Time is Fundamental

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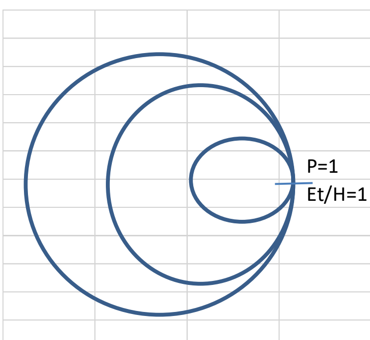
Many people interested in science probably started, as I did, taking things apart to see what they were made of. I wanted badly to know what was inside neutrons and worked on the problem for many years. After the discovery that quarks are inside heavy fundamental particles, I wanted to know what quarks are made of. Recently I studied new Particle Data Group (PDG) data [17] that lists measured properties of baryons and mesons. Baryon and meson properties are simple additions of quark properties. But quark properties are Schrodinger based quantum circles consisting of time and information that obey conservation rules involving Charge, Parity and Time (CPT) and Fields (F).

Nested Quantum circles

Schrodinger's equation [1] gives Probability= 1 representing a quantum circle P= exp(-iEt/H)*exp(iEt/H). Quantum circles represent mesons and baryons at P= 1*1*1=1, but we must look inside the 1's. Their quarks can have different associated times and energies as long as Et/H=1, where H is Heisenberg's constant.



Each quantum circle has properties and with the correct nested quantum circles they represent neutron and proton properties. We can study quark, meson and baryon properties with quantum circles but they become orbits in the full neutron model which includes mass, kinetic energy and field energy [18].

Time underlies everything

Quarks have charge, spin and handedness (information). Charge (C) and spin (T) are related to time. Spin is angular momentum and it could be mc^2 r/(ch)=1 (h is H/2pi) or inertia*angular velocity/h=1, but this would give the quantum circle angular momentum and properties of an orbit. We will use Et/H=1 as the spin property with time moving around the circle. Charge is a state related to electromagnetic field energy and it will also have the value Et/H=1. The Standard Model assigns quarks spin number 0.5 (T). The Strange quark has fractional charge -0.33 [17]. The diagram shown below shows that parity or spin conjugation changes the charge to 0.67 (a change of 1). The strange quark conserves CPT (meaning C+P+T) = 0.67.

Strange quark			
initial charge= -0.33			
spin number= 0.5			
parity number =0.5			
add and subtract numbers		conjugated Strange	
Charge	-0.33	0.67	0.67
Parity	0.5	-0.5	0.5
Time	0.5	0.5	-0.5
CPT conserved	0.67	0.67	0.67

(Use your hands to illustrate this. Your left hand has parity 0.5 and your thumb is charge down. Spin (T) is positive when it comes into the tip of your fingers).

Each quark also has a strong Field (F) state. The strong field energy is opposite quark mass energy and often larger. It can also be assigned the value Et/H=1 but its Field number is -0.5. Mesons always contain one quark (Q) and one anti-quark (q). According to my analysis, the 130 mesons in the 2016 PDG Particle Physics Booklet [17] all conserve CPTF=0. Some baryons contain three quarks (QQQ) with at least one Up or Down quark. The remaining baryons contain three anti-quarks (qqq) with at least one up or down anti-quark. Baryons must have isospin (I) to balance the three quark -0.5 fields and the up and down quarks contribute this property. The 50 baryons in the PDG tables conserve CPTFI=0.

The property diagrams below represent the neutron and proton. Parity conjugation changes the proton quark (Down, Up, Up) properties into neutron quark properties. The properties below the table are the sum of the individual quark properties.

	Proton D-U-U		
Original parity	0.5	-0.5	-0.5
Parity P	0.5	-0.5	-0.5
isospin I	0.5	-0.5	-0.5
Charge	-0.33	0.67	0.67
spin (T)	0.5	0.5	0.5
name	DOWN	UP	UP
Mass	4.35685114	2.49	2.49
MeV			
CPT invariance	0.67	0.67	0.67
	Isospin		-0.5
	Proton charge		1
	Proton parity		-0.5
	Proton spin		1.5
	CPTI		1.5
	Fields		-1.5
	CPTIF		0

	Neutron D-U-U (parity changes charge)		
Original parity	0.5	-0.5	-0.5
Parity P	0.5	-0.5	0.5
isospin I	0.5	-0.5	-0.5
Charge	-0.33	0.67	-0.33
spin (T)	0.5	0.5	0.5
name	DOWN	UP	UP
Mass	4.356851	2.49	2.49
MeV			
CPT invariance	0.67	0.67	0.67
	Isospin		-0.5
	Neutron charge		0
	Neutron parity		0.5
	Proton spin		1.5
	CPTI		1.5
	Fields		-1.5
	CPTIF		0

Quarks are simple quantum circles that can change states by 1 as long as the sum of the states is conserved. The question is why does spin or parity change the charge? I think the answer is "it doesn't". When you look down at the top of the parity -0.5 (right hand) circle, spin is clockwise (into your fingertips) and charge is up but if you turn your hand over, both charge and spin are opposite the original values. Quantum circles for quarks are like coins with two sides and looking down at a stack of quarks it contains some "heads and tails". Other coins (parity conjugated coins) have the same right hand face on the top but a left hand face on the bottom. Charge direction is up on one side and down on the other but spin is unchanged (put your hands together with fingers matched but one hand turned over). Quark quantum circles are two sided "objects" but spin or parity don't change charge.

Strange quark (Q)					anti-strange quark (q)		
initial charge= -0.33					initial charge= 0.33		
spin number= 0.5					spin number= -0.5		
parity number =0.5					parity number =0.5		
						conjugated	
add and subtract numbers			conjugated Strange			anti strange	
Charge		-0.33	0.67	0.67	0.33	-0.67	
Parity		0.5	-0.5	0.5	0.5	0.5	
Time		0.5	0.5	-0.5	-0.5	0.5	
CPT conserved		0.67	0.67	0.67	0.33	0.33	
			time reversal				

Anti-quarks are time-reversed quarks (based on the Dirac equation). They have CPT=0.33. Mesons have one quark and one anti-quark and 0.67+0.33=1. With two fields F= -0.5, they total CPTF=1-1= 0. The stack can contain time reversed heads with two types of conjugated tails.

The Up and Down quarks have an isospin (I) state. This is somewhat speculative but I believe that isospin is illustrated in the following diagram. The Up quark mass according to PDG [17] is 2.2+/- 0.75 MeV and the down quark 4.7 MeV. This suggests that the Up quark consists of properties related to the mass 0.622 MeV (4*0.622=2.49 MeV) from the proton model. The extra (fourth) 0.622 MeV gives the Up quark isospin and isoparity.

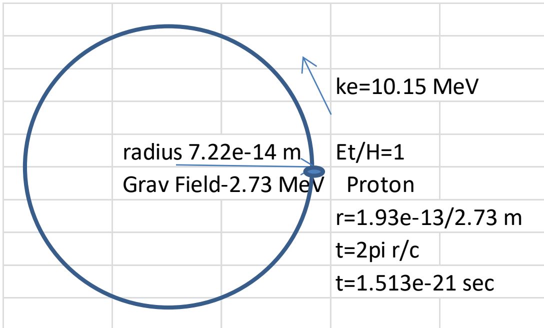
cpt	isoparity	isospin	spin	p	mass	charge	
0.33			0.5	-0.50	0.62	0.33	
0.33			0.5	-0.50	0.62	0.33	
0.33			-0.5	0.50	0.62	0.33	
0.67	0.5	0.5			0.62	-0.33	
0.67			0.5	-0.5	2.49	0.67	UP

Summary of quark properties

Quark properties are two-sided Schrodinger based quantum circles (Et/H=1) with charge and spin. Their properties are time based. Each also has a time reversed partner. Stacks of three quarks (QQQ or qqq) form baryons and stacks of two quarks (Qq) form mesons. Allowed combinations have 0 or 1 charge. Considering fields and isospin, zero is conserved overall with the correct combination of heads and tails.

Probabilities and the proton

The neutron (a baryon) consists of three nested quark quantum circles but the proton itself is located at Et/H=1 in a "gravitational" outer quantum circle. Considering the neutron's mass, kinetic energy and fields, its quantum circle becomes an orbit that determines the space and time around us [11]. The gravitational field energy -2.73 MeV is found in the proton model [Appendix 2]. Time simply repeats in quark quantum circles but time counts revolutions in the gravitational outer quantum circle.



The circle above is called a cell and is the basis of a cosmology model (Appendix 1). Cells have quantum circle radius 7.22e-14 meters and the neutron→proton has 10.15 MeV of kinetic energy. The quantum circle does not change but the orbit expands and becomes non-quantum. The proton's kinetic energy (temperature) decreases with expansion.

With E=2.73 MeV, P=1 and Et/H=1, time around this quantum circle at velocity C is 1.5e-21 seconds (call this fundamental time). As the cosmology model [10][16] expands, we can identify how much time has elapsed from the beginning by matching cosmology data [3] like Hubble's constant. They match at 13.6 B years or 8.5e17 seconds. I used 1.5e-21*exp(N) as the time axis of the model and was a little surprised that NOW was N= 89.2. I believe in this context that N counts revolutions of fundamental time. Time means something because we have memories and see changes. If we are looking for a ratio for perception of elapsed time, the obvious ratio is t/T, where T is 13.6 Billion years (cosmological time).

Think of time as the separation of the past from the future. We identify ourselves as living in the separated part anticipating a future. Consciousness unfolds in time because we are continually forced to create a new present. Time separates us in distance because light arrives from the past at velocity C. When I realized the power of separating us from our present, I was a little upset. It is stealing the effort that creates the moment (and I rather like most moments). But if nature didn't steal the moment we probably would not exist, think or evolve. Time passage (separation of past from present and future) is the motivating source for evolution. Nature forces us to create new information.

Distance

Above we studied dimensionless time (time/time) but in natural units light speed is the ratio circumference/time=natural length/natural time =1 for the quantum circle. We experience distance the same way we experience time, in relation to everything else. The "everything else" is the geometry of the universe. Separation and expansion of gravitational quantum circles is a feature of cellular cosmology. If we are looking for a denominator for a meaningful distance ratio, it is cosmological distance.

Information changes with time

Shannon defined the information content of a series of improbable communication symbols as high entropy (N) and used them to break code (N= -lnP). I recently published [18] a derivation of the equation E=e0*exp(N) where e0 is an energy constant. To be valid a very specific set of values N must be used to eliminate imaginary numbers. The "Fundamental N values" below must be arranged in sets of four (called quads) that represent Probability=1/1*1/1*1/1*1/1. Properly combined, the N values below produce a very accurate model of mass for the neutron (proton, electron, etc. reviewed in Appendix 2). The model also produces a 'treasure box" of information (Appendix 3) useful for understanding interactions and cosmology.

	Fundamental	time ratios are probabilities		
	N values	Probabilities		
	N= -ln(P)	P=(TE/te0)	P=t0/T	N= -ln(P)
set1	15.43	1.99E-07		
	12.43	3.99E-06		
set2	13.43	1.47E-06		
	12.43	3.99E-06		
set3	13.43	1.47E-06		
	12.43	3.99E-06		
set4	10.41	3.02E-05		
	-10.33	0.00E+00		
set 5	10.33	3.25E-05		
			multiply probabilities	
sum	90.00	8.17E-40	8.17E-40	90
		TE=e0*exp(N)	T=to*exp(90)	
		te0=2.02e-5/H	t0=1.5e-21 sec	

Each quad represents a quantum circle in the neutron with Et/H=1. The strange quark found at 102 MeV [17] is close to E=e0*exp(15.431)= 101.95 MeV. But t/te0=1/exp(15.431)=E/e0. The ratio 1/exp(N) is a probability. Probability carries its reference in the denominator (some of something/all of something) and is dimensionless. We need to be skeptical about what our senses tell us but nature is reducible to probability (information) and time. The value N=90 is the sum of fundamental N values. It appears to represent the potential for time and information to increase. But probability 1/exp(90) for mass+ kinetic energy and simultaneous probability 1/exp(90) for field energy yields combined P=1/exp(180). The value exp(180) probably represents the number of neutrons since this normalizes probability 1. This value agrees with several sources [2] and is used in cellular cosmology. If all neutron/protons came from one separation, they remain entangled in some way. Neutrons are persistent patterns of time and information (Schrodinger based orbits) with the freedom to have different positions (cellular cosmology). The particles emit and absorb light and exchange properties. An interacting network changes its information content with time [13]. If the particles are a gas, information is lost (thermodynamic entropy) with expansion decreases temperature. But neutrons, protons, electrons, etc. can fuse into atoms and be reshaped into objects by gravitational accumulation. There are a few niches where things becomes more complex over time although information overall is decreasing. Complexity increase [7] inside networks with time is another reason that time has my vote for the most fundamental thing in nature. I wanted to know what was inside the neutron but found an impasse. It was the pearly white, impervious value 1. But the 1 was opened, and inside, treasure!

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Appendix 1 Cellular cosmology

Consider large mass M broken into exp(180) protons labelled lower case m below. The mass (m) of a proton is 1.67e-27 kg. Fill a large spherical volume with exp(180) small spheres we will call cells. Consider the surface area of many small cells as a model of the surface of one large sphere with the same surface area. For laws of nature to be uniform throughout the universe there can be no preferred position. A surface offers this property but the equivalent surfaces of many small spheres also offer this property as long as we do not distinguish an edge. As such a surface model equivalent to the surface of many small cells is useful if the fundamentals of each cell are known.

In general relativity [1][2] the metric tensor (scholarly matrix equations from general relativity) is based on (ds^2=three distances^2 and (C*time)^2). The value ds^2 is a surface area and it is this surface that we will break into exp(180) small spheres. Let small r represent the radius of each small cell and big R represent the radius of one large sphere containing exp(180) cells with the same surface area. Position a proton like mass on the surface of each cell. The total energy will be that of one protons/cell plus a small amount of kinetic energy. We will evaluate the gravitational constant G of a large sphere and compare it with G of small cells. For gravitation and large space, we consider velocity V, radius R and mass M as the variables (capital letters for large space) that determine the geodesic. With G constant, M=m*exp(180) and the surface area substitution R=r*exp(90), the gravitational constant would be calculated for large space and cellular space as follows (lower case r,v and m below are for cellular space):

Area=4 pi R^2		Large space G		Cellular size G			
Area=4 pi r^2*exp(180)		RV^2/M	G=G	rv^2/m	r is the cell radius		
A/A=1=R^2/(r^2*exp(180)		R'V^2/M	G=G	r'v^2/m	r' is the proton size geodesic		
R^2=r^2*exp(180)		R'=r*('v/V)^2*(M/m)*1/exp(90)					
R=r*exp(90)			RV^2/M=	r*exp(90) *v^2/(m*exp(180))			
M=m*exp(180)				G=(r *v^2/m)*1/exp(90)			

The extremely small value 1/exp(90) is the coupling constant for gravity. When measurements are made at the large scale as must done to measure G, the above derivation indicates that we should multiply cell scale values (r*v^2/m) by 1/exp(90) if we expect the same G. Geometric and mass relationships give the cell "cosmological properties". I call this cellular cosmology.

Calculation of gravitational constant from the proton mass model

Using values for the proton mass model that the author believes unify nature's forces [9], the gravitational constant is calculated below [11] and agrees with the published constant, G=6.674e-11 N meters^2/kg^2. The goal is to use the fundamental radius 7.224e-14 meters to calculate the gravitational inertial force. The inputs listed at the top of the table originate in the neutron model above. The gravitational field energy 2.723 MeV gives R=7.224e-14 but there is kinetic energy (10.14 MeV) in the orbit that the neutron falls into. With mass and kinetic energy, gamma and V/C can be calculated. Next the inertial force is determined for the mass orbiting at radius R.

GRAVITY			
			neutron
Neutron Mass (mev)			**939.565**
Neutron Mass M (kg)			**1.675E-27**
Field Energy E (mev)			**2.732**
Kinetic Energy ke (mev)			**10.140**
Gamma (g)=M/(M+ke)			**0.9893**
Velocity Ratio v/C=(1-g^2)^0.5			**0.1457**
R (meters) =(HC/(2pi)/(E*E		**E=2.732**	**7.224E-14**
Inertial Force (F)=(M/g*V^2/R)*1/EXP(			**3.666E-38**
HC/(2pi)=1.97e-13 mev-m			**3.2319E-12**
Calculation of gravitational constant G			
G=F*(M/g)^2/R^2=NT m^2/kg^2			**6.6743E-11**
Published by Partical Data Group (PD(			**6.6743E-11**

The measured gravitation constant G is calculated above from fundamentals. The constant 1/exp(90) scales the quantum level to the large scale we observe around us. It has the effect of dramatically reducing the force between neutrons and makes gravity very long range compared to the other forces. The inertial force 3.66e-38 N is the same force as literature and confirms the radius 7.22e-14 as the radius for quantum gravity.

Appendix 2 Neutron model

This model is described in reference 18. The Down and Up quarks have the masses below and the column labelled difference KE are correspondingly higher than originally defined by the quads. Mass plus kinetic energy is conserved. The value 30.5 MeV KE separates from quark kinetic energy and becomes 10.15 MeV of strong residual kinetic energy and 20.3 MeV of expansion kinetic energy plus potential energy. For convenience in showing quanta that make up mesons and baryons, the value 3*0.69=2.06 MeV is shown separately (I didn't find it in simulations of meson and baryon masses). The neutron is lower in mass than total 960.539 MeV, the difference is strong residual field energy (-20.3). Position in the quads has the following meaning:

Mass		Strong Field	
kinetic energy		Grav Field Component	

	Unified.xls cell cq5											
	Calculation of Neutron Mass				Mass and Kinetic Energy					Field Energy		
	mass	Energy	S field	Energy	Mass	Difference	strong residual	Neutrino	Expansion	Strong fiel	Gravitational	
	ke	MeV	G field	MeV	MeV	MeV	MeV	MeV	KE or PE	MeV	Energy MeV	
Quad 1	15.432	101.95	17.432	753.29	4.357	651.344				-753.29		
	12.432	5.08	10.432	0.69		97.590					-0.69	
Quad 2	13.432	13.80	15.432	101.95	2.490	88.150	10.15		10.15	-101.95		
	12.432	5.08	10.432	0.69		**11.307**					-0.69	
Quad 3	13.432	13.80	15.432	101.95	2.490	88.150			10.15	-101.95		
	12.432	5.08	10.432	0.69		**11.307**					-0.69	
						-30.45						
						2.06						
Quad 4	-10.333	0	-10.333	0	0			0.67	t neut ke	0	-0.67	
	10.408	0.67	10.408	0.67				0	neut m			
Quad 5	10.333	0.622	10.333	0.622	0	0.62				-0.62		
			0.000	0.000							0.00	
	90.000	sum	90.000	sum	9.3361	920.0780	**939.5654133**	0.67	20.30	-957.807	-2.73	
							NEUTRON MASS		Total m+k	Total fields		
									Total posit	Total negative		
									960.539	-960.539	0	

Quads 4 and 5 transition as follows during neutron decay:

-10.333	0	-10.333	0	0.00	-5.44E-05		0.67	v neutrino ke		
10.408	0.67	10.408	0.67		-0.67		0.67	t neutrino	-0.62	-0.67
Neutron separates here to form proton and				9.34	918.78	**938.272073**	**PROTON MASS**			
10.136	0.511	10.333	0.622	**0.511**	**0.111**	0.622	Electron + ke			
0.197	2.47E-05	0	0	**ELECTRON**			2.47E-05	ae neutrino ke		

Appendix 3 Neutron model "treasure box"

1) The masses of the neutron and proton with many significant digits.
2) Gravitational field energy -2.73 MeV that yields the gravitational constant G combined with the right geometry (cellular cosmology)
3) The initial expansion kinetic energy 10.15 MeV that expands cells and determines the history of our cosmos [10][16].
4) The value 0.111 MeV (T=1.29e9 K). When the universe decreases to this temperature neutrons readily combine with protons balancing photo-disintegration of deuterium. This is the trigger for primordial nucleosynthesis and consistent with the observation that He4 is 24% of all atoms [12].
5) The neutron contains a quantum circle with 10.15 MeV of kinetic energy [18]. This value changes and causes the atomic binding energy curve [5] in association with 0.111 MeV that reverses neutron decay. Values from the binding energy model allow observed atomic abundances to be modelled [6].
6) Energy quanta found in the neutron model, properly combined, give the masses of the mesons and baryons [18].
7) Values that unify the four interactions [9][4]. Diagrams showing the interactions are in reference 18.
8) The possible number of neutrons in the universe (exp(180)).
9) The quantum basis of cosmological time (t=1.5e-21 sec) and space R=exp(60)*7.22e-14 meters and expanding.

10) The basis of a cosmology model that predicts that known mass plus dark matter is consistent with Hubble constant observation and CMB analysis (no missing matter). In this model, dark energy is expansion created by stars as they light up [16].
11) Values of N for masses and fields that allow the decay times of the mesons and baryons to be simulated. This includes decay time for the neutron [18].
12) The mass of the electron (m=e0*exp(10.136)=0.511 MeV.
13) The electromagnetic field of the electron (E=e0*exp(3*0.0986)=27.2e-6 MeV (N=ln(3/e)=0.0986 is derived in reference 18).
14) The kinetic energy of the three neutrinos.
15) The 0.622 MeV particle of fractional charge -0.33, multiples of which apparently form the Up and Down quarks (2.49 and 4.36 MeV).
16) The numbers N=0.0986 that describe absorption of light in wavelengths the eye perceives as color vision. Perception is thought to underlie cellular networks [7].