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Title: A Top-down Approach to Fundamental Interactions

Abstract

Accurate estimates regarding the number of neutrons in the universe are now available due to the COBE, WMAP [8] and PLANCK projects. There are approximately the natural number e (2.71828) to the power 180 (exp(N)) protons in the universe (Technical endnote 1). The author explored the possibility that this number is fundamental to physics. Probabilities similar to the field of information theory developed by Claude Shannon [16] and others were used as tools to develop an information based approach to energy. Considering the probability of one neutron as 1/exp(180) a "top-down" model lead to information anchored fundamental energy values. A model of the neutron and proton was developed that lead to unification of the fundamental interactions (forces).

A cosmology model the author describes as "cellular cosmology" defines space associated with each proton that geometrically combine into the universe. The relationship between large scale space and proton size space (cells) gives a small factor equal to 1/exp(90) identified as the gravitational coupling constant. A key field energy (2.732 MeV) extracted from the proton model is associated with the radius r=7.22e-14 meters. The source of gravity is the inertial force mv^2/r*(1/exp(90)) on a proton of mass m=1.67e-27 kg where r is the above radius and velocity v is associated with a kinetic energy of 10.11 MeV (v/C=0.145). The author considers this quantum gravity and the proton mass 938.272 MeV the energy scale for gravity. This is much lower than the Planck scale energy 1.2e22 MeV. This approach to gravity reconciles general relativity with the three other fundamental interactions. A "Force Table" is presented for the hierarchy of interactions sourced from the proton model and comparisons to published data are carried out.

Radius r=7.22e-14 meters expands and is the source of space around us.

Time counts forward based on fundamental time 2*pi*r/C*number of cycles.

Methodology

Information theory and thermodynamics define probability P and uncertainty S as shown in the following table. The methodology involves the use of the natural log (ln). Information theory probability and energy are defined together [13] with P=1/exp(N)=e0/E. This makes Energy E=e0*exp(N). The pre-exponential e0 will be evaluated and E=e0*exp(N) will be used to anchor energy values. There are fundamental energy values associated with N based on (P=1/exp(N)=1/exp(180)). Information operations on N yield excellent energy models of the neutron and proton.

Comparison		
Information Theory	**S= -ln P**	**S is called information**
		P is a probability
Thermodynamics	**S=- ln P**	**S is called entropy**
		P is a probability
This proposal	**N= -ln P**	**N is called information**
		P is a probability
		P=1/exp(N)
		P=e0/E=v0/v
	E=e0 exp N or N=ln E/e0	

Relationship between exp(180) neutrons and energy

Neutrons are energy and it is reasonable to take P=1/exp(180)*exp(180)=1 as the beginning condition where exp(180) is the number of neutrons and P=1/exp(180) is the probability associated with neutron energy.

Wave/particle duality is fundamental in physics and describes energy with complex numbers. The probability associated with the energy of a neutron requires multiplying the square root of probability where probability is a complex number i.e. psi=e0/E*exp(iv dt) with its complex conjugate psic=e0/E*exp(-iv dt). The symbol i designates an imaginary number, v is frequency and dt is differential time. With e0/E= 1/exp(90), this gives probability 1/exp(90)*1/exp(90)= 1/exp(180).

Define probability and e0 as follows:
e0/E=1/exp(N)
psi=1/exp(N)*exp(ivt)
P=1/exp(N)*exp(ivt)*1/exp(N)*exp(-ivt)
P=1/exp(180)
e0/E=1/exp(N)=1/exp(90)

The evaluation is limiting to times when exp(iv dt)*exp(-iv dt)=1. There will be two e0/E values associated with energy (mass + kinetic energy) and e0/E associated with field energy. As waves they may be out of phase but they are both improbable and

probabilities multiply. We evaluate the components of e0/E in operations 1-5 below where energy E is represented by the value 90 through the equation E=e0*exp(N).

We will also use the concept of frequency (v=1/time) and the conventional physics relationship E=Hv, where H is Planck's constant, 4.136e-21 MeV-sec. Planck's constant lets us relate conventional time (sec) and energy (MeV).

Note: We will use million electron volts (MeV) as the basic energy unit. An electron has charge and one electron volt of energy is required to move it across a one volt potential. Since an electron volt is small, physicists often multiply it by one million. Distance is meters, time is seconds (sec) and mass is kilograms (kg).

Information operations 1, 2, 3, 4, 5 and the Higgs

Modern physics accurately describes many aspects of nature but also requires the insertion of many constants. The standard model [4][5] makes the Higgs energy the source of particle mass and its energy has recently been identified experimentally.

Five information operations will be described below, the first of which is simply, divide the N= 90 by 4 to give four values of 22.5 each. The author associates these values with what will be called the Higgs N value (see Technical endnote 1 under the column entitled N). The author also associates these values with four equal dimensions.

							Fundamental	
		Operation 1					N values	
		↓	Operation 2&3		Operation 4&5		↓	
Higgs X dimension		22.5	10.167	5.167	15.333	0.0986	15.432	set1
			12.333		12.333	0.0986	12.432	
Higgs Y dimension		22.5	10.167	3.167	13.333	0.0986	13.432	set2
			12.333		12.333	0.0986	12.432	
Higgs Z dimension		22.5	10.167	3.167	13.333	0.0986	13.432	set3
			12.333		12.333	0.0986	12.432	
			0.667		0.667	0.0750	0.075	set4
Time		22.5	11.500					
			10.333		10.333		10.333	
Total		90	90		90		90	

The third, fourth and fifth operations are arithmetic operations on the logarithm N=90 as shown in the table above. The number 0.6667 in the second column above is related to charge and is associated with the value 0.0986 = ln(3/e)-1. The source of the information operations is unknown but the author will show how the fundamental N values in the table above specify parts of the neutron. The numbers 15.43, 13.43 and 13.43 will be associated with quarks in the neutron/proton. After each operation, N= 90 is maintained

as the sum. Each fundamental N value above has a probability 1/exp(N) associated with it and the total probability P= 1/exp(90)=8.194e-40 =1/exp(15.432)*1/exp(12.432)…..etc.

Identify e0 for E=e0*exp(N)

We are going to use the equation E=e0*exp(N) to evaluate energy but we must find e0. That association is found with the number 10.333 - 3*0.0986=10.136. The number N=10.136 represents the electron which has known mass 0.511 MeV and the number N=0.296= 3*0.0986 is associated with the charge of the electron, 2.72e-5 MeV. Data labelled PDG in this document is from the Particle Data Group [4].

						e0=E/exp(N)	
Find the value e0 by solving the above equation with E=.511						**e0= 0.511/exp(10.136)**	
Electron mass (mev)		**mass of electron (MeV)**		**0.5110**	**MeV**	**2.025E-05**	**mev**
		(best value from PDG)		**0.5110**	**MeV**		
Note that 3*.0986=.296				**E=eo*exp(.296)=2.72e-5 mev**		**2.72E-05**	**mev**
The electric field energy of the electron is known to be: (MeV)						**2.72E-05**	**mev**

All subsequent energies are evaluated with the constant e0: i.e. E=eo*exp(N), where e0=2.025e-5 MeV. The Higgs energy can be determined with the equation E=2.025e-5*exp(22.5)=119671 MeV. This value for the Higgs published on July 4 2012 is 125300 and was within the range identified [5].

The Energy interaction

Operations one through five created four sets of numbers and set2 (N=13.432 and N=12.432) will be used below for demonstration.

Fundamental N values	
15.432	set1
12.432	
13.432	set2
12.432	
13.432	set3
12.432	
0.075	set4
10.333	
90	

The energy interaction adds the number 2 to 13.43 to give 15.43 while at the same time the number 2 is subtracted from 12.43 to give 10.43. Each number in the interaction has a specific place and a specific meaning described below. We will call these 4 numbers and associated energy a quad.

E1 will be identified as a mass (a quark for the strong interaction)
E2 is identified as a kinetic energy (ke) addition to energy E1.
E3 is identified as field energy (strong potential energy for this N).
E4 is identified as a gravitational energy component.

		mev			mev		
		E=e0*exp(N)			E=e0*exp(N)		
N1	13.432	13.797	E1 mass	N3	15.432	101.947	E3 field
N2	12.432	5.076	E2 ke	N4	10.432	0.687	E4 field

This energy interaction has powerful implications resulting from the addition and subtraction of the number 2. The interaction involving E1 can be read E1 is given exp(2) of energy to become E3 . Since the numbers (N) are exponents (recall that E=e0*exp(N)), the number 2 can be associated with a divisor 1/exp(2)=0.135 that increases E1 energy to E3. In other words, energy 13.78 MeV becomes 101.947 MeV after the interaction since 13.79/0.135=101.947 MeV. The value 0.135 is identical to the concept of gamma in relativity. Gamma is the divisor that increases the kinetic energy of a fast moving mass involved in the Lorentz transformation. The definition required is: ke=m/gamma-m.

These above energy values are placed in a table below with mass plus kinetic energy (102.634 MeV) separated from field energy (102.634). The total energy across the interaction is conserved at zero with mass (E1) + ke (E2) +ke difference (E4+E3-E2-E1) balancing field energies (E3+E4 shown as negative).

	ke (difference ke)			E3 field1	
E1 mass	E3+E4-E1-E2	E2 ke			E4 field2
mev	mev	mev		mev	mev
13.797	83.761	5.076		-101.947	
					-0.687
E1+difference ke+E2		102.634		E3+E4	-102.634
Energy is conserved since 102.634=102.634					

The interaction creates orbits with mass orbiting field energy. The table above can be read “a quark of mass 13.797 MeV with 83.761 MeV of kinetic energy orbits in strong field energy of 101.947 MeV”. “The quark mass also orbits in a second field energy 0.687 MeV (a gravitational field energy component) with 5.076 MeV of kinetic energy”.

These may be special case Lagrangians and the energy interaction is similar to a conventional qauge transition.

The neutron mass model

The concepts are now in place to understand the overall energy balance for the logarithm N= 90 components. There were five operations on 90 that created 4 sets of fundamental N values. An energy interaction involving adding and subtracting the number 2 separated mass plus kinetic energy from field energy. The result was called a quad since the interaction involved four numbers. The tables below assemble the 4 quads into an overall energy balance that gives the neutron mass.

The neutron mass model is broken into two parts below. The first part shows three quads for the quarks and the two quads (the forth quad splits into two quads by borrowing N=10.33) for what will become the neutrinos and electron. Quads are separated by lines and energy is derived from E=e0*exp(N) where e0=2.02e-5 MeV.

	N for Neutron Energy Interactions			
	mass	Energy	S field	Energy
		MeV	G field	MeV
Quad 1	15.43	101.95	17.43	753.29
	12.43	5.08	10.43	0.69
Quad 2	13.43	13.80	15.43	101.95
	12.43	5.08	10.43	0.69
Quad 3	13.43	13.80	15.43	101.95
	12.43	5.08	10.43	0.69
Quad 4	10.41	0.67	-10.33	-0.62
	-10.33	-0.62	10.41	0.67
Quad 5	10.33	0.62	10.33	0.62
	0.00	0.00	0.00	0.00
	↓		↓	
	90.00	sum	90.00	

The second part of the neutron mass model below shows the associated mass and kinetic energy for the quads above. The results of 5 energy interactions are arranged into columns. The columns labelled Mass, Difference kinetic energy (KE), Residual KE and Expansion energy are designated as positive while the Strong field energy and Gravitational field energy are designated as negative. The sum of all energy is zero composed of 959.2 MeV-959.2 MeV.

		Mass, Kinetic Energy and Fields for Neutron					
							Gravitational
				Residual ke	Expansion		Field
	Mass	Difference KE			KE	Strong field	
	mev	mev		mev	mev	MeV	MeV
Quad 1	101.95	641.88		10.15		-753.29	
							-0.69
Quad 2	13.80	78.69			10.15	-101.95	
							-0.69
Quad 3	13.80	78.69			10.15	-101.95	
							-0.69
Quad 4	0.00	0.00		0.0485			-0.67
Quad 5	0.62	0.00					
	130.16	799.25	939.57	**0.048**	20.30	-957.18	-2.73
			NEUTRON MASS		Total m+k	Total fields	
					Total posi	Total negative	
					959.916	-959.92	
					MeV	MeV	

The mass and kinetic energy value 939.57 MeV is the mass of a neutron and compares within measurement error for a neutron in the section below entitled "Data Comparisons". We can name the energy components of the neutron using Technical endnote 1. It contains one quark of mass 101.95 MeV that is called the strange quark and two quarks of mass 13.8 MeV called down quarks. The quarks are in orbits around strong field energy shown in the column labeled Strong Field. They have kinetic energy shown in the column labeled Difference KE.

The author identifies the total energy 2.732 MeV as the gravitation field energy. The energy labelled residual ke is 10.15 MeV (2*5.08) of energy that changes when fusion occurs. The energy 20.3 MeV (4*5.08) is expansion energy [22].

Quads 4 and 5 use the same position identifiers and mass+ke is equal and opposite field energy like the other quads. All energies are MeV.

			Difference KE
E1 mass	**E3 field**		**KE=E3+E4-E1-E2**
E2 ke	**E4 field**		

E1 for quad 4 is 0.671 but E2 is subtracted yielding a neutrino of energy 0.048 Mev (0.671-0.622).
E3 is zero for quads 4 and 5 together (0=0.62-0.62).
E4 for the 4th quad contributes gravitational field energy component -0.671 MeV.

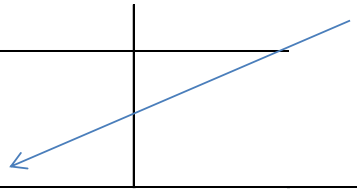
Difference KE=0=E3+E4-E1-E2.
E1 for quad 5 contributes 0.622 MeV to the neutron mass but E2 and E4 are zero. E3 as indicated above is zero for quads 4 and 5 combined. Difference ke is zero.

A simplified model is presented below based on adding the quark values together. The quark masses total 129.51 MeV in the strong field energies total 957.2 MeV.

	Mass and Kinetic Energy			Field energy	
	Mass	ke		Strong	Gravitational
				field ener	Energy
	MeV	MeV		MeV	MeV
Quark S	101.947	641.880		-753.291	-0.687
Quark U	13.797	78.685		-101.947	-0.687
Quark D	13.797	78.685		-101.947	-0.687
	129.541	799.251		-957.185	-2.061

The quarks are added together in the simplified model below. The value 130.16 includes the 5th quad mass 0.62 MeV.

Simple neutron model					
r20 uc2					
	Mass and Kinetic Energy			Field energy	
	Mass	KE	Strong	Strong	Gravitational
	Quarks		Residual	field ener	Energy
	MeV	MeV	Field	MeV	MeV
Strong	130.16	799.25		-957.18	-2.73
Strong Residual KE		10.15			
Neutron		939.57	(-20.30)		-959.92
neutrino		0.05			
Gravitational ke		10.15			
Gravitational pe		10.15			
Total		959.92			



Strong residual field energy is a reference value. The proton has only 939.57 MeV but the total field energy is -959.92 and the missing energy acts like a field energy of value 20.3 MeV.

The proton mass model

The neutron decays to a proton, electron and neutrinos with a half-life of 881 seconds (PDG). The decay process starts with a separation between the 4th and 5th quads. Quad 5 changes slightly as the neutron decays. The N=10.33 borrowed from quad 4 becomes 10.136+0.196. The electron is mass E1=0.511 MeV. Charge separates giving the electron and proton equal and opposite electromagnetic field energy 27.2e-6 MeV. Details follow:

			-0.296	-2.72E-05	
			equal and opposite charge		
E1 Quad 4	-10.33	-0.62	-10.33	-0.62	**E3**
E2 Quad 4	10.41	0.67	10.41	0.67	**E4**
E1 Quad 5	10.136	0.51	10.33	0.62	**E3**
E2 Quad 5	0.197	2.47E-05	0.296	2.72E-05	**E4**

			Difference KE
E1 mass	**E3 field**		**KE=E3+E4-E1-E2**
E2 ke	**E4 field**		

Quads 4 and 5 use the same position identifiers and rules.
E1 for quad 5 mass is the electron 0.511 MeV.
E2 for quad 5 ke=2.47e-5 MeV is the electron anti-neutrino.
E3 is identified as field energy but is 0 for quad 4 and 5 together (0= -0.62+0.62).
E4 is the electromagnetic field energy as N=0.296-0.296 splits. E4 is 2.72e-5 MeV.
Difference energy 0.111 MeV=0.622+2.7e-5-0.511-2.47e-5.

	Mass, Kinetic Energy and Fields for Proton						
						Gravitational	
			Residual ke				Field
	Mass	Difference KE		Expansion		Strong field	
	mev	mev	mev	mev	KE	MeV	MeV
Quad 1	101.95	641.88				-753.29	
							-0.69
Quad 2	13.80	78.69				-101.95	
							-0.69
Quad 3	13.80	78.69				-101.95	
							-0.69
			10.15		20.30	expansion pe	
					0.00	expansion ke	
Quad 4		-0.67		0.67	v neutrino		
				0.05	neutrinos		-0.67
	129.54	798.58	**938.27**	**PROTON MASS**		2.72E-05	
Quad 5	0.51	0.11	e ke	2.47E-05	e neutrin	-2.72E-05	
	ELECTRON						
				Total m+ke		Total Negative	
		0.62	938.27	0.72	**959.92**	**-959.92**	-2.73
					MeV	MeV	

The 5th quad mass E1 0.622 MeV separates from the neutron and becomes the electron 0.511 MeV with 0.11 MeV KE. Also a neutrino of mass 0.671 MeV leaves the neutron. Together 0.671 and 0.622 =1.293 MeV give the energy difference between the neutron and proton.

Neutrinos and Spin

Nature maintains another zero. It allows an electron to be created if and only if an anti-particle in the lepton family is created. That particle is the energy 2.47e-5 MeV named the anti-electron neutrino. The neutron and proton models show three neutrinos each with half spin. Their energies are 0.671, 0.0485 and 2.47e-5 MeV. Three neutrinos agree with the standard model although their energies are not well known. The neutron gets its half spin by ejecting the 0.0485 MeV neutrino. The electron gets its half spin by ejecting the 2.47e-5 neutrino. The proton keeps the neutron half spin by ejecting the electron and 0.671 neutrino of opposite half spin.

Adding the quarks together, ejecting the 0.622 MeV for the electron quad and ejecting a neutrino 0.671 MeV gives the proton mass 938.272 MeV.

	129.541	**799.251**	**-0.671**
		10.151	
Proton		**938.272**	**Mev**

The simplified proton mass model follows:

	Mass and Kinetic Energy			Field energy	
	Mass	KE	Strong Residua	Strong field energy	Gravitational Energy
	MeV	MeV		MeV	MeV
Strong	130.16	799.25		-957.18	-2.73
Strong Residua		10.15			
Neutron		939.57	(-20.3)		-959.92
neutrino		0.05			
below, the Neutron decays to a proton, electron and neutrino					
Proton		938.27		2.72E-05	
ejected neutrino		0.67		E/M charge splits	
Electron	0.51	0.11		-2.72E-05	
Gravitational k		10.15	10.11		
Gravitational p		10.15	10.19		
Total		959.92			

Data comparisons

Note the excellent agreement with (National Institute of Standards and Technology [15] and Particle Data Group[4].

931.4940281	nist		0.51099891		0.5110002	548.581341	-1.33472E-06		1.30E-07
931.4940282	pdg	548.5799095	0.51099891		0.5110002	548.581343		-0.00143339	2.40E-07
simple cell g67	Data		Data (mev)		Calculation (mev)	calculation	Difference	Difference	measurem
	Ratio		Particle Data Group		Present model	(amu)	(mev)	(amu)	error
		(amu)			(mev)				
Neutron		1.008664916	939.5653600		939.565353	1.00866492		-8.3214E-09	
Proton		1.007276467	938.2720132	pdg	938.272013	1.00727647	-1.42109E-10	4.77933E-10	6E-10
Neutron/electron	1838.683661		939.5653460	nist	939.565353		-7.11786E-06		2.30E-05
Proton/electron	1836.152672		938.2720130	nist	938.272013		-2.30142E-07		2.30E-05

The radius of quantum mechanical orbits

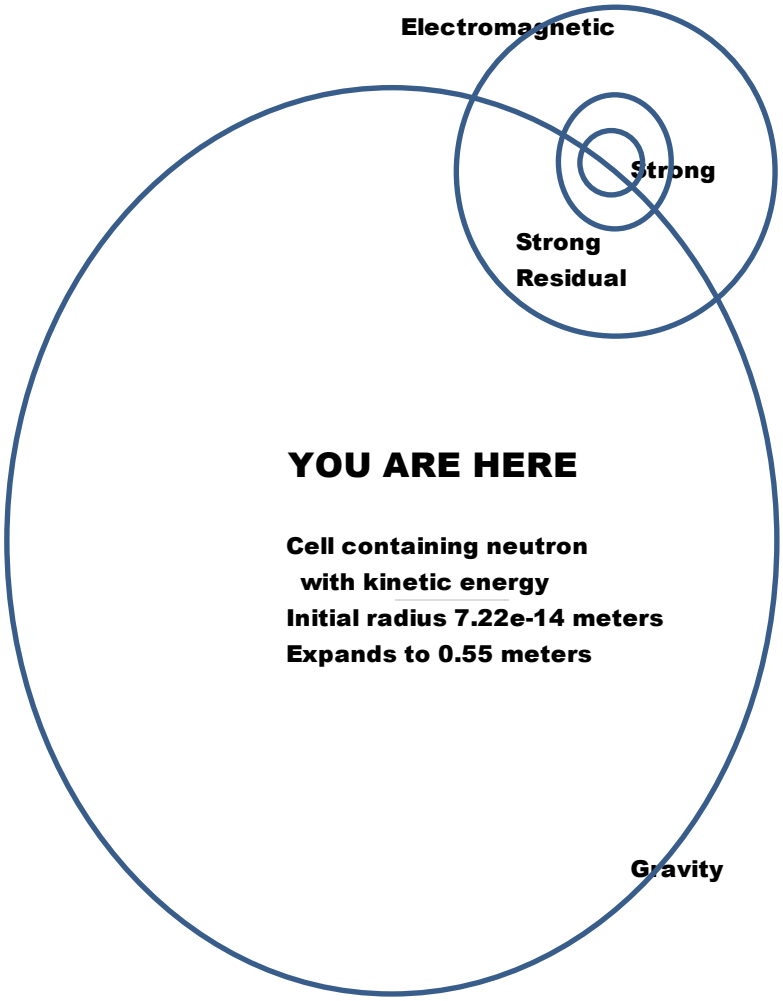
Technical endnote 2 shows development of the equation R= HC/(2pi)/E. This known equation for orbital radius [14] gives the energy that establishes a quantum mechanical orbit. R is also (HC/(2pi)/(E*m/g)^0.5 where mass (m) with velocity (gamma) orbits field energy (E) at radius R. Gamma (g)= ke/(m+ke). It must be understood that position of a particle associated with the circle is probabilistic.

Fundamental forces

The proton is a manifestation of information and energy interactions and contains orbits that underlie the fundamental forces. The following table reviews four orbits associated with the proton mass model above. Gamma and radius (R) are shown for each orbit.

	Mass (m) (mev)	Ke (mev)	gamma (g	R meters	Field (E (mev)
Gravity	938.272	10.110	0.9893	7.2238E-14	-2.732
Electromagn	0.511	1.36E-05	0.99997	5.2911E-11	-2.72E-05
Strong	129.541	798.580	0.1396	2.0936E-16	-957.18
Strong residu	928.121	10.151	0.9892	1.4297E-15	-20.303

The basis of all four forces is a mass that falls into a field energy and establishes an orbit with kinetic energy. There are four nested orbits.



Strong Force: The three quarks 129.5 MeV fall into strong field energy labelled -957.185 MeV with kinetic energy 798.6 MeV.

Strong Residual Force: The total field energy for the entire table is -959.92 MeV. This is lower than the known neutron mass 939.565 MeV and the "missing energy" is field energy -20.3 MeV. The quarks with their kinetic energy fall into this field energy and gain 10.15 MeV from their fall. At this point the neutron mass is 939.59 MeV.

Gravitational Force: The neutron subsequently falls to a radius 7.22e-14 meters established by the gravitational field energy labelled -2.723 MeV. The neutron originally had kinetic energy 20.3 MeV but when the gravitational orbit was established, the kinetic energy was 10.15 and the potential energy was 10.15 MeV. The cellular cosmology model and the gravitational coupling constant described below must be used to understand the forces. Radius 7.22e-14 meters expands to 0.54 meters as the universe expands and there are exp(180) cells of this radius. (You are here).

Electromagnetic Force: After neutron decay, the electron has negative field energy 27.2e-6 MeV and the proton has positive field energy 27.2e-6 MeV. The electron mass 0.511 MeV falls into the field energy and establishes an orbit with 13.6e-6 MeV of kinetic energy.

The cellular cosmology model

A cosmology model is proposed [17][18][19] that is based on exp(180) cells, each associated with a proton. Let small r represent the radius of a many small spheres and large R represent the same surface area of one large sphere containing exp(180) spheres. There is one proton on the surface of each cell. Large M equals small m*exp(180). A cosmology model based on a large surface offers the feature that no particle occupies a preferred position. This feature is required so that the laws describing the particle and its position are no different than any other particle. Geometrically, many small cells with the same combined surface area offer the same feature. General relativity uses the metric tensor (ds^2=three dimensions dr^2+ Cdt^2). The surface area of a 2-sphere is broken into many small spheres with an equal surface area i.e., Area=4*pi*r^2*exp(180) and this leads to R=r*exp(90). The total energy will be that of one proton like mass/cell plus a small amount of kinetic energy. Based on geometry, two substitutions are placed in the gravitational constant G below, i.e. M=m*exp(180) and R=r*exp(90).

Area=4*pi*R^2
Area=4*pi*r^2*exp(180)
A/A=1=R^2/(r^2*exp(180)
R^2=r^2*exp(180)
r=R/exp(90) surface area substitution
M=m*exp(180) mass substitution

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):

At any time during expansion		
Large space		**Cellular Space**
		With substitutions:
		R=r*exp(90) and M=m*exp(180)
R*V^2/M=	**G=G**	**r*exp(90)*V^2/(m*exp(180))**
R*V^2/M=	**G=G**	**(r*v^2/m)/exp(90)**

It is known that gravity is inertial as stated by the general theory of relativity. The source of information about gravity is a fundamental radius that partially defines the geometry of space time. The radius (by the equation R=(HC/(2pi)/(2.732) is 7.22e-14 meters. The orbital velocity is given below:

Identify the radius and time for the gravitational orbit described above				
Fundamental radius=1.93e-13/(2.732*2.732)^.5=7.224e-14 meters				
Fundamental time=7.224e-14*2*PI()/(3e8)=h/E=4.13e-21/2.732				
Fundamental time	**1.514E-21**	**seconds**		

Gravitational Constant

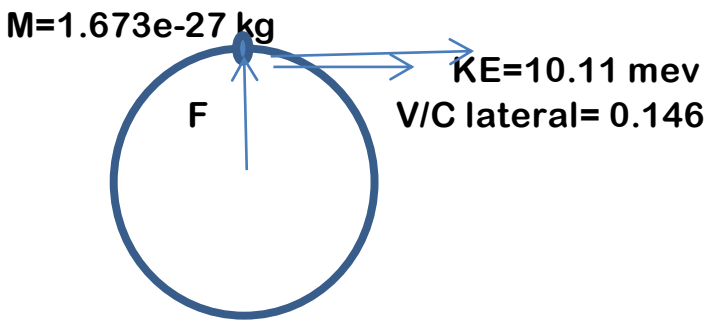
The above information leads directly to a calculation for the gravitational constant. Physics has struggled with the reconciliation of general relativity and quantum field theory. The main reason for the difficulty is gravity's very low force and very long range effect. The above radius partially defines the geodesic for gravity. The proton is on this radius and its mass and velocity complete the geodesic (a geodesic is the combination of r,v and m that give the gravitational constant G, i.e. G=r*v^2/m). The author also believes that the value 1.51e-21 sec defines fundamental time. As this value repeats, time increases. The author used these concepts to study cosmology [24][18][20].

Source of Gravitational Constant G:

GRAVITY				
			proton	neutron
Neutron Mass (mev)			**938.2720**	**939.565**
Neutron Mass M (kg)			**1.673E-27**	**1.675E-27**
Field Energy E (mev)			**2.732**	**2.732**
Kinetic Energy ke (mev)			**10.111**	**10.140**
Gamma (g)=M/(M+ke)			**0.9893**	**0.9893**
Velocity Ratio v/C=(1-g^2)^0.5			**0.1456**	**0.1457**
R (meters) =(HC/(2pi)/(E*E)^0.5			**7.224E-14**	**7.224E-14**
Inertial Force (F)=(M/g*V^2/R)*1/EXP(90) N			**3.656E-38**	**3.666E-38**
HC/(2pi)=1.97e-13 mev-m				
Calculation of gravitational constant G				
G=F*R^2/(M/g^2)=NT m^2/kg^2			**6.6739E-11**	**6.6743E-11**
Published by Partical Data Group (PDG)			**6.67E-11**	**6.6743E-11**

The inertial force m/g*v^2/R*1/exp(90) equals 3.66e-38 Nt. This orbit is caused by firstly, a field energy of 2.732 MeV establishing the radius and secondly a neutron falling from a potential energy of 20.3 MeV to the radius and developing kinetic energy 10.14 MeV. Gravitation is known to be inertial and in general relativity the central mass shapes space-time and a body follows the curvature. When a body of mass M finds the combination of radius R and velocity V where it experiences no force, it is called the geodesic. This is known as the equivalence principle in general relativity. In cellular cosmology, general relativity continues down to the quantum level. The field energy 2.732 MeV shapes space-time and a neutron falls to that radius. The proton model gives the neutron 20.3 MeV at the beginning. When a geodesic is established it has 10.14 MeV (10.11 for the proton) of potential energy and 10.16 MeV of kinetic energy. For the cell with the aid of 1/exp(90), the geodesic is:

V m/sec 0.146*3e8=4.4e7
M kg 1.67E-27
R=GM/V^2*exp(90) 7.22e-14 meters



The author believes that the radius 7.22e-14 meters is the fundamental radius of exp(180) cells that define the beginning radius of a large volume that expands and becomes the universe. As these cells expand to about 0.54 meters each they define a large radius of about 6.2e25 meters.

Calculation of gravitational force with accepted the accepted coupling constant

In physics, the gravitational coupling constant, αG, is the coupling constant characterizing the gravitational attraction between two elementary particles having nonzero mass. αG is a fundamental physical constant and a dimensionless quantity, so that its numerical value does not vary with the choice of units of measurement (Wiki).

AlphaG=Gme^2/(hC)=(me^2/mP^2)=1.752e-45

This coupling constant can be understood as follows:

http://en.wikipedia.org/wiki		
alphaG=(mp/me)^2=1.752e-45		
mp/me=1836.	where mp/me=proton/electron	
alphaG=1836.15^2*1.752e-45=5.907e-39		
F=(5.9068e-39)*hC/R^2		

If R for the force calculation is 7.22e-14 meters, as proposed above, the force is:

F=(5.9068e-39)*hC/R^2				
	hbar		6.5821E-22	mev-sec
	hbar in NT-m-sec		1.05E-34	NT m sec
	hbarC in NT-m^2=K		3.16E-26	NT m^2
F=(5.9068e-39)*K/R^2				
F=(5.9068e-39)*3.16e-26/(7.22e-14)^2=3.58e-38 NT				
3.579E-38	NT			

This result agrees with the simple Newtonian force within adjustments for gamma:

F=Gmm/R^2 (nt)=6.67428e-11*1.6726e-27^2/7.224e-14^2=3.666e-38 nt

The force (3.58e-38 NT) derived from the accepted coupling constant is identical within gamma to the calculation above (3.66e-38 NT) under the above heading “Source of Gravitational Constant G”. Based on this the author believes the coupling constant for G is in fact the small factor 1/exp(90). This is the derived value 1/exp(90) in the heading above entitled “The Cellular Cosmology Model”.

Force Table

The sources of information for this table are the neutron/proton orbits identified in the diagram above and the neutron/proton information model. The strong interaction values come from the total quark values indicated above in the simplified proton model. The author notes that the quarks in the model are in high energy states [3] and that the accepted energy states (up and down quarks) have the same total energy (lower mass and higher kinetic energy). Each interaction is organized as a column of inputs, calculations for gamma and calculation for the radius of the quantum orbit. The force is F=E/R in Newtons and also inertial force F=m/g*V^2/R. The orbits are balanced force orbits although for gravity E/R is non-meaningful.

Below the author's calculations, conventional physics results are presented for comparison.

Unification Table	cell ax74	Strong		Electromagn	Gravity
		Combined	Strong Residual		proton
		MeV	MeV	MeV	MeV
Field Energy E		957.18	20.303	2.72173E-05	2.732
Particle Mass (mev)		130.16	928.121	0.511	938.272
Mass M (kg)		2.32E-28	1.65E-27	9.11E-31	1.6726E-27
Kinetic Energy (mev)		798.58	10.151	1.361E-05	10.111
Rydberg energy from PDG				1.361E-05	
Gamma (g)=m/(m+ke)		0.1401	0.9892	0.99997	0.9893
Velocity Ratio	v/C=(1-(g)^2)^.5	0.9901	0.1467	7.298E-03	0.1456
R (meters) =((HC/(2pi)/(E*M/g)^0.5)		2.0929E-16	1.4297E-15	5.291E-11	7.2238E-14
Electromagnetic R minus proton R=5.291627e-11-1.4297e-15				5.291E-11	
Force Newtons	F=E/R*1.6022e-13	732765.9	2275.2	8.242E-08	3.6556E-38
Inertial F Nt	F=M/g*V^2/R	710992.321	2262.86246	8.241E-08	3.6556E-38
Force=HC/(2pi)/R^2=3.16e-26/Range^2 (n		721797.0	15466.9	1.129E-05	
HC/(2pi) 3.16E-26	(4.13e-21*3e8*6.24e12/(2*pi())				
F=(5.907e-39)*hC/R^2 (nt)					3.5786E-38
F=6.67428*m^2/R^2					3.5782E-38
Coupling constant derived from this work		1.0152	0.147099	137.03047	1/exp(90)
Derived c^2 (E*R) mev m		2.00E-13	2.90E-14	1.44E-15	1.19E-51
Derived c^2 joule m		3.21E-26	4.65E-27	2.31E-28	1.91E-64
Derived exchange boson (mev)		942.856	138.02	0.0037	
*published c^2 mev m			1.56E-14	1.44E-15	1.17E-51
*published c^2 joule m			2.5E-27	2.31E-28	1.87E-64
*Range				5.29E-11	8.82E+25
*http://www.lbl.gov/abc/wallchart/chapters/04/1.html				5.29177E-11	
Published coupling constant (PDG)		Rydberg data from PDG		137.03599	

Comparison of force table coupling constants with published results

Conventional physics utilizes a coupling constant to give the force (interaction) for each of the four fundamental forces in nature. The table above reviews the coupling constant for the hierarchy of additional interactions. The concept of gauge forces utilizes bosons moving at velocity C and exchanging inertia to explain action at a distance. For example the strong residual energy is described historically by the Yukawa potential and a pion exchange particle. Interaction coupling constants in the literature are based on this concept (gluons for the strong interaction).

Conventional physics forces are F (NT) = HC/(2*pi)/R^2=3.16e-25/R^2 NT. From this a coupling constant is calculated for comparison as the ratio of this force divided by the author's force in the box.

The calculated electromagnetic coupling constant is very close to the published value. The electron and its field have many states, some separated by low amounts. The Rydberg energy is the accepted field energy and may be slightly reduced due to field shielding. (Measurements are carried out on electrons orbiting protons, whereas the author's model is based on ideal field energy).

The Strong residual coupling constant is 0.147. The author found published coupling [21] constants for comparison. The values were labelled c^2 and the values were in Joule-MeV. Good agreement is shown between derived values and published values. The residual kinetic energy value 10.151 is exactly the value that matches the binding energy curve (see "A Simple Model of Binding Energy" [1]). The author did not find coupling constants for the strong interactions (they are not observed independently)

Boson masses calculated in the table above and reproduced below using boson energy (MeV)=HC/R=1.97e-13 MeV-m/R. The literature value for the exchange pion is 131.5 MeV, slightly lower than the author's calculation for this boson is 138 MeV.

Derived exchange boson (mev)		**942.856**	**138.02**	**0.0037**	

Range of the gravitational force

The gravitational coupling constant 1/exp(90) is the reason that the gravitational force has a large range compared to the other forces. The analysis could involve dh proportional to dp*dx or de*dt. Multiplying dx by exp(90) makes the most sense and the long range could be 7.22e-14*exp(90)=8.8e25 meters.

Summary

The author believes that nature's underlying laws are information laws based on the large number exp(180). This paper appears to decode some of the information laws. Particles are assigned information values N that give the Energy E=e0*exp(N). The value e0 is

2.025e-5 MeV based on the recognizable electron with N=10.136. Nature apparently assembles N values into the neutron and proton because their mass models agree with published data. Considering the proton as a manifestation of four orbits, information was extracted that appears to unify the four fundamental interactions. The interaction hierarchy was condensed into a "Force Table" and comparisons were made between accepted coupling constants and predicted values.

Gravity in known to be the geometry of space time but current gravitational theory produces infinities and quantum foam like space under some conditions. It is generally accepted that the source of the gravitational constant (G) is the Planck scale. The fundamental relationship gives the Compton wavelength (for gravity the Planck length L), L=(\h*G/C^3)^.5 as a function of the reduced Planck or Heisenberg constant (\h pronounced hbar), G and C the speed of light. The Compton wavelength is 1.61e-35 meters and this is associated with the Planck energy 1.2e22 MeV. Technical endnote 3 compares that Planck scale with the proton scale proposed and concludes that the protons scale is more reasonable. Based on the proton mass model field energy 2.732 MeV defines a radius (7.22e-14 meters) that the proton falls to and establishes a geodesic. The theory required a new approach to modeling cosmology. Cells were defined as small spaces associated with each proton that has a geometrical relationship to the universe as a whole. This allowed two substitutions in the equation G=RV^2/M. The first substitution is M universe= m proton*exp(180). In general relativity the metric tensor (ds^2) of a 2-sphere is and the second substitution is R universe= r cell*exp(90). Together the substitutions give G=rv^2/m*(1/exp(90). The small factor 1/exp(90) was shown to be the coupling constant for gravitation when forces were compared with currently accepted coupling constants. The inertial force 3.66e-38 Newtons is the source of gravitational constant G. The author believes that this source of gravity can be considered a reconciliation of the standard model [4] [5] and Einstein's general relativity.

The author proposes that the basis of space and time are the values 7.22e-14 meters and 1.51e-21 seconds.

Further summary from other documents by the author:

A unified theory must meet other criteria to be of value. The muon, taon, mesons and baryons should also be manifestations of the underlying laws. The author found a tentative progression of energies underlying these particles [3].

The binding energy curve should also be explained by the theory and this is successfully demonstrated [1] using the residual kinetic energy 10.15 MeV.

A unified theory will also be fundamental to the field of cosmology. Equations for expansion were developed [24][18] for the cellular model that agree with WMAP [8] expansion history. The resulting expansion model was used to evaluate kinetic energy and potential energy of expansion. The kinetic and potential energy values 10.15 MeV from this document are the correct values for expansion.

Conservation of energy is demonstrated but dark energy was shown to be negligible. Based on matching the Hubble constant with the accepted value (2.3e-18/sec) the current radius of each cell is 0.54 meters. The cellular approach, expansion history and the value 1/exp(90) were used to compare time dilation values for special and general relativity. Schwarzschild equations including time dilation dt (dt=1/gamma-1) are known to be solutions in general relativity. It was shown that (dt) values for general relativity and special relativity are equal for cells throughout expansion when the value exp(90) is introduced into the Schwarzschild equation. The equation becomes: dt=1/(1-exp(90)*GM/(C^2*R))^.5-1. Values for (dt) range from 0.01 sec to 1.67e-15 sec.

Technical endnote 1 Particle review and number of neutrons

unifying concepts.xls cell aw48			Proposed	IS Hughes
		Particle Data	Energy	Bergstrom
		Group energy	E=eo*exp	Randall
Identifier	N	(Mev)	(Mev)	energy
			e0=2.02e-	(Mev)
0.0986	0.0986			
e neutrinc	0.197	2.00E-06	2.47E-05	3.00E-06
E/M Field	0.296	0.0000272	2.72E-05	
	(3*.0986=.296)			
ELECTRO	10.136	0.51099891	0.511	
mu neutri	10.408	0.19	0.671	less than 0.2
Graviton*		1.75E-26	2.732	
Up Quark	11.432	1.5 to 3	1.867	1.5 to 4.5
vt ?	12.432	18	5.076	less than 35
Down Qua	13.432	3 to 7	13.797	5 to 8.5
Strange q	15.432	95+/-25	101.947	80 to 155
Charmed	17.432	1200+/-90	753.29	1000 to1400
Bottom Qu	19.432	4200+/-70	5566.11	4220
Top Quarl	21.432		41128.30	40000
W+,w- bos	22.099	80399	80106.98	81000
Z	22.235	91188	91787.1	91182
HIGGS	22.575	125300	128992.0	105000
* sum of 3 Ns of 10.431+10.408 (2.73/exp(60)=2.4e-26 mev)				
Mw/Mz	Weinberg radians		sin^2 theta	
0.87275	0.509993	0.48817152	0.23831	

The above table strongly suggests an exponential relationship in energy for the fundamental particles. The proposed N values compare favorably with data from various sources and sin^2 theta agrees with Erler [5] figure 10.1 at low energy.

Number of neutrons

The best data is from the recent WMAP project reported [8] and the Supernova Cosmology Project [11]. Recent data indicate that there are two components to expansion [8] [11]. Critical density [9] has been used historically to predict the size of the universe and early equations like the Friedmann equation [6][7][9][10] give expansion predictions. There are questions regarding components of the critical density WMAP [8] but data indicates that 0.27 of the value represents mass, comprising dark and light particles. For purposes of estimating the number of particles half are assumed to have mass of a neutron (1.675e-27 kg).

Note: units used in this document are kilograms (kg), meters (M), newtons (nt), seconds (sec) and million electron volts (MeV).

Question about number of particles in universe				
Critical Density Predictions (kg/M^3)				
Density	**8.93E-27**	**pg 337 isHughes**		
Density	**3.73E-26**	**rho zero pg 103 Peebles at H=.71**		
Density rh	**9.5E-27**	**WMAP basic results Table 3**		
R	**6.30E+25**	**meters**		
N protons	**1.61E+78**	**N=rho*0.27*(4/3)*PI()*R^3/1.67e-27**		
ln (N)	**180.0759**			

Technical endnote 2 The equation for quantum radius

There is a circle associated with the concept of frequency. One (1) divided by frequency is the time required for a wave at velocity C to move around the circumference of the circle. The table below gives us the radius of the circle in terms of H and E. This circle also allows us to relate the energy interaction of operation 7 to an orbital radius R. The radius is 1.93e-15 meters when the field energy E= 101.947 MeV is put into the equation R= (HC/2pi)/E. Because 101.947 MeV is also equal to 13.79/0.135 and 0.135 is gamma, E is also equal to m/g. The new relationship R= (HC/(2pi)/(E*m/g)^0.5 (mass with velocity orbits a field energy at radius R) tells us that the energy interaction establishes an orbit because this equation is a known equation [14]. This orbit is established and maintained by the energy interaction. The last part of the following table demonstrates the relationships with set 2 fundamental N values. The author is aware that because of particle-wave duality only a probabilistic determination of radius is possible and it is noted that all results using these radii are probabilistic in nature.

The time for one cycle of the wave is 2*pi*R/C since the wave moves at C (R is the radius of a circle).							
2*pi*R/C=1/frequency							
2*pi*R/C=H/E		where H=Heisenberg's Constant 4.136e-21 mev-sec.					
Using the same example as detailed in operation 6:							
Field energy E		101.947	mev				
2*pi*R/C	time	4.057E-23	seconds				1.973E-13
H/E	time	4.057E-23	seconds	mev-meters			pdg value
R=H*C/(2*pi)/E		1.936E-15	meters	E in the equation to the left can also be:			
				E=(E*E')^.5=(E*m/g)^.5			
convenient constant: HC/(2*pi)=1.973e-13 mev-meters				because in the equation to the left, E'=m/g=13.977/.1353			
			1.973E-13	(E*m/g)^.5=E=(101.947*13.797/.1353)^.5			
Substitute (E*m/g)^.5 for E in the above equation to give an equation for radius involving mass, field energy and gamma.							
R=(HC/(2pi)/(E*m/g)^0.5		This equation represents a force balanced orbit with kinetic energy 0.5*field energy.					
		It is also accurate for orbits determined by energy balances as demonstrated below.					
	From operation 6 definitions and the operation 6 example.						
Field energy E		101.947	mev				
mass (m)		13.7970	mev	mass divided by g is equivalent to the field			
ke		88.150	mev	Instead of g=1/exp(2) gamma can be defined from ke			
gamma (g)	g=1/exp(2)	0.13534			g=(m/(m+ke)	0.13534	
v/C	v/C=(1-(g)^2)^0.5	0.9908	297034325.2			101.9469	
v/c		1.9356E-15	R=(HC/(2pi)/(E*E)^0.5				
R	meters	1.9356E-15	R=(HC/(2pi)/(E*m/g)^0.5				
	The following conversion constant converts mev to kg:				1.783E-30	kg/mev	
	Convert mev to newton-meters with the following conversion constant:						(nt-m)/mev
	Check the force balance:						
	Inertial:	F=m/g*C^2/R	8438.623	newtons		Ef=F*R=m+ke=m/g*C^2	
1	Field	F=E/R	8438.623	newtons			
			8438.623	newtons			

The equation above for orbital radius R=HC/(2pi)/E applies to all quantum mechanical orbits.

Technical Endnote 3

TWO CANDIDATES FOR THE CORRECT GRAVITATIONAL ENERGY SCALE

Candidate #1 the conventional Planck scale

There are tests for quantum gravity: We will compare the Planck scale relationships [22] with the relationships above.

Nomenclature and review of the Planck scale

	Constants				
h	6.58E-22	MeV-sec	reduced		
E	1.22E+22	MeV	Planck Energy		
M	2.18E-08	kg	Compton mass		
G	6.67E-11	Nt m^2/kg^2	gravitational		
C	3.00E+08	m/sec			
	Relationships				
	L=G*M/C^2	Compton wavelength			
	L=G*M/C^2	6.67e-11*2.18e-8/3e8^2	1.62E-35	meters	
	L=C*h/E	3e8*6.58E-22/1.22E+22	1.62E-35	meters	
	L=h/(M*C)		1.61E-35	meters	
	G=h*C/M^2	6.58E-22*3e8/2.18e-8^2*1.6	6.67E-11	Nt m^2/kg^2	

The criteria for quantum level is "action" [22]. Action must be 1.0 to be at the quantum level (it just tests whether the variables make a quantum circle.) Action is the value P*L/h where P is momentum, L is the wavelength and h is Heisenberg's reduced constant (H/(2*pi) labelled \h, hbar or just lower case h). Compare action for two energy levels, the Planck scale (1.22e22 MeV and the much lower level 938.27 MeV proposed above. Either level could be a candidate for defining gravity since the action is 1 in both cases.

	action= p*L/h				
	Planck energy	(MeV)	1.22E+22		
	Planck L	(meters)	1.62E-35		
	Momentum	p=E/C	4.07E+13		
	p*L	Mev-sec	6.58E-22		
	action= p*L/h		1.00E+00		

Yes, the Planck scale meets the criteria for being at the quantum level because action=p*L/h is 1.

Candidate #2 quantum gravity (the "dark horse" candidate)

Proposal		(cell d305 "unified")	
Field Energy		2.732	mev
constant	HC/(2pi)	1.97E-13	mev-m
	R=constant/	7.22E-14	m
	Field side	R side	
	H/E	2*pi*r/C	
time (t)	1.51E-21	1.51E-21	sec
Proposal p	(p=E/C)	9.11E-09	mev-sec/m
	p*R	6.58E-22	mev-sec
qm test	p*R/h	1.00	

The proposal also meets the action=1 requirement for a quantum level relationship since action =p*R/h=1.

Further comparison:

The proton mass is 938.27 MeV, not 1.22e22 MeV (1.67e-27 kg, not 2.17e-8 kg). Compare the calculation for gravitational constant for the Planck scale and the quantum gravity mass level and note that they differ by a large factor.

G=h*C/M^2
G=(6.58e-22*3e8/(2.18e-8)^2*1.603e-13)
6.66E-11 Nt m^2/kg^2

G=h*C/M^2
Proposed mass 1.67e-27 kg
G= (6.58e-22*3e8/(1.67e-27)^2*1.603e-13)/exp(88.03)

6.66E-11 Nt m^2/kg^2

Gravity, defined the Planck way requires a large divisor exp(88.03). Both candidates use a large divisor but there is a huge difference between exp(88.03) and exp(90). A divisor is required because gravity is shared among exp(180) protons and the surface area of each cell is 1/exp(90) of the surface area of the universe but this makes 1/exp(90) the correct coupling constant.

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