mathit{J}(G_6^{0})_G = I(G_6^{0})_G - E_q(G_6^{0})_G = 1.232227935 \cdot 10^{-12}\ (J) =$
$= 7.690958499\ (MeV/c^2)$
$E\mathit{J}(G_6^{\pm\frac{1}{3}})_G = I(G_6^{\pm\frac{1}{3}})_G - E_q(G_6^{\pm\frac{1}{3}})_G = 8.225501721 \cdot 10^{-13}\ (J) =$
$= 5.133952133\ (MeV/c^2)$

From here and as we already have described the magnitudes of the gaudinos masses inside nucleonic quarks —$m(G_6^{\pm\frac{1}{3}}) = 1.69196046 \cdot 10^{-11}\ (J) = 105.6038198\ (MeV/c^2)$, $m(G_6^{\pm\frac{2}{3}}) = 1.63018933 \cdot 10^{-11}\ (J) = 101.7483708\ (MeV/c^2)$— and the nucleonic gaudino 6 radius —$r_{G6} = 8.299740193 \cdot 10^{-17}\ (m)$—, it can be straightforwardly deduced in a similar way the dynamic features of all isogaudinos inside nucleonic quarks. For example, in the case of $G_6^{\pm\frac{1}{3}}$ we have that the linear velocity on gaudino's surface is:

$v(G_6^{\pm\frac{1}{3}}) = [\ E\mathit{J}(G_6^{\pm\frac{1}{3}})_G / m(G_6^{\pm\frac{1}{3}})]^{\frac{1}{2}} = 6.610642204 \cdot 10^{7}\ (m\ s^{-1}) =$
$= 0.220507288\ c$

The intrinsic angular velocity due to spin is:

$\omega(G_6^{\pm\frac{1}{3}}) = v(G_6^{\pm\frac{1}{3}}) / r(G_6^{\pm\frac{1}{3}}) = 7.964878478 \cdot 10^{23}\ (s^{-1})$

And the acceleration on gaudino's surface:

$a(G_6^{\pm\frac{1}{3}}) = v(G_6^{\pm\frac{1}{3}})^2 / r(G_6^{\pm\frac{1}{3}}) = 5.265296182 \cdot 10^{31}\ (m\ s^{-2})$

On the other hand, if we want to maintain the gaudino $G_6^{\pm\frac{2}{3}}$ as a constituent of nucleonic quarks, we have to postulate that the distance between dalinos with *like* charges —which feel electromagnetic repulsion— is greater than the distance between dalinos with *unlike* charges —which feel electromagnetic attraction—. Say the half, we would have:

$$\begin{aligned}
&E_q(G_6{}^0)_G = E_q(3D_{+45}\,3D_{-45}\,)_D = +6\ E_q(2D_{45}) - 9\ E_q(2D_{45}) = \\
&\quad = \{[\tfrac{1}{2}\ 6(1/6)^2] - [9(1/6)^2]\}\ (1/4\pi\varepsilon_0)\ e^2\ /\ d_{D45} = \\
&\quad = -(1/6)\ (1/4\pi\varepsilon_0)\ e^2 / d_{D45} = -2.46445587 \cdot 10^{-12}\ (J) = \\
&\quad = -15.38191699\ (MeV/c^2)
\end{aligned}$$

$$\begin{aligned}
&E_q(G_6{}^{\pm 1/3})_G = E_q(4D_{\pm 45}\,2D_{\pm 45}\,)_D = +7\ E_q(2D_{45}) - 8\ E_q(2D_{45}) = \\
&\quad = \{[\tfrac{1}{2}\ 7(1/6)^2] - [8(1/6)^2]\}\ (1/4\pi\varepsilon_0)\ e^2\ /\ d_{D45} = \\
&\quad = -(1/8)\ (1/4\pi\varepsilon_0)\ e^2 / d_{D45} = \\
&\quad = -1.848341903 \cdot 10^{-12}\ (J) = -11.53643775\ (MeV/c^2)
\end{aligned}$$

$$\begin{aligned}
&E_q(G_6{}^{\pm 2/3})_G = E_q(5D_{+45}\,1D_{-45}\,)_D = +10\ E_q(2D_{45}) - 5\ E_q(2D_{45}) = \\
&\quad = \{[\tfrac{1}{2}\ 10(1/6)^2] - [5(1/6)^2]\}\ (1/4\pi\varepsilon_0)\ e^2\ /\ d_{D45} = 0
\end{aligned}$$

In this case the spin energy of nucleonic gaudinos will be:

$$\begin{aligned}
&E\mathcal{J}(G_6{}^0)_G = I(G_6{}^0)_G - E_q(G_6{}^0)_G = 2.46445587 \cdot 10^{-12}\ (J) = \\
&\quad = 15.38191699\ (MeV/c^2)
\end{aligned}$$

$$\begin{aligned}
&E\mathcal{J}(G_6{}^{\pm 1/3})_G = I(G_6{}^{\pm 1/3})_G - E_q(G_6{}^{\pm 1/3})_G = 2.26014943 \cdot 10^{-12}\ (J) = \\
&\quad = 14.10673705\ (MeV/c^2)
\end{aligned}$$

$$\begin{aligned}
&E\mathcal{J}(G_6{}^{\pm 2/3})_G = I(G_6{}^{\pm 2/3})_G - E_q(G_6{}^{\pm 2/3})_G = 1.0295188 \cdot 10^{-13}\ (J) = \\
&\quad = 0.64257482\ (MeV/c^2)
\end{aligned}$$

Starting from these magnitudes it can be easily deduced in a similar way as above the dynamic features of all the isogaudinos which compose the nucleonic quarks.

NUCLEONIC DALINOS SPIN ENERGY

The intervalic energy of nucleonic dalinos at their own dalinar structure level is:

$$\begin{aligned}
&I(D_{45})_D = c^{\pm 2}\ \hbar\ (45\ \mathbf{q_I})^{-2} = c^{\pm 2}\ \hbar\ [45\ \sqrt{-(c^{-1}h)}]^{-2} = 45^{-2}\ c^{-1} = \\
&\qquad\qquad = 1.64723010 \cdot 10^{-12}\ (J) = 10.28119715\ (MeV/c^2)
\end{aligned}$$

The dynamic electromagnetic interaction of dalinos is not calculated through the interaction intervalino-to-intervalino of its 45 constituent intervalinos, but through the electromagnetic potential energy because all dalinos are by definition composed by identical intervalinos —with like charges—. Moreover, an isolated intervalino has not got any electric charge yet, nor has zero electric charge, since the own degree of freedom named *electric charge* was just born right *after* the assembly of intervalinos in the Intervalic Primordial Aggregation, as we have explained in other sites.

$E_q(D_{45})_D = E_q(45\mathbf{I})_{\mathbf{I}} = U_{G6\pm\frac{1}{3}}(D_{45})_D = 1.02685550 \cdot 10^{-12}\,(J) =$
$= 6.409125138\ (MeV/c^2)$
$E_q(D_{45})_D = E_q(45\mathbf{I})_{\mathbf{I}} = U_{G6\pm\frac{2}{3}}(D_{45})_D = 1.001117531 \cdot 10^{-12}\,(J) =$
$= 6.24848144\ (MeV/c^2)$

Therefore, the spin energy of nucleonic dalinos is:

$E\mathcal{J}(_{G6\pm\frac{1}{3}}D_{45})_D = I(D_{45})_D - U_{G6\pm\frac{1}{3}}(D_{45})_D = 6.205348175 \cdot 10^{-13}\,(J) =$
$= 3.873072012\ (MeV/c^2)$
$E\mathcal{J}(_{G6+\frac{2}{3}}D_{45})_D = I(D_{45})_D - U_{G6+\frac{2}{3}}(D_{45})_D = 6.461125689 \cdot 10^{-13}\,(J) =$
$= 4.03271571\ (MeV/c^2)$

Hence, being ω_{D45} the intrinsic angular velocity and v_{D45} the linear velocity on dalino 45's surface, we have:

$E\mathcal{J}(D_{45}) = m_{D45}\, r_{D45}{}^2\, \omega_{D45}{}^2$

Since we already know the magnitudes of the dalino 45 masses inside nucleonic gaudinos, $m_{G6\pm\frac{1}{3}}(D_{45}) = 2.67408560 \cdot 10^{-12}\,(J) = 16.69032229\ (MeV/c^2)$, $m_{G6\pm\frac{2}{3}}(D_{45}) = 2.648347631 \cdot 10^{-12}\,(J) = 16.52967859\ (MeV/c^2)$ and the nucleonic dalino 45 radius, $r_{G6\pm\frac{1}{3}}(D_{45}) = 3.12047512 \cdot 10^{-18}\,(m)$, $r_{G6\pm\frac{2}{3}}(D_{45}) = 3.200696811 \cdot 10^{-18}\,(m)$, we can calculate the dynamic features of dalinos 45. Thus, the linear velocity on dalino's surface is:

$v_{G6\pm\frac{1}{3}}(D_{45}) = (E\mathcal{J}(_{G6\pm\frac{1}{3}}D_{45}) / m_{G6\pm\frac{1}{3}}(D_{45}))^{\frac{1}{2}} = 1.444162712 \cdot 10^8\ (m\ s^{-1}) =$
$= 0.481720828\ c$
$v_{G6\pm\frac{2}{3}}(D_{45}) = (E\mathcal{J}(_{G6\pm\frac{2}{3}}D_{45}) / m_{G6\pm\frac{2}{3}}(D_{45}))^{\frac{1}{2}} = 1.480768959 \cdot 10^8\ (m\ s^{-1}) =$
$= 0.493931358\ c$

The intrinsic angular velocity due to spin is:

$\omega_{G6\pm\frac{1}{3}}(D_{45}) = v_{G6\pm\frac{1}{3}}(D_{45}) / r_{G6\pm\frac{1}{3}}(D_{45}) = 4.628021876 \cdot 10^{25}\ (s^{-1})$
$\omega_{G6\pm\frac{2}{3}}(D_{45}) = v_{G6\pm\frac{2}{3}}(D_{45}) / r_{G6\pm\frac{2}{3}}(D_{45}) = 4.626395585 \cdot 10^{25}\ (s^{-1})$

And the acceleration on dalino's surface:

$a_{G6\pm⅓}(D_{45}) = v_{G6\pm⅓}(D_{45})^2 / r_{G6\pm⅓}(D_{45}) = 6.683616624 \cdot 10^{33}$ (m s^{-2})
$a_{G6\pm⅔}(D_{45}) = v_{G6\pm⅔}(D_{45})^2 / r_{G6\pm⅔}(D_{45}) = 6.850622972 \cdot 10^{33}$ (m s^{-2})

At this point it may be very interesting and edifying to make in a peer-viewed mode a full *comparison* between all these physical features and magnitudes derived in IT and in SM.

INTERVALIC NUCLEON TOTAL SPIN ENERGY

The intervalic nucleon total spin energy will simply be the sum of the spin energies at all its constituent levels of the intervalic structures. Recapitulating previous results:

- At the monteverdic level the spin energy of nucleons is:

$E_J(p)_M = 4.5756390 \cdot 10^{-14}$ (J) = 0.285588809 (MeV/c^2)
$E_J(n)_M = 5.58841376 \cdot 10^{-14}$ (J) = 0.34880120 (MeV/c^2)

The average value is: $\langle E_J(N)_M \rangle = 0.317195004$ (MeV/c^2)

- At the lisztinian level the spin energy of nucleonic quarks is:

$E_J(u)_L = 2.573797104 \cdot 10^{-13}$ (J) = 1.60643710 (MeV/c^2)
$E_J(d)_L = 5.662353564 \cdot 10^{-13}$ (J) = 3.53416158 (MeV/c^2)

The average value is: $\langle E_J(q)_L \rangle = 2.57029934$ (MeV/c^2)

- At the gaudinar level we have several possible structures. The one with the lowest magnitude of the spin energy is:

$E_J(G_6^{\,0})_G = 1.232227935 \cdot 10^{-12}$ (J) = 7.690958499 (MeV/c^2)
$E_J(G_6^{\,\pm⅓})_G = 8.225501721 \cdot 10^{-13}$ (J) = 5.133952133 (MeV/c^2)

The average value is: $\langle E_J(G_6)_G \rangle = 6.412455316$ (MeV/c^2).

It must be noted that the change in the isocharge values of the constituent gaudinos involve a change in the dynamic electromagnetic interaction of quarks at the lisztinian level, and therefore a change in the spin energy of quarks. By these reason no accurate value of the total spin energy is available until the isocharges if gaudinos have been fixed down.

- At the dalinar level the spin energy of nucleonic dalinos is:

$E_J({}_{G6\pm\frac{1}{3}}D_{45})_D = 6.205348175 \cdot 10^{-13}$ (J) = 3.873072012 (MeV/c^2)
$E_J({}_{G6+\frac{2}{3}}D_{45})_D = 6.461125689 \cdot 10^{-13}$ (J) = 4.03271571 (MeV/c^2)

The average value is: $\langle E_J(D_{45})_D\rangle = 3.952893861$ (MeV/c^2).

Taking average values at every structure level and remembering that the intervalic structure of nucleon is:

$M_3 = 3\ L_3 = 9\ G_6 = 54\ D_{45} = 2430\ \mathbf{I}$

we can obtain a value for the average spin energy of nucleon at every level:

$\langle E_J(M_3)_M\rangle = 5.082026446 \cdot 10^{-14}$ (J) = 0.317195004 (MeV/c^2)
$3\langle E_J(L_3)_L\rangle = 1.23542260 \cdot 10^{-12}$ (J) = 7.71089802 (MeV/c^2)
$9\langle E_J(G_6)_G\rangle = 9.246501483 \cdot 10^{-12}$ (J) = 57.71209784 (MeV/c^2)
$54\langle E_J(D_{45})_D\rangle = 3.419947943 \cdot 10^{-11}$ (J) = 213.4562685 (MeV/c^2)

And the average total spin energy of nucleon will be:

$\sum E_J(N) = \langle E_J(M_3)_M\rangle + 3\langle E_J(L_3)_L\rangle + 9\langle E_J(G_6)_G\rangle + 54\langle E_J(D_{45})_D\rangle =$
$= 4.473222378 \cdot 10^{-11}$ (J) = 279.1964594 (MeV/c^2)

NUCLEON AVERAGE TOTAL STRUCTURAL ENERGY

From the preceding result we can finally calculate an average value for the total structural energy of nucleon:

$A(N) = I(N) + U(N) + E_J(N) = c^{\pm 2}m(N) + E_J(N) =$
$= 1.951636926 \cdot 10^{-10}$ (J) = 1,218.115429 (MeV/c^2)

NUCLEON AVERAGE STRUCTURAL ENERGY RATIOS

And the average ratios between spin energy, mass and total structural energy of nucleon will be:

$m(N)\ /\ A(N) = 0.770796385$

$E_J(N) / A(N) = 0.229203614$
$E_J(N) / m(N) = 0.297359482$

INTERVALIC NUCLEONS MAGNETIC MOMENT RATIO

The ratio between the magnitudes of the magnetic moment of nucleons are likely to be understood by means of the charges of their constituent quarks. Experimentally the nucleons magnetic moment ratio is $\mu_n/\mu_p =$ 0.68497934. The explanation ad hoc of SM based on the constituent charges of quarks gives a ratio 0.66666667, which represents a deviation of ~2.75%.

Since the magnetic moment relies principally on the distribution of the electric charges inside nucleons, we should obtain an approximate magnitude of the nucleons magnetic moment ratio through the distribution of the intervalic energy of nucleons. Actually, the relation between the distribution of electric charges only at the lisztinian level gives us the same result obtained by SM:

$I(p)_L = 2\ I(u)_L + I(d)_L = 3.85544894\ (\mathrm{MeV/c^2})$
$I(n)_L = I(u)_L + 2\ I(d)_L = 5.78317343\ (\mathrm{MeV/c^2})$
$I(p)_L / I(n)_L = 0.66666667$

We may reasonably think that the deeper levels of the intervalic structure will have a slight influence on the nucleons ratio. However it is clear that the monteverdic level of the intervalic structure is an important feature which has not been considered in the above calculus. The difficulty is that we have no way yet to measure the contribution of the intervalic energy to the magnetic moment when passing from one level to another of the intervalic structure. On the assumption that such contribution is determined by simple share according to the number of particles between two near structure levels, we will have, introducing the intervalic energy of nucleons at the monteverdic level shared among the lisztinian level:

$\sum I(p) = ⅓\ I(M_3^+)_M + 2\ I(u)_L + I(d)_L = 3.95064521\ (\mathrm{MeV/c^2})$
$\sum I(n) = ⅓\ I(M_3^0)_M + I(u)_L + 2\ I(d)_L = 5.78317343\ (\mathrm{MeV/c^2})$
$\sum I(p) / \sum I(n) = 0.68312757$

Now, if it was introduced the nucleons' mass and spin energy —that is to say, the *total structural energy* of nucleons— in the preceding ratio it can be expected to obtain a result very close to the experimental value. Both mass and spin energy are greater in neutron than in proton. Actually, introducing only the first value we obtain:

$[\sum I(p) / m(p)] / [\sum I(n) / m(n)] = 0.684069197$

This represents a deviation of ~0.13% with respect to the experimental value, or in other words, an error more than twenty times smaller than the one obtained by SM.

It is clear that by means of the intervalic structure of nucleons it does not seem very difficult to yield and to explain the exact magnitude of the intervalic nucleons magnetic moment ratio.

From the experimental value of the nucleons magnetic moment ratio we could probably deduce the total structural energy ratio between nucleons:

$[\sum I(p) / A(p)] / [\sum I(n) / A(n)] = \mu_n/\mu_p = 0.68497934$
$A(n)/A(p) = [\sum I(n)/\sum I(p)] \cdot [\mu_n/\mu_p] = 1.002710724$

SPIN ENERGY OF MESONS OF THE PRINCIPAL INTERVALIC SEQUENCE

The spin energy of particles composed by like charges is the difference between the double of the intervalic energy and the total mass: $E(J) = 2I - c^{\pm 2}m$. Although this is not the case of a lot of mesons, we can check where would carry us this assumption. Following this line it is expected that the spin energy ratio of mesons should be smaller than those ones of leptons and massive bosons, which goes from 1/6 to 1/10. Expressing them in ratios spin energy / mass energy, it can be seen that they are in good agreement:

π^0 meson: $E(J) \sim 0.0231$
η^0 meson: $E(J) \sim 0.0436$
K mesons: $E(J) \sim 0.0003$
η', f_0, a_0 mesons: $E(J) \sim 0.0123$
D mesons: $E(J) \sim 0.0027$
ρ, ω mesons: $E(J) \sim 0.0635$
η, f_0 mesons: $E(J) \sim 0.0475$
J/ψ meson: $E(J) \sim 0.0755$
Φ meson: $E(J) \sim 0.1562$
ψ meson: $E(J) \sim 0.1338$
χ mesons: $E(J) \sim 0.0984$

The slight deviation of mesons masses of a same family with respect to the table can be easily explained because of the different contribution of the electromagnetic interaction between its constituent lisztinos, which can vary without changing neither the intervalic structure nor the intervalic energy of the particle. According to the intervalic principle of energy balance for subatomic particles, I - U - E(J) = 0, a variation in the electromagnetic energy of a particle involve a corresponding variation in the spin energy in order to maintain the structural energy balance of the particle. Henceforth we have a lot of powerful mechanisms to explain by different ways the slight differences in the masses of "excited" states of mesons which constitutes the so named zoo of subatomic particles.

NUCLEUS SPIN ENERGY

Once we have seen that there are very compelling and powerful reasons to postulate that nuclei with A>3 are not palestrinos composed by an assembly of nucleons but intervalic structures composed by an assembly of nucleonic quarks —we can name them palestrinos lacking of monteverdic level, although they are really monteverdinos and perhaps would be better to name them in this way—, we can calculate the spin energy of nucleus.

To do it we need to know the electromagnetic dynamic interaction between the constituent quarks inside nucleus. There can be chosen two first rough approximations: the first one based on grouping the interactions between quarks on interactions *u-u*, *d-d* and *u-d*, and the other one based on grouping on interactions *p-p*, *n-n* and *p-n*, since the number of constituent quarks of any nucleus can be always grouped in nucleons sets. Let show the last one way.

In first place we need to calculate the electromagnetic dynamic interaction between the constituent quarks of the sets *p-p*, *n-n* and *p-n*. Representing as usually the plus sign, attraction, and the minus sign, repulsion, and taking the average distance between the constituent quarks of nucleus as: $d_q \approx 1.9 \cdot 10^{-15} / 3^{⅓} = 2.740274184 \cdot 10^{-15}$ (m), it is obvious to check that there are 15 quark-to-quark interactions as follows:

$$\mathrm{E_q}(p\text{-}p) = [\ 1(⅓)^2 + 6(⅔)^2 - 8(⅓ \cdot ⅔)^2\ ]\ (1/4\pi\varepsilon_0)\ e^2 / d_q =$$
$$= +1\ (1/4\pi\varepsilon_0)\ e^2 / d_q = +8.419155897 \cdot 10^{-14}\ (\mathrm{J}) =$$
$$= +0.525482151\ (\mathrm{MeV/c^2})$$

$$\mathrm{E_q}(n\text{-}n) = [\ 6(⅓)^2 + 1(⅔)^2 - 8(⅓ \cdot ⅔)^2\ ]\ (1/4\pi\varepsilon_0)\ e^2 / d_q =$$
$$= -⅔\ (1/4\pi\varepsilon_0)\ e^2 / d_q = -5.612770598 \cdot 10^{-14}\ (\mathrm{J}) =$$
$$= -0.350321434\ (\mathrm{MeV/c^2})$$

$$E_q(p\text{-}n) = [\ 3(⅓)^2 + 3(⅔)^2 - 9(⅓ \cdot ⅔)^2\ ]\ (1/4\pi\varepsilon_0)\ e^2 / d_q =$$
$$= -⅓\ (1/4\pi\varepsilon_0)\ e^2 / d_q = -2.806385299 \cdot 10^{-14}\ (J) =$$
$$= -0.175160717\ (MeV/c^2)$$

To obtain the resultant electromagnetic dynamic interaction inside a nucleus now we only need to calculate the number of interactions between the groups *p-p*, *n-n* and *p-n*, “as if” the nucleus was composed by nucleons. Being Z the atomic number and N the neutron number, $N = A - Z$, the elemental formula involving binomial coefficients which is naively obtained is:

$$E_q(nucleus) = ({}^{Z}{}_{2})\ E_q(p\text{-}p)\ + ({}^{N}{}_{2})\ E_q(n\text{-}n) + ZN\ E_q(p\text{-}n)\ =$$
$$= [\ ½\ Z(Z\text{-}1) - (1/6)N(N\text{-}1) - ⅓\ ZN\ ]\ (1/4\pi\varepsilon_0)\ e^2 / d_q$$

This formula does not allow the existence of nuclei composed —”as if”— only by protons or by protons and a few number of neutrons because the resultant electromagnetic dynamic interaction between the constituent quarks will be repulsive and greater than the intervalic interaction at the last level of the intervalic structure. On the other hand it also prevents the existence of nuclei composed —”as if”— only by neutrons or by neutrons and a few number of protons because both the electromagnetic energy and the spin energy would be anomalous great. Of course the solely formula does not give us the exact number of protons to neutrons for every element, but imposes a right constraint on the share of protons and neutrons: their numbers must be roughly similar in all nuclei. This is much more than the reached by SM, which can not explain either why do not exist nuclei composed only or mainly by protons or by neutrons.

Applying the formula to the case of Helium ^{4}He nucleus, we have:

$$E_q(^4He) = 1E_q(p\text{-}p) + 1E_q(n\text{-}n) + 4E_q(p\text{-}n) = -1\ (1/4\pi\varepsilon_0)\ e^2 / d_q =$$
$$= -8.419155897 \cdot 10^{-14}\ (J) = -0.525482151\ (MeV/c^2)$$

In the case of Lithium ^{7}Li nucleus we have:

$$E_q(^7Li) = 3E_q(p\text{-}p) + 6E_q(n\text{-}n) + 12E_q(p\text{-}n) = -5\ (1/4\pi\varepsilon_0)\ e^2 / d_q =$$
$$= -4.209577948 \cdot 10^{-13}\ (J) = -2.627410755\ (MeV/c^2)$$

For Oxygen ^{16}O nucleus we have got:

$$E_q(^8Li) = 28E_q(p\text{-}p) + 28E_q(n\text{-}n) + 64E_q(p\text{-}n) = -12\ (1/4\pi\varepsilon_0)\ e^2 / d_q =$$
$$= -1.010298708 \cdot 10^{-12}\ (J) = -6.305785812\ (MeV/c^2)$$

And finally for Gold ^{197}Au nucleus:

$$
\begin{aligned}
E_q(^{197}Au) &= ({}^{79}{}_{2})\ E_q(p\text{-}p) + ({}^{118}{}_{2})\ E_q(n\text{-}n) + (79\cdot 118)\ E_q(p\text{-}n) = \\
&= -4{,}628.333333\ (1/4\pi\varepsilon_0)\ e^2 / d_q = -3.896665987 \cdot 10^{-10}\ (J) = \\
&= -2{,}432.106555\ (MeV/c^2)
\end{aligned}
$$

We see that it is always obtained a resultant attractive electromagnetic frequorce between the constituent quarks of nucleus, in all these ones as well as in whatsoever other nuclei, whilst in SM, which affirms that nuclei are composed by nucleons, those values are always repulsive due to the electromagnetic interaction between protons inside nucleus.

Henceforth, the spin energy at the last level of the intervalic structure of, for example, the preceding nuclei will be:

$$
\begin{aligned}
&I(^4He) - E_q(^4He) - E_J(^4He) = 0 \\
&E_J(^4He) = c^{\pm 2}\hbar\ (2e)^{-2} + [\ 1\ (1/4\pi\varepsilon_0)\ e^2 / d_q\ ] = \\
&\qquad = 9.563065626 \cdot 10^{-14}\ (J) = 0.596879349\ (MeV/c^2)
\end{aligned}
$$

$$
\begin{aligned}
&I(^7Li) - E_q(^7Li) - E_J(^7Li) = 0 \\
&E_J(^7Li) = c^{\pm 2}\hbar\ (3e)^{-2} + [\ 5\ (1/4\pi\varepsilon_0)\ e^2 / d_q\ ] = \\
&\qquad = 4.26041838 \cdot 10^{-13}\ (J) = 2.659142843\ (MeV/c^2)
\end{aligned}
$$

$$
\begin{aligned}
&I(^{16}O) - E_q(^{16}O) - E_J(^{16}O) = 0 \\
&E_J(^{16}O) = c^{\pm 2}\hbar\ (8e)^{-2} + [\ 12\ (1/4\pi\varepsilon_0)\ e^2 / d_q\ ] = \\
&\qquad = 1.011013652 \cdot 10^{-12}\ (J) = 6.31024814\ (MeV/c^2)
\end{aligned}
$$

$$
\begin{aligned}
&I(^{197}Au) - E_q(^{197}Au) - E_J(^{197}Au) = 0 \\
&E_J(^{197}Au) = c^{\pm 2}\hbar\ (79e)^{-2} + [\ 4{,}628.333333\ (1/4\pi\varepsilon_0)\ e^2 / d_q\ ] = \\
&\qquad = 3.89666606 \cdot 10^{-10}\ (J) = 2{,}432.106601\ (MeV/c^2)
\end{aligned}
$$

Now it is easy to calculate some dynamic features of nuclei. The maximum linear velocity on, for example, ^{4}He nucleus' surface will be:

$$v(^4He) = (E_J(^4He) / m_{He})^{½} = 3.793693356 \cdot 10^6\ (m\ s^{-1}) = 0.012654398\ c$$

The angular velocity will be:

$$\omega(^4He) = v(^4He) / r_{He} = 1.991564215 \cdot 10^{21}\ (s^{-1})$$

And the linear acceleration on ^{4}He nucleus' surface:

$$a(^4He) = v(^4He)^2 / r_{He} = 7.555383931 \cdot 10^{27}\ (m\ s^{-2})$$

And in the case of Gold ^{197}Au nucleus we have got that the dynamic features increase along with the mass number, as expected:

$$v(^{197}Au) = (E_J(^{197}Au) / m_{Au})^{½} = 3.452021397 \cdot 10^{7} \text{ (m s}^{-1}) =$$
$$= 0.115147039 \text{ c}$$

The angular velocity will be:

$$\omega(^{197}Au) = v(^{197}Au) / r_{Au} = 4.943905462 \cdot 10^{21} \text{ (s}^{-1})$$

And the linear acceleration on ^{197}Au nucleus' surface:

$$a(^{197}Au) = v(^{197}Au)^{2} / r_{Au} = 1.706646744 \cdot 10^{29} \text{ (m s}^{-2})$$

The conclusion of the above results is clear: while SM of Structureless Particles mutters that there is an extremely strong bond between the constituent nucleons of nucleus, which are subdued under enormous forces, given uncannily by the Yukawa potential and other blunders, which is much greater than the electromagnetic repulsion between the supposed constituent protons inside nucleus, and which in an absolutely unexplainably way does not rely on the number of constituent nucleons and takes a practically constant magnitude (~8 MeV/c^{2}) to leave out a nucleon from nucleus (I wonder how many mistakes and absurdities there have been said up to here!), on the other hand and on the contrary, IT states that the true way of Nature is far away from that lucubration:

- There are no huge strong bonds between any of the constituent particles of nucleus but a marvellous hierarchy of intervalic structures, every one contributing to the formation of a cascade of deep potential wells which are what create the appearance that the constituent particles are continuously subdued under extreme forces.
- Nucleus with mass number greater than 3 are not composed by nucleons but by quarks (or less probably and to a later extent by gaudinos).
- The value of the binding energy per nucleon in nucleus is not due principally to that weird strong nuclear force described —or undescribed— by SM, but to the amount of energy needed for the assembly of three of the constituent quarks to leave out the nucleus as a nucleon insofar as the existence of isolated quarks is not allowed by the intervalic symmetries.
- Since the magnitude of the structural energy at the monteverdic level of nucleons does not vary, we can deduce that the value of the so named binding energy per nucleon will be almost constant, varying scarcely relying

on the number of constituent quarks of nuclei which determine the intervalic and electromagnetic energies at the last intervalic structure of nucleus.

- Nucleus, as like as any other intervalic structure, is not in a static state but it is always in an *intervalic exchange structure* which is under the powerful and elegant constraints of the intervalic symmetries. At once, the changeless intervalic interaction inside nucleus is closely determined by the intervalic exchange structures, and vice versa. Therefore in the intervalic exchange structure there is an unbelievably perfect and ultra sophisticated match between to independent realms: on one hand, the abstract features imposed by the intervalic symmetries, and on the other hand, the dynamic features imposed by the changeless intervalic interaction.

- The enormous forces of the changeless intervalic interaction operating between intervalic structures are neither *long ranged* nor they are *real* and *continuous* forces creating a field as in the classical theory of fields which SM still tries to apply to the fantastic gluon field. On the contrary, the forces inside nucleus are *short ranged* and do not create a continuous field since they are *virtual exchange* frequorces relying on the *intervalic exchange structure*, whose carriers are the virtual bosons or mesons of the changeless intervalic interaction which at once are closely related with the involved intervalic structures.

- Needless to say that isospin, gluon fields, colours and so absurdities on have become not only irrelevant but entirely false, insofar as all of them try to explain a wrong model which does not exist in Nature. Moreover, the features derived from the intervalic structure are the most opposite ones which can be derived or related with the SM.

Chapter 33

INTERVALIC NEUTRINO

Contrarily to all the other 107 fundamental subatomic particles (excluding baryons and mesons), which existence, intervalic structure and physical quantities are *logical and necessarily* derived from the theory, and specifically, from only the intervalic dimensional system of physical quantities, the neutrino is in a slightly different position form a epistemological point of view. The existence and intervalic structure of neutrino, which is identical to a intervalic string, is *logical and necessarily* derived from the theory, but its physical features, although logically derived likewise, are not necessarily derived from the theory. By this reason the parts of this chapter that introduce the physical features of neutrino should not be considered to having a strong logical bond with the theory, as they do not have it inasmuch as they are not necessary.

As the gravitational interaction would be, according to those parts, the responsible of the gravitational mass of neutrinos, we have introduced at the final of the chapter some details about the gravitational interaction which have not been commented in other sites, and whose full explanation can not be included in this book.

INTERVALIC GRAVITATIONAL ENERGY

As I have explained in other site, the structural energy (that is to say, the mass and spin energies) have a *non linear* effect. Since it is a long range interaction is described by the same equation of the inverse of the intervalic energy, I^{-1}, with the unique difference that now it has to be substituted the *source* of interaction, which is the own *structural energy* instead of the *electric charge*. We will name this non linear contribution O. By means of the intervalic principle of equivalence, the mass of a subatomic particle is the sum of its intervalic and electromagnetic energies, so we can make the substitution: $I + U + E(J) = c^{\pm 2}m + E(J)$, in order to avoid the electric charge appearing in the equations. Being k a by the moment unknown dimensionful constant and remembering that in intervalic units $c^{\pm 4} = 1$ (1) is a rotation of ±360º in the Intervalic Space, we have:

$$O = k\, c^{\pm 2} (n\hbar)^{-1} (I + U + E(J))^2 = k\, c^{\pm 2} (c^{\pm 2}m + E(J))^2 / r =$$
$$= (k\, c^{\pm 2} m^2 / r) + (k\, c^{\pm 2} E(J)^2 / r)$$

Now, if we define the magnitude k as: $G = k\, c^{\pm 2}$, being G the non linear energy intervalic constant, we have:

$$O = (G\, m^2 / r) + (G\, E(J)^2 / r)$$

The first term of the equation is the well known Newtonian formulation of the gravitational potential energy, and the second term means that the spin energy of a particle have a non linear effect. The gravitational energy is valid for all scales, from subatomic particles to stars. On the contrary, the second relies on spin, and therefore it has only meaning in subatomic particles.

The magnitude of the constant G is deduced from intervalic dimensional analysis, and its value in intervalic units is:

$$G = \pi\, 270^2\, \mathbf{t_I}$$

where $\mathbf{t_I}$ is the intervalic quantum of time, $\mathbf{t_I} = c^{-1}\hbar$. Since in SI units the value of the magnetic constant was set by definition as $\mu_0/4\pi = 10^{-7}$ instead of 1, to obtain G in traditional units we only have to add this factor 10^{-7} in the above definition:

$$G = \pi\, (270^2\, 10^{-7})\, \mathbf{t_I} = \pi\, \alpha\, c^{-1}\hbar$$

And multiplying by the scalizator $c^{\pm 4} = 1$ (1) to obtain the unique half symmetry which appears in non singular units, we finally have:

$$G = \pi\alpha c^{-1}\hbar \cdot c^{\pm 4} = \pi\alpha c^{3}\hbar = 6.5140911 \cdot 10^{-11} \text{ (s)}$$

The slight deviation of the magnitude of G with respect to the experimental value of Newton's gravitational constant G_N is highly *meaningful* and has been fully explained in the opportune site on the Intervalic Cosmology according to the new intervalic symmetries of gravitation.

It is clear that the contribution of the non linear energy to the structural energy of subatomic particles is despicable and can be omitted. For example, the non linear gravitational energy of electron's energy mass would be, taking the intervalic electron radius, $r_e = 3.1940984 \cdot 10^{-15}$ (m):

$$O = G\, m_e^{2} / r_e = 1.6923263 \cdot 10^{-56} \text{ (J)} = 1.0562655 \cdot 10^{-40} \text{ (eV/c}^{2}\text{)}$$

INTERVALIC NEUTRINO STRUCTURAL ENERGY

Since the neutrino is *intervalinoless*, it is clear that neutrino is not affected by neither the intervalic nor the electromagnetic interaction, which both rely on the electric charge of intervalinos.

Henceforth, the structural balance can not be reached through the usual *intervalic principle of energy balance* for subatomic particles: $I - I^{-1} - E(J) = 0$. Nevertheless, if the intervalino would have a mass, it is clear that the gravitational energy (spin 2) will play an analogous role to the intervalic energy (spin 0), since both interactions have spin *even*. Incorporating the non linear energy, the full intervalic principle of energy balance will be:

$$I + O - I^{-1} - E(J) = 0$$

In that case, and in absence of intervalic and electromagnetic energies, the structural energy balance of neutrino will be:

$$O - E(J) = 0$$

Since it is clear that the existence of neutrino is due to the *conservation of angular momentum of leptons*, we know something about its maximum spin energy, which *can never be greater than the spin energy of the corresponding lepton*. Fortunately, we already have deduced the spin energy of lepton in other site, which is simply the difference between its intervalic and electromagnetic energies:

$E(J_e) = I(e) - U(e) = 9.6416670 \cdot 10^{-15}$ (J)
$E(J_\mu) = I(\mu) - U(\mu) = 2.8384131 \cdot 10^{-12}$ (J)
$E(J_\tau) = I(\tau) - U(\tau) = 2.4148730 \cdot 10^{-11}$ (J)

The total *structural energy* of leptons is the sum of the mass energy — which is the intervalic plus the electromagnetic energies— plus the spin energy:

$E(e)_{\mathrm{str}} = 9.151277868 \cdot 10^{-14}$ (J)
$E(\mu)_{\mathrm{str}} = 1.976676078 \cdot 10^{-11}$ (J)
$E(\tau)_{\mathrm{str}} = 3.088556415 \cdot 10^{-10}$ (J)

The lepton's ratios between the spin energy and the total structural energy are:

$E(J_e) / E(e)_{\mathrm{str}} = 0.105358695$
$E(J_\mu) / E(\mu)_{\mathrm{str}} = 0.143595257$
$E(J_\tau) / E(\tau)_{\mathrm{str}} = 0.078187757$

Lepton's spin energy is the origin of neutrino's structural energy. Therefore, it will have to be shared between its constituent energies: gravitational and spin, so at first sight we have an upper limit for neutrinos masses:

$m(\nu_e) \leq c^{\pm 2} E(J_e) = 0.060178527$ (MeV/c^2)
$m(\nu_\mu) \leq c^{\pm 2} E(J_\mu) = 17.715974$ (MeV/c^2)
$m(\nu_\tau) \leq c^{\pm 2} E(J_\tau) = 150.72445$ (MeV/c^2)

Of course, it is expected that neutrinos masses are much below these limits.

INTERVALIC NEUTRINO MASS

We have seen that the non linear gravitational energy of massful subatomic particles is despicable. Nevertheless, in the case of massless particles that energy can be the unique mass of the particle. This is the case of the neutrino. Since it does not have intervalic nor electromagnetic energy, its mass only can come from the non linear contribution of its spin energy:

$O(\nu_e) = G\, E(J_e)^2 / r_e = 1.8958754 \cdot 10^{-24}$ (J) $= 1.1833119 \cdot 10^{-11}$ (MeV/c^2)
$O(\nu_\mu) = G\, E(J_\mu)^2 / r_\mu = 3.2051729 \cdot 10^{-17}$ (J) $= 0.00020005108$ (MeV/c^2)

$O(\nu_\tau) = G\ E(J_\tau)^2 / r_\tau = 4.2902695 \cdot 10^{-14}\ (J) = 0.2677774477\ (MeV/c^2)$

where the leptons radius are already known by intervalic means, as I have explained with detail in other site:

$r_e = ½\ (1/4\pi\varepsilon_0)\ (270\ \mathbf{q_I})^2 / U(e) = 3.1940984 \cdot 10^{-15}\ (m)$
$r_\mu = ½\ (1/4\pi\varepsilon_0)\ (270\ \mathbf{q_I})^2 / U(\mu) = 1.6373954 \cdot 10^{-17}\ (m)$
$r_\tau = ½\ (1/4\pi\varepsilon_0)\ (270\ \mathbf{q_I})^2 / U(\tau) = 8.8543737 \cdot 10^{-19}\ (m)$

INTERVALIC NEUTRINO ANGULAR VELOCITY

From the neutrino mass it can be deduced its angular velocity:

$E(J_l) = ½\ I_\nu\ \omega_\nu^2 = ¼\ m_\nu\ r_l^2\ \omega_\nu^2$

$\omega(\nu_e) = 1.33867014 \cdot 10^{28}\ (s^{-1})$
$\omega(\nu_\mu) = 1.08970565 \cdot 10^{28}\ (s^{-1})$
$\omega(\nu_\tau) = 1.60656282 \cdot 10^{28}\ (s^{-1})$

Unexpectedly all neutrinos have similar angular velocities. Please note that in the calculus figures the lepton radius instead of the still unknown neutrino radius because the last one is not involved in the origin of the structural energy balance between lepton and neutrino yet. The neutrino's angular velocity ratios are:

$\omega(\nu_e) / \omega(\nu_e) = 1.000000000$
$\omega(\nu_\mu) / \omega(\nu_e) = 0.814021032$
$\omega(\nu_\tau) / \omega(\nu_e) = 1.200118515$

INTERVALIC NEUTRINO STRUCTURAL VELOCITY

We have seen that the non linear effect of the spin energy of a massful particle in the gravitational energy is absolutely despicable since the spin energy is roughly ~1/10 of the structural energy of electron. Nevertheless, in the case of massless particles as neutrino we should study it, since that non linear effect of lepton's spin energy will necessarily be converted in any kind of energy when the passing to the neutrino. It can not be energy mass nor can be involved in the direct spin energy. By exclusion, it will have to be ad-dressed to the kinetic energy of neutrino. In this case, the neutrino would strangely have a *intrinsic structural kinetic energy*, unlike the other massful particles which do not have it. That is to say, the neutrino would have a *fixed structural velocity*. In the context of IT this means a geometric velenergy related with one of the two fundamental constant of the Intervalic Space: c.

According to traditional view, it is supposed that the velocity of the neutrino should be near the speed of light because a massful particle can't reach c. However, this refers to a *dynamical* feature of particles, but not to a *structural* feature. Moreover, the Special Relativity is inside IT a mere geometric theorem about the "distortion" in the *measurement* of physical quantities inside a quantized manifold which is easily deduced in the Intervalic Space, as I have demonstrated with detail in other site. Since the velocity of neutrino is intended to be a *geometric* feature, like the velenergy of photon, the most simple and elegant result would be that its velenergy was just c. In this case, the neutrino, like the proton, could not be at rest, but only moving at the speed of light. Unfortunately, it seems to be difficult to *deduce* just such a structural velenergy for all the three neutrinos from its spin energy.

According to the intervalic energy balance principle, that structural velenergy must be equal to the non linear contribution of spin energy. We only have to express this velenergy as an intrinsic dynamic gravitational intervalic potential, Φ_{dyn}, since it has intervalic dimensions of velenergy squared:

$$v_{\mathrm{struc}}{}^2 = \Phi_{\mathrm{dyn}} = G\ E(J)^2 / (m\ r)$$

Being I the moment of inertia, ω the angular velocity, and taking ½ as geometrical coefficient of the moment of inertia ($I = ½\ m\ r^2$) as we ever do when calculating the spin energy of subatomic particles, we have:

$$v_{\mathrm{struc}}{}^2 = G\ (½\ I\ \omega^2)^2 / (m\ r) = (1/16)\ G\ m\ r^3\omega^4$$
$$v_{\mathrm{struc}}{}^2(\nu_e) = (1/16)\ G\ m(\nu_e)\ r_e{}^3\ \omega(\nu_e)^4 = 8.98755186 \cdot 10^{16}\ (-1)$$
$$v_{\mathrm{struc}}{}^2(\nu_\mu) = (1/16)\ G\ m(\nu_\mu)\ r_\mu{}^3\ \omega(\nu_\mu)^4 = 8.98755187 \cdot 10^{16}\ (-1)$$
$$v_{\mathrm{struc}}{}^2(\nu_\tau) = (1/16)\ G\ m(\nu_\tau)\ r_\tau{}^3\ \omega(\nu_\tau)^4 = 8.98755175 \cdot 10^{16}\ (-1)$$

The *intrinsic structural velenergy* of neutrino is, with astonishing exactness, the speed of light (!).

$$v_{\mathrm{struc}}(\nu_e) = 2.99792459\ (m\ s^{-1}) \approx c$$
$$v_{\mathrm{struc}}(\nu_\mu) = 2.99792459\ (m\ s^{-1}) \approx c$$
$$v_{\mathrm{struc}}(\nu_\tau) = 2.99792457\ (m\ s^{-1}) \approx c$$

Therefore, the neutrino is a leptonic particle came to light. It has to be noted that this is an impressive result since all the principal physical quantities of leptons —which ratios are relationless— are indirectly involved in the calculus, apart from the magnitude of the intervalic gravitational constant, G = $\pi\ 270^2\ \mathbf{t_I}$ (iL) = $\pi\alpha c^3\hbar$ (s), which already contains the magnitudes of the intervalic fine structure constant and the intervalic length.

INTERVALIC NEUTRINO RADIUS

Finally, since the neutrino is a particle came to light, we can apply the boundary assumption on the linear velocity on neutrino's surface, which is supposed to be the speed of light. According to this, the neutrino radius is:

$r(\nu_e) = c\ \omega(\nu_e)^{-1} = 2.23947968 \cdot 10^{-20}$ (m)
$r(\nu_\mu) = c\ \omega(\nu_\mu)^{-1} = 2.75113246 \cdot 10^{-20}$ (m)
$r(\nu_\tau) = c\ \omega(\nu_\tau)^{-1} = 1.86604877 \cdot 10^{-20}$ (m)

This means that the electron radius is ~142,627 times the electronic neutrino radius, which makes sense with the extremely low interaction of neutrino with matter.

As can be seen, the ratios between lepton and neutrino radius are apparently relationless:

$r(\nu_e) / r(\nu_\mu) = 0.81402103$
$r(\nu_\mu) / r(\nu_\tau) = 1.4743090$
$r(\nu_e) / r(\nu_\tau) = 1.2001185$

$r_e / r_\mu = 195.07191$
$r_\mu / r_\tau = 18.492504$
$r_e / r_\tau = 3{,}607.3680$

NEUTRINO TRANSVERSAL ENERGY

If neutrino is a particle come to light it should have the same or similar transversal energy as photons, according to the Einstein's equation: E = $h\nu$. According to IT, photons are closed strings which radius is the intervalic length, $\hbar = 1.0556363 \cdot 10^{-34}$ (m). The classic equation of dynamics acquire new meanings when they are reformulated in intervalic dimensions, as for example in our case. We can suppose that the closed string conforming the photon is turning along a central axis perpendicular to the closed string's plane. According to traditional classic dynamics, the energy due to the movement along the path is simply force times space:

$$E = F\,s$$

The classic concept of force in IT is a misleading one, and in any case the intervalic dimensions of force and frequency are just the same. This means that both concepts are the same underlying physical quantity although they may have different phenomenology *apparently*. Since the intervalic dimensions are fully *consistent*, they have an epistemological rank unknown in other dimensional systems, and therefore we can affirm the identity between both physical magnitudes into a unified one: the *frequorce*, φ.

On the other hand, what is the length of the path? Obviously it is $s = 2\pi r = 2\pi\hbar$, since the radius of the quantum ring is just $\hbar$. Therefore we have:

$$E = F\,s = \varphi\; 2\pi\hbar = h\varphi$$

which is the well known Einstein's equation for the transversal energy of the photon. As $\hbar$ in intervalic dimensions describes both length as well as action, it is clear that spin of *"single"* particles —photon, graviton and intervalino— must be related to the radius of a string in a deep level. Actually, on the assumption that action and length must refer to a unique underlying physical quantity, we can postulate that the transversal energy of a single particle is:

$$E = 2\pi J\varphi$$

Thus it can be demonstrated that the transversal energy of all single particles postulated by IT existing in Nature are:

- Spin ½ neutrino: $E = \frac{1}{2}\,h\varphi$
- Spin 0 bistring: $E = 0$
- Spin 1 photon: $E = h\varphi$
- Spin 0 intervalino: $E = 0$
- Spin 2 graviton: $E = 2\,h\varphi$

As can be seen, the transversal energy of intervalino is just zero. This is entirely consistent since intervalino is not a light-particle. Intuitively speaking we can say that the transversal energy of graviton is double of photon because it is composed by the assembly of two photon in a symmetric state under interchange. On the contrary, the intervalino is assembled in an antisymmetric state under interchange, which means the two constituent photons are turning in opposite ways. Therefore their transversal energies do not sum one another as in graviton, but they "friction" one against other. In this way is introduced a new degree of freedom in the primordial Universe —the *mass*— and a new fundamental particle or block of Nature is created —the *intervalino*—, whose aggregations will make what we usually know as *matter*.

Besides we have obtained a naïve result that not for being expected, it is less important to be logically yielded in the general framework of a theory: the transversal energy of bistring, that is to say of spacetime, is zero.

Thus we can say that all intervalinoless particles of the Intervalic Space have transversal energy but not spin energy, and move structurally at the intervalic velocity —the speed of light—. On the contrary, all intervalinoful particles have spin energy instead of transversal energy, and do not move at the speed of light. The unique exception to that rule would be the bistring whose energy is related with the whole range of frequorces allowed to an harmonic oscillator, which are comprised between the intervalic geometric heights, $\boldsymbol{\varphi}_{\mathbf{I}}$ and $\boldsymbol{\varphi}_{\mathbf{I}}^{-1}$. (Actually, it can be supposed that the Cassimir effect would not exist in other way, and therefore it can be considered as a naïve empirical demonstration of the universal harmonic oscillator energy of bistings —that is to say, of spacetime—).

To conclude, neutrino would be no other than a spin ½ string with an intrinsic angular momentum. However in IT we have already described such a spin ½ string: it is the intervalic string. Of course, the intervalic string existed *before* the creation of spacetime and of photons. Nevertheless, neutrinos exist *after* the assembly of photons and bistrings, once the imaginary space has been introduced in the dimensions of the Universe. Therefore, intervalic strings which stay or exist *after* the assembly of photons and bistrings must have got the imaginary space, that is to say, they must move at the intervalic velocity, the speed of light. This is in great agreement with the structural velocity of neutrinos, which are strings came to light. Therefore we can postulate with enough confidence and great logical economy that the intervalic structure of neutrinos is similar as of intervalic strings. They are like intervalic strings but existing in actual spacetime, that is to say, came to light.

THE COSMIC MICROWAVE BACKGROUND OF PRIMORDIAL GAUDINAR ANTINEUTRINOS

If the spin-statistics theorem is absolutely right, the rule of addition of spin in composite particles will have to break at least in one level of the intervalic structures involved in subatomic particles. Perhaps the spin-statistics theorem is not applicable below the structure level of leptons and quarks, or perhaps the spin-statistics theorem is not complete. But as we believe that the spin-statistics theorem is wholly right and applicable, we would be compelled to postulate the existence of another particle in a similar way as Pauli did with the *neutrino* in 1930. That particle must appear as a consequence of the conservation of the intrinsic angular momentum during the primordial aggregation of gaudinos and lisztinos at the Big Bang. Since the intervalino spin is 0, we will find it when appears the first intervalinoful fermions. They are, apart from already known leptons, the quarkic gaudinos:

$$6\ \mathrm{D}_{45} \rightarrow \mathrm{G}_6$$

The next one assembly of quarkic gaudinos which made the lisztino: 3 $\mathrm{G}_6 \rightarrow \mathrm{L}_3$, can be explained without any violation of the intrinsic angular momentum.

If according to IT the interchange symmetry of the constituent gaudinos inside a lisztino is an antisymmetric state, we would need a new *gaudinar antineutrino* for the conservation of the intrinsic angular momentum:

$$6\ \mathrm{D}_{45} \rightarrow \mathrm{G}_6 + \underline{\nu}_{\mathrm{G6}}$$

What is this new neutrino? Since the intervalic structure of muon is:

$$\mathrm{L}_1 = \mathrm{G}_6 = 6\ \mathrm{D}_{45} = 270\ \mathbf{I} \rightarrow \mu\text{, muon}$$

we find with the surprising and unexpected result that this neutrino is no other than the own *muonic neutrino*, $\nu_{\mathrm{G6}} \equiv \nu_{\mu}$. Of course, we also have the following symmetry in the primordial aggregation of dalinos to make the muon, where a muonic antineutrino is needed:

$$6\ \mathrm{D}_{45} \rightarrow \mu + \underline{\nu}_{\mu}$$

Since intervalinos and dalinos involved in the assembly of quarks and muon are bosons we do not need to consider them. Nevertheless the electron is the only gaudino which is at once a dalino:

$$\mathrm{L}_1 = \mathrm{G}_1 = 1\ \mathrm{D}_{270} = 270\ \mathbf{I} \rightarrow e\text{, electron}$$

Therefore we find the electronic antineutrino in the following primordial aggregation of intervalinos:

$$270\ \mathbf{I} \rightarrow e + \underline{\nu}_e$$

According to these deductions, there will be an additional *cosmic microwave background of antineutrinos* across all the Universe similar to the already detected CMB of photons, which would be composed in primordial times by a number of three gaudinar antineutrinos per quark and one electronic antineutrino per electron created at the Big Bang. That is to say, there are at least 9 gaudinar antineutrinos and 1 electronic antineutrino per each Hydrogen atom in the Universe, and 36 gaudinar antineutrinos and 2 electronic antineutrinos per each Helium atom. Unfortunately, these are extremely small values to be detected.

Finally, it is clear that the physical meaning of the so named leptonic number is simply a quantum number which is introduced for the conservation of the intrinsic angular momentum, but does not have any mysterious intrinsic quality applicable only to leptons. Moreover, since neutrinos are intervalinoless particles, their intervalic structure has nothing to do with the gaudinar one of leptons. Therefore, neutrinos can not be considered intrinsically as some strange kind of uncanny light leptons, as they are absurdly considered in SM.

THE INTERVALIC FAMILY OF NEUTRINOS

According to SM there is one corresponding neutrino per lepton. On the contrary, in IT we have seen that there is *one neutrino per gaudino*. This fact is simply and necessarily deduced from the conservation of the intrinsic angular momentum in the primordial aggregation of particles. In actual Universe there only remains neutrinos corresponding to *elementary* gaudinos —namely, leptons and charged intermediate massive bosons—, since neutrinos corresponding to *fractional charged* gaudinos —constituent of quarks— are not needed for the conservation of spin since quarks never appears in isolated state due to its fractional charge. Thus, the neutrino family will correspond to the following gaudinos:

$L_1 = G_1 = 1\ D_{270} = 270\ \mathbf{I} = 0.51099909 \rightarrow \nu_{G1}$, *electronic neutrino*
$L_1 = G_2 = 2\ D_{135} = 270\ \mathbf{I} = 4.0879928$
$L_1 = G_3 = 3\ D_{90} = 270\ \mathbf{I} = 13.796975$
$L_1 = G_5 = 5\ D_{54} = 270\ \mathbf{I} = 63.874885$
$L_1 = G_6 = 6\ D_{45} = 270\ \mathbf{I} = 110.37580 \rightarrow \nu_{G6}$, *muonic neutrino*
$L_1 = G_9 = 9\ D_{30} = 270\ \mathbf{I} = 372.51833$
$L_1 = G_{10} = 10\ D_{27} = 270\ \mathbf{I} = 510.99909$
$L_1 = G_{15} = 15\ D_{18} = 270\ \mathbf{I} = 1{,}724.6220 \rightarrow \nu_{G15}$, *tauonic neutrino*

$L_1 = G_{18} = 18\ D_{15} = 270\ \mathbf{I} = 2{,}980.1466$
$L_1 = G_{27} = 27\ D_{10} = 270\ \mathbf{I} = 10{,}057.995$
$L_1 = G_{30} = 30\ D_9 = 270\ \mathbf{I} = 13{,}796.975$
$L_1 = G_{45} = 45\ D_6 = 270\ \mathbf{I} = 46{,}564.794 \rightarrow \nu_{G45}$, *Znic neutrino*
$L_1 = G_{54} = 54\ D_5 = 270\ \mathbf{I} = 80{,}463.964 \rightarrow \nu_{G54}$, *Wnic neutrino*
$L_1 = G_{90} = 90\ D_3 = 270\ \mathbf{I} = 372{,}518.33 \rightarrow \nu_{G90}$, *Ynic neutrino*
$L_1 = G_{135} = 135\ D_2 = 270\ \mathbf{I} = 1{,}257{,}249.4 \rightarrow \nu_{G135}$, *Xnic neutrino*
$L_1 = G_{270} = 270\ D_1 = 270\ \mathbf{I} = 5{,}621{,}244.5 \rightarrow \nu_{G270}$, *Inic neutrino*

The existence of the last one charged massive boson ($I^{\pm}$) and its corresponding neutrino (ν_{G270}) is really not expected. At energies available in colliders there only appears the intervalic structures which incorporate the greatest symmetries: the three leptons already detected and the $W^{\pm}$ boson (really $W^{\pm}$ and all gaudinos are surely *fermions* according to IT, although we still refer to them as *bosons*). The last five heavy neutrinos would be virtual states as they are related with intermediate particles: $Z^{\pm}$, $W^{\pm}$, $Y^{\pm}$, $X^{\pm}$, $I^{\pm}$. Some of the three last heavy gaudinos are predicted to be detected in a near future —in determine decays involving their corresponding intervalic structures— when such high energies become available in experiments.

The Z^0 boson is not a gaudino but a lisztino 2, and therefore it is postulated to be a *boson*, as in SM (although its spin according to IT would preferably be 0 instead of 1). Nevertheless, since its two constituent gaudinos are involved in the changeful —weak— intervalic interaction, its corresponding gaudinar 45 neutrino is postulated, ν_{G45}, which always must appear in pairs neutrino-antineutrino (or neutrino-neutrino if the spin of Z^0 was 1).

What we said about the existence of intermediate massive bosons in the chapter on the changeful —weak— intervalic interaction, which is determined by the isocharge values allowed to the quarks by the intervalic symmetries, can be applied in an analogous way to the existence of neutrinos because their existence is determined on the conservation of the angular momentum of fundamental particles, which at once relies on the intervalic structures of leptons-massive bosons, that is to say, in gaudinos. Quarks were also involved in neutrino production, but only at IPA —in the primordial assembly of nucleonic gaudinos—, since below the threshold temperature quarks can not exist in isolated state and therefore they never need a neutrino production for the conservation of the intrinsic angular momentum.

The changeful —weak— intervalic interaction which interchanges the two values of the isocharge doublet of a quark can not be produced in quarks pertaining to {D30}, {D18} and {D6} symmetries, but only in the dalinar symmetries which have got the *isocharge* doublet, namely: {D45}, {D5}, {D3}, {D2} and {D1}. Therefore the allowed intermediate bosons of these last five symmetries will have their corresponding neutrinos.

Unfortunately, we have no way to determine yet whether leptons-massive bosons —along with their corresponding neutrinos— which are not involved in a changeful intervalic interaction can be made below the recombination temperature. There are around a half of intervalic structures allowed by the dalinar symmetries which are not made by Nature below the threshold temperature. The most dramatic among them is perhaps the corresponding lepton-massive boson —and its corresponding neutrino— pertaining to the {D30} symmetry, as the full family of seven quarks pertaining to that dalinar symmetry are actually made by Nature. This {D30} set is the unique one where there have not been experimentally found a complete correspondence between the allowed particles —leptons-massive bosons and quarks—, as there only have been detected quarks of that symmetry, but not leptons-massive bosons. This is an uncanny and intriguing feature which is still waiting for an explanation. There has not been detected any particle likely to the lepton G9D30$^{\pm}$ (373 MeV/c^2) or to its corresponding zero charged massive boson L2G9D30^0 (727 MeV/c^2). To reach an entire understanding of Nature we would need to know why there is such lack of leptons-massive bosons below the threshold temperature in the {D30} symmetry of subatomic particles, as all the remaining dalinar sets show a remarkable completeness. The answer may probably lie in the deep relation existing between intervalic symmetry and intervalic energy with form and information, which is not understood yet.

GRAVITATION INTERVALIC PROPORTIONALITY CONSTANT

The gravitational proportionality constant, G, has been deduced from intervalic dimensional analysis, and its value in intervalic units is: $G = \pi\ 270^2\ \mathbf{t_I}$ (*i*L), where $\mathbf{t_I}$ is the intervalic quantum of time, $\mathbf{t_I} = c^{-1}\hbar$. Since in SI units the value of the magnetic constant was set by definition as $\mu_0/4\pi = 10^{-7}$ instead of 1, to obtain G in traditional units we only have to add this factor 10^{-7} in the above definition. Thus we have:

$$G = \pi\ 270^2\ 10^{-7}\ \mathbf{t_I} = \pi\ \alpha\ \mathbf{t_I} = \pi\ \alpha\ c^{-1}\hbar\ (s)$$

where α is just the *intervalic fine structure constant*, whose exact geometric value is: $\alpha = 270^2\ 10^{-7}$ (1). Now simply multiplying by the scalizator $c^{\pm 4} = 1$ (1) to obtain the unique half symmetry which appears in non singular units, we have got the theoretical value of the intervalic proportionality constant of gravitation:

$$G = \pi\ \alpha\ c^{-1}\ \hbar \cdot c^{\pm 4} = \pi\ \alpha\ c^3\ \hbar = 6.514091066 \cdot 10^{-11}\ (s)$$

The difference between this exact theoretical value and the traditional empirical value, ~2.4%, may be due to the contribution of the intervalic dark matter.

GRAVITATIONAL QUANTIZATION

It must be noted that the intervalic dimension of the gravitational constant, G, is the unique one among all proportionality constants which is not dimensionless, that is to say, (1). Its intervalic dimension, which has got an epistemological rank, is time, (*i*L). This extraordinary feature means that the gravitational interaction is *quantized in time* by the proportionality constant G. Thus, two consecutive gravitons emitted by an intervalino are separated *n*G in time, being *n* = 1, 2, 3,…

This quantization defines an upper *geometric limit* for the *modulating frequency* of gravitational waves, a value which may be useful when working with gravitational or antigravitational fields:

$$G^{-1} = 1\ /\ (\pi\ \alpha\ c^3\ \hbar) = 1.535133589 \cdot 10^{10}\ (s^{-1})$$

Chapter 34

INFORMATIONAL INTERACTION

INFORMATION: THE FIRST INTERACTION OF THE UNIVERSE

Hereinafter we can see that *all* subatomic particles of Nature (including intervalinos, gravitons, photons and the space —or spacetime— itself) are affected by the *informational* interaction, from the intervalic string and the photon, to all the intervalino-made particles. Really, it can not be in other way: How could exist any stuff in the Universe *before* the existence of information? It is impossible. In other way, the Logic and the own Mathematics would be a creation of Physics, and the numbers would be a creation of matter.

Moreover, how could not be affected the intervalinar matter by information if the own intervalino is composed by two photons —every one of them carrying information—? It can be also seen that the intervalic string was assembled to make closed strings (photons) and bistring (spacetime) only by means of the informational interaction because at this step of the primordial Universe existed *nothing* but the own intervalic string (the intervalic length) and the own information (mathematical logic). It can not be introduced any frequorce to explain that first assembly of intervalic strings because no one frequorce existed yet.

Besides, time, movement and energy neither existed at this step yet. Really, these are three different phenomenology for a unique underlying quality, described by the imaginary dimension (*i*): time is (*i*L), and movement —velocity— and energy are under the same intervalic physical quantity, velenergy (i^{-1}). Here the confrontation with the traditional String Theory is served insofar as this one begins with a Universe where space-time, dimensions and all physical quantities of Physics are absolute and pre-existent entities. This is no other than another post Newtonian conception of the physical world: the whole dimensions of space-time and the physical quantities of Physics are supposed to exist absolutely in a divine realm *before* the creation of the Universe. Really, the String Theory has not question nor to be aware of its own poor and unconscious Newtonian conception of Physics.

Although the study of the primordial Universe till the assembly of *intervalino* —the last block of matter— may be considered as logically independent of the IT of Particle Physics and pertains preferably to the Intervalic String Theory, we would not like to leave this chapter without taking a brief look at some fascinating informational features of that Universe which transform the traditional paradigm of Physics in another very different one. The early keys of Physics, named in the Classic era materialism, mechanicism and causality, and in the Quantum era uncertainty, indeterminism and absurdity, are substituted in the Intervalic era by others like information, consciousness, connectedness, symmetry, love and beauty.

We live in a Universe which is made principally from *information*, from consciousness. And now this is not a newager or esoteric affirmation, but a fact derived from the Intervalic Theory of Particle Physics. Since the information interaction was the first one, born of the intervalic string, *information* pervades all and every one particle existing in the Universe. The following interactions will not affect to all particles, depending on its order of appearance in the intervalic primordial aggregation. Thus, we can say effectively that there is genuine consciousness in space, in photons, in gravitons, in intervalinos and in every subatomic particle.

The four traditional frequorces of Nature —now named by order of apparition in the Universe: intervalic changeless, gravitational, electromagnetic and intervalic changeful— existed and exist inside spacetime because all of them arose when spacetime (photon and bistring) was already assembled. On the contrary, the remaining fundamental interaction —the informational one—, which by order of apparition was the first of them, existed *before* the assembly of photon, and therefore in a *timeless* Universe. This means that informational interaction is independent of *time*. Information is independent of time, and therefore it is also independent of energy and matter. (We should not confuse the lay meaning of "information" which is a linguistic or semiotic process dependent of time and matter, with this pristine information). Really we can consider information almost like as a mathematical feature instead of a physical one, insofar as information was the interaction by means

<table>
<tr><th colspan="7">CORRESPONDENCE BETWEEN THE STEPS IN VEDANTA COSMOLOGY
AND THE STEPS IN THE INTERVALIC PRIMORDIAL AGGREGATION</th></tr>
<tr><th>0</th><th>1</th><th>2</th><th>3</th><th>4</th><th>5</th><th>6</th></tr>
<tr><td colspan="3"></td><td colspan="4">Visible matter Universe</td></tr>
<tr><td colspan="2"></td><td colspan="5">Dark matter Universe</td></tr>
<tr><td></td><td colspan="6">Light Universe</td></tr>
<tr><td colspan="7">Information Universe</td></tr>
<tr><td rowspan="7">INTERVALIC STRING</td><td rowspan="6">PHOTON (TIME)</td><td>GRAVITON</td><td colspan="4">Second symmetry breaking → GRAVITATIONAL INTERACTION</td></tr>
<tr><td rowspan="5">INTERVALINO</td><td rowspan="4">DALINO (ELECTRON)</td><td rowspan="3">GAUDINO (MUON, TAU, CHARGED MASSIVE BOSONS)</td><td>LISZTINOS (ZERO CHARGED MASSIVE BOSONS)</td><td>Fifth symmetry breaking → ELEMENTARY PSEUDO INTERACTION</td></tr>
<tr><td rowspan="2">FRACTIONAL LISZTINOS (QUARKS)</td><td>MONTEVERDINOS (MESONS)</td></tr>
<tr><td>MONTEVERDINOS (BARYONS)</td></tr>
<tr><td>BIDALINO (DARK MATTER)</td><td colspan="2">Fourth symmetry breaking → → INTERVALIC CHANGEFUL INTERACTION</td></tr>
<tr><td>BINTERVALINO (DARK MATTER)</td><td colspan="3">Third symmetry breaking → ELECTROMAGNETIC INTERACTION</td></tr>
<tr><td>BISTRING (SPACE)</td><td colspan="5">First symmetry breaking → INTERVALIC CHANGELESS INTERACTION</td></tr>
<tr><td>NOTHING</td><td colspan="6">Zero symmetry breaking → INFORMATIONAL INTERACTION</td></tr>
</table>

of the own continuum space (bistring) was assembled.

Closely related with the interactions are the assembled intervalic structures from which they were born. According to this we can see in the corresponding table that *information* exists from the 0 step of the intervalic primordial aggregation and pervades all the Universe, *light* and *space* —or *spacetime*— exists from the 1 step and forward, *dark matter* exists from the 2 step and ahead, and finally *visible matter* exists from the 3 step of the intervalic primordial aggregation. Thus we can speak about an information Universe, a light Universe, a dark matter Universe and a visible matter Universe, which were added by juxtaposition up to conform the actual Universe composed by all this four kinds of radical stuff: information, light and space (or spacetime), dark matter and visible matter.

What we have commented involves that informational interaction can be viewed as the simplest imaginable relation or logical statement —*i. e.* an abstract bit— which does neither depend on matter, energy nor any physical device. By this reason the strange and still unknown features of a *form —i.e.* a pyramid— does not depend on the stuff or material of which it is made, because they rely exclusively on information which is independent of any physical quantity incorporating the *i* number in its equation of dimensions. Now we are going into one of the most beautiful fields of research: the relations between *form, information,* Logic and the foundations of Physics. Here finally meet epistemologically all the principal branches of the human knowledge: Mathematics, Music, Physics, Art, Philosophy and Religion.

There have been postulated some models and experiments which seem to be different phenomenology of a unique underlying feature of Nature, and which rely anyway on the informational interaction. They are, among others, the *morphic fields* of Rupert Sheldrake, the *Sintergetics* of Jorge Carvajal, the *memory of water* of Masaru Emoto (and many others linked with Homeopathy), the *quantum potential* of David Bohm, the *fractal objects* of Benoît Mandelbrot, and the still unexplainable features discovered in *form* which emerge in several realms.

Of course, all and everyone of these scientists and pioneers have been insulted and vituperated by the Physics community, which thinks that it is better to follow the fantastic mental masturbation of a String Theory based on the misleading Standard Model: a structureless, formless and informationless model. They affirm —and believe fanatically— that *structure*, *form* and *information* are unnecessary and have not been used by Nature to make the Universe. I really wonder how can somebody hold that extremely absurd and stupid assumption yet.

Although information has been related long time ago with entropy, the fact is that it is far from to be a usual physical quantity and actually it does not pertain to the core of Physics. Modern Physics does not know how to make of information an interaction where there is a source particle and a carrier. Since according to the Standard Model subatomic particles are *structureless*, it is clear that there is no way in this model by means of particles can keep inside them further information. On the contrary, according to IT any subatomic particle can keep a lot of information in its inner level of its intervalic structure. Think for example that a simple proton or neutron has underneath it up to *seven* structural levels, hidden for the structureless observer. Its constituent intervalic structures are, namely: 1-intervalic string, 2-photon, 3-intervalino, 4-dalino, 5-gaudino, 6-lisztino and 7-monteverdino. Even an electron has *four* intervalic structure levels beneath it. Needles to say that in those inner structure levels it can be kept a huge amount of information, which is unthinkable for the structureless model. Now it might be understood that the Standard Model is absolutely blind to the marvellous informational richness hidden inside the particles of the subatomic world.

CAN TIME EXIST WITHOUT LIGHT?

Please remember that the closed string and the bistring were assembled at once in the first step of the intervalic primordial aggregation. The closed string (photon) is the assembly of intervalic strings in symmetric state under interchange, which involved the introduction of the *imaginary space*; and the bistring is the assembly of intervalic strings in antisymmetric state under interchange, which involved the introduction of continuum *real space*. Both real and imaginary space conform what we actually name as *spacetime*. The fact that space is not separable from time in experimental measurements does not mean that there are a unique dimensional stuff, as it might seem from the reformulation of Special Relativity by Minkowski, and much more from the introduction of the infamous “geometrized” units of the Standard Model, where space and time have got the same dimension (as c is dimensionless) and are treated as a unique dimension.

Even worst, for modern Physics the substances of light and spacetime are relationless. Thus they say that light propagates across spacetime, and that spacetime existed before the creation of light and matter. On the contrary, according to IT both affirmations are absolutely false. Time only exist from the assembly of photon: light can not exist without time and vice versa. It can be said that imaginary space, time, light, movement and energy are five different names and phenomenology for a unique radical fact: the assembly of photon. Photon involves all of them, and the 34 imaginary physical quantities of the intervalic group as well. There is nothing like time without light, and vice versa. In this sense it should not be said that light propagates across spacetime, insofar as light introduced time in the Universe. Light propagates only through real space and light itself introduces time. Time is merely a physical quantity among other 34 introduced by light, which our limited senses perceive as an *imaginary* dimension of space (never best said). The fact that light (and also matter) propagates through real space at a definite rate, c, makes a specific spatial geometry in the Universe, which is just what describes the Intervalic Space.

TWO DIFFERENT KINDS OF CONTINUUM: THE CONTINUOUS SPACE-TIME *VS*. THE DISCRETE TIMELESS SPACE

There is a great contrast between the geometric conception of space in IT and in the traditional theories. Both Classic Mechanics, Relativity and Quantum Mechanics conceive a smart space or space-time —full and continuous inclusive at quantum scale—. In this sense there is no difference between the Newtonian *ether* and the *vacuum* of Relativity and Quantum Mechanics. On the contrary, IT conceives a granular space —empty and discontinuous at quantum scale—.

Real space in IT is made from an assembly of fermions —the intervalic strings of length ħ— in antisymmetric state under interchange, which made bistrings, the particle which constitutes the real space. On the contrary, space-time in traditional and modern Physics has neither an origin nor a definite nature: it is simply a pre existent entity, so all of them are functionally different kinds of ether, disregarding its composition. Even worst, these conceptions involve always infinitesimalness —and even infiniteness— in the composition of spacetime.

Geometrically, the Intervalic Space is made from a finite set of intervalic lengths, whilst the other space-times are made from an infinite set of points.

Henceforth the Intervalic Space can not be endlessly divided, but only up the size of the intervalic length, ħ, or the intervalic time, c^{-1}ħ, whilst the other space-times and they may be endlessly divided.

From an information point of view, this involve that the total physical information kept actually in the intervalic space is finite, although the potential information was infinite. On the contrary, the total physical information kept actually in the other space-times is unavoidably infinite, and the potential information is infinite as well.

Finally, and as a paramount crown of all incoherence, the space-time of Classic Mechanics, Relativity and Quantum Mechanics is… *structureless*, like any other particle in the Standard Model. Consequently, we don't know what is the stuff of which is made space-time in such theories. It is equally undefined as the stuff of which are made subatomic particles. And when an object is undefined is very easy to sticky to it any feature *ad hoc*. In great contrast with this, the Intervalic Space is structureful, it is made from the assembly of intervalic strings in antisymmetric state under interchange.

It must be noted that the till now worshipped uncertainty principle is a trivial consequence of the geometry in the Intervalic Space. Since by definition the intervalic string is the smallest unit of length, it can be made any measurement with precision greater than the intervalic length, ħ. Therefore, in IT this is not interpreted like an *uncertainty*, but as a logic and trivial geometric consequence of the structure of space-time in the Intervalic Space. In this way, the repeated *indeterminism* is not a feature of Nature but only a misconception of the philosophy which has reigned sovereignly over Quantum Mechanics and its derivates. A clumsy misconception and a gross mistake that consists in applying to the last blocks of Nature, which by definition are discrete blocks —in other way they would not be blocks—, the features and modes of measurement of the macroscopic world, governed by continuity in spacetime, which is merely a very useful approximation.

THE NATURE OF MOVEMENT: SOLVING THE ZENON PARADOX

The evolution in Physics may be viewed as a process of approximation or transformation of Physics into *Geometry*. Relativity Theory gave a step in this process and now the Intervalic Theory has given another step. Although the Standard Model claims to have reached the final destiny of Physics, it is sure that it has not got, and it is debatable whether its supposed little step was or not on the right track, or perhaps backwards.

In Classical Mechanics the way of description of the world was through the movement of matter particles in an absolute and continuum space and time. In Relativity the way of description was through the movement of matter or energy particles in a relative and continuum frame of reference, the relativistic space-time, and the equivalence between matter and energy. Quantum Mechanics added to this mode the consideration of subatomic particles as waves, that is to say, as energy. Later the Standard Model considered subatomic particles as structureless energy densities and the String Theory still tries to explain those structureless particles as coming from the vibration of a string (needless to say that both assumptions are totally misleading). The Intervalic Theory has described the structure of subatomic particles, which after successive structure levels can be reduced to light. And both light and spacetime can finally be reduced to information by means of the Intervalic String Theory, which has also introduced in Physics the underlying geometry and symmetries of Nature.

In this way there is a great difference in the explanation of the nature of *movement* in IT and in the remaining theories. Traditional and modern Physics conceive the movement of a subatomic particle as a structureless packet of matter or energy moving infinitesimally along a full, smart and continuous space-time.

On the contrary, IT conceives the movement of a subatomic particle as a structure composed of intervalic strings whose information is transmitted or replicated from an intervalic string to the next one, at a *rate* c in real space. Here we have neither a *continuous* movement, nor even a *discontinuous* movement, but the perceptual *illusion* called ‘movement’ which is really made from the replication of information inside the Intervalic Space. The illusion is analogous to what is made in *cinema* where the eye interprets as continuous movement what is simply a quick succession of pictures. Therefore, physical movement is usually a macroscopic event and always an event which occurs necessarily at scales much greater than the intervalic quantum of length. By the way, the unsolvable Zenon paradox about movement, which really is a deep one, is finally solved.

Now, the record of all movements in the Universe creates another perceptual illusion: the illusion of *time*, which is imagined as a further *dimension*. However, strictly speaking time is not a real dimension, that is to say, time is nothing like a fourth dimension, L^4, but it is merely a physical quantity, in which equation of dimensions is involved the imaginary number i. Thus, time —understood as a fourth dimension along with the three spatial ones— would be the illusion of an illusion: the record of the replication of information in the Universe.

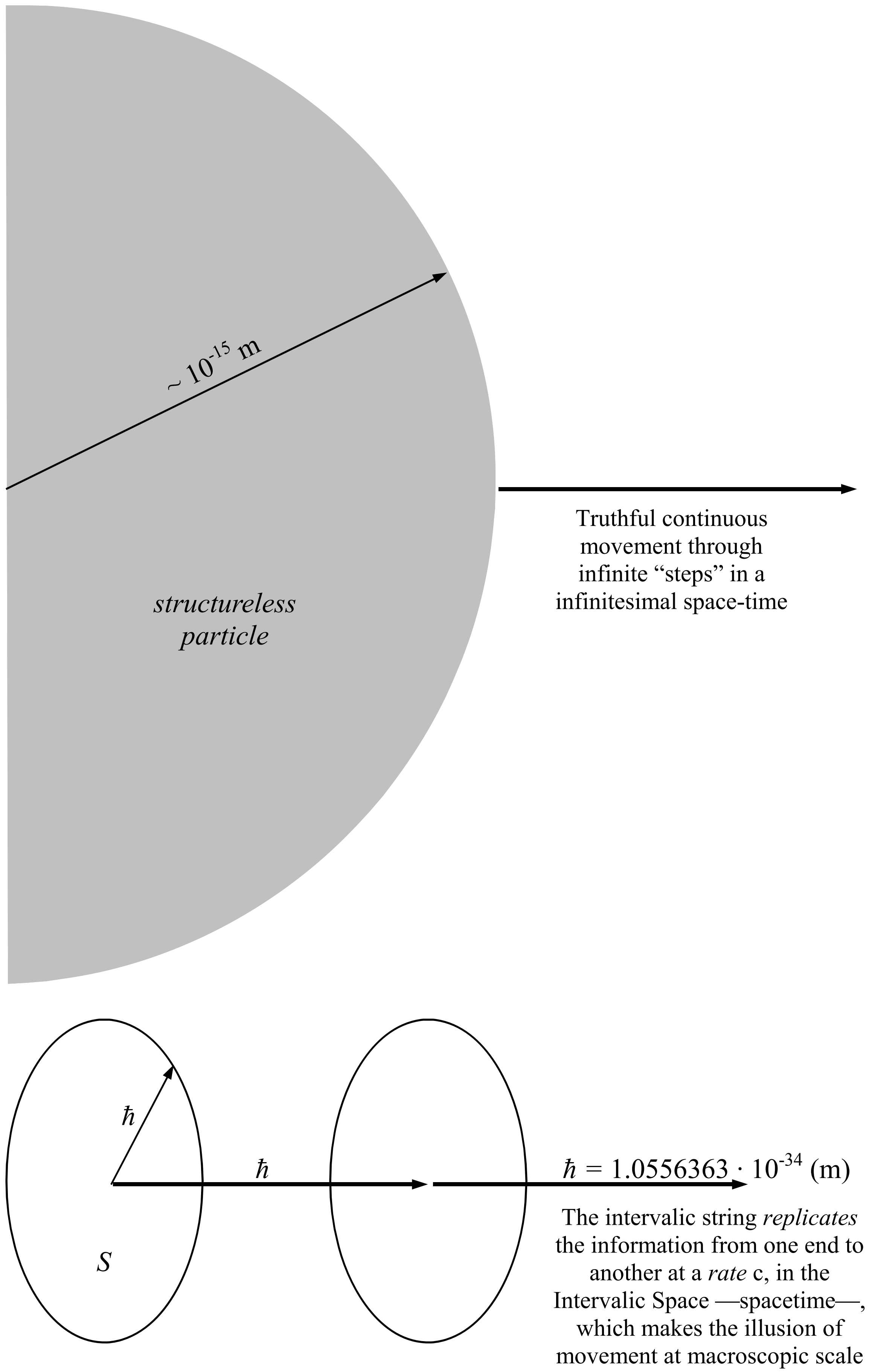
The fact that the replication of closed strings in real space is made at a constant *rate*, c, explains why we can say that geometrically all bodies are moving always at the speed of light, c, in the Intervalic Space, that is to say, in *spacetime*. The word ‘spacetime’ involves by its own the introduction of the magnitude of the speed of light as the constant rate of replication of the information in real space.

It is clear that photon and the symmetric assembly of photons —graviton— “move” at the speed of light forever. Nonetheless, if the closed strings are always replicated at a constant rate, c, the antisymmetric assembly of photons —intervalino— should also be “moving” at the speed of light.

This is just the case: the two constituent photons of intervalino are in an everlasting state of exchange and the information of the two constituent closed strings is interchanged or replicated at a rate c. Here it may be marvellously understood why the two constituent photons of intervalino are in an antisymmetric state under interchange —they are always with opposite spin orientation—, while the constituent photons of graviton are in a symmetric state —they are always with identical spin orientation—. By the way, this also explains intuitively why the decay of intervalino makes two photons spinning and moving just in opposite ways; and *a fortiori* explains why the decay of matter-antimatter and the conversion of any particle of matter into radiant energy makes always pairs photon-antiphoton. Therefore graviton moves like the photon through the real space, but intervalino is already moving at the speed of light when it is apparently "at rest" in real space because its constituent photons are already being replicated at rate c. This explains in an independent way the result that the linear velocity in intervalino's surface is just c, the speed of light, that we have described in the chapter about the intervalino. Hereinafter we say that photon and graviton moves only through real space whilst intervalino moves apparently without moving, staying in the same place, so we say that intervalino moves in an imaginary space, called *time* (although intervalino can also move through real space, which gives us the features of the intervalic geometry of the speed of light: the *spacetime*).

With the postulation of Relativity the classic conception of the Universe as composed by *matter* was substituted by the relativistic one which reduced matter to energy and therefore conceived the Universe as made from *energy*, being matter like condensed energy. It has to be remarked that this reduction was made exclusively by means of one famous equation of Special Relativity, $E = mc^2$, but without knowing neither the origin nor the nature and mechanism of the deep equivalence between matter and energy. Now it can be said that energy has been reduced to *information* as well. To follow the analogy, if matter is "condensed energy", energy would be "condensed information". Or in other words, if we consider information as the last and unique constituent of the intervalic Universe —which is a Universe made of consciousness—, energy would be the "liquid" state of information, and matter would be the "solid" state of information.

To conclude with a corollary, which although it is evident I think it is a good idea to write it down: when information travels through spacetime, we have got a *movement*; when information goes through real space —and not through imaginary space—, we have got an *act at a distance*. In other words, movement is possible only in *spacetime*, whilst and act at a distance only is possible in the *real space*.



Truthful continuous movement through infinite “steps” in a infinitesimal space-time

$\hbar = 1.0556363 \cdot 10^{-34}$ (m)

The intervalic string *replicates* the information from one end to another at a *rate* c, in the Intervalic Space —spacetime—, which makes the illusion of movement at macroscopic scale

THE TWO DIFFERENT CONCEPTIONS OF MOVEMENT OF SUBATOMIC PARTICLES:
IN MODERN PHYSICS *VS*. IN THE INTERVALIC SPACE

RATE OF INFORMATION EXCHANGE

The rate of information exchange along the three dimensions of *space* is instantaneous. This is the rate at which works photonless particles, that is to say, the intervalic string (consciousness, mathematics).

The rate of information exchange along the dimension of *time* is the speed of light, c. This is the rate at which works photonful particles. Each and every particle with energy or mass is always moving at the speed of light in the intervalic dimensional space. This is a result already shown by the merge of spacetime in Special Relativity. However now we have an additional extension of that result by means of the uncovering of the bridge between light and matter: the *intervalino*.

The intervalino —the last block of matter— is composed by the assembly of two photons moving at the speed one around the other and composing what is the own structure of intervalino. Therefore, it is clear that the last constituent particles of matter and all massful subatomic particles are forever moving at the speed of light because such last constituent particles are no other than the constituent photons of intervalino.

Another way to interpreting the meaning of the speed of light is that such information exchange is a consecutive assembly between *closed* and *open* intervalic strings in an antisymmetric state under interchange performed at a fixed rate c along the imaginary axe of the intervalic dimensional space. The intervalic string is always in an exchanging state, performed at a *rate* c, in the imaginary space, which makes the illusion of *movement* at macroscopic scale, and therefore of *time*. Actually this is the way that the imaginary axe we call time is unfolded and becomes into existence; in other case the imaginary axe would not exist. The mathematical explanation of time through the existence of the imaginary dimension of space (*i*L) has an extraordinary and remarkable logical economy as all physical quantities —and therefore Nature and the own Universe— can be explained in a geometric manner since all they are made by a unique genuine dimension: space, (L). And the *mathematical features* of the *i* number determines that it can only exist mathematically —and therefore physically— *one* dimension of time.

EXPLANATION OF THE NATURE OF MOVEMENT AS THE ASSEMBLY OF INTERVALIC STRINGS IN SYMMETRIC AND ANTISYMMETRIC STATE UNDER INTERCHANGE

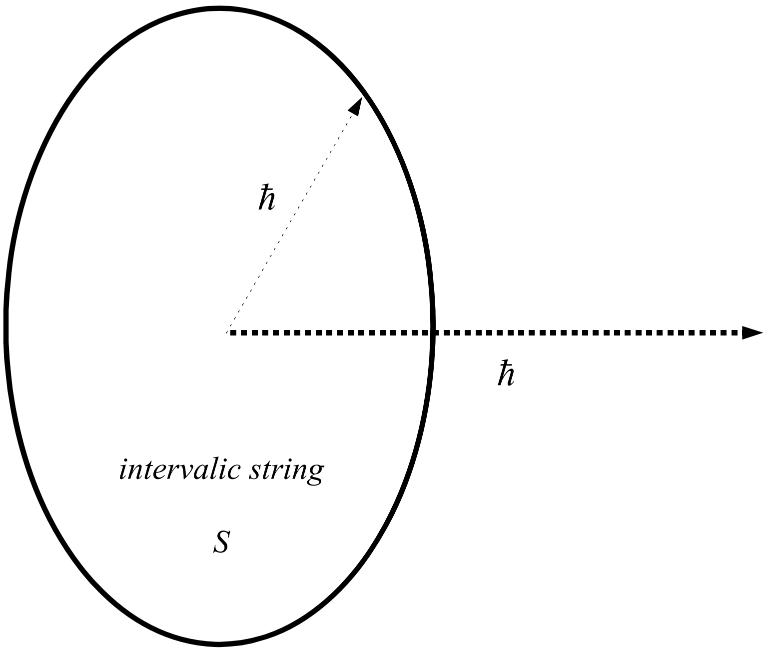
We have seen that the unique physical stuff of which are made subatomic particles and the entire Universe is exclusively the one-dimensional intervals of real space: the intervalic quantum of length that conform the intervalic string. Such set of intervalic string is a finite one and represents the total primordial consciousness or information of the Universe.

In the first phase of the intervalic primordial assemble, the intervalic strings were assembled —always in both allowed states: symmetric and antisymmetric under interchange— to make photon and chi; in the next phases there were assembled successive particles composed only by one-dimensional space in a similar way, always in both allowed states: symmetric and antisymmetric under interchange. All these phases are made with one-dimensional physical space —real space—, which is unfolded or curved in a three-dimensional mathematical space.

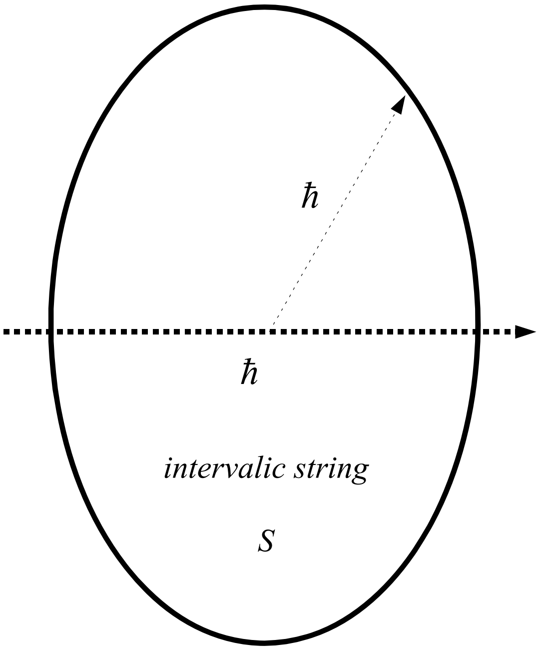
Nevertheless, the intervalic strings of physical space —closed strings— are also assembled with intervalic lengths of mathematical space —open strings—. And this assembly is made, as always according to the universality assumption, in both symmetric and antisymmetric under interchange. As this synthesis is made between two particles, on a one-to-one basis, such assembly can not be made simultaneously, as it would yield the double of intervalic strings. Therefore, such assembly, necessarily in both states under interchange, can only be made along the imaginary axe of the intervalic dimensional space, namely, the *imaginary space* axe, *i*L, which is, by definition, the intervalic dimension of *time*. Thus we have the assembly of those particles beginning in, say, antisymmetric state under interchange, followed by the assembly in symmetric state along the imaginary space axe, that is to say, along the time axe. The magnitude of the imaginary axe existing between both states is just the intervalic quantum of time, namely:

$$\mathbf{t_I} = c^{-1}\hbar = 3.5212226 \cdot 10^{-43} \text{ (s)}$$

Without continuity solution, this last symmetric state under interchange is followed by the corresponding antisymmetric state, this one is then followed by the corresponding symmetric state, and so on indefinitely. In this way, each and every intervalic string existing in the Universe is permanently being assembled in symmetric and antisymmetric state under interchange, at the everlasting, during the all life of the Universe. And as all subatomic particles without exception are finally made from intervalic strings, all the Universe is “recreated”, to say someway, at every intervalic quantum of time, al-



Assembly of a intervalic string (closed string) with a
intervalic length (open string) in *antisymmetric* state under interchange



Assembly of a intervalic string (closed string) with a
intervalic length (open string) in *symmetric* state under interchange

ternating de assembly of intervalic strings in symmetric and antisymmetric states under interchange. The perception by our senses of this singular phenomenon is what we perceive as *time*, that is entirely a fabulous perceptual illusion. In this surprising and fundamental way is explained by the Intervalic Theory the nature of *time* and also the so called *time arrow*, which now becomes a simple and unavoidable fact.

It is clear that there is no any continuity, neither in time nor in space. The apparent three-dimensional space is just of mathematical nature, and time is no other than one-dimensional imaginary space. And the illusion of movement is merely the endless assembly of real intervalic strings (closed strings, with radius $\hbar$) with imaginary intervalic strings (open strings, with length $\hbar$) —in both symmetric and antisymmetric states under interchange—.

INFORMATION AS THE LAST CONSTITUENT OF THE DEGREES OF FREEDOM IN NATURE

THE EXCHANGE FREQUORCE AS THE PHYSICAL MANIFESTATION OF *SAT-CHIT-ANAND*

Modern Physics seriously considers as one of its paramount achievements the understanding that any force is mediated by the interchange of a particle. So in any interaction there is always a *source* particle and a *carrier* particle. The interpretation of IT goes beyond, to the origin and foundations of that interchange, explaining it in terms of information.

The explanation of any force due to a source particle and a carrier is a very restrained one and does not reach to see the nature of the interchange. Source and carrier is a suitable quality in the macroscopic world of long-ranged interactions, but it becomes useless when descending to the quantum world of short-ranged interactions. The Standard Model still maintains infantilely that source particles must be fermions and carriers must be bosons. This is false as we have seen when describing the intervalic interaction. Besides, at the first levels of assembly all the interactions are necessarily made between bosons due to elemental reasons of economy, as we have also explained thoroughly in other sites. The rule of the Standard Model is true only in long-ranged interactions —electromagnetism and gravitation—, but they are only a half of the number of the traditional fundamental interactions. Since this conception is simply misleading and can not be arranged by no means, as like as all the Standard Model in full, it is better to shift and to begin directly treating the physical frequorces in terms of *information*: as an interchange of information between two particles.

In this view, the carrier particle does not create a *force* between two particles, but carries *information* between them. The way of working of the Standard Model starts from the Physics of the macroscopic world and tries unfruitfully to apply it to the quantum world. We work in just the opposite way: the macroscopic world is explained from the intervalic-quantum one. Thus we have to start from the very beginning of the Universe, at the zero step, when there was only the intervalic string, before the assembly of spacetime and light, and much before the assembly of matter. This means that the intervalic string is not made of matter, not made of energy and inclusive not made of spacetime. Then, what is the stuff of which is made the intervalic string? Is there anything between the absolute nothingness and the physical spacetime? Yes, it is something: the mathematic realm. This is the “stuff” of which is made the intervalic string, which therefore may be considered as a mathematic entity instead of a physical one. What has not been realized yet is that both information, mathematics and logic involve necessarily the existence of a *one-dimensional space.* And that all of them are diverse looks or names of *consciousness*, the primordial consciousness from which is made all subatomic particles, which can be assimilated to *one-dimensional space,* which is different to the usual concept of consciousness.

Henceforth, the beginning of the beginning was some relation between intervalic strings. But how is possible that the first *physical* stuff of the Universe —spacetime and light— was made starting from a *mathematic* stuff? In that case, all the Universe would be finally made of some kind of information. Well, this is just the case. Rigorously speaking, to make spacetime and light —whose energies just vanish between themselves— it is only needed the existence of a one-dimensional spatial interval. The existence of this interval implies the existence of logic or mathematics, and vice versa. And any of them involves the existence of primordial consciousness, so all of them may be considered as different views of a single genuine and irreducible phenomenon. In a similar way, he existence of information involves the existence of *consciousness*, which leads to the existence of *logic*, which at once leads the existence of *mathematics*, and vice versa. Of course these important concepts need to be redefined more accurately in a restricted sense since they are at the very last roots of the Universe.

Applying logically the expanded spin-statistics theorem to the preceding concepts we already have got the starting of the intervalic primordial assembly. Nevertheless, in order to allow the assembly of intervalic strings in this abstract mathematical realm, we still would need the existence of something like a “wish” or “tendency” towards *relation, interchange, integration, union.* This is no other than the *exchange interaction,* which lives at the very heart of physics although quantum mechanics has not been explained it, but only to recognise its existence at subatomic scale. Philosophically speaking, in a spiritual word, such fundamental and irreducible *exchange interaction* can be interpreted as *love*. IN this view, the spin-statistics theorem may be interpreted as the supreme theorem of exchange interaction or love in physics. The essence of the spin-statistics theorem, although it is applied to physics, is really mathematical and does not need the existence of physics to be formulated; actually this is one of its outstanding features which make of it a very strong and reliable principle. This gathering spark, which will lead this mathematical realm to be manifested as a physical realm, may be symbolized through the introduction of the *i* number into existence, which represents the corresponding manifestation which will produce the first intervalic assembly in Nature to make light and spacetime.

This coincide astonishing with the three *uncaused* attributes of the Universe according to the ancient Oriental wisdom. These divine and genuine attributes must exist by themselves because they can not be made nor caused by anything by no means: *Sat-Chit-Anand* (Truth-Consciousness-Bliss), which in terms of Physics may be translated as Information-Consciousness-Exchange. By the way, after comprehending the physical implications of this attributes one can understand better the significance of the mantra: *Satyam-Shivam-Sundram* (Truth-Godliness-Beauty) as well. When viewing such coincidences one might wonder about the unbelievable insight of the illuminated masters and yogis to reach such knowledge by straight intuition and meditation.

<table>
<tr><th colspan="4">CLASSIFICATION OF EXCHANGE FREQUORCES ACCORDING TO
THE RELATION BETWEEN THE CARRIER AND THE SOURCE PARTICLES</th></tr>
<tr><td colspan="3">*Relation between carrier and source particles*</td><td>*Interaction*</td></tr>
<tr><td colspan="3">Carrier ≡ source</td><td>Intervalic changeless</td></tr>
<tr><td rowspan="3">Carrier ≠ source</td><td colspan="2">Carrier = whole source drawn in a different intervalic structure</td><td>Structural intervalic changeful</td></tr>
<tr><td rowspan="2">Carrier = fragment source</td><td>Carrier = massful</td><td>Intervalic changeless
Electric charged
Intervalic changeful</td></tr>
<tr><td>Carrier = massless</td><td>Electromagnetic
Gravitational</td></tr>
</table>

So it can be said that the mere existence of *logic —consciousness—* triggered the creation of the Universe through the assembly of intervalic strings. This first assembly of the Universe involves an *exchange of information*: the source particle is the intervalic string and the carrier is also the intervalic string. In other words, the source particle is information and the carrier is information as well. Moreover, both source and carrier are just the same particle.

This is the simplest semiotic scenario imaginable: all agents that make the communication are played by a unique particle, the intervalic string. There is no different particles to play different roles yet, but a unique particle which play all roles. By this reason it can be said that the intervalic string represents the very last and genuine *consciousness* of the Universe. Now we can draw and interpret the assembly of every subatomic particle in the intervalic primordial aggregation as the result of an *exchange of information* between particles. Then, the nature of every subatomic particle would be no other than an intervalic *structure of consciousness* (see the table).

CLASSIFICATION OF EXCHANGE FREQUORCES

We can divide the interactions into some kinds depending on whether the carrier particle is identical to the source particle or not. In this last case we also can differentiate two kinds: the carrier particle is the whole particle but their constituent subparticles are drawn composing a different intervalic structure, or it is a fragment of the source particle. And finally in this last case we can differentiate as well two cases: the carrier is a massful or a massless particle (see table).

Although the usual meaning of the exchange frequorce is reserved for some interactions between molecules where the interchange of molecules make some kind of attractive “force” between them, the fact is that the carrier of any interaction must always come from the own source particle, and therefore always exists some kind of exchange in an interaction. According to this criterion *all* interactions would effectively be exchange frequorces, and all derive and have its origin in the first exchange frequorce between intervalic strings. Because of in long-ranged interaction the carriers are massless particles (photon and graviton), these interactions do not seem to be exchange frequorces, but they can be considered this way too. Therefore, in certain sense all interactions of Nature are manifestations —more or less apparent— of the primordial consciousness.

ORGANIC *VERSUS* INORGANIC WORLD

Across all the Modern Era it has been a common place to believe that the laws governing life and organic world was absolute and essentially different than those ones governing the physical —inorganic— world. This mismeeting was going to mean a great fracture in the human knowledge which has not benefited from this separation: "organic" sciences have lacked a lot of times of a truthful scientific rigour and mathematical way of thinking; on the other hand, "inorganic" sciences have become, say, inquisitorial regarding new ideas as well as regarding some facts coming from outside the inorganic world —a deplorable behaviour which goes against the aim and method of real *science*, and which reduces the extraordinary greatness of science—.

Nevertheless IT has already postulated in this subject some features that join both worlds (really both realms are only separated in the primitive human mind, not in Nature). Moreover, the parallelisms are drawn and reach to the last foundations of the inorganic world, that is to say, the connect the laws of life with the last and strongest principles and laws of Physics at quantum world —or better, at the subquantum world insofar as they derive from the intervalic structure of subatomic particles, a scale which should be named subquantum since for Quantum Theory the physical world ends with the subatomic particles as they are postulated axiomatically to be structureless—. Let us mention, among others, the following isomorphisms:

1) The primordial aggregation, from intervalinos to palestrinos, is a clear and dramatically huge example of *spontaneous order* and organization in the inorganic physical world, leaded by the most fundamental principles of Physics. The next assembly of atoms, molecules, stars, galaxies and life structures is another example of the same principle which leads towards an spontaneous order in the Universe. This spontaneous order is not a metaphysical concept, but an important feature of the Universe which is fully explained by physical principles, although at some scales (like galaxies and life) they are not completely understood yet.

2) Closely related with the primordial aggregation, the successive symmetry breakings produced an *increasing* of the global symmetry in the primordial Universe, which led to the actual Universe, instead of a *decreasing* as the Standard Model have postulated erroneously, and supposing stupidly that God plays dice. This is perhaps the first case in which such an increasing of order and symmetry has been postulated based on fundamental laws of Physics, but not on some more or less fantastic speculations on the mysteries

of life.

3) The fact that, according to IT, nucleus is composed by quarks or gaudinos instead of nucleons, may seem disconcerting since when breaking a nucleus in a reaction of nuclear fission the broken nucleus leaves nucleons, but not quarks or gaudinos. However, anyone with some experience in scenic arts, music, dance or drama, will understand this phenomenon as it is closely related with one the most important rules of scenic arts: Nature does not *pre-form* anything. In piano playing this is an important aspect of the transcendental technique: when a chord or any other complex disposition has to be played, the hand *never pre-form* the fingers, making a mould with the fingers equal to the chord disposition before the hand touches the keyboard. On the contrary, when the hand touches the keyboard, and exactly just at this moment, the fingers adopt instantaneously the disposition of the chord, which disappears immediately as soon as the fingers leaves those keys. From a mechanic point of view this may seem to be an unexplained miraculous of the physiology of life, but this is the way in which Nature reaches the minimal state of energy in the movement of organic bodies. We will see along this book how a lot of features of the typical behaviour of life (for example, auto organization and spontaneous order), will be also found at the last foundations of the inorganic world at quantum scale. Here we have another example: in the same way as natural biomechanics does not pre-form in a mould the notes of a chord, Nature does not pre-form the constituent quarks or gaudinos of nucleus as nucleons inside the nucleus: nucleons are formed just when some quarks or gaudinos have enough energy to leave the nucleus making a nucleon.

4) All living beings are holograms of energy and matter. The holographic concept is a so powerful feature of life, known by various ancient medicines several thousands of years ago, that is was disappointing the fact that we would not know any other example of inorganic hologram but the photographic ones. Now we have find it at the very last foundations of Nature, in the own real space of the Universe: the *space hologram*, which stuff is made from intervalic strings and which can be “viewed” when illuminating with the corresponding “laser” of information, the *coherent consciousness*, a state of consciousness which today unfortunately only can be reached by very few persons like lamas, yogis and so on.

5) The series of the *intervalic code* of subatomic particles is analogous and resembles the *genetic code* of human being and animals. Both codes are made in the same manner: *long strands composed by the most simple elements* which encode the information in binary digits. The main difference be-

tween both codes from an information view does not lie in the host, which is irrelevant, but that the intervalic code of subatomic particles is composed with *one* bit: ↑—↓, while the genetic code is more complex because of the intervention of four molecules: A, G, C, T. The logic inherent to both constructions is the same, and it is clear that Nature knows that this way is the most safe mode to made the world, and Nature has used the same mode or working to make both the inorganic blocks —subatomic particles— and the organic blocks —the living cells— as well. The other principal rule of paramount wisdom in which Nature works, which is complementary to this one, is the following:

6) Those long strands of bits are not drawn in spacetime as free strands. On the contrary, they are precisely packed and assembled forming *successive levels of structures* in which reside the majority of the physical features. The last level of those structures is what is viewed as subatomic particles for the intervalic code (inorganic world), and proteins for the genetic code (organic world). It can also be noted that these two rules of Nature are also closely shared in composition of musical works using intervals in the Intervalic Theory of Music.

7) The transmission of information along the continuum spacetime of intervalic strings is analogous to the transmission of information in the nervous system. Both intervalic strings and neurones merely transmit or *replicate* the information in one end to the other end, where the next intervalic string or the next neurone makes just the same, and so on. Thus what is replicated from one end to another is essentially neither matter nor energy, but *information*. That replication of that information is perceived as *movement in spacetime*, and the velocity of that movement in the Intervalic Space is always the speed of light, both for energy as for matter, as we have explained in the chapter on the intervalic geometry of light. On the other hand, when what is to be replicated is not energy or matter but pure information —that is to say, intervalic strings—, the replication takes place at a distance because intervalic strings are timeless —or energyless— and do not move in spacetime, but only in real space.

8) The *harmonious growth* of living bodies is ruled by the the Φ number, the *golden mean* or the Φ number. The old classic-quantum paradigm believed that this number makes a separation between the organic and the inorganic world. However, the Intervalic Theory has found that the golden mean appears at the very beginning of the intervalic primordial Universe, ruling the constituent energies involved in the assembly of subatomic particles:

Structural energy ratios of nucleon

$\langle \mathrm{I}(N)/\mathrm{U}(N)\rangle = 1.618829402 \sim \Phi$

$\langle \mathrm{I}(N)/\mathrm{E}(N)_{\mathrm{mass}}\rangle = 0.618143766 \sim \Phi^{-1}$

$\langle \mathrm{U}(N)/\mathrm{E}(N)_{\mathrm{mass}}\rangle = 0.381855365 \sim 1 - \Phi^{-1}$

Deviation from the golden mean, Φ

$\Delta[\langle \mathrm{I}(N)/\mathrm{U}(N)\rangle] = +0.0491593\%$

$\Delta[\langle \mathrm{I}(N)/\mathrm{E}(N)_{\mathrm{mass}}\rangle] = +0.0177623\%$

$\Delta[\langle \mathrm{U}(N)/\mathrm{E}(N)_{\mathrm{mass}}\rangle] = -0.0289759\%$

Chapter 35

THE INTERVALIC CODE

THE *INTERVALIC CODE*

We have seen that information is the first degree of freedom of Nature and that the informational interaction is beneath all intervalic structures inside subatomic particles. This means that every degree of freedom of Nature could finally be reduced to information. Being two *identical* intervalic strings, S and $\underline{S}$, of length the intervalic length, $\hbar$; if they have got identical *position* they must be in a *symmetric* state under interchange:

$S = +\frac{1}{2}\hbar$, and $\underline{S} = +\frac{1}{2}\hbar$, or equally
$S = -\frac{1}{2}\hbar$, and $\underline{S} = -\frac{1}{2}\hbar$

And the assembly —closed string (photon)— is:
$|S\underline{S}|_s = \{ |SS|, 2^{-\frac{1}{2}} (|S\underline{S}| + |\underline{S}S|), |\underline{SS}| \}$

If they have not got identical *position* they must be in an *antisymmetric* state under interchange, as we have explained hereinbefore:

$S = +\frac{1}{2}\hbar$, and $\underline{S} = -\frac{1}{2}\hbar$, or equally
$S = -\frac{1}{2}\hbar$, and $\underline{S} = +\frac{1}{2}\hbar$

And the assembly —bistring (continuum space)— is:
$|S\underline{S}|_a = 2^{-\frac{1}{2}} (|S\underline{S}| - |\underline{S}S|)$

In order to simplicity we can replace S and $\underline{S}$ by the usual spin notation ↑ and ↓, since the intervalic strings are identical, however now the arrows refer to *prespin* instead of spin. So in the beginning of the beginning we have a Universe composed uniquely by identical intervalic strings, with $\uparrow \equiv S$ and $\downarrow \equiv \underline{S}$.

Both ↑ and ↓ can be considered as the simplest kind of *information* available in the Universe, which is related to the position *—prespin—* of two intervalic strings. This would be like the last *bit* of information of Nature. In this way we have that the states of photon, *γ*, and of bistring, BS, which structures are made from the assembly of identical intervalic strings (open strings), are:

$\gamma = \{ |\uparrow\uparrow|, 2^{-\frac{1}{2}} (|\uparrow\downarrow| + |\downarrow\uparrow|), |\downarrow\downarrow| \}$
$BS = 2^{-\frac{1}{2}} (|\uparrow\downarrow| - |\downarrow\uparrow|)$

Since graviton, *g*, and intervalino, **I**, are made respectively from the assembly in a symmetric and antisymmetric states under interchange of closed strings (photons), we can write their states as an assembly of assemblies of identical intervalic strings:

$$g = |\gamma\underline{\gamma}|_s = [\, |\gamma\gamma|, 2^{-\frac{1}{2}} (|\gamma\underline{\gamma}| + |\underline{\gamma}\gamma|), |\underline{\gamma}\underline{\gamma}| \,] =$$
$$= [\, |\{ |\uparrow\uparrow|, 2^{-\frac{1}{2}} (|\uparrow\downarrow| + |\downarrow\uparrow|), |\downarrow\downarrow| \} \{ |\uparrow\uparrow|, 2^{-\frac{1}{2}} (|\uparrow\downarrow| + |\downarrow\uparrow|), |\downarrow\downarrow| \}|, 2^{-\frac{1}{2}} (|\{ |\uparrow\uparrow|, 2^{-\frac{1}{2}} (|\uparrow\downarrow| + |\downarrow\uparrow|), |\downarrow\downarrow| \} \{ |\downarrow\downarrow|, 2^{-\frac{1}{2}} (|\downarrow\uparrow| + |\uparrow\downarrow|), |\uparrow\uparrow| \}| + |\{ |\downarrow\downarrow|, 2^{-\frac{1}{2}} (|\downarrow\uparrow| + |\uparrow\downarrow|), |\uparrow\uparrow| \} \{ |\uparrow\uparrow|, 2^{-\frac{1}{2}} (|\uparrow\downarrow| + |\downarrow\uparrow|), |\downarrow\downarrow| \}|), |\{ |\downarrow\downarrow|, 2^{-\frac{1}{2}} (|\downarrow\uparrow| + |\uparrow\downarrow|), |\uparrow\uparrow| \} \{ |\downarrow\downarrow|, 2^{-\frac{1}{2}} (|\downarrow\uparrow| + |\uparrow\downarrow|), |\uparrow\uparrow| \}| \,]$$

$$\mathbf{I} = 2^{-\frac{1}{2}} (|\gamma\underline{\gamma}| - |\underline{\gamma}\gamma|) =$$
$$= 2^{-\frac{1}{2}} (|\{ |\uparrow\uparrow|, 2^{-\frac{1}{2}} (|\uparrow\downarrow| + |\downarrow\uparrow|), |\downarrow\downarrow| \} \{ |\downarrow\downarrow|, 2^{-\frac{1}{2}} (|\downarrow\uparrow| + |\uparrow\downarrow|), |\uparrow\uparrow| \}| - |\{ |\downarrow\downarrow|, 2^{-\frac{1}{2}} (|\downarrow\uparrow| + |\uparrow\downarrow|), |\uparrow\uparrow| \} \{ |\uparrow\uparrow|, 2^{-\frac{1}{2}} (|\uparrow\downarrow| + |\downarrow\uparrow|), |\downarrow\downarrow| \}|)$$

We will name the state of the identical intervalic strings which constitute any subatomic particle as the *intervalic code* of the particle.

In a similar way, insofar as dalino, D, and bintervalino, BI, are made respectively from the assembly in a symmetric and antisymmetric states under interchange of intervalinos, we can write their intervalic codes as an assembly of assemblies of assemblies of identical intervalic strings:

$$D = \{ |\mathbf{I}\,\mathbf{I}|, 2^{-\frac{1}{2}} (|\mathbf{I}\,\underline{\mathbf{I}}| + |\underline{\mathbf{I}}\,\mathbf{I}|), |\underline{\mathbf{I}}\,\underline{\mathbf{I}}| \} =$$
$$= \{ |\, [\, 2^{-\frac{1}{2}} (|\gamma\underline{\gamma}| - |\underline{\gamma}\gamma|) \,] \, [\, 2^{-\frac{1}{2}} (|\gamma\underline{\gamma}| - |\underline{\gamma}\gamma|) \,] \,|, 2^{-\frac{1}{2}} (|\, [\, 2^{-\frac{1}{2}} (|\gamma\underline{\gamma}| - |\underline{\gamma}\gamma|) \,] \, [\, 2^{-}$$

^{½} (|γ̲γ| - |γγ̲|)] | + | [$2^{-½}$ (|γ̲γ| - |γγ̲|)] [$2^{-½}$ (|γγ̲| - |γ̲γ|)] |), | [$2^{-½}$ (|γ̲γ| - |γγ̲|)] [$2^{-½}$ (|γ̲γ| - |γγ̲|)] | } =

= { | [$2^{-½}$ (|{ |↑↑|, $2^{-½}$ (|↑↓| + |↓↑|), |↓↓| } { |↓↓|, $2^{-½}$ (|↓↑| + |↑↓|), |↑↑| } | - |{ |↓↓|, $2^{-½}$ (|↓↑| + |↑↓|), |↑↑| } { |↑↑|, $2^{-½}$ (|↑↓| + |↓↑|), |↓↓| }|)] **[** $2^{-½}$ (| { |↑↑|, $2^{-½}$ (|↑↓| + |↓↑|), |↓↓| } { |↓↓|, $2^{-½}$ (|↓↑| + |↑↓|), |↑↑| }| - |{ |↓↓|, $2^{-½}$ (|↓↑| + |↑↓|), |↑↑| } { |↑↑|, $2^{-½}$ (|↑↓| + |↓↑|), |↓↓| }|)] |, $2^{-½}$ (| [$2^{-½}$ (|{ |↑↑|, $2^{-½}$ (|↑↓| + |↓↑|), |↓↓| } { |↓↓|, $2^{-½}$ (|↓↑| + |↑↓|), |↑↑| }| - |{ |↓↓|, $2^{-½}$ (|↓↑| + |↑↓|), |↑↑| } { |↑↑|, $2^{-½}$ (|↑↓| + |↓↑|), |↓↓| }|) **]** **[** $2^{-½}$ (|{ |↓↓|, $2^{-½}$ (|↓↑| + |↑↓|), |↑↑| } { |↑↑|, $2^{-½}$ (|↑↓| + |↓↑|), |↓↓| }| - |{ |↑↑|, $2^{-½}$ (|↑↓| + |↓↑|), |↓↓| } { |↓↓|, $2^{-½}$ (|↓↑| + |↑↓|), |↑↑| }|) **]** | + | [$2^{-½}$ (|{ |↓↓|, $2^{-½}$ (|↓↑| + |↑↓|), |↑↑| } { |↑↑|, $2^{-½}$ (|↑↓| + |↓↑|), |↓↓| }| - |{ |↑↑|, $2^{-½}$ (|↑↓| + |↓↑|), |↓↓| } { |↓↓|, $2^{-½}$ (|↓↑| + |↑↓|), |↑↑| }|) **]** **[** $2^{-½}$ (|{ |↑↑|, $2^{-½}$ (|↑↓| + |↓↑|), |↓↓| } { |↓↓|, $2^{-½}$ (|↓↑| + |↑↓|), |↑↑| } | - |{ |↓↓|, $2^{-½}$ (|↓↑| + |↑↓|), |↑↑| } { |↑↑|, $2^{-½}$ (|↑↓| + |↓↑|), |↓↓| }|) **]** |), | [$2^{-½}$ (|{ |↓↓|, $2^{-½}$ (|↓↑| + |↑↓|), |↑↑| } { |↑↑|, $2^{-½}$ (|↑↓| + |↓↑|), |↓↓| }| - |{ |↑↑|, $2^{-½}$ (|↑↓| + |↓↑|), |↓↓| } { |↓↓|, $2^{-½}$ (|↓↑| + |↑↓|), |↑↑| }|) **]** **[** $2^{-½}$ (|{ |↓↓|, $2^{-½}$ (|↓↑| + |↑↓|), |↑↑| } { |↑↑|, $2^{-½}$ (|↑↓| + |↓↑|), |↓↓| }| - |{ |↑↑|, $2^{-½}$ (|↑↓| + |↓↑|), |↓↓| } { |↓↓|, $2^{-½}$ (|↓↑| + |↑↓|), |↑↑| }|) **]** | }

BI = $2^{-½}$ (|**I I̲**| - |**I̲ I**|) =

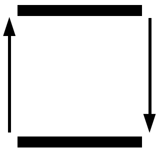
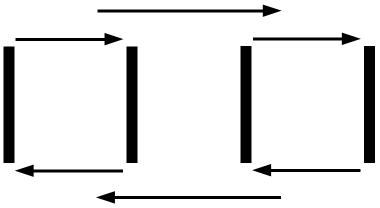
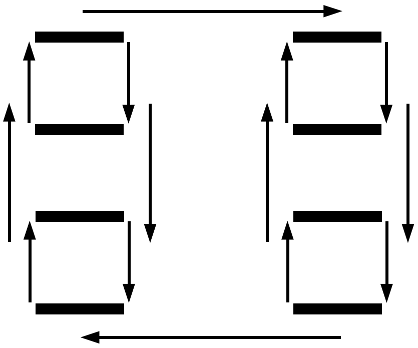
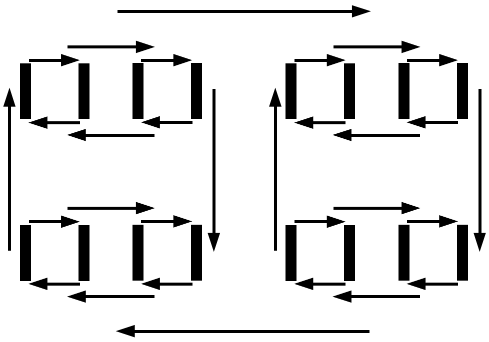
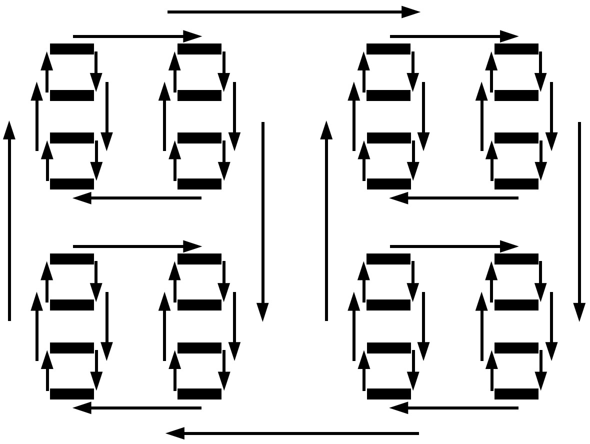
= $2^{-½}$ (| [$2^{-½}$ (|γγ̲| - |γ̲γ|)] [$2^{-½}$ (|γ̲γ| - |γγ̲|)] | - | [$2^{-½}$ (|γ̲γ| - |γγ̲|)] [$2^{-½}$ (|γγ̲| - |γ̲γ|)] |) =

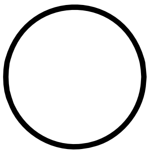
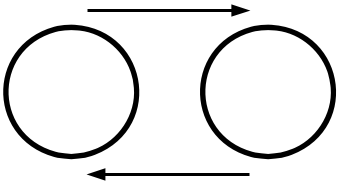
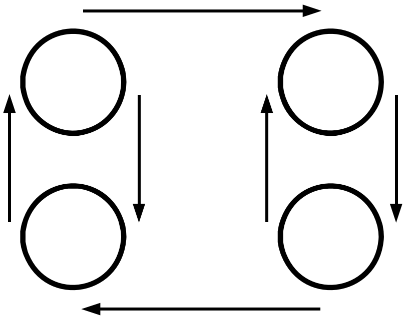
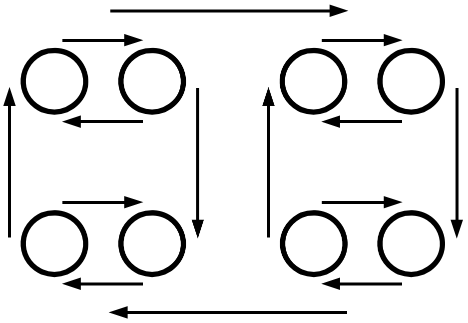
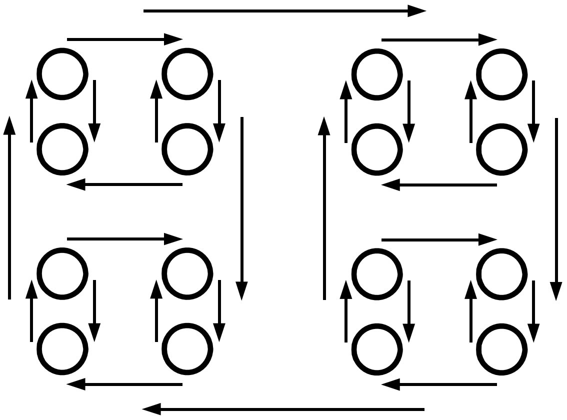
= $2^{-½}$ (| [$2^{-½}$ (|{ |↑↑|, $2^{-½}$ (|↑↓| + |↓↑|), |↓↓| } { |↓↓|, $2^{-½}$ (|↓↑| + |↑↓|), |↑↑| }| - |{ |↓↓|, $2^{-½}$ (|↓↑| + |↑↓|), |↑↑| } { |↑↑|, $2^{-½}$ (|↑↓| + |↓↑|), |↓↓| }|) **]** **[** $2^{-½}$ (|{ |↓↓|, $2^{-½}$ (|↓↑| + |↑↓|), |↑↑| } { |↑↑|, $2^{-½}$ (|↑↓| + |↓↑|), |↓↓| }| - |{ |↑↑|, $2^{-½}$ (|↑↓| + |↓↑|), |↓↓| } { |↓↓|, $2^{-½}$ (|↓↑| + |↑↓|), |↑↑| }|) **]** | - | [$2^{-½}$ (|{ |↓↓|, $2^{-½}$ (|↓↑| + |↑↓|), |↑↑| } { |↑↑|, $2^{-½}$ (|↑↓| + |↓↑|), |↓↓| }| - |{ |↑↑|, $2^{-½}$ (|↑↓| + |↓↑|), |↓↓| } { |↓↓|, $2^{-½}$ (|↓↑| + |↑↓|), |↑↑| }|) **]** **[** $2^{-½}$ (|{ |↑↑|, $2^{-½}$ (|↑↓| + |↓↑|), |↓↓| } { |↓↓|, $2^{-½}$ (|↓↑| + |↑↓|), |↑↑| }| - |{ |↓↓|, $2^{-½}$ (|↓↑| + |↑↓|), |↑↑| } { |↑↑|, $2^{-½}$ (|↑↓| + |↓↑|), |↓↓| }|) **]** |)

These are dalinos D_2 composed by two intervalinos, but the process is identical for all dalinos. To write the intervalic code of electron we only have to replace those 2 intervalinos in symmetric state by 270 intervalinos in symmetric state under interchange (theoretically is trivial, but try to write it down in full!). For gaudinos, lisztinos and monteverdinos the process is similar. Gaudinos will be an assembly of assemblies of assemblies of assemblies of identical intervalic strings, lisztinos will be an assembly of assemblies of assemblies of assemblies of assemblies of identical intervalic strings, and so on. To write down completely the series of the intervalic code of a simple proton is an easy labour, but it can take some thousands pages.

In this way we have reached a great achievement: to reduce the state of subatomic particles to a set composed with the last and simplest blocks of information in Nature. Now I think it is not difficult to understand the enormous amount of information —encoded in bits— that is kept in the intervalic code of a nucleon or any other subatomic particle. And be aware that we have neither discussed the information which may be encoded in the *neutral* states of subatomic particles which constituent subparticles are in symmetric state under interchange (as for example photon, graviton, dalino and gaudino), neither the *virtual* states of subatomic particles, which will be explained opportunely when describing the intervalic changeless interaction. Taking in consideration such states the number of possibilities are overwhelming. Henceforth the objections about the absence of a physical host in matter, or in light, or in spacetime for the *Sintergetics* of Carvajal, the *morphic fields* of Sheldrake, the *memory of water* of Emoto, or the *quantum potential* of Bohm, will vanish by themselves since the fantastic assumption on the structurelessness of subatomic particles has proved its logical absurdity and fruitlessness. In the Universe all is made from the most simple and symmetric forms and structures, and to deny its existence is to deny the mind of Nature, the way in which Nature works.

INTERVALIC STRUCTURES OF SUBATOMIC PARTICLES REPRESENTED AS *STRUCTURES OF INFORMATION* STARTING FROM THE INTERVALIC STRING (OPEN STRING)

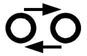
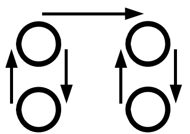
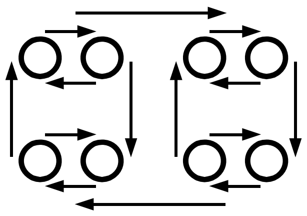
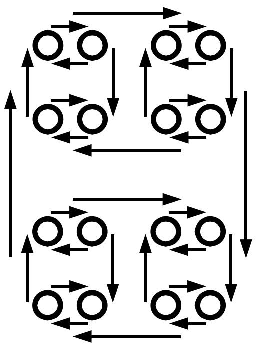
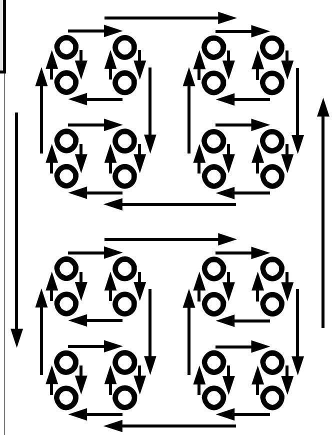
Photon	
Intervalino	
Dalino	
Gaudino	
Lisztino	

INTERVALIC STRUCTURES OF SUBATOMIC PARTICLES REPRESENTED AS *STRUCTURES OF INFORMATION* STARTING FROM THE PHOTON (CLOSED STRING)	
Photon	
Intervalino	
Dalino	
Gaudino	
Lisztino	

INTERVALIC PRIMORDIAL ASSEMBLY OF INTERVALIC STRUCTURES AS CONSECUTIVE ASSEMBLIES OF INTERVALIC STRINGS

Assemblies at each level are made in symmetric and antisymmetric states under interchange, both ones with identical shares. The appearance of each new *intervalic structure* assembled makes automatically the introduction of a new *degree of freedom* in the primordial Universe which is manifested as a new *fundamental interaction* corresponding to that degree of freedom.

Intervalic structure levels: 1 Intervalic String (S), 2 Photon (γ), 3 Intervalino (**I**), 4 Dalino (D), 5 Gaudino (G), 6 Lisztino(L), 7 Monteverdino (M), 8 Palestrino (P).

1	2	3	4	5	6
INTERVALIC STRING (Share = 1) *Intervalic string state* $S = \{\uparrow, \downarrow\}$ *Intervalic string radius* $r_S = \tfrac{1}{2}\hbar$ *Intervalic string spin* $J_S = \tfrac{1}{2}\hbar$ *Intervalic string length* $l_S = \pi\,\mathbf{l_I} = \pi\hbar$	**PHOTON** (Share = 1/2) = Symmetric assembly of Intervalic Strings: $\gamma = \{ \lvert\uparrow\uparrow\rvert,$ $2^{-\frac{1}{2}} (\lvert\uparrow\downarrow\rvert + \lvert\downarrow\uparrow\rvert), \lvert\downarrow\downarrow\rvert \}$ *Photon radius* $r_\gamma = \hbar =$ $= 1.0556363 \cdot 10^{-34}$ (m) *Frequorce of* *primordial photon* $\varphi_\gamma = \boldsymbol{\varphi}_\mathbf{I} = c\,\hbar^{-1} =$ $= 2.839921837 \cdot 10^{42} (s^{-1})$ *Temperature of* *primordial photon* $\Theta_\gamma = \boldsymbol{\Theta}_\mathbf{I} = c\,k_B^{-1} =$ $= 2.17138589 \cdot 10^{31}$ (K)	**INTERVALINO** (Share = 1/4) = Antisymmetric assembly of photons $\mathbf{I} = 2^{-\frac{1}{2}} (\lvert\gamma\underline{\gamma}\rvert - \lvert\underline{\gamma}\gamma\rvert)$ *Intervalino charge* $\mathbf{q_I} = \sqrt{-(c^{-1}\hbar)} = 5.93398995 \cdot 10^{-22}$ (C) *Intervalino intervalic energy* $I(\mathbf{I}) = c^{\pm 2}\,\hbar\,\mathbf{q_I}^{-2} = c^{-1} =$ $= 20{,}819.42423 (MeV/c^2)$ *Electromagnetic energy:* $U(\mathbf{I}) = 0$ *Intervalino mass:* $m(\mathbf{I}) = I(\mathbf{I})$ *Spin energy:* $E_J(\mathbf{I}) = I(\mathbf{I}) - U(\mathbf{I}) = c^{-1}$ *Intervalino radius*: $r_\mathbf{I} = c / \omega_\mathbf{I} = 2\hbar$	16 **DALINOS** (Share = 1/8) $D^{(\pm 1/1,2,3,5,6,9,10,15,18,27,30,45,54,90,135,270)}$ = Symmetric assembly of Intervalinos (Big Bang origin) ***Electron*** $e = G_1 = D_{270} = 270\,\mathbf{I}$ *Electron charge* $e = 270\,\mathbf{q_I} = 270\sqrt{-(c^{-1}\hbar)}$	**GAUDINOS** (Share = 1/16) = Symmetric assembly of Dalinos $G^{(\pm 1/3, \pm 2/3)}$: ***Nucleonic gaudinos*** $G^{(\pm)}$: ***Leptons-Ch. Mass. Bosons:*** **Muon, Tau, $Z^\pm$, $W^\pm$, $Y^\pm$, $X^\pm$**	49 **LISZTINOS**$^{(\pm 1/3, \pm 2/3)}$ (Share = 1/32) = Assembly of gaudinos. ***Quarks***
	CHI = Antisymmetric... Dark energy ¢ = $2^{-\frac{1}{2}} (\lvert\uparrow\downarrow\rvert - \lvert\downarrow\uparrow\rvert)$	**GRAVITON** = Symmetric… Dark energy, $g = \lvert\gamma\underline{\gamma}\rvert_s =$ $= [\lvert\gamma\gamma\rvert, 2^{-\frac{1}{2}} (\lvert\gamma\underline{\gamma}\rvert + \lvert\underline{\gamma}\gamma\rvert), \lvert\underline{\gamma}\underline{\gamma}\rvert]$	**BINTERVALINO** = Antisym… Dark matter $BI = 2^{-\frac{1}{2}} (\lvert\mathbf{I}\,\underline{\mathbf{I}}\rvert - \lvert\underline{\mathbf{I}}\,\mathbf{I}\rvert)$	**BIDALINO** = Antisymmetric... Dark matter $BD = 2^{-\frac{1}{2}} (\lvert\mathbf{D}\underline{\mathbf{D}}\rvert - \lvert\underline{\mathbf{D}}\mathbf{D}\rvert)$	**LISZTINOS**$^{(0)}$ ***Bileptons-ZCMB*: Z^0, W^0, Y^0, X^0**
					

Chapter 37

THE END
OF
STANDARD MODEL

STRUCTURELESSNESS *VERSUS* COMPOSITENESS

> When two theories are available and both are compatible with the given arsenal of facts, then there are no other criteria to prefer one over the other except the intuition of the researcher. Therefore one can understand why intelligent scientists, cognizant both of theories and of facts, still be passionate adherent of opposing theories.
>
> ALBERT EINSTEIN
> *Alice Calaprice, The Expanded Quotable Einstein*

The misleading SM can not explain neither the value nor the origin of mass and electric charge of no one subatomic particle, and *a fortiori*, the own origin and making of mass and electric charge in Nature. On the contrary, IT does it, and in a very economic and elegant way. And there are hundreds of new important deductions forbidden to SM because they can only be made within intervalic dimensions or in the Intervalic Space. Therefore, the comparison between SM and IT is immediate and straightforward: SM explains almost nothing and in a awkward and doubtful way, IT explains almost everything and in a simple and reliable way.

As Einstein wrote in a famous sentence (***On Special and General Relativity***), the most beautiful destiny of a theory is to stay as a *limit case* inside a wider theory. However I am afraid that this is not the final destiny deserved to SM. Of course there are a lot of knowledge which can and must be saved. But an overall theory of structurelessness is radically incompatible with the compositeness found in Nature by IT. Therefore structurelessness and its related degenerate units can not be maintained by no means as a "limit case" inside IT because they are simply false, they are absolutely uncertain, they are definitively wrong.

On the contrary, Relativity does stay as a limit case inside the fascinating geometric features of the Intervalic Space, as I have showed in other site.

Before the postulation of IT compositeness seemed to be an unattainable task, plagued of troubles and logical difficulties elsewhere. *After* IT has been formulated it is hard to understand the credit given during almost one century to a theory of compositelessness like SM. Such model affirmed *ad hoc* the uncanny existence of 3 structureless —yet different— leptons, 3 structureless —yet different— neutrinos, 6 · 3 = 18 structureless —yet different— quarks, 10 structureless —yet different— massless bosons (photon, graviton and 8 gluons), and 2 structureless —yet different— massive bosons ($W^{\pm}$, Z^0), not to mention that these numbers can be freely increased at any moment depending on the last results obtained in the newest colliders. And not to mention the mystery about the existence of some number of structureless —yet different— dark matters. And not to mention the outlandish and wondrously structureless —yet different— Higgs bosons, whose odd existence is postulated in some number, and the wide set of fantastic particles, of course, all of them structureless —yet different—, postulated by SUSY. In resume, we have got not less than 36 structureless —yet different— fundamental particles, plus some considerable number of structureless —yet different— Higgs bosons, SUSYnos and dark matters. It is really grotesque! Perhaps we should repeat this *logical absurdity* once more: SM postulates that there are more than 36 *structureless —yet different*— fundamental particles (!). If I am not still absolutely crazy (and I am not), it follows that no one respectable theory can postulate more than *one* structureless thing without falling into… logical inconsistency, ambiguity, animism, mysticism, fairy tales,… At worst SM should have had postulated the existence of 36 different fundamental particles whose structures were unknown yet, but it can not postulate by no means that those 36 *different* things are however and mysteriously *structure-*

less. And less of all, to broad a fanatic statement based on such postulate of *structurelessness*, almost denying the rank of "science" to any theory that avoids that fantastic assumption.

Henceforth, although any comparison between SM and IT is unequal, we can perhaps make some comments on the subject where the comparison is possible.

LEPTON SECTOR

The lepton sector of SM is perhaps one of the places where the Intervalic Theory reach directly its most astonishing results because all masses of leptons-intermediate massive bosons are derived, with insulting simplicity, directly from the intervalic system of units, through the most simple intervalic structures allowed to subatomic particles by the intervalic symmetries: *dalinos* and *gaudinos*. Moreover, IT gives us inclusive the inner dynamics of leptons-massive bosons based on the geometric means of their intervalic architecture.

When this astounding simplicity and fruitful features are compared with the awkwardness of SM, the result can't be more disappointing for the traditional model. In order to yield *ad hoc* the magnitudes of the lepton's masses SM has to introduce three arbitrary coupling constants without demonstrated physical existence (the usually named g, g_1 and g_2); two additional arbitrary parameters: the Higgs mass and the vacuum expectation value of the Higgs field, neither of them have been detected and its existence is enough doubtful, not to say the fantastic Higgs mechanism —both mathematical and physically— to give mass to particles…; and finally three more parameters to "deduce" the lepton's masses. Not to mention the artificialness in the introduction of the Weinberg mixing angle, which looks Nature like a strange chef making a melting pot, but we do not believe that subatomic particles could be the result of that clumsy mixing, but of an underlying and extraordinarily simple and elegant principles of symmetry, of *intervalic symmetry*. We also don't know what is the supposed electroweak interaction since there is not a real unification of both interactions into a single one. Thus, in total, we have a minimum of 8 arbitrary parameters plus some doubtful physical features and assumptions in the SM lepton sector, whilst in IT we have no one parameter and no one assumption to deduce the same and more particles than SM.

Moreover, the general process of breaking symmetry in the deduction of GWS model appears to be doubtful: why a SU(2) symmetry is broken for giving a residual U(1) symmetry? This would mean that *Nature goes back-*

wards. Do we believe that this may be the way of Nature? I really don't think so. On the contrary, the IPA postulated by IT establishes a very different concept of symmetry breaking, where each interaction of Nature is intimately related to an intervalic symmetry and appears as a consequence of the new kind of particles born at each one of the steps in the primordial aggregation of particles, which started from the intervalic string, as I have explained in other site.

QUARK SECTOR

The quark sector of SM has been acknowledged as a weak model, lacking of any mathematical elegance, with the ominous introduction of ten arbitrary parameters: the four arbitrary parameters in the Kobayashi-Maskawa matrix and the six parameters in the quark masses. Besides, QCD is not comparable by no means to QED or inclusive to the doubtful GSW model, where a lot of non attractive physical features has been introduced ad hoc, like the degrees of freedom of flavours and colours, and the supposed long ranged gluon field. It can be said that the quark sector and the strong interaction lack of a solid explanation yet. The only partially successful feature of this sector may be the quarks model of M. Gell-Mann, Y. Neeman and G. Zweig, which reaches only a poor and partial explanation on the zoo of particles detected. Although the quark model goes right for a small part of particles, there is a greater part for which the model does not go anyway.

On the contrary, the description of the changeless —strong— intervalic interaction in IT is one of its most outstanding features due to its remarkable physical simplicity which relies on the intervalic energy and on fundamental intervalic principles in close relation with the own intervalic system of units and dimensions. The masses and intervalic structures of quarks, mesons and baryons are yielded in IT in a similar way as the masses and intervalic structures of leptons-massive bosons in the lepton sector. Although it is absolutely clear that the intervalic structures of dalinos, gaudinos, lisztinos and monteverdinos are the last and underlying physical principles and symmetries of Nature, the intervalic structures involved are much more complex in this case and therefore there is still a lot of research pending to do since we now have two additional levels of the intervalic structure: the lisztinian and the monteverdic levels.

The traditional quark model shows some combinations among quarks which goes —although blindly and by chance— only because of the powerful underlying intervalic symmetries of Nature. Now it can runs much more well starting from the intervalic structure of quarks since we known the inner intervalic structure of quarks. This is specially important when studying *decays*, since now they can be much more better understood. In general some few explanations of the structure of hadrons in SM are quite right... *after* correcting all masses and structures of constituent quarks according to IT (perhaps it is equivalent to say that it was in general wrong since its basis were misleading). Really, someone could be tempted to think that the assumption on the "free masses" of quarks and the Higgs mechanism appears to be as the most fantastic and stupid assumption that can ever be made by an intelligent person, although obviously this is not our case (or it is?). Nevertheless, there are still some flashy inaccuracies in hadrons structures and decays that will be shown as the particle model is reformulated according to IT.

The intervalic symmetries of quarks, derived without any adjust by IT, yields a total of seven quark families according to its dalinar symmetry: {D45}, {D30}, {D18}, {D6}, {D5}, {D3} and {D2}, each one composed by seven quarks —some of them are isoquarks determined by the intervalic structures—. Masses, charges and all physical features of quarks are completely derived from their intervalic structures. The contrast between this golden picture and the SM can be more evident.

For example, regarding the constituent quarks of, say, the supposed octet of pseudo scalar mesons of SU(3) with spin 0, it is clear the constituent light quarks of the π meson can't be, by no means, the same quarks *up* and *down* of nucleons… unless it was postulated that sometimes some quarks can have "free masses", which however they are not really "free" because the mass of the π meson is precisely always the same (!). In this case it is doubtful that SM looks like a *scientific theory* but it looks perhaps like an arbitrary pattern adjusted at own convenience.

ANNIHILATION CROSS-SECTION RATIO

The empirical value of the annihilation cross-section ratio in the resonance region with energy < 60 GeV is:

$$R(\sigma) = \sigma(e^+e^- \rightarrow \text{strongly interaction particles}) / \sigma(e^+e^- \rightarrow \mu^+\mu^-) \sim 4$$

The latest experimental value of the ratio R(σ) have been "adjusted" on 3.9 ± 0.3, although a look to the actual graphics shows at first sight that it is slightly greater than 4, apparently around 4.3, as anybody can check easily. Anyway, it is a fact usually forgotten by SM that its proposed value, 11/3 ≈ 3.67, is perhaps too far inclusive from the "adjusted" experimental data to be acceptable. And I am afraid that deviations from the theoretical values below the experimental data appear to be less reliable than deviations above it.

On the contrary, according to IT, there are 21 intervalic structures of quarks below the $Z^0/2$ mass, which is totally verified by means of $W^\pm$ and Z^0 decays (maintaining the usual *universality* assumption). These 21 intervalic structures correspond just and precisely to the whole three first sets of the intervalic symmetries of quarks: {D45}, {D30} and {D18}. The electric charges of those quarks made in the annihilation are fifteen of ⅓ charge and six of ⅔ charge, being the annihilation cross-section ratio postulated by IT:

$$R(\sigma)' = 6\,(⅔)^2 + 15\,(⅓)^2 = 39/9 \approx 4.33$$

The magnitude of R(σ)' is the annihilation cross-section ratio of the intervalic structures of quarks postulated by IT which matches very well with graphics of empirical data, and in any case enough better than SM.

I could lamentably confess that, at first sight, due to the obnoxious influence of SM on my delicate brain, I tried to adjust the original sequence of quarks in order to fit with the experimental data, as there was too much quarks. I made this error because I was so stupid to consider that every quark pertaining to the symmetry {D45} which can have got both charges, ⅓ and ⅔, was to be counted as *two* different intervalic structures, as like as quark *up* is different from quark *down* in the misleading SM. However it is clear that they have the same intervalic structure, $L3D45^{(⅓,\,⅔)}$, and therefore they are only *one* and the same intervalic structure, disregarding their resultant electric charge. Thus, it has to be necessarily postulated that in the annihilation (e^+e^- → strongly interaction particles) is made *one intervalic structure* of the allowed ones, according to the *universality* assumption, disregarding the fantastic silliness of flavours. This means that the pairs of quarks pertaining to the {D45} symmetry made in the annihilation must have all of them electric charge ⅓ instead of ⅔. In other words, there are not made pairs of former quarks up, but only of former quarks down, and likewise with the remaining quarks of that symmetry. This strange and surprising prediction will be able to be experimentally confirmed in a near future.

Recapitulating without to recapitulate, the accurate values predicted by IT according to the threshold energies of the whole families of quarks are as follows:

- At threshold energy of the family of quarks with symmetry {D45} the annihilation cross-section ratio would be: $R(\{D45\}) = 7\,(⅓)^2 = 7/9 \sim 0.78$. However, the mass energy of the last {D45} quark is greater that the mass energy of the first three {D30} quarks. Therefore adding these three ones the ratio is:

$$R(\{D45\}) = 9\,(\tfrac{1}{3})^2 + 1\,(\tfrac{2}{3})^2 = 13/9 \sim 1.44$$

And adding the quarks up to the mass energy of quark $\mathrm{L2D30}^{(\frac{2}{3})}$ (699), which supposedly are the pretended former quarks up and down:

$$R(\{D45\}) = 10\,(\tfrac{1}{3})^2 + 2\,(\tfrac{2}{3})^2 = 18/9 = 2$$

- At threshold energy of the family of quarks with symmetry {D30} the annihilation ratio would be: $R(\{D30\}) = 11\,(\tfrac{1}{3})^2 + 3\,(\tfrac{2}{3})^2 = 23/9 \sim 2.56$. However, the mass energy of the last {D30} quark is once more greater that the mass energy of the first three {D18} quarks. Therefore adding these three ones the ratio will be:

$$R(\{D30\}) = 13\,(\tfrac{1}{3})^2 + 4\,(\tfrac{2}{3})^2 = 29/9 \sim 3.22$$

- At threshold energy of the family of quarks with symmetry {D18}:

$$R(\{D18\}) = 15\,(\tfrac{1}{3})^2 + 6\,(\tfrac{2}{3})^2 = 39/9 \sim 4.33$$

This is the value which SM tries futilely to close with its calculated value —11/3 ~ 3.67, a value too much small— through the fantastic assumption of colouring quarks.

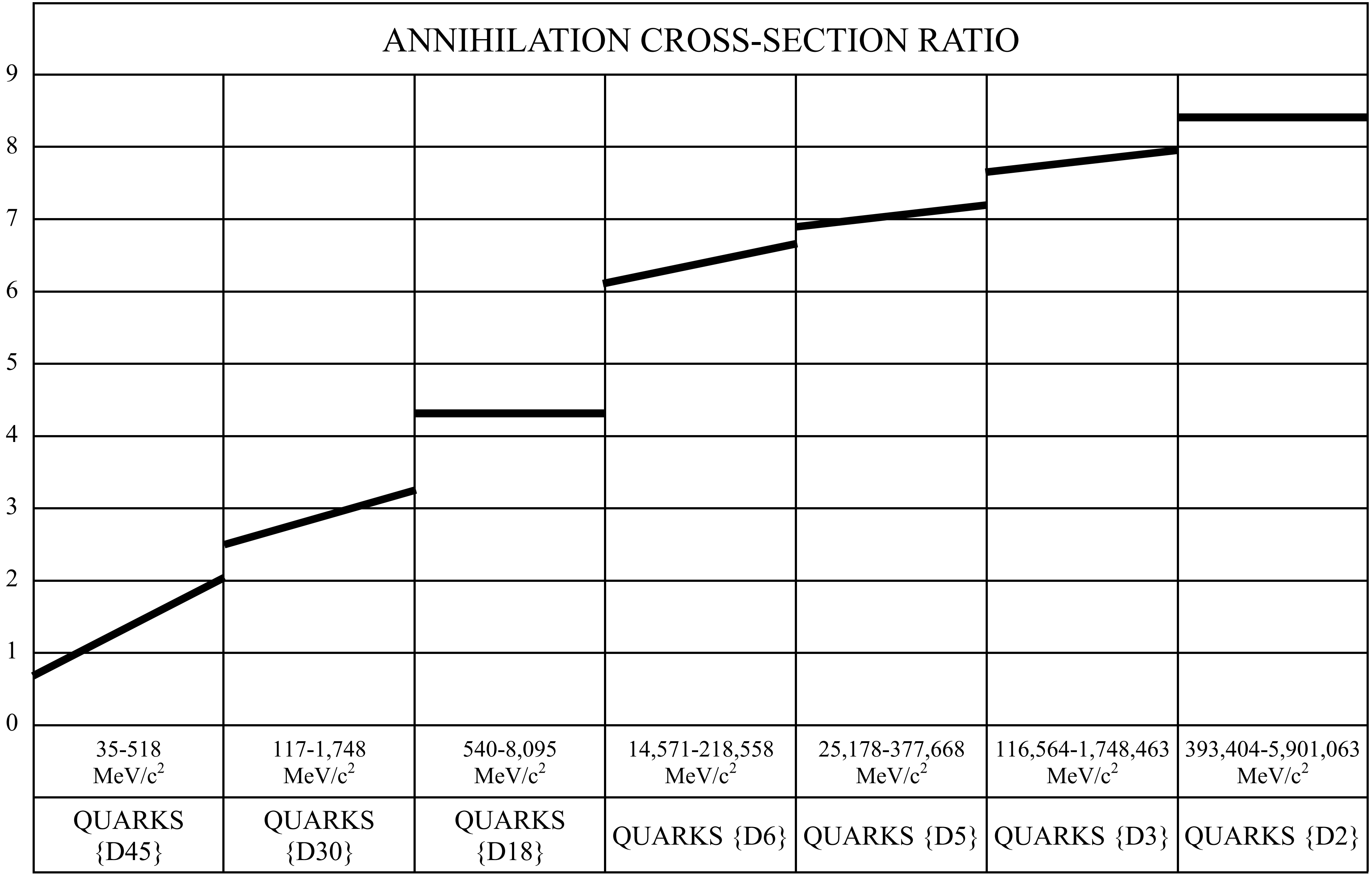
- At threshold energy of the family of quarks with symmetry {D6} the annihilation ratio would be: $R(\{D6\}) = 19\,(\tfrac{1}{3})^2 + 9\,(\tfrac{2}{3})^2 = 55/9 \sim 6.11$. However, the mass energy of the last {D6} quark is greater that the mass energy of the first four {D5} quarks and of the first {D3} quark. And adding these five ones the ratio will be:

$$R(\{D6\}) = 24\,(\tfrac{1}{3})^2 + 9\,(\tfrac{2}{3})^2 = 60/9 \sim 6.67$$

- At threshold energy of the family of quarks with symmetry {D5} would be $R(\{D5\}) = 26\,(\tfrac{1}{3})^2 + 9\,(\tfrac{2}{3})^2 = 62/9 \sim 6.89$. And adding in a similar way the first three {D3} quarks below the mass energy of the last {D5} quark, $\mathrm{L5D5}^{(\frac{1}{3},\,\frac{2}{3})}$ (377,668), the ratio is:

$$R(\{D5\}) = 29\,(\tfrac{1}{3})^2 + 9\,(\tfrac{2}{3})^2 = 65/9 \sim 7.22$$

- At threshold energy of the family of quarks with symmetry {D3} would be $R(\{D3\}) = 33\,(\tfrac{1}{3})^2 + 9\,(\tfrac{2}{3})^2 = 69/9 \sim 7.67$, and adding the {D2} quarks below the mass energy of quark $\mathrm{L5D3}^{(\frac{1}{3},\,\frac{2}{3})}$ (1,748,463):



ANNIHILATION CROSS-SECTION RATIO

$R(\{D3\}) = 36\,(\tfrac{1}{3})^2 + 9\,(\tfrac{2}{3})^2 = 72/9 \sim 8$

- At threshold energy of the family of quarks with symmetry {D2}:

$R(\{D2\}) = 40\,(\tfrac{1}{3})^2 + 9\,(\tfrac{2}{3})^2 = 76/9 \sim 8.44$

In this last case we have not included the supposed quarks of the next symmetry $L\tfrac{1}{3}D1^{(\frac{1}{3})}$ (1,873,748), $L\tfrac{2}{3}D1^{(\frac{1}{3},\,\frac{2}{3})}$ (3,747,496) and $L1D1^{(\frac{1}{3},\,\frac{2}{3})}$ (5,621,245) because we have not postulated yet the existence of particles with {D1} symmetry, which by the moment it is supposed to be a limit case which do not make any particles unless in the recombination era of the primordial Universe.

Although it is difficult to drawn a table with these ratios because they are superposed, we are going to make a graphic separating the intervalic families of quarks. Please note the wide range of energies covered in contrast with the tiny range covered by SM, as that disastrous model hardly can not predict anything but only until *after* having experimental results.

Anyway, the postulation of the intervalic structure of quarks makes of the existence of *colour* a superfluous assumption.

Finally, the annihilation cross-section ratio for the zero charged massive bosons is:

- for Z^0: $R(\sigma)' = 6\,(\tfrac{2}{3})^2 + 15\,(\tfrac{1}{3})^2 = 39/9 \approx 4.33$
- for W^0: $R(\sigma)' = 6\,(\tfrac{2}{3})^2 + 17\,(\tfrac{1}{3})^2 = 41/9 \approx 4.56$
- for Y^0: $R(\sigma)' = 7\,(\tfrac{2}{3})^2 + 20\,(\tfrac{1}{3})^2 = 48/9 \approx 5.33$
- for X^0: $R(\sigma)' = 9\,(\tfrac{2}{3})^2 + 23\,(\tfrac{1}{3})^2 = 59/9 \approx 6.56$

COLOUR AND NEUTRINOS IN THE HADRONIC DECAY OF Z^0

Another supposed test for the existence of colour lies on the hadronic decay of Z^0. On the assumption of *universality*, the Z^0 could decay according to IT in 21 intervalic structures. Experimentally, the total decay rate of the lepton-antilepton pairs is ~1/10, the hadronic decay rate is ~7/10 and of the neutrino-antineutrino pairs have to be the remaining ~2/10. According to SM there are 5 quarks times 3 colours = 15 coloured quarks pairs to decay, and the hadronic decay rate should be: 15/(15+9) = 5/8, in clear disagreement with experimental data. On the contrary, according to IT the hadronic decay rate is just: 21/(21+9) = 7/10.

Of course, it is known that the artificialness of SM *always* can match the experimental data through adjusting some rows of parameters, like the Weinberg angle, θ_W. But in this case the "accepted value" of $\sin^2 \theta_W = 0.2315$ makes the relation $\cos \theta_W = m_W/m_Z$ to have an error of 3.35%. I think that a clumsy *artifice* introduced *ad hoc* like the Weinberg angle may be accepted *provisionally* —up to the fundamental pattern will be discovered— if it makes an explanation with null error, but not when it is clearly not a fundamental theory and besides makes an error such as of 3.35% in the masses of intermediate massive bosons.

Besides, we have the neutrino production in the decay of Z^0. The basic principles of lepton families in SM predict —*before* being adjusted *ad hoc*— that the neutrinos widths should be equal to the leptons widths. On the contrary, experimental data shows that neutrinos width is just double of leptons'. This is just in accordance with IT because each leptonic decay of Z^0 is accompanied by the neutrino-antineutrino pair corresponding to the lepton-massive boson.

Since according to IT there are just 21 fractional charged lisztinos —namely, quarks— below the mass of $Z^0/2$, the partial widths of the Z^0 decay as postulated by IT are:

$Z^0 \rightarrow$ $e^- e^+ = 1/30$
$\mu^- \mu^+ = 1/30$
$\tau^- \tau^+ = 1/30$
leptonic neutrinos, $\nu_l \underline{\nu}_l = 3/30$
massive bosonic neutrinos, $\nu_Z \underline{\nu}_Z = 3/30$
hadrons pairs, $q \underline{q} = 21/30$

This gives the following intervalic decay rates:

- lepton-massive boson decay rate: 3/30 = 1/10
- neutrino decay rate: 6/30 = 2/10
- hadron decay rate: 21/30 = 7/10

This is in splendorous agreement with experimental data.

To finalize a last comment: according to this, the spin of Z^0 could be 0 in spite of 1 —although 1 is not forbidden by intervalic symmetries—, possibility that simply makes an additional disagreement with SM.

THE INTERVALIC INTERACTION MAKES USELESS THE ASSUMPTION OF COLOUR AND QUANTUM CHROMODYNAMICS

If we would try to apply logically QCD to the intervalic quarks we should define around 7 x 7 = 49 new *flavours* instead of the 6 traditional flavours (!). Moreover, we should introduce a lot of new *colours* for each of the intervalic interactions among all intervalic structures. Roughly, this means 3 colours for quarks, up to 6 new colours for lisztinos, 180 new additional colours for gaudinos, and finally 45 further colours for dalinos… And this only in nucleonic quarks with {D45} symmetry. I wonder if there are so many colours to assign and to obtain finally just only mysterious colourless particles (!). In addition to this it should be calculated how many hundreds of new *gluons* would be needed to join those particles. And the fragrant massless gluon fields are postulated to be *long ranged* against all evidence (!) and auto interacting… Not to mention the absurdity of Higgs mechanism to give happily the desired masses to quarks (perhaps through a new... *touchons?*). This was the misleading QCD way.

On the contrary, the short ranged intervalic interaction does not castigate us with any of these fantastic and uneconomical assumptions on the senses of fundamental interactions. The structural energy and the total mass of subatomic particles are completely well defined. The *intervalic principle of energy balance for subatomic particles*: $I - I^{-1} - E(J) = 0$ —where I is the intervalic energy, $I^{-1} = U$ is the electromagnetic energy, and $E(J)$ is the spin energy— and the concept of *energy interval* between intervalic structures fully explains, in a remarkable natural way, not only enigmatic features as the asymptotic freedom, but the entire process of aggregation of intervalinos at all levels of the intervalic structure to make dalinos, gaudinos and so on up to monteverdinos (nucleons and nucleus), without introducing ad hoc a new degree of freedom, namely, colour.

Moreover, it can be said that all the supposed four “forces” of Nature relies finally on the intervalic energy, as I have explained in other sites: strong and weak are two kinds —*changeless* and *changeful* respectively— of the wide spectrum of the intervalic interaction, the electromagnetic interaction is derived as the inverse of the intervalic energy, and the gravitational one is yielded in a similar way as its non linear effect. In resume, colour and QCD are unnecessary assumptions in IT.

ASYMPTOTIC FREEDOM AND CONFINEMENT IN I.T.

The intervalic interaction confinement between a pair of intervalinos is determined by the *energy interval* between the two states which, implicit or explicitly, are being considered:

$$\Delta \mathrm{I}(\mathbf{I\text{-}I}) = \mathrm{I}(\mathbf{q}_\mathrm{I}+\mathbf{q}_\mathrm{I}) - \mathrm{I}(2\mathbf{q}_\mathrm{I}) = 2\,(c^{\pm 2}\,h\,\mathbf{q}_\mathrm{I}^{-2}) - (c^{\pm 2}\,h\,(2\mathbf{q}_\mathrm{I}^{-2})) =$$
$$= (7/4)\,c^{-1} = 5.8373716 \cdot 10^{-09}\,(\mathrm{J}) = 36{,}433.993\,(\mathrm{MeV}/c^{2})$$

It give us an idea of the extreme powerfulness of the intervalic energy which creates potential wells of enormous deep between near intervalic structures. The electromagnetic energy of the pair is, supposed an average distance between intervalinos inside electron, $d_\mathbf{I} \approx (3\cdot 270/4\pi)^{1/3} = 7.9662986 \cdot 10^{-16}$ (m):

$$\Delta \mathrm{E}(\mathbf{I\text{-}I}) = \mathrm{E}(\mathbf{q}_\mathrm{I}+\mathbf{q}_\mathrm{I}) - \mathrm{E}(2\mathbf{q}_\mathrm{I}) = 0 - (1/4\pi\varepsilon_0)\mathbf{q}_\mathrm{I}^{2} / d_\mathbf{I} = -3.9726330 \cdot 10^{-18}\,(\mathrm{J})$$
$$= -0.00024795215\,(\mathrm{MeV}/c^{2})$$

In our case the minus sign is irrelevant. Therefore, the intervalinar interaction between two electronic intervalinos is around $\sim 10^9$ greater than its corresponding electromagnetic interaction:

$$\Delta \mathrm{I}(\mathbf{I\text{-}I}) / \Delta \mathrm{E}(\mathbf{I\text{-}I}) = 1.4693961 \cdot 10^{9}$$

As can be seen, this ratio of energies for intervalinos is around $\sim 10^7$ greater than the supposed ratio of the strong nuclear force.

It can be said that in a similar way as, according to general relativity, while bodies follow a geodesic in spacetime they do not “feel” any dynamical frequorce, when intervalinos are in a “geodesic” in intervalic energy —that is to say, in a state of *minimal energy*—, they do not “feel” any dynamical frequorce yet. To this respect, the only difference between gravitational and intervalic interactions is the huge difference in the involved energies: since the energy interval ratio between gravitational and intervalic interactions is around 10^{52} bodies can “easily” deviate from geodesics, but it is extremely difficult that an intervalino reach enough energy to deviate from its geodesic in intervalic energy because the needed energy is enormous. This feature of the intervalic energy is what is explained through the concept called *asymptotic freedom* of quarks. It is valid not only for quarks but for all constituent subparticles. As can be seen, asymptotic freedom can be widely explained in IT without introducing any new assumption ad hoc as SM does, but only based on fundamental and well known physical principles.

This assumption born in SM is closely related with the so named *confinement* of quarks. In IT we have to talk about the confinement of all subparticles, since no one of them have still been detected. Nevertheless the explanation for that experimental phenomenology is clear: the intervalic energy makes extremely deep potential wells on which are placed the stable particles of Nature. An it is not necessary to introduce any fantastic assumption to describe that potential wells but only the simple description of the intervalic structures according to the intervalic energy and the intervalic principles of energy balance for subatomic particles.

As an example, the difference between the intervalic energy of electron and the intervalic energy of its *isolated* constituent intervalinos yields the magnitude of the intervalic interaction among intervalinos inside electron. This concept is similar to the definition of the electromagnetic potential energy of a composite particle, although in a new way. The corresponding electromagnetic potential of electron would be:

$$V(e) = \Delta U(e) / m_e = 3.964559695 \cdot 10^{16}\ (m^2\ s^{-2}), \text{ as:}$$

$$\Delta U(e) = U(e) - 270\ U(\mathbf{I}) = U(270\mathbf{q_I}) - 270\ U(\mathbf{q_I}) = U(270\mathbf{q_I}) - 0 =$$
$$= c^{\pm 2} m_e - I(e) = 3.611471925 \cdot 10^{-14}\ (J) = 0.22541025\ (MeV/c^2)$$

In the case of electromagnetic energy (and *long ranged* interactions) ‘isolated’ means separate by an infinite length. However, in the case of intervalic interaction (and *short ranged* interactions) ‘isolated’ means *out* of the intervalic structure, an event which does not relies on the macroscopic distance of the separation as in the case of a long ranged interaction. Therefore, the electron intervalic potential is determined by the difference on the intervalic energy between electron and its constituent disaggregated intervalinos:

$$\Phi(e) = \Delta I(e) / m_e = -9.886754667 \cdot 10^{23}\ (m^2\ s^{-2}), \text{ as:}$$

$$\Delta I(e) = I(e) - 270\ I(\mathbf{I}) = I(270\mathbf{q_I}) - 270\ I(\mathbf{q_I}) =$$
$$= [c^{\pm 2} h\ (270\ \mathbf{q_I})^{-2}] - [270\ c^{\pm 2} h\ \mathbf{q_I}^{-2}] = 270^{-2} c^{-1} - 270 c^{-1} =$$
$$= -9.006230113 \cdot 10^{-7}\ (J) = -5{,}621{,}244.256\ (MeV/c^2)$$

The magnitude of the intervalic potential is around ~3 · 10^7 times greater than the electromagnetic potential traditionally managed by SM. This fully explains why electron has not been broken into its constituent intervalinos. The solely intervalic potential well can explain easily the assembly of particles from intervalinos to lisztinos. At the last levels of the intervalic structure the intervalic energy becomes smaller as the electromagnetic energy becomes greater.

Moreover, to the intervalic potential well, it have to be added the feature of the *elementary attractor*. This concept postulates that the *elementary charge* is a state of minimal energy spread throughout the Universe, which imposes a strong order in the electric charges of all particles obligating then to reach that state of minimal energy and uniformity in lesser information. This means that any subatomic particle with electric charge different from zero or the elementary one is extremely unstable and can not exist isolated. If a particle with fractional charge, as quarks, is forced to be isolated in a high energy collision, and it can assemble with another isolated quarks, it will decay immediately. Thus, quarks and whatever subparticles with fractional charge will be confined forever since they will decay immediately when forced to stay isolated. In this way, the elementary charge can be considered as a new quantum number which by no means can be removed, regardless the energy of the collision.

Need not to say that according to IT the changeless —strong— intervalic frequorce is short ranged, and the existence of gluons is simply a superfluous or unnecessary assumption because they already have not any role to play inside IT, since no one of the problems arranged by the introduction *ad hoc* of the colour remain in IT.

THE PRIMORDIAL RELATION BETWEEN PARTICLES, FREQUORCES AND SYMMETRY BREAKINGS

SM postulates, as one of its basic principles, that subatomic particles are *structureless, single, immutable* and *eternal*. Really all these features are intimately closed. On the contrary, IT postulates a different paradigm in particle physics: subatomic particles are *structureful*, *composite*, *mutable* and *non eternal* since they were born through primordial aggregation and they would be able to disaggregate through a possible reversible process. Really.

A very important point that makes a drastic difference between the traditional and the intervalic paradigm lies on the primordial relation between the structure of subatomic particles, frequorces and symmetry breakings. As particles are structureless in SM, all these concepts are equally relationless. However, in IT both frequorces and symmetry breakings are a consequence of the intervalic structure of particles yielded at every step in the primordial aggregation. Each new aggregation of particles yields its corresponding *frequorce* —which is no other than the unique pristine *intervalic interaction* dressed with a new phenomenology—. At the same time, each new stop in one of the two possible kinds of aggregating particles —symmetric or antisymmetric under interchange— yields a *symmetry breaking*, and therefore there is a very close relation between the intervalic structure, the frequorce and the symmetry breaking at each step of the primordial aggregation of subatomic particles.

It is clear that the concept of symmetry breaking in IT is absolutely different from the same in SM. The last one is a clumsy breaking of a supposed higher symmetry into a poorer one, which has no reliable foundations, being

<table>
<tr><th colspan="8">COSMOLOGICAL SPELLS MADE BY
THE INTERVALIC PRIMORDIAL AGGREGATION
IN THE INTERVALIC OSCILLATING UNIVERSE</th></tr>
<tr><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td></tr>
<tr><td>Stationary Minimal Universe</td><td>Universe of light</td><td>Universe of dark matter</td><td>Dalinar Universe. Energy release that made the Big Bang</td><td>Universe of three forces</td><td>Universe of four traditional forces. Assembly of quarks</td><td>Assembly of nucleons</td><td>Assembly of deuteron</td></tr>
<tr><td>Timeless</td><td colspan="3">Pre Big Bang (or Post Big Crunch) spells</td><td colspan="4">Post Big Bang spells: part of the Universe conjectured by the Standard Model</td></tr>
<tr><td rowspan="8">INTER-VALIC STRING</td><td rowspan="7">PHOTON</td><td>GRAVITON</td><td colspan="5">Second symmetry breaking → GRAVITATIONAL INTERACTION</td></tr>
<tr><td rowspan="6">INTER-VALINO</td><td rowspan="5">DALINO (ELECTRON)</td><td rowspan="4">GAUDINO (MUON, TAU, CHARGED MASSIVE BOSONS)</td><td>LISZTINOS (ZERO CHARGED MASSIVE BOSONS)</td><td colspan="2">Fifth symmetry breaking → → “ELEMENTARY PSEUDO INTERACTION”</td></tr>
<tr><td rowspan="3">FRACTIONAL LISZTINOS (QUARKS)</td><td>MONTE-VERDINOS (MESONS)</td><td>Sixth symmetry breaking (despicable)</td></tr>
<tr><td rowspan="2">MONTE-VERDINOS (BARYONS)</td><td>-</td></tr>
<tr><td>PALESTRINOS</td></tr>
<tr><td>ZERO CHARGED GAUDINO (DARK MATTER)</td><td colspan="3">Fourth symmetry breaking → → INTERVALIC CHANGEFUL INTERACTION</td></tr>
<tr><td>ZERO CHARGED DALINO (DARK MATTER)</td><td colspan="4">Third symmetry breaking → ELECTROMAGNETIC INTERACTION</td></tr>
<tr><td>CHI</td><td colspan="6">First symmetry breaking → INTERVALIC CHANGELESS INTERACTION</td></tr>
<tr><td>NOTHING</td><td colspan="7">Zero symmetry breaking → INFORMATIONAL INTERACTION</td></tr>
</table>

only an assumption introduced by hand in the model. On the contrary, the intervalic symmetry breakings are not a mere mathematical artifice but an important physical behaviour based mainly on the spin-statistics theorem, which leads to an *increasing* in the number of symmetries of Nature since each symmetry breaking is complemented by a new frequorce which at once leads to a new aggregation of particles with the assembly of a new intervalic structure, that is to say, a new particle, thus beginning a new step in the process of primordial aggregation, and so on.

ISOSPIN AND STRONG NUCLEAR FORCE

IT makes to become irrelevant the infamous 18 arbitrary parameters (or more) of SM. Moreover, a lot of fundamental physical concepts and postulates of SM become likewise irrelevant, such as Higgs field and boson, electroweak, flavour, colour, gluon, etc. In other words, only QED appear to remain (although it must be reformulated in intervalic dimensions), but the whole GWS model as well as QCD fail and fall miserably. Among those irrelevant concepts there is the so named "binding energy" and the same "per nucleon". As I have explained thoroughly in other site, the supposed "binding energy" is a misleading concept since no one subatomic particle *loss* mass to make a bond. On the contrary, the real binding energy always *adds* mass to the particle, but never *subtracts* it. This fundamental fact can be clearly understood since the postulation of the intervalic structure of nucleus. Really nucleus with A > 3 are not composed by nucleons as traditionally supposed, but they are composed by quarks (or by gaudinos).

The quarkic (or gaudinar) structure of nucleons involve that isospin becomes absolutely irrelevant. Although isospin has been established in Physics without some criticism, the truth is that the existence of isospin is mainly a fantastic assumption introduced ad hoc, and which can't have of course an experimental verification. In order to introduce an exchange force between proton and neutron to explain the origin of the nuclear strong force, it was necessary to identify proton and neutron as the same particle. However, this clumsy artifice is superfluous when the intervalic interaction has entered in scene. According to IT the former nuclear force, as well as all the aggregation of subparticles in all structure levels from intervalinos to nucleus, is due to the intervalic principle of energy balance: $I - I^{-1} - E(J) = 0$. Since nucleus is composed by quarks or gaudinos, the former nuclear force is due to the changeless —strong— intervalic interaction between quarks or gaudinos. The isospin concept simply disappears at this level of the intervalic structure.

In this way three important traditional concepts: the supposed isospin, the binding energy per nucleon in nucleus and the former strong nuclear force —the changeless intervalic interaction— can be fully explained through a much more fundamental and elegant manner which relies at last, through a logical cascade and without any mathematical formalism, in the own intervalic system of dimensions and units.

ISOSPIN AND ISOCHARGE

Isospin is a doubly misleading concept: as we have seen at nuclear level it becomes irrelevant; on the other hand, at quarkic level it is substituted by the concept of *isocharge*.

We also have seen opportunely that isocharge is the degree of freedom of the electric charge of quarks, which relies and is logical and completely determined by its intervalic structure. There is no such 'abstract isospin space' intended by SM, but a specific set of quarks which have this additional degree of freedom. They are just the 24 quarks L⅔, L1, L2, L3, L4 and L5 pertaining to the families of dalinar symmetries {D45}, {D5}, {D3} and {D2}. These quarks with two allowed charges, ⅓ *and* ⅔, are named *isoquarks*, in contrast with the other quarks with only one allowed charge, ⅓ *or* ⅔, which are named *uniquarks*.

It is not necessary to comment the difference between the doubtful concept of isospin, introduced *ad hoc* over some supposed flavoured quarks, and the concept of isocharge, which is based on the strong logical foundations of the intervalic symmetries, making a whole classification over the entire families of quarks according to this degree of freedom: there are exactly 24 charged doublets of isoquarks (6 among the lightest and 18 among the heaviest quarks), and 25 charged singlets of uniquarks, summing in total the 49 intervalic structures of quarks postulated by IT:

- 25 **uniquarks:** quarks with one allowed charge: ⅓ *or* ⅔
- 24 **isoquarks:** quarks with two allowed charges: ⅓ *and* ⅔

As the intervalic structure of isoquarks do not change depending on the electric charge, the spin-statistics theorem is applicable to this degree of freedom among *identical* particles. Therefore we can introduce a new SU(2) isocharge symmetry in the intervalic model of quarks. Setting the values of isocharge for the doublets of SU(2) to ½ for electric charge ⅔, to -½ for electric charge ⅓, and to 0 for the remaining not isocharged quarks which would be singlets of SU(1), we obtain just the same traditional values of *isospin* which had the former supposed flavoured quarks. This may be useful because some of the combinations due to isospin in the model of quarks remain still valid when substituting the abstract concept of isospin —which is really false from a physical point of view— by the truthful physical concept of isocharge.

INTERVALIC SYMMETRIES OF FUNDAMENTAL PARTICLES

The concept of intervalic symmetry is one of the deepest ever postulated in Physics. It can be said that the vast majority of the physical features of every subatomic particle is derived from its intervalic structure. On the other hand, in SM the parallel concept of the *intervalic structure,* which allows to define a particle, is a fantastic mixing of doubtful concepts: 3 families (postulated *ad hoc* in order to cancelling infinites between the lepton sector and the quark sector), 6 flavours (its existence is based on a naïve and partial interpretation *a posteriori* of the experimental data, lacking of a reliable theoretical basis), 3 colours (fantastically postulated *ad hoc* to solve clumsy some results which do not fit with experimental data), etc., which can't lead to deduce any of the physical features of subatomic particles by no means. Moreover, their existence relies on still more fantastic assumption such as some Higgs bosons, 8 gluon fields and so on. As usually quarks are not denoted with their colours, but only with their flavours, we probably have not been aware of the misleading look of SM yet, but this become apparent as soon as all quarks are written down in a table, showing their colours through a sub index for each colour: 1, 2, 3, as to speak about quark up red, quark up green and quark up blue is really bizarre. But this is just what SM has postulated (!).

In order to be charitable we should not compare the quark sector (nor any sector) of SM with the quark sector of IT. But since charity with such a tremendous bag of mistakes named SM, is neither our speciality nor the aim of science, we have draught several tables in which it can be compared mercilessly the global picture of subatomic particles postulated, on one hand, by SM, and on the other hand, by IT. I think that the comparison between the tables speak by itself, so no comment is needed.

(Regarding neutrinos there is *one neutrino per lepton* according to SM, whilst we have seen that there is *one neutrino per gaudino* according to IT, in order to conserve the total intrinsic angular momentum. Nevertheless, if desired neutrinos can be placed in the column of leptons-massive bosons, which does not deny the neutrino production of quarkic origin, mainly ν_{D45}, in the primordial assembly of gaudinos at the Big Bang).

The partial success of SM is based completely on a shameless ad hoc

FAMILIES OF FUNDAMENTAL PARTICLES ACCORDING TO THE STANDARD MODEL

No one particle or mass has been theoretically predicted or postulated by the Standard Model,
but only adjusting clumsy *by hand* one (or more) parameters for each particle,
and ever *after* it has been experimentally detected.

FAMILY	LEPTONS	MASSIVE BOSONS	QUARKS
No. 1	e (by hand) v_e (0)	$W^\pm$ (by hand) Z^0 (by hand) Higgs bosons (by hand)	u_1 (free mass) u_2 (free mass) u_3 (free mass) d_1 (free mass) d_2 (free mass) d_3 (free mass)
No. 2	μ (by hand) v_μ (0)		c_1 (free mass) c_2 (free mass) c_3 (free mass) s_1 (free mass) s_2 (free mass) s_3 (free mass)
No. 3	τ (by hand) v_τ (0)		t_1 (free mass) t_2 (free mass) t_3 (free mass) b_1 (free mass) b_2 (free mass) b_3 (free mass)

INTERVALIC STRUCTURES
OF FUNDAMENTAL PARTICLES
ALLOWED BY THE INTERVALIC SYMMETRIES

The symbol (?) means an allowed intervalic structure whose existence is not expected below the threshold temperature

DALINAR SYMMETRY	INTERVALIC STRING (NEUTRINO)	GAUDINO-BIGAUDINO (LEPTON-MASSIVE BOSON)	FRACTIONAL LISZTINO (QUARK)
{D270}	$\nu_{D270} = \nu_e$ $(1.1833119 \cdot 10^{-14})$	G1D270$^{\pm}$ = $e^{\pm}$ (0.5)	
{D135}			
{D90}			
{D54}			
{D45}	$\nu_{D45} = \nu_\mu$ $(2.0005108 \cdot 10^{-7})$	G6D45$^{\pm}$ = $\mu^{\pm}$ (106)	L⅓D45$^{(\frac{1}{3})}$ (35) L⅔D45$^{(\frac{1}{3},\,\frac{2}{3})}$ (69) L1D45$^{(\frac{1}{3},\,\frac{2}{3})}$ (104) L2D45$^{(\frac{1}{3},\,\frac{2}{3})}$ (207) L3D45$^{(\frac{1}{3},\,\frac{2}{3})}$ (311) L4D45$^{(\frac{1}{3},\,\frac{2}{3})}$ (414) L5D45$^{(\frac{1}{3},\,\frac{2}{3})}$ (518)
{D30}	ν_{D30} (?)	G9D30$^{\pm}$ (?) (373)	L⅓D30$^{(\frac{1}{3})}$ (117) L⅔D30$^{(\frac{2}{3})}$ (233) L1D30$^{(\frac{1}{3})}$ (350) L2D30$^{(\frac{2}{3})}$ (699) L3D30$^{(\frac{1}{3})}$ (1,049) L4D30$^{(\frac{2}{3})}$ (1,399) L5D30$^{(\frac{1}{3})}$ (1,748)
{D27}			
{D18}	$\nu_{D18} = \nu_\tau$ $(2.677774477 \cdot 10^{-4})$	G15D18$^{\pm}$ = $\tau^{\pm}$ (1,777)	L⅓D18$^{(\frac{1}{3})}$ (540) L⅔D18$^{(\frac{2}{3})}$ (1,079) L1D18$^{(\frac{1}{3})}$ (1,619) L2D18$^{(\frac{2}{3})}$ (3,238) L3D18$^{(\frac{1}{3})}$ (4,857) L4D18$^{(\frac{2}{3})}$ (6,476) L5D18$^{(\frac{1}{3})}$ (8,095)

INTERVALIC STRUCTURES OF FUNDAMENTAL PARTICLES ALLOWED BY THE INTERVALIC SYMMETRIES

The symbol (?) means an allowed intervalic structure whose existence is not expected below the threshold temperature

DALINAR SYMMETRY	INTERVALIC STRING (NEUTRINO)	GAUDINO-BIGAUDINO (LEPTON-MASSIVE BOSON)	FRACTIONAL LISZTINO (QUARK)
{D15}			
{D10}			
{D9}			
{D6}	v_{D6}	G45D6$^{\pm}$ = Z$^{\pm}$ (?) (46,565) 2G45D6^{0} = Z^{0} (91,188)	L⅓D6$^{(⅓)}$ (14,571) L⅔D6$^{(⅔)}$ (29,141) L1D6$^{(⅓)}$ (43,712) L2D6$^{(⅔)}$ (87,426) L3D6$^{(⅓)}$ (131,135) L4D6$^{(⅔)}$ (174,846) L5D6$^{(⅓)}$ (218,558)
{D5}	v_{D5}	G54D5$^{\pm}$ = W$^{\pm}$ (80,423) 2G54D5^{0} = W^{0} (?) (160,928)	L⅓D5$^{(⅓)}$ (25,178) L⅔D5$^{(⅓,\ ⅔)}$ (50,356) L1D5$^{(⅓,\ ⅔)}$ (75,534) L2D5$^{(⅓,\ ⅔)}$ (151,068) L3D5$^{(⅓,\ ⅔)}$ (226,601) L4D5$^{(⅓,\ ⅔)}$ (302,134) L5D5$^{(⅓,\ ⅔)}$ (377,668)
{D3}	v_{D3}	G90D3$^{\pm}$ = Y$^{\pm}$ (372,518) 2G90D3^{0} = Y^{0} (?) (745,037)	L⅓D3$^{(⅓)}$ (116,564) L⅔D3$^{(⅓,\ ⅔)}$ (233,128) L1D3$^{(⅓,\ ⅔)}$ (349,693) L2D3$^{(⅓,\ ⅔)}$ (699,384) L3D3$^{(⅓,\ ⅔)}$ (1,049,078) L4D3$^{(⅓,\ ⅔)}$ (1,398,771) L5D3$^{(⅓,\ ⅔)}$ (1,748,463)
{D2}	v_{D2}	G135D2$^{\pm}$ = X$^{\pm}$ (?) (1,257,249) 2G135D2^{0} = X^{0} (2,514,499)	L⅓D2$^{(⅓)}$ (393,404) L⅔D2$^{(⅓,\ ⅔)}$ (786,808) L1D2$^{(⅓,\ ⅔)}$ (1,180,213) L2D2$^{(⅓,\ ⅔)}$ (2,360,424) L3D2$^{(⅓,\ ⅔)}$ (3,540,638) L4D2$^{(⅓,\ ⅔)}$ (4,720,850) L5D2$^{(⅓,\ ⅔)}$ (5,901,063)
{D1}			

adjusting combined with wide empirical data, but this is a *descriptive model*, and not *theoretical science*. Of course, the intervalic symmetries of Nature are so powerful that some parts of them can be seen reflected through several mirrors and though variegated ways, but these are partial and poor achievements which are very different from a whole understanding of the underlying geometry of Nature: to look straight at them and to see all the intervalic symmetries in all their completeness and splendour.

EPILOGUE

> It is hard to sneak a look at God's cards. But that he would chose to play dice with the world… is something I cannot believe for a single moment.
>
> ALBERT EINSTEIN
> *To Cornel Lanczos, 21.03.1942*

From a historical point of view it may be interesting to make a parallelism between the leading theories in Physics and in Music along the eras. Astonishing, we will discover that the concept of *physical* spacetime represents the same underlying idea as the *musical* spacetime. Moreover, the concept of the physical Universe is just the same as the so named "abstract" musical Universe. The *underlying fundamental geometry* of Nature derived from musical and physical theories of each epoch is really the same inasmuch as they are born from the same thinking, form the same paradigm. Really, it could not be other way, as the global paradigm and belief of mankind affects and impregnates all fields of knowledge in a similar manner. Now, by means of IT in Physics, in Music and in other fields of knowledge, this deep junction becomes more apparent and meaningful.

To conclude, we could paraphrase Leibnitz's famous sentence on music, which states that Music is a *sonorous algebra* made by a mind who doesn't know that it is doing mathematics. In a similar way, it can be said that Physics is a *silent music* made by a mind who is not conscious to be doing music.