

Author E.H. Barbee
 Foundations Questions Essay Contest June 2012
 Revised November 2013
 genebarbee@msn.com

Title: A top-down approach to fundamental interactions

Abstract

This paper proposes that the Standard Model [4] [5] and Einstein’s general relativity theory can be unified by introducing probabilities similar to the field of information theory developed by Claude Shannon [16] and others. Accurate estimates regarding the number of neutrons in the universe are now available due to the WMAP [8] project. The author noted that there are approximately the natural number e (2.71828) to the power 180 (exp(N)) protons in the universe (Technical endnote 1) and explored the possibility that the number is fundamental to physics. Considering the probability of one neutron as 1/exp(180) a “top-down” model lead to a direct calculation of the gravitational constant and a uniform method of evaluating fundamental forces.

Methodology

Information theory and thermodynamics define probability P and uncertainty S as shown in the following table. The terminology and methodology involves the use of the natural log (ln). This proposal will seek meaningful quantities associated with N, where N will be derived from the value 180. Subsequently the relationship $E=e_0 \exp N$ will be used to give energy after the pre-exponential can be clearly defined. The current Standard Model is based on symmetries [5][12]. The author explores symmetries that are information theory operations on the logarithms $N=180$, $N=90$, etc. and related to probabilities by the equation $P=1/\exp(N)$. Information theory probability and energy are defined together [13] as follows: As an energy ratio E/e_0 increases, probability decreases to retain $E/e_0 * P=1$.

Define probability and e0 as follows:		Comparison	
		Information Theory	S = -ln P P is a probability
		Thermodynamics	S = -ln P P is a probability
$e_0 = E / \exp(N)$		Proposal	$E = e_0 \exp N$ or $N = \ln E / e_0$ $N = -\ln P$ $P = e_0 / E = 1 / \exp(N)$ P is a probability

Modern physics accurately describes many aspects of nature but also requires the insertion of many constants.

Operations 1, 2, 3, 4, 5 and the Higgs

The Standard Model [4][5] makes the Higgs energy the source of particle mass but its energy has only recently been identified experimentally. A proposed value for the Higgs energy is derived from the number 90 and its energy is calculated from measurable quantities.

Eight information operations will be described below, the first of which is simply, divide the number 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.

	Operation 1	Operation 2&3	Operation 4	Operation 6	Fundamental N values	Probability P=1/exp(N)
Higgs X dimension	22.5	10.167 12.333	5.167	15.333	0.0986 15.432	1.99E-07
Higgs Y dimension	22.5	10.167 12.333	3.167	13.333	0.0986 13.432	1.47E-06
Higgs Z dimension	22.5	10.167 12.333	3.167	13.333	0.0986 13.432	1.47E-06
		0.667		0.667	0.0750	0.075
Time	22.5	11.500				
Total	90	90		90	90	8.19E-40

The third, fourth and fifth operations are arithmetic operations on the number 90 as shown in the table above. The number 0.666 in the second column above is related to charge as indicated in operation 6 below. The author will show how the numbers in the table specify parts of the neutron. After each operation, the number 90 is maintained as the sum. Each part has a probability 1/exp(N) associated with it and the total probability 1/exp(90)=8.194e-40 is the multiple of these probabilities.

Operation 6 Energy

The numbers 15.43, 13.43 and 13.43 will be associated with sub-particles in the neutron/proton and the author found meaningful energies associated these numbers. That association is found with the number 10.333 - 3*0.0986=10.136. The number 10.136 represents the electron. Data label PDG in this document is from the Particle Data Group [4].

$$e_0 = E / \exp(N)$$

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)	0.51099892 mev	2.025E-05
	(best value from PDG)	0.510998918 mev	2.025E-05
Note that 3*.0986=.296	0.296	E=e0*exp(.2958)=2.72e-6 mev	2.722E-05 mev
The electric field energy of the electron is known to be:		2.72E-05 mev	

All subsequent energies are evaluated with the constant e0: i.e. E=e0*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].

Operation 7 Energy interaction

The author calls operation 7 an "energy interaction". Operations 2, 3 and 4 created four sets of numbers and the set identified as N=13.431 and N=12.431 will be used below for demonstration. The energy interaction adds the number 2 to 13.431 to give 15.431 while

at the same time, the number 2 is subtracted from 12.431 to give 10.431. Each number in the interaction has a specific place and a specific meaning described below:

- 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.

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). Values are placed in a table to the right of the basic interaction.

N1	E1 mass	N3	E3 field1		ke (difference ke)			E3 field1	
N2	E2 ke	N4	E4 field2		E1 mass	E3+E4-E1-E2	E2 ke		E4 field2
	mev		mev		mev	mev	mev	mev	mev
13.432	13.797	15.432	101.947		13.797	83.761	5.076	-101.947	
12.432	5.076	10.432	0.687						-0.687
					E1+difference ke+E2		102.634	E3+E4	-102.634
					Energy is conserved since 102.634=102.634				

This energy interaction has powerful implications resulting from the addition and subtraction of the number 2. The interaction creates orbits based on $E=ke$ and are special case Lagrangians (technical endnote 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 $E=e_0 \exp(N)$), the number 2 can be associated with a fractional divisor for the original energy. The number 2 is evaluated as $1/\exp(2)=0.135$. After the interaction, energy 13.78 mev becomes 101.947 mev since $13.79/0.135=101.947$ mev. This is identical to the concept of gamma in relativity. Gamma is the fractional divisor that increases the kinetic energy of a fast moving mass involved in the Lorentz transformation. The definition required is: $ke=m/\gamma-m$.

Operation 2 proposed that the Higgs N value is associated with each of four dimensions. Three of the dimensions are distance (think x,y,z) while the other dimension is time (t). Gamma is a measure of how far mass moves into the time dimension while distance changes by an incremental amount due to kinetic energy. Since the dimensions are equal, x/t is a constant (C, the speed of light). Furthermore, the dimensions are orthogonal, meaning that they cross each other at right angles (90 degrees). The above information leads to the famous Einstein energy momentum relationship [13].
 $(E_{total}^2 = E_{mass}^2 + (pC)^2$, where p is momentum).

Operation 8 Waves

Wave/particle duality is fundamental in physics and operation 8 describes everything as waves by multiplying the probabilities and associated energies defined in operation 6 by the quantities $\exp(iv dt)$ and $\exp(-iv dt)$. The symbol i designates an imaginary number, v is frequency and dt is differential time. However, it is possible to maintain a simple approach by limiting our evaluation to times when $\exp(iv dt) * \exp(-iv dt) = 1$.

After operation 8, we can use the concept of frequency ($v=1/\text{time}$) and use the well known relationship $E=Hv$, where H is Planck's constant. Planck's constant lets us relate conventional time (sec) and energy (mev).

The R equation

Technical endnote 2 shows development of the equation $R = (HC/(2\pi))/(E \cdot m/g)^{0.5}$. This known equation for orbital radius [14] tells us that the energy interaction establishes an orbit. Mass (m) with velocity (gamma) orbits field energy (E) at radius R. The author calls this the R equation.

Operation 9 The neutron

The concepts are now in place to understand the value 90 in a different way. Recall that the probability of one neutron is $P = 1/\exp(90) \cdot 1/\exp(90)$. There were 8 operations on the logarithm $N = 90$ that set up at least three orbits. The table below is an overall energy balance comprised of the various components of the value 90. The mass and kinetic energy value 939.56 mev is the mass of a neutron and compared to the 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 101.97 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 fields shown in the column labeled Strong Field. They have kinetic energy shown in the column labeled Difference Ke. Note that a third interaction is shown below the quarks. It adds 0.622 mev to the neutron mass, is later involved in the decay of a neutron to a proton and contributes negative energy to the right hand side of the balance. The author identifies the total energy 2.683 mev as the gravitation field energy. The kinetic energy 20.3 mev ($4 \cdot 5.08$) is set aside for expansion [2]. A diagram of the neutron is shown. The three quarks are confined within a range less than $2.01e-15$ meters and contain 798.6 mev of kinetic energy. The "bundle of quarks" is held in a larger orbit with kinetic energy 10.15 mev by the field energy 20.3 mev. This field energy is a result of the overall energy balance and the force is called the strong residual force. The value of this energy is the difference between the neutron mass 939.56 mev and the (negative by convention) sum of the strong field energy 957.18 mev. The overall spin of the neutron is known to be 0.5 (spin is a measure of angular momentum) and the spin components are shown in the spin column which obeys the exclusion principal disallowing two down quarks to be one orbit unless they have opposite spin). The overall charge of the neutron is zero and the column labeled Charge shows the components.

Unified.xls cell g191		Mass and Kinetic Energy				Field Energy						
Charge	mass ke	Energy-mev	S field G field	Energy mev	Mass mev	Difference KE mev	strong residual ke mev	Neutrino mev	Expansion KE	Strong field energy mev	Gravitation/spin Energy mev	
0.667	15.432	101.95	17.432	753.29	101.947	641.880				-753.29	0.5	
	12.432	5.08	10.432	0.69							-0.69	
-0.333	13.432	13.80	15.432	101.95	13.797	78.685				-101.95	0.5	
	12.432	5.08	10.432	0.69							-0.69	
-0.333	13.432	13.80	15.432	101.95	13.797	78.685				-101.95	-0.5	
	12.432	5.08	10.432	0.69							-0.69	
	10.408	0.67	0.075		0.000	0.000	10.15		20.303			
	-10.333											
	10.333	0.6224	0	2.02E-05	0.6224	0.000		2.02E-05		-2.02E-05		
	0	2.02E-05	10.333	0.6224							-0.6224	
	90.000	sum	90.000		130.163	799.251	939.5653485	2.02E-05	20.303	-957.185	-2.683	Totals
							NEUTRON MASS		Total m+ke	Total fields		
									Total positive	Total negative		
									959.868	-959.868	0.000E+00	0.500

Note that the energy $2.02e-5$ is a neutrino that carries away 0.5 spin. This allows the neutron/neutrino system to maintain overall zero spin.

Operation 10 The proton

The neutron decays to a proton and electron in about 881.49 seconds (PDG). The decay process starts with a separation in the interaction mentioned above containing the value $E=e0*\exp(10.33)=0.622$ mev. Zero separates into minus 10.33 and plus 10.33 and the 10.33 moves outside the proton to form the base for the electron. Charge components involve another separation, zero= $3*0.0986-3*0.0986$. Recall that the electric field energy 27.2 electron volts= $e0*\exp(0.296)$. This gives the electron and the proton their opposite but equal electrical field energies as shown in the column labeled Charge. The electron is formed by the energy interaction near the bottom of the diagram below. 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. Physics knows of these particles because there is missing energy in known interactions. It leaves the proton along with the 0.622 mev. Another neutrino (the mu neutrino) results from the leftovers ($10.33+.075-10.33$) in the proton. As it leaves it takes energy $E=e0*\exp(10.408)=0.671$ mev with it. (Together 0.671 and 0.622 mev make up the energy difference between the neutron and proton (1.293 mev). Again refer to measured data and compare it to the authors "model" of the proton and electron. The spin column reviews components for the proton, electron and neutrinos (all 0.5).

Proton mass model

Charge	Unifying.xls cell g228		CALCULATION OF PROTON MASS				Mass and Kinetic Energy			Field Energies			
	mass	Energy-mev	strong field	Energy-me	Mass	Difference ke	Strong residual ke	Neutrinos	Expansion ke	Strong & E/M	Gravitation	spin	
	ke		grav field	mev	mev	mev	mev	mev	mev	mev	mev	mev	
0.667	15.432	101.947	17.432	753.291	101.947	641.880							
	12.432	5.076	10.432	0.687						-753.29		0.5	
-0.333	13.432	13.797	15.432	101.947	13.797	78.685				-101.95		0.5	
	12.432	5.076	10.432	0.687								-0.69	
-0.333	13.432	13.797	15.432	101.947	13.797	78.685				-101.95		-0.5	
	12.432	5.076	10.432	0.687								-0.69	
1.000 (0+1)			-0.296	-2.72E-05				10.151		20.303 expansion ke			
1.000 Total proton charge			equal and opposite charge							0.000 expansion pe			
	10.408	0.67	0.075		0.000	0.000		-0.671	→ 0.671 v neutrino				
	-10.33	-10.333	0										
	Neutron separates here to form proton and electron				129.541	799.251	938.272013	PROTON MASS				0.5	
-1.000	10.33	10.136	0.51	10.333	0.62	0.511	0.111			5.44E-05	-0.622	0.5	
		0.197	2.47E-05	0.296	2.72E-05	ELECTRON		→ 2.47E-05 e neutrino					
					130.052	0.111			0.671	20.303	-957.185	-2.683	
		90.000		90.000					Total m+ke	Total fields			
									Total positive	Total negative			
									959.868	-959.868	0.00E+00	difference	

Data comparisons

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

Compare the above values for the neutron and proton with measured values.								
Source	Value	Unit	Source	Value	Unit	Difference	Difference	Measurement
931.4940281 nist			0.51099891			0		1.30E-07
931.4940282 pdg	548.57991		0.51099891			-5.0496E-07		2.40E-07
simple cell g Data		Data (mev)		Calculation (mev)	calculation	Difference	Difference	measurmen
Ratio		Particle Data Group		Present model	(amu)	(mev)	(amu)	error
		(amu)		(mev)				
Neutron	1.0086649	939.5653600		939.565348	1.00866492		-3.3522E-09	
Proton	1.0072765	938.2720132 pdg		938.272013	1.00727647	2.16232E-10	4.78317E-10	6E-10
Neutron/elect	1838.683661	939.5653460 nist		939.565348		-2.48904E-06		2.30E-05
Proton/electr	1836.152672	938.2720130 nist		938.272013		-2.29784E-07		2.30E-05
deuteron		1875.61279						

Fundamental forces

The following table follows directly from the proton mass model above. The proton is a manifestation of information symmetries and contains orbits that underlie some of the fundamental forces. Gravitational mass is 129.541. Refer to the proton model above to see the source its Ke (10.151 meV) and Field Energy (-2.683 meV). The strong field energies of the three quarks are added together and orbit the true mass of the three quarks (129.541 meV). The Standard Model identifies the weak force as the fourth fundamental force but information from the proton model involves what is called the strong residual force. The strong residual field energy (-20.3 meV) is the missing energy required to balance the total to zero (negative 959.868 and positive 959.868 meV). The strong residual mass is the 129.5 true mass of the quarks plus the quark kinetic energy (799.251 meV) because of the orbits identified in the following section. From these values, gamma and a radius (R) are derived. Gamma is $\gamma = k_e / (m + k_e)$ and R is $R = (hc / (2\pi)) / (E^2 m / g)^{0.5}$.

Purpose:	The proton stores constants that underlie nature.				
Understanding:	the table below is the source of the four forces				
	Mass (m)	Ke	gamma (g)	R	Field (E)
	(mev)	(mev)		meters	(mev)
Gravity	938.272	10.151	0.9893	7.3149E-14	-2.683
Electromagne	0.511	1.36E-05	0.99997	5.2911E-11	-2.72E-05
Strong	129.541	799.251	0.1395	2.0928E-16	-957.18
Strong residu	928.792	10.151	0.9892	1.4292E-15	-20.303

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. This proposal places a proton in nature with reduced force and extended range by multiplying it's force from the proton model by the value $1/\exp(90)$. A small energy, by the Heisenberg uncertainty principle, will have long range.

A cosmology model is proposed [17][18][19] that is based on $\exp(180)$ cells, each containing a proton. Combined the cells make up the universe. General relativity uses

the metric tensor (ds^2) . The surface area of a 2-sphere may be broken into many small spheres with an equal surface area. Let r represent the radius of a many small spheres and R represent the same surface area of one large sphere containing $\exp(180)$ spheres. Position one proton on the surface of each cell. The total mass is $m \cdot \exp(180)$. The total energy will be that of 1 (or 2) protons/cell plus a small amount of kinetic energy. This energy will be constant during expansion and the energy density at a particular time in expansion will be a constant, i.e. $E/\text{Volume}=\text{constant}$. We will evaluate the energy density of many small cells each with the same energy density of one large sphere.

	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)			
	M=m*exp(180)			
	Energy density is a constant			
	Constant=M*V^2/(4/3*pi*R^3)			
	Constant=m*exp(180)*V^2/(4/3*pi*r^3*exp(60)^3)			
	Constant=m*exp(180)*V^2/(4/3*pi*r^3)/exp(180)			
	Constant=m*V^2/(4/3*pi*r^3)			
	V doesn't change but r and m do			
	below we place the cell r and m into the geodesic with G=constant			
space		proton size at current expansion		
RV^2/M	G=G	r^2/m	r is the cell radius	
R'V^2/M	G=G	r'^2/m	r' is the proton size geodesic	
R'=r*(v/V)^2*(M/m)*1/exp(90)				
	RV^2/M=	r*exp(90) *v^2/(m*exp(180))		
		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 $R=(HC/(2\pi))/(E*m/1)^{0.5}$) is $7.35e-14$ meters. The orbital velocity is given below:

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).				
$2\pi R/C=1/\text{frequency}$				
$2\pi R/C=H/E$				
Using the same example as detailed in operation 6:				
Field energy E		2.683	mev	
$2\pi R/C$	t	1.541E-21	sec	
H/E	t	1.541E-21	sec	
convenient constant:	HC/(2*pi)	1.973E-13	mev-m	
$R=H*C/(2\pi)/E$		7.3543E-14	m	

The above radius partially defines the geodesic for gravity. The proton is on this radius and its mass and velocity complete the geodesic that defines the gravitational constant.

				GRAVITY
				proton
Proton Mass (mev)				938.272
M (kg)		1.001E+00		1.673E-27
Field Energy (mev)				2.683
Kinetic Energy (mev)		0.318		9.833
Gamma (g)=m/(m+ke)				0.9896
Velocity Ratio		$v/C=(1-(g)^2)^{.5}$		0.1437
Scale Factor G				1.00E+00
"R equation"	$R=(HC/(2\pi))/(E^*m/g)^{0.5}*G^{(2/3)}$ meters			7.3543E-14
	$F=M/(g^*G^{(2/3)})*(V/c^*C)^2/R/exp(90)$ nt			3.456E-38
HC/(2pi)	1.973E-13	mev-m		
Calculation of gravitational constant G				
Inertial Force=(m/g^*C^2/R)*1/EXP(90) nt				3.456E-38
Radius R (Meters)				7.3543E-14
Mass (kg)		1.673E-27	9.109E-31	1.674E-27
Gravitational Constant (g=F^*R^2/M^2=nt m^2/kg^2)				6.6746E-11

Published $G=6.6743e-11$ nt m^2/kg^2 .

Note that definition of gravity based on this orbit gives a quantum mechanical action on the order of 1 as demonstrated below. The author believes that the radius $7.35e-14$ meters is the fundamental radius of $exp(180)$ cells that define the beginning radius of a large volume associated with the universe. As these cells expand to about 0.46 meters each they define a large volume with about $5.2e25$ meters. The author also believes that the value $1.54e-21$ sec defines fundamental time. As this value repeats, time increases. The author used these concepts to study cosmology [2][18][20].

			cell d305 "unified"	
Gravitational Action		E	2.6831E+00	mev
		const HC/(2pi)	1.97E-13	mev-m
		R=const/E	7.3543E-14	m
		t	1.54135E-21	sec
		Field side	R side $E'=m/g$	
	E=Hv	H/E	$2*\pi*R/V$	
	$t=H/E=2\pi R/V$	1.541E-21	1.541E-21	sec
		1.54135E-21		
1	qm test	$m/c^2x^2/t$	6.5821E-22	mev-sec
	qm test/h	$m/c^2x^2/t/h$	1.00	

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. Coupling constants to the proposed Higgs energy are shown since it appears to be at the top of the mass/energy hierarchy.

Force Unification Table	cell ax74		Strong strang	Strong down	Strong down	Gravity	Electromagne	Strong Residual
Higgs energy (mev)			119671.5	119671.5	119671.5	proton		
***Field coupling to Higgs field Energy			0.00629	0.00085	0.00085			
Field Energy (mev)			753.29	101.95	101.95	2.683	2.72172E-05	20.303
Mass Coupling to Higgs field energy			0.00085	0.00012	0.00012			
Particle Mass (mev)			101.947	13.797	13.797	938.272	0.511	928.792
M (kg)			1.82E-28	2.46E-29	2.46E-29	1.67E-27	9.11E-31	1.66E-27
Kinetic Energy (mev)			651.34	88.15	88.15	9.833270164	1.36086E-05	10.151
	Rydberg energy from PDG						1.360569E-05	
Gamma (g)=m/(m+ke)			0.1353	0.1353	0.1353	0.9896	0.99997	0.9892
Velocity Ratio	v/C=(1-(g)^2)^.5		0.9908	0.9908	0.9908	0.1437	0.0073	0.1466
*R equation output" --meters			2.6195E-16	1.9356E-15	1.9356E-15	7.3543E-14	5.291126E-11	1.4292E-15
Rydberg data from PDG							5.291772E-11	
E/M radius plus proton radius=5.291627e-11+1.4287e-15							5.2913E-11	
Force	newtons	F=E/R	460733.2	8438.6	8438.6		8.241498E-08	2276.0
						**Gravity	Electromagnetic	
	newtons	F=m/gC^2	460733.215	8438.623	8438.623	3.456E-38	8.241389E-08	2263.68011
Force=3.16e-26/Range^2 (nt)		3.16E-26	460733.2	8438.6	8438.6		1.129E-05	15478.0
Coupling constant derived from this work			1.0000	1.0000	1.0000	7.22E+00	137.023281	0.147047
Derived c^2 mev sec	field energy=c^2/R		1.97E-13	1.97E-13	1.97E-13	1.62E-52	1.44E-15	2.90E-14
Derived c^2 joule sec			3.16E-26	3.16E-26	3.16E-26	2.59E-65	2.31E-28	4.65E-27
Derived exchange boson (mev)			753.291	101.947	101.947	2.683E+00	0.0037	138.07
	boson from published range							131.55
*published c^2 mev sec		field energy=c^2/R				1.17E-51	1.44E-15	1.56E-14
*published c^2 joule sec						1.87E-64	2.31E-28	2.5E-27
*Range	**Range for gravity equals	8.98E+25 meters					5.29E-11	1.50E-15
*http://www.lbl.gov/abc/wallchart/chapters/04/1.html						7.22E+00		10.40
Published coupling constant (PDG)							137.03599	1111.1
***	0.0063 EXP(17.432)/EXP(22.5)					6.6818E-11		1.41E+04
***	0.00085 EXP(15.432)/EXP(22.5)							0.079
***	0.00012 EXP(13.432)/EXP(22.5)					7.245343629		

Comparison of force table coupling constants with published results

Energy components of the neutron model allow coupling to the Higgs energy to be clearly stated. From operations 2, 3, 4 and 5, we can identify the coupling that gives the field energies and quark energies. Numerically the couplings are ratios like $\exp(17.43)/\exp(22.33)=0.00744$ shown at the bottom of the above table. Strong coupling constants in the literature are 1.0 based on the field energies acting as exchange bosons (gluons). Calculated forces compare favorably with the conventional physics forces $=3.16e-25/R^2$ newtons and the derived coupling constants c^2 compare favorably with published values (converted from Joule-sec). If the gravitational field energy 2.683 mev is divided by $\exp(90)$, the graviton energy is $2.2e-39$ mev with range $7.35e-14*\exp(90)=9e25$ meters. The calculated coupling constant for gravity is 7.22. It is no coincidence that this is also the ratio of proton mass/true mass ($938.272/129.5=7.22$). Literature uses the neutral pion (131.5 mev above) as the exchange energy and the author's calculation for this boson is 138 mev. The strong residual coupling 0.147 is verified by a binding energy curve constructed by the author based on 20.3 mev field energy [1]. A proton model orbital diagram allows accurate calculations to be made regarding the electromagnetic force. With a low correction to the electromagnetic field

energy due to shielding, the Rydberg constant, coupling constant and electric constant agree with published values (PDG).

Exchange bosons and quantum mechanical probability:

The quantum mechanical probability (action) is equal to mx^2/t divided by Planck's reduced constant (m and x come from the Force Table above and t is the time to travel across x at V/C). The calculated action was almost exactly 1 in all cases. The current 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. It appears that the boson mass is "back calculated" as shown in the table above for velocity C although the actual mass and actual velocity from the proton model give the correct action. One of the difficulties with gravity is that a different explanation is offered for action at a distance because the distances are often large even at the speed of light. It is often stated that mass bends space-time and particles follow curved space. The author believes that all four forces are based on the proton mass model but gravity is the shape of space-time based on R , mass and kinetic energy. If space is curved enough an orbit is established and for gravity is called a geodesic. The field, mass and velocity carried by particles gives their contribution to space-time curvature. That is, when we write the equation for gravitational force $=g*Mm/R^2$ or electromagnetic force $=1/(4\pi)*e_0*qq/R^2$ we are describing space time curvature for the combination of energies.

Summary

Introducing information theory probabilities into physics can reconcile the Standard Model and general relativity at the quantum level for gravity. The author believes that nature's underlying laws are information laws based on the large number $\exp(180)$. The neutron, proton and the number of protons are manifestations of the underlying law and are sources of information for the four forces. This paper appears to decode some of the information laws applicable to well documented particles. A unified theory must meet other criteria to be of value. The neutrinos, electron, muon, taon, mesons and baryons should also be manifestations of the underlying laws. Although beyond the scope of this document, the author found a progression of energies underlying these particles [3]. The binding energy curve should also be explained by the theory and this is successfully demonstrated [1][18]. In addition a unified theory will also be fundamental to the field of cosmology. The R equation used throughout this document was modified by replacing gamma with another time ratio, giving what the author believes is the correct expansion equation for the universe [2][13][17][18][19]. This does not contradict WMAP data since the expansion curves match. However, the new approach suggests that dark energy is a misconception related to misuse of the critical density concept [18]. Combined with the author's study of mesons and baryons it is possible that dark matter consists of "mirror" particles with the mass of a neutron that only couples with gravity.

Have we "cracked" the code?

The author views the present document as a serious attempt to “crack” a code that seems to underlie all of physics. At the most basic level the code consists of N values that underlie the Proton mass model. The references include other papers [1][2][3][17][18][19][20] by the author that explore other aspects of physics. To date, the work in the present document has never failed to be applicable and often leads to a deeper understanding.

Technical endnote 1 Particle review and number of neutrons

Particle review									
unifying concepts.xls cell aw48									
		Particle Data PDG		Proposed					
		Group energy	charge	Energy	IS Hughes	Bergstrom	Randall	Best	N difference
Identifier	N	(Mev)		E=eo*exp(N)	energy	energy	energy	data for	(proposal-
				(Mev)	(Mev)	(Mev)	(Mev)	N Value	best data)
0.0986 ener	0.099								
e neutrino	0.000	2.00E-06		2.02E-05	1.50E-07	3.00E-06		-2.31486941	
E/M Field	0.296	0.0000272		2.72E-05				0.295200381	0.000636485
							0.0011		
ELECTRON	10.136	0.51099891	-1.00	0.511				10.13610614	2.61223E-06
mu neutrino	10.408	0.19		0.671	less than 0.25			9.146762759	1.261563509
Graviton*		1.75E-26		2.683					
Up Quark	11.432	1.5 to 3	0.67	1.867		1.5 to 4.5		2.4	11.6829627
vt neutrino	12.432	18		5.076	less than 35		18		-0.251017081
Down Quark	13.432	3 to 7	-0.33	13.797		5 to 8.5		4.8	12.37610988
	16.432			277.120					
Strange qua	15.432	95+/-25	-0.33	101.947		80 to 155		104	15.45188486
	16.432			277.120					
Charmed Q	17.432	1200+/-90	0.67	753.29		1000 to 1400		1300	17.97761351
Bottom Qua	19.432	4200+/-70	-0.33	5566.11	4220	4000 to 4500		4200	19.15033377
Top Quark	21.432		0.67	41128.30		40000	171200	21.4041287	0.027816923
W+,w- boson	22.099	80399	-1.00	80106.98	81000	80000	80400	22.10225098	-0.003638694
Z	22.235	91188	0.00	91787.1	91182	91000	91200	22.22817255	0.007
HIGGS	22.500	125300		119671.5		105000		22.54596011	-0.046
* sum of 3 N's of 10.431 and one 10.333 and graviton is 2.68/exp(90)=1.59e-38 mev.									
Mw/Mz	Weinberg radians		sin^2 theta						6.3432E-11
0.87274771	0.509993439	0.48817152	0.238311				6.674E-11		6.3263E-11

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).

Critical Density (kg/M ³)		R final-M	N particles	ln (N)
9.50E-27	WMAP basic results Table 3	7.18E+25	1.19E+78	179.78
	N particles=	$4/3 \cdot \pi \cdot R_{\text{final}}^3 \cdot 0.27 \cdot 9.5 \cdot 10^{-27} / 1.675 \cdot 10^{-27} / 2$		

Technical endnote 2 The R equation and Lagrangian

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 $R = (HC/2\pi)/E$. 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 $R = (HC/(2\pi))/(E*m/g)^{0.5}$ (mass with velocity orbits a field 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 values from operation 7. 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).			
$2*\pi*R/C=1/\text{frequency}$			
$2*\pi*R/C=H/E$			
Using the same example as detailed in operation 6:			
Field energy E	101.947	mev	
$2*\pi*R/C$ time	4.057E-23	seconds	
H/E time	4.057E-23	seconds	
convenient constant:	$HC/(2*\pi)$		1.973E-13 mev-meters 1.973E-13 pdg value
$R=H*C/(2*\pi)/E$	1.9356E-15	meters	E in the equation to the left can also be:
			$E=(E*m/g)^{.5}=(E*m/g)^{.5}$
			because in the equation to the left, $E=m/g=13.977/.1353$
			$(E*m/g)^{.5}=E=(101.947*13.797/.1353)^{.5}$
Substitute $(E*m/g)^{.5}$ for E in the above equation to give an equation for radius involving mass, field energy and gamma.			
$R=(HC/(2\pi))/(E*m/g)^{0.5}$	This equation represents a force balanced orbit with kinetic energy 0.5 times the 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)	$g=1/\exp(2)$	0.1353	$g=(1-(m/(m+ke)))^2)^{0.5}$
v/C	$g=(1-(v/C)^2)^{0.5}$	0.9908	
R	meters	1.9356E-15	$R=(HC/(2\pi))/(E*m/g)^{0.5}$
	The following conversion constant converts mev to	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
			Calculation with conventional equation defined in force table

The author refers to the equation above for orbital radius as the R equation.

An orbit based on R is a special case of a Lagrangian as shown below:

E=potential energy		
KE=kinetic energy		
Lagrangian		
L=0=potential energy-kinetic energy		
E=ke		
1=ke/E		
1=ke/(E*E)^.5		
1=ke/(m*E/g)^.5		
1=ke/c/(h/(2pi)*hc/(2pi))/(m*E/g)^.5		
r=hc/(2pi)/(m*E/g)^.5		
1=ke/c/(h/(2pi)*r		
pc=ke	(p=momentum)	
1=p*r/(h/(2pi)	(pr=action)	

References

1. Barbee, E. H., *A fundamental model of atomic binding energy*, viXra:1307.0102, July 2013. Reference Microsoft ® spreadsheet atom.xls, Barbee.
2. Barbee, E. H., *Application of information in the proton mass model to cosmology*, viXra:1307.0090, revised Nov 2013. Reference Microsoft ® spreadsheet simple1c.xls, Barbee.
3. Barbee, E.H., *Baryon and meson mass estimates based on their natural frequency components*, viXra:1307.0133, July 2013. Reference Microsoft ® spreadsheet mesonbaryon.xls, Barbee.
4. Particle Data Group, pdg.lbl.gov <http://pdg.lbl.gov/2011/reviews/rpp2011-rev-phys-constants.pdf>
5. Erler, *Electroweak Model and Constraints on New Physics*, U. Mexico, 2009.
6. Bergstrom, L., Goobar, A., *Cosmology and Particle Astrophysics*, Second Edition, Praxis Publishing, Ltd, 2004.
7. D. E. Groom et al. (Particle Data Group). *Eur. Phys. Jour.* C15, (2000) (URL: <http://pdg.lbl.gov>)
8. Bennett, C.L. et al. *First Year Wilkinson Microwave Anisotropy Probe (WMAP) Observations: Preliminary Maps and Basic Data*, *Astrophysical Journal*, 2001
9. Peebles, P.J.E., *Principles of Physical Cosmology*, Princeton University Press, 1993.
10. I.S. Hughes, *Elementary Particles*, 3rd Edition, Cambridge University Press, 1991.
11. A. Conley, et al, (*THE SUPERNOVA COSMOLOGY PROJECT*), *Measurement of Omega mass and Omega lambda from a blind analysis of Type Ia supernovae with CMAGIC*.
12. David McMahon, *Quantum Field Theory Demystified*, McGraw Hill, New York, 2008.
13. Barbee, E.H., Microsoft ® spreadsheet, *Unifying concepts of nature.xls*, unpublished.
14. Feynman, R.P., Leighton, R.B., Sands, M., *The Feynman Lectures on Physics*, Addison-Wesley, 1965.
15. National Institute of Standards and Technology, <http://www.nist.org>.

16. Claude Shannon, *A mathematical Theory of Communication*, 1948.
17. Barbee, E. H., *Application of information in the proton mass model to cosmology*, viXra:1307.0090, revised Nov 2013. Reference Microsoft ® spreadsheet entitled simple1c.xls.
18. Barbee, E.H., *Kinetic and potential energy during expansion*, viXra:1307.0089, revised Nov 2013. Reference Microsoft ® spreadsheet entitled Why Gconstant.xls
19. Barbee, E.H., *Semi-fundamental abundance of the elements*, viXra:1308.0009, July 2013. Reference Microsoft ®spreadsheet atom.xls.
20. Barbee, E.H., *The case for a low energy gravitational scale*, viXra:1307.0085, revised Nov 2013.

