The Flatness Problem

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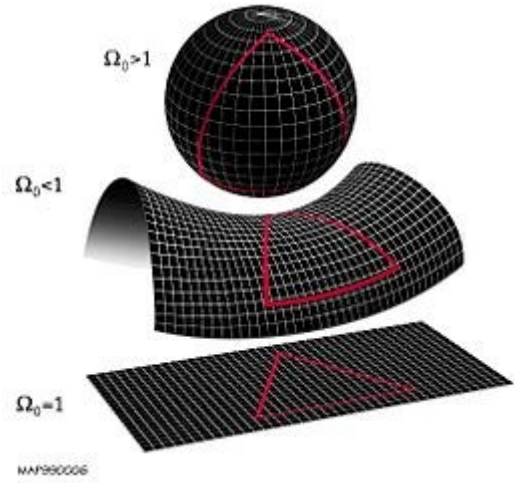
Summary

The Wiki Diagram below [22] reminds us that there is an important problem in Cosmology.



In the above diagram, Omega (Ωc) is critical density. Data from projects that measure and interpret the Cosmic Background Radiation [4][PLANCK] indicate that nature is "fine-tuned" to expand the universe in a way that it does not collapse or catastrophically expand. The currently popular Lambda CDM cosmology model [4] is strongly supported, meaning that critical density is very near 1. There is discussion regarding the components that make up critical density. Besides normal matter there is cold dark matter (CDM) and a Lambda term that stands for Einstein's cosmological constant. Many appear to believe that we exist in the bottom shape shown above. Is space time really flat? This concept is associated with the hyperbolic nature of a four dimensional universe [18][19]. To understand what flat means, one must study the Robertson-Walker metric and the Friedmann and Einstein-de Sitter models [3]. I have noticed reluctance by authors to state clearly the shape of the universe. They know that curvature is at the heart of gravitation and can calculate a "Hubble length" describing how far expansion has progressed but leave the shape unstated. If it is a four dimensional sphere, its volume is infinite [19].

This document shows a way to side step the above issues. I believe we live in a spherical finite universe and the key is how we measure time. Quantum mechanics measures time and distance around a quantum circle. For light the ratio between distance and time is C, the speed of light. If space time originates in a quantum circle, the shape of the universe could be similar to the composite of many quantum circles (spheres considering the probabilistic nature of position around a circle). The Robertson-Walker metric [18] satisfies the global condition that space time is homogeneous and isotropic (no preferred position) but the surface of a sphere also has these properties.

The author developed a model called cellular cosmology and a model of the neutron mass that leads to the source of the gravitational constant [5][6][7][8][12][13][23]. A cell is one neutron (that decays to a proton) and its associated space attracted to a central neutron. Each proton contains kinetic energy that expands the cell against the gravitational field and is converted to potential energy. Breaking a large surface we will call the universe into many small cell surfaces introduces an important degree of freedom. A cell is initially the quantum circle for gravity. The circle expands and defines space. As it expands it becomes non-quantum and protons are allowed inside the sphere. Protons appear to be around us and able to move relative to one another obeying special relativity. The space we exist in incorporates the Lorentz transformation and many call this space time.

The general theory of relativity states roughly that "space time is curved by mass and mass follows curvature", approaching Newtonian gravity. But the other three forces (interactions) of nature are also based on the curvature of quantum circles. The author's unification theory [12] is reviewed for comparison in Appendix 3.

Review of the FLRW model

Firstly, what is critical density?

The standard method of simulating expansion involves the Friedmann-Lemaitre-Robertson-Walker (FLRW) model [10]:

H^2=H0^2*(OmegaMatter*(1+z)^3+OmegaR*(1+z)^2+OmegaLambda)
Where:
OmegaTotal=1 WMAP result
Rhoc=H0^2/(8/3 pi G) (critical density)
OmegaR(1+z)^2=0 (wrong shape)
OmegaMatter separated into =Omega cold dark matter and baryons
OmegaLambda is the cosmological constant
H0=2.26e-18/sec WMAP 9 year result
z=(r/rf-1) where radius is the developing radius and rf is the final radius.

Historically, the equations are written to be consistent with geometric models of the universe involving metric tensors that characterize a four dimension universe where ds^2= three distances^2 and (C*time)^2. The model is also known as the lambda cold dark matter model or the concordance model. Lambda stands for the famous Einstein constant and is related to the concept of dark energy. The equations below start with the FLRW model and show that it is identical to the equations most use to characterize expansion, i.e. R=R0*(time/time0)^power. The power (2/3) is for conversion of kinetic energy to potential energy. The present radius is calculated from this equation, starting from 8.24e12 meters [17].

	H0^2=H^2*(OmegaMatter*(1+z)^3+OmegaR*(1+z)^2+OmegaLambda)					
	set OmegaR=0					
	set OmegaLambda=0					
	set OmegaMatter=Rho/RhoC where RhoC=critical density					
	1+z=Rend/R					
	H0^2=H^2*Rho/RhoC*(Rend/R)^3					
	(H0/H)^2=Rho/RhoC*(Rend/R))^3					
	(H0/H)^2					
	(t/t0)^2=Rho/RhoC*(Rend/R))^3					
	Rend/R=(Rho/RhoC)*(t/t0)^2)^(1/3)					
	Rend/R=(Rho/RhoC)^(1/3)*(t/t0)^(2/3)			R/R0=const(t/t0)^(2/3)		
	t=3.93e17 sec					
	t0=.059 sec					
	3.81161E+12		(t/0.0529)^(2/3)			
Rend	3.14077E+25	meters	8.24e12*(t/t0)^(2/3)			
	Rho=RhoC at 3.14e25 meters					
	Rho=RhoC=9.14e-27 kg/m^3					

The derivations above look correct and yield the accepted expansion equation, i.e. R/R0=(t/t0)^(2/3). The equations below appear to define critical density RhoC. The basic concept is that kinetic energy at the beginning will be converted to potential energy.

	substituting to give rho
ke	pe
1/2Mv^2	Fr
1/2Mv^2	GMM/r
ke/M	pe/M
1/2v^2	GMMr^2/r^3)/m
	GMr^2/r^3)
	4/3*Gr^2(M/(4/3*pi r^3))
1/2 v^2	(4/3 pi G rho) r^2
v^2	(8/3 pi G rho) r^2
v/r=H	(8/3 pi G rho)^.5

G		6.67480E-11			
Ho		2.26E-18			
rhoC	8/3 pi G/Ho^2	9.124E-27	2.26E-18^2/(8/3*PI()*6.674e-11)		

The equation is useful to relate the Hubble constant 2.26e-18/sec to rho but it only works because the present density is 9.14e-27 kg/m^3. This is rhoC but the considerations below indicate that it cannot be used to characterize other possible components of expansion.

Kinetic energy and critical density

We can see problems with critical density when we relate it to kinetic energy. The velocity can be found by multiplying V/R*R. From here, we can find kinetic energy at the current time ½*m*V^2.

	H=(8/3*PI()*6.67e-11*9.14E-27)^0.5			
v/r=H	2.26E-18	1/sec		
v=v/r*R	9.08E+07	m/sec with R=4.02e25 m		
ke=1/2*mv^2	43.1	mev		
pe=4/3 G m r^2 rho				
pe=(4/3*PI()*6.67e-11*9.14E-27)*1.67E-27*4.02E+25^2/1.6e-13				
	43.07			

We are starting to see a problem. Why is the potential energy equal to kinetic energy? Kinetic energy should be converted to potential energy. Now we calculate the above expressions for the beginning.

ke=1/2*mv^2		5.18639E+13	MeV	
ke=0.5*1.67E-27*(9.97e13)^2/1.6e-13				
pe=4/3 G m r^2 rho		2.0988E+14	MeV	
pe=(4/3*PI()*6.67e-11*1.06e12)*1.67E-27*(8.24e12)^2/1.6e-13				

The above values represent major problems. Firstly the kinetic energy and potential energy are much too high. Secondly, kinetic energy should be high at the beginning and potential energy should be low. Kinetic energy is the huge velocity 9.97e13 meters/second (derived from R=R0(t/t0)^(2/3) for a short time increment. Obviously it is larger than C and some justify velocities like this by saying "expansion is carrying C with it as it expands". The problem goes deeper; expansion is actually occurring in many small cells (described below) and the overall result is expansion. The potential energy equation also gives an unrealistic value. It assumes that one proton is expanding against a central mass consisting of the mass of the entire universe. The separation of the one proton from the whole is so small that the force=G Mm/R^2 is unrealistically large which makes F*r unrealistically large. This is the wrong approach. **We must scale the expansion down to many cells where one proton is being separated from another proton with gravitational force between them.** The problems are solved with the

concepts below called cellular cosmology. We will find from the proton mass model that the beginning kinetic energy is 10.15 MeV/proton, not 5.2e13 MeV/proton calculated above.

The concept of critical density is incorrect. It cannot be relied upon to help understand the flatness problem.

Space time

The discovery that time and distance must shift to prevent mass from exceeding the universal speed limit (C) underlies special relativity. Gamma is a special relativity ratio defined simply as gamma = mass/(mass+ kinetic energy). Velocity= (1-gamma^2)^0.5*C. There has been much written about time as fourth dimension and the related space time concept.

> It is useful to know that gamma for all practical purpose is near 1. For example, the author's cosmology model starts with a 939.57 MeV neutron with 10.15 MeV of kinetic energy. For this extreme condition gamma= 939.57/(939.57+10.15)=0.989. Time dilation dt, according to a Schwarzschild equation is also low. In the above case, dimensionless time ratio=1/0.989-1=0.0108 (less than 1%). Time dilation is not curvature (R) but it means there is velocity (V). Curved space is for practical purposes R=GM/V^2, where G is the gravitational constant and M is the central mass. The concept of proper time and proper distance is important but will not be discussed for simplicity.

General relativity is the current theory of gravity and involves the curvature of surfaces. A metric is a matrix like representation of infinitesimal quadratic terms that describe a surface [18]. The four dimensional "local" equation for space time is:

ds^2=(Cdt)^2-dx^2-dy^2-dz^2 where Cdt is a distance.

This equation is hyperbolic and ds is the infinitesimal distance between events that occur in space time. A way of visualizing the surface is a sphere that changes its radius as time advances [19]. Since anything multiplied by C (3e8m/sec) is a large number, the sphere becomes large very fast (and very unrealistic in the author's view). Cosmology uses a "global" equation that extends the local relationship. That metric was developed independently by Robertson and Walker to satisfy the observation that the universe is homogenous and isotropic but the metric is hyperbolic. The FRW model (F is for Friedmann) and the Einstein-de Sitter models are useful comparisons in cosmology. Some equations involve a constant k that alters space time shape depending on whether k= 1, 0 or -1. Literature is full of discussion on the subject [18][2][10] but observations [4] strongly support k=0. This value is again associated with flat space time.

Quantum Circles

Quantum mechanics (QM) deals with small circles. The circle is a model and the position of a particle on the radius is probabilistic making the circle into a sphere. The basic concept is that energy is related to a circle by the equation E=H*v. Frequency v is the number of times per second something travels around a quantum circle at the speed of light and H is Heisenberg's constant 4.136e-21 MeV-sec. Frequency can be a large number but cycle time t will be 1/frequency=1/v. How much time does it take to move around a circle (R) at velocity C? The time t= 2*pi*R/C equals time t= H/E. The important constant H (Heisenberg's constant) relates time and energy. Knowing the constant relationship, radius is defined. If we are to understand quantum circles, we need to know their radii. Below, we will find a radius from accepted facts about an electron circling a proton (the element hydrogen) and then generalize the equation for other quantum circles.

t=H/E and t=2*pi*R/V are equal for a little quantum circle.
2*pi*R/C=1/frequency
2*pi*R/C=H/E
where H=Heisenberg's Constant 4.136e-21 mev-sec.

Electromagnetic field		**2.72E-05**	**MeV**
t=H/E	**t=4.14e-21/27.2e-6**	**1.52E-16**	**seconds**
2*pi*R/V	**equal but V?**	**1.52E-16**	**seconds**

If we know V above, we can calculate R

Known	**1.36E-05**	**MeV**	**kinetic energy**
Known	**0.511**	**Mev**	**electron mass**
g	**0.999973**	**g=0.511/(0.511+13.6e-6)**	
V/C	**0.007296**	**V/C=(1-g^2)^0.5**	

R calculated from H/E=2piR/V
R=H/E*V/(2pi)
R=4.136E-21/27.2e-6*0.00729*3e8/(2*PI())=5.29e-11 meters

The equation for radius R is central to fundamental forces with different inputs.

Where: H=Heisenberg's constant
M=mass of the particle. If the particle is moving fast relativistic mass is M/gamma
E=field energy that helps define the radius of the circle.
R=maximum probabilistic position of the particle.
R=HC/(2*pi)/(E*m/g)^0.5
R=1.973e-13/(E*m/g)^0.5 and sometimes=1.973e-13/E
where HC/(2*pi) =1.973e-13 MeV-m

Large orbits and small circles

What is the source of gravity and where does the space around us originate? If it originates in quantum circles like the other forces, there is a huge gap. General relativity is the large scale curvature of space time, gravity is very weak and long range but the other 3 forces (interactions) of nature involve small quantum circles.

Consider what the orbital radius of the earth might be on a proton by proton basis (I am aware that the earth is not made of protons with a circling electron but we can use protons as an example). Speculate for a moment that we can consider the volume of the earth broken into smaller volumes around each proton. The mass of the earth is 4e24 kg and the mass of a proton is 1.67e-27 kg. There are 4e24/1.67e-27=3.58e51 protons in the earth and the volume of the earth is 4/3pi*6.3e6^3=1.1e21 m^3. Dividing these we find the volume surrounding each proton (3e-31 m^3) and then determine the radius for this volume. The answer is r = (vol/(4/3*pi))^(1/3) = 4.17e-11 meters. Actually, this makes sense. We know that the electron orbits a proton at 5.29e-11 meters. The electrons repel each other and resist being compressed. Even with considerable mass building up pressure down through the layers of the earth, the electrons are only on average compressed to 4.17e-11 meters. This helps us understand why the earth pushes up on our feet, resisting gravity but it doesn't help us reconcile large orbits like something orbiting earth radius at radius 6.4e6 meters with little orbits like those encountered with quantum mechanics. If we could move at a high enough velocity around the circle, we would feel no force. The reason we feel the force is that we lack inertial force (mV^2/R).

Newton probably could not estimate the number of particles in the universe. Further the whole concept of expansion of the universe was centuries in the future. In Newton's wildest dreams, he would not have anticipated that the sky temperature contains clues regarding the beginning we call the big bang. After cosmic microwave background (CMB) radiation was discovered around 1956, cosmologists started to analyze what the signature of the cosmic background radiation might reveal. They proposed and later received funding for a balloon project called COBE and satellite projects called WMAP [4] and PLANCK. We can analyze how many protons there are in the universe from the data. Data gave us increasingly accurate estimates of rho, the density of the present universe and its radius [3][10][4]. Comprehensive modeling of expansion was carried out and Appendix 6 contains a comparison of parameters that fit the best data. It appears to the author that there are 1.67e78=exp(180) protons. (The nomenclature exp(180) stands for the natural number e to the power 180 and 1.67e78 means moves the decimal point to the right 78 places.

Cellular cosmology

Consider large mass M (for our purposes the mass of the universe although the term universe seems a little presumptive) broken into exp(180) protons labelled lower case m below. The mass (m) of a proton is 1.67e-27 kg. 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 (homogeneous and isotropic). A surface offers this property but the equivalent surfaces of many small spheres positioned throughout a composite sphere 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.

The model below is successful in answering many questions but bear with me for a moment. Firstly, I consider the surface of a sphere as a model of the universe. 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.

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)**

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.

It must be recognized that for equal gravitational constant the radius of curvature and mass are vastly different between the large and small scale. It was unfortunate that the great physicists of the 1900's did not have the advantage of WMAP [4] and Cmagic expansion models, nor did they have the advantage of knowing the approximate number of protons in the universe. Perhaps they couldn't compare cellular scale space to large space because they lacked information.

The Source of gravity

A simplified neutron mass model [5][12][21] is shown below. It is derived from a full neutron mass model and fundamentals [2] reviewed in Appendix 5. Mass+ke=960.52 MeV is overall equal and opposite field energy 960.52 MeV with the net zero. The value of interest for gravity is the field energy 2.723 MeV. (The neutron mass is 939.57 MeV made up of quarks and kinetic energy). Add down through the values in each column of the table below to see the components that total 960.54 MeV. Note that nature uses the value 10.15 MeV many times. Each force of nature is found in an orbital defined by values in the diagram below. Appendix 3 uses these values in a unification theory and describes the slight differences between the forces.

Simple neutron model

r20 uc2

	Mass and Kinetic Energy			Field energy	
	Mass Quarks	**KE**	**Strong Residual**	**Strong field energ**	**Gravitational Energy**
	MeV	**MeV**	**Field E**	**MeV**	**MeV**
Strong	**130.16**	**799.25**		**-957.18**	-2.73
Strong Residual KE		**10.15**			
Neutron		**939.57**			
neutrino ke		0.67		**-0.62**	
Total		940.24	**(-20.30)**		-960.54
Expansion ke		**10.15**			
Expansion pe		**10.15**			
		960.54			

R(meters)=HC/(2*pi)/(E*E)^.5=HC/(2*pi)/2.723=7.224e-14

HC/(2*pi)=1.973e-13 MeV-m

The radius of a quantum circle for gravity is 7.224e-14 meters with E=2.723 MeV.

Large scale gravity is the result of a body with mass m falling into curved space time defined by a central mass M. As a body falls it loses potential energy, gains kinetic energy and finds a geodesic where it feels no force. Again, the geodesic variables R, V and M combine to give G, the gravitational constant; G=R*V^2/M. Quantum gravity follows the same physics except the curvature is the radius 7.224e-14 meters above and the geodesic is G=(r*V^2/m)*(1/exp(90). The body that falls to the geodesic curvature r= 7.224e-14 meters is the neutron. It has mass 1.675e-27 kg and according to the model above, it initially has potential energy 20.3 MeV but when it achieves an orbit, its kinetic energy has increased to 10.14 MeV and its potential energy has decreased to 10.16 MeV.

Calculation of gravitational force with accepted coupling constant

Literature regarding a coupling constant for gravity is reviewed below. The gravitational coupling constant α_G is the coupling constant characterizing the gravitational attraction between two elementary particles having nonzero mass. α_G is a fundamental physical constant and a dimensionless quantity, so that its numerical value does not vary with the choice of units of measurement:

$\alpha_G = Gm_e^2/(hC)=(m_e^2/m_p^2)=1.752e-45$

where G is the Newtonian constant of gravitation; m_e is the mass of the electron; C is the speed of light in a vacuum; ħ is the reduced Planck constant; m_p is the Planck mass.

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

Calculation of gravitational constant from the neutron mass model

Using values for the neutron mass model that the author believes unify nature's forces (12), the gravitational constant is calculated below and agrees with the published constant, G=6.674e-11 N meters^2/kg^2.

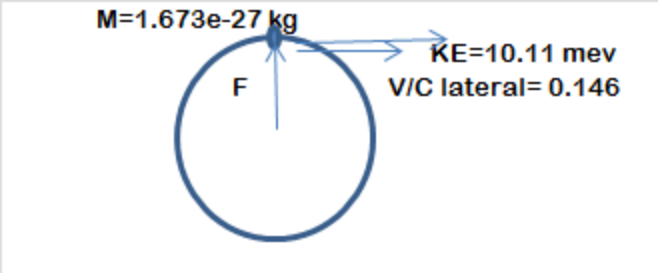
The following table follows a format that will be used several times. The goal is to use the fundamental radius 7.224e-14 meters to calculate the gravitational inertial force. The inputs

listed at the top of the table originate in the neutron model above. Firstly, the mass of a proton in MeV and its mass in kg are specified in the table. 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		
	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 measured gravitation constant G [17] 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 the literature above and confirms the radius 7.22e-14 as the radius for quantum gravity. Appendix 3 is a review of the other three forces (interactions) in nature. It shows that the proton model contains other useful information.

The calculation for G above indicates that nature uses the general theory of relativity at the quantum level. The author calls this cellular cosmology. A cell is diagrammed below. The inertial force F=m*V^2/R=3.66e-38 N. The proton "feels" no force just like an astronaut travelling on a geodesic. This geodesic is a "quantum circle" but it is related through cellular cosmology to a large orbit.



Expansion energy changes

Quantum gravity is fundamental to expansion equations that give the size of the universe. Simple kinetic energy and potential energy equations are applied to expanding cells. Each particle of mass m has kinetic energy and an associated velocity V tangential to the cell surface. The model shows protons with about 20.3 MeV that fall into "orbits" with 10.11 MeV of kinetic energy and 10.11 MeV of potential energy. Initially the proton on the cell surface has high velocity (0.14C) and inertial force, the basis of quantum gravity. Tangential kinetic energy ratio decreases directly with expansion ratio and can be modeled as orbit that maintains the gravitational constant at G.

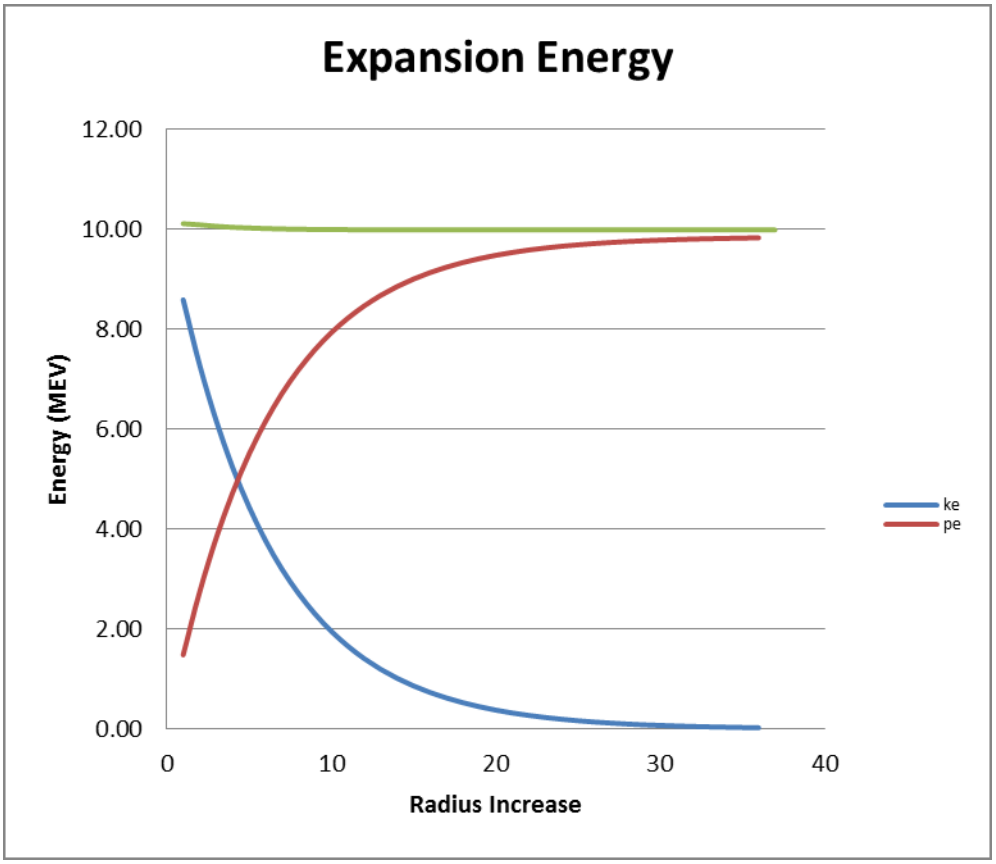
G remains constant G=rv^2/(M)			
RV^2/(M/g)=rv^2/(M/g0)	RV^2/M=rv^2	10.11 ke	ke=.5 (m/g)v^2
RV^2*g=rv^2*g0	RV^2=rv^2		ke0=.5 (m/g0)V^2
(v/V)^2=(r/R)*g0/g	(v/V)^2=(r/R)		ke/ke0=(m/g)v^2/((m/g0)V^2)=r/R
(v/V)=(r/R)^.5*(g0/g)^.5			ke/ke0=(g0/g)(v/V)^2
ke=ke0*(r/R)	Ke decreases with r		ke=ke0*(g0/g)(r/R)

After expansion cells are no longer quantum. (Magnetic moments or other forces may disrupt the proton forcing it to move throughout the cell). This is explored below in Appendix 2 entitled "Proof of non-quantum behavior". The kinetic energy of the proton can be considered pressure and pressure expands the cell. The integral PdV does work against gravity converting kinetic energy to potential energy (dV is a small volume change and PdV is a small energy change that must be added (integrated) since P and V are both changing). During expansion, gravity causes some protons to fall (accelerate) toward each other and accumulate, exchanging potential energy for kinetic energy. It is this energy that we see when orbits are established around galaxies and planetary systems. It is also this energy that provides pressures and temperatures high enough to initiate fusion.

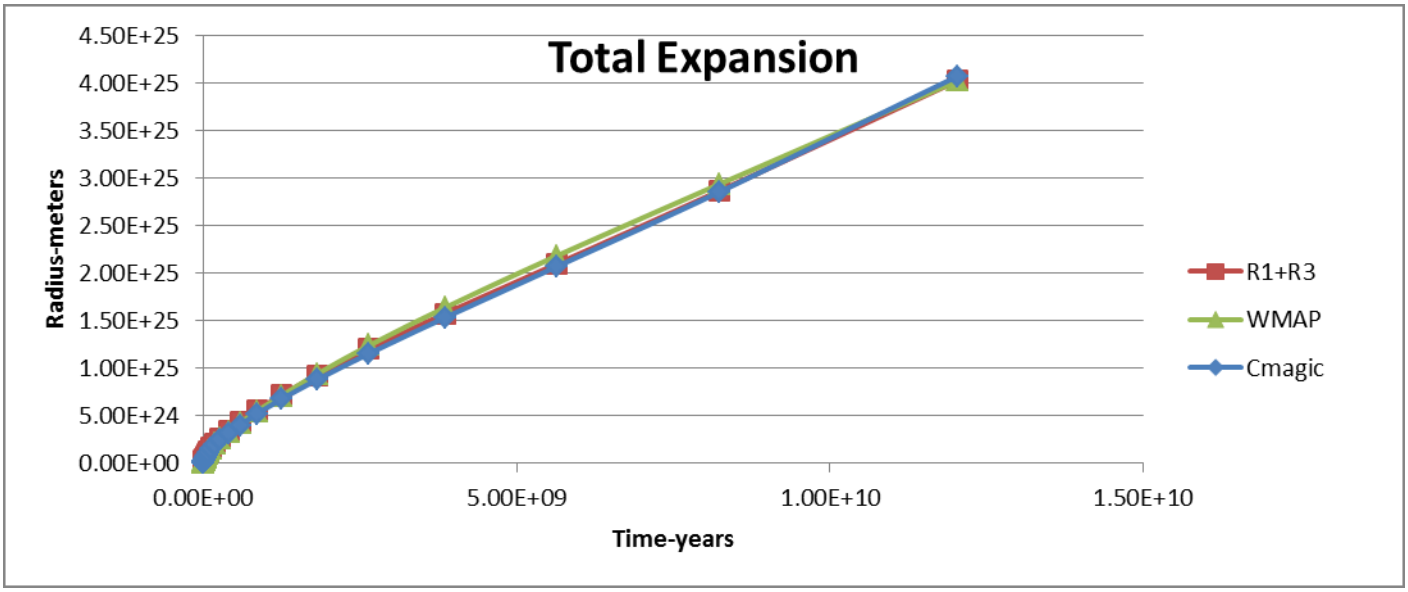
Kinetic energy conversion to potential energy

The integral of PdV is shown below plotted against the kinetic energy change of the proton producing the inertial force. The cell expands because the kinetic energy (pressure) exceeds the resisting force but the result is that the proton has expanded against the gravitational force. Since

the force is the same, the loss of kinetic energy is exactly the gravitational potential energy gain. The original kinetic energy has been converted to potential energy in about 500 seconds. At this point He4 fusion occurs and adds 0.55 MeV [26]. This is the energy we see in the cosmic background radiation. There is a third and final energy injection [24] when stars light up at expansion z=16. This energy is currently on the order of 3e-10 MeV (2.73K). All of these energy values are converted to potential energy at the current time.



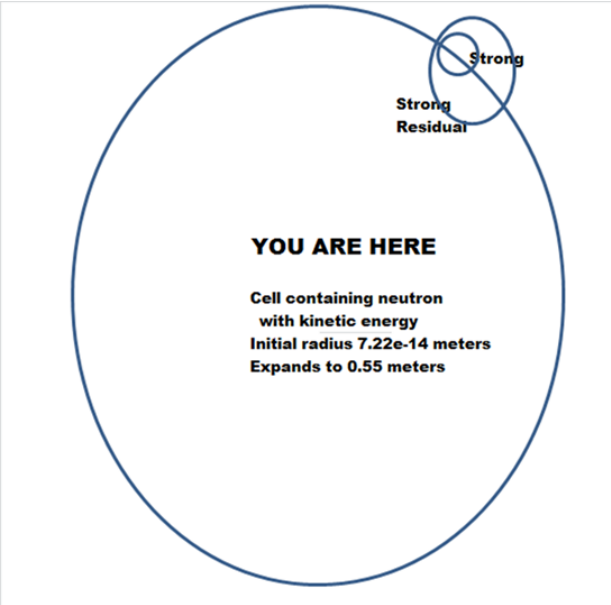
There have been many estimates of expansion. Below, three models are compared. All three models fit the data gathered to date regarding the ending Hubble constant and the WMAP 9 year parameters. There is considerable discussion about the apparent acceleration occurring at the present time (I believe it is the addition of energy due to star ignition and analyzed this possibility in Reference 24). The author's model is spherical and "side steps" the equations that originate from a hyperbolic metric.



The Source of space time

Cellular cosmology accurately describes our perception of the protons around us. This cosmology provides a degree of freedom in which protons are free to move. Cells are gravitational quantum circles. This was the source of the misunderstanding regarding how to treat the fourth dimension. Time is always measured around the circumference of quantum circles and the following metrics apply:

2pi*r=C*t measured around the circumference of the quantum circle for gravity and dr^2=dx^2+dy^2+dz^2.



We exist in the space created as cells expand. Particles are able to move and obey the Lorentz transformation in the composite sphere. Quantum circles are building blocks of nature. Particles exclude one another but sometimes are allowed into the conceptual center of a quantum circle. For example, a proton is allowed to become the center of an electron's orbit. Another example is that protons and neutrons form atoms by moving inside the strong residual orbit (see appendix 5 for a picture of nature's 4 quantum circles). The strong interaction is considered here to be the sum of "color forces" for three quarks.

Time and cosmology

There is a strange situation in fundamental physics regarding time. Well respected physicists point out that all quantum mechanical equations are cyclical with time. Common sense tells us that time advances and tension exists between fundamentals and what we observe. This situation extends to fundamentals of space as well as fundamentals of time. Special relativity and curvature of space time is known to be the source of gravity at the large scale but the author's approach to quantum gravity is not generally known. Further, the concept that velocity is relative seems to be accepted but velocity is related to kinetic energy that is conserved.

We can calculate time around the gravitational quantum circle:

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		

The author believes that the cycle time 1.51e-21 seconds has repeated many times since the beginning. In other words, a quantum mechanical fundamental time is defined that cycles *and* counts forward (fundamental time*exp(N)).

Consider why the universe expands. Kinetic energy (ke=1/2*Mv^2) must be turned into gravitational potential energy (pe= integral F dr) over *time*. Elapsed time enters physics through cosmology! The derivation below indicates that the increasing radius of the universe and increasing time are related through expansion.

ke	pe
ke	F r
1/2M(v)^2	GMM/r
1/2M(r/t)^2	GMM/r
1/2Mr^3/t^2	GMM
1/(2GM)*r^3	t^2

(r/r0)^3 increases as (t/t0)^2

The above derivation contains only radius and time. If we believe that expansion occurred we must believe that time advances (perhaps in increments of fundamental time 1.5e-21 sec).

(r/r0)^3 increases as (t/alpha)^2 (kinetic energy requirement)

With the understanding that the large scale we observe is made of cells defined by gravity and the further understanding that fundamental time cycles, counts and moves everything forward we can simplify our understanding of nature. This cycle is established by the quantum mechanics of the gravitational field inside each proton (the proton model in Appendix 5) and each proton is identical and none occupy a preferred position. All protons advance in elapsed time simultaneously ready for the next count. Elapsed time is the primary variable for the expansion equations and they determine the expanded radius we will label radius prime (r'). It determines how much kinetic energy has been converted to potential energy. In fact, expanded kinetic energy is simply ke=10.11*7.22e-14/r' MeV. But this kinetic energy is devoted to expansion. Movement not part of the expansion "flow" is called peculiar motion. Particles can bump and exchange kinetic energy. Gamma (m/(m+ke)) produces peculiar motion [18]. A particle in relative motion is subject to time dilation. This means there are two types of time and the source of the twin paradox. The proof that there are two types of time is that the twins come back together and occupy the same space time but one is slightly younger (verified by instruments in relative motion). Fundamental time must be cyclical and uniform however to preserve energy.

The Schwarzschild Solutions

Karl Schwarzschild solved the metric equations for general relativity and reference 18 contains a concise summary including derivations. The solutions lead to important contributions. For example, understanding the advance of the perihelion of Mercury, bending of light around mass, slowing of time in a gravitational field, time delay of signals passing the sun, the radius of black holes and proper distance (distance in curved space). The Schwarzschild metric must be correct but important applications do not depend of time being multiplied by the speed of light and the resulting large hyperbolic. (What I object to is a measure of time that does not follow a quantum circle).

Firstly, it can be demonstrated that Schwarzschild's time dilation (dt) can be derived from special relativity for cellular cosmology (Appendix 4). The differences are that the gravitational coupling constant 1/exp(90) is introduced and the mass is one proton. This equation predicts the same slowing of time in a gravitational field.

There is no question that in curved space, distances must be "proper distances" but the Schwarzschild metric cleverly avoids a large hyperbolic surface by considering two events at the same coordinate time, i.e. dt=0 and only separated by an infinitesimal distance. The equation becomes for a fixed value of r is:

$D\sigma=r^2\, d\theta^2 + r^2\sin^2\theta d\varphi$

This is the line element for the surface of an ordinary three-dimensional sphere embedded in Euclidean space.

Secondly, the coefficient (1-2GM/C^2R) is introduced into the Schwarzschild metric to make it agree in the limit with Newton's G. This coefficient is simply R=2GM/V^2 with V set to C (and the 2 is questionable). Newton's G can predict the radius of a black hole.

The advance of Mercury's perihelion is primarily due to changes in angular momentum due to the eccentric orbit but there is a relativistic contribution. Again, the equation is for curved space and avoids a large hyperbolic that results from multiplying time by the speed of light.

The bending of light around massive objects is especially important. The useful equation is:

δ=4 GM/(c^2 b), where b is the distance of the light ray from the center of the massive object. Again space is curved by a geodesic and the solution does not depend on multiplying time by C.

Conclusion

It is well known that kinetic energy causes a slight shift in time but this does not mean that space time must be described in four dimensions involving a hyperbolic equation for global cosmology. Quantum mechanics teaches us that time is measured around a quantum circle just like distance. General relativity describes space time curvature but is not very different than the geometry of other interactions when reduced to its origin in a quantum circle. Gravity is weak and long range due to its coupling constant 1/exp(90). This coupling constant is a result of the way many quantum circles are incorporated into a composite sphere.

A model called cellular cosmology is based on breaking the surface of a sphere into the equivalent surface of many small spheres. These surfaces have cosmological properties including isotropy and homogeneity. Each cell contains a proton with kinetic energy located inside a composite sphere and able to move relative to one another. The space around us is expanded quantum gravity and the inertial force (F=M/g*v^2/r) is both the expanding force and the resisting force (see section entitled "Calculation of gravitational constant from the neutron mass model"). This dynamic means that the initial kinetic energy is exactly asymptotic to the expanded potential energy. This solves the flatness problem if one considers the problem a matter of kinetic and potential energy balance.

Data (Hubble constant= H= v/r=2.26e-18/sec) gives us the present density 9.14e-27 kg/m^3. The authors spherical radius R1+R3 is approximately 4.0e25 meters in this model (volume = 2.72e77 meters^3). Multiplying current density by volume is compatible with the author's estimate of the number of protons if all mass is "proton like". The universe is considered to be exp(180) expanded cells of approximately 0.35 meters radius that were originally quantum at a radius of 7.2e-14 meters. As such, it is spherical and does not involve the equations associated with the literature constant k. Of course expanded particles have potential energy and can accelerate toward one another. This does not mean that the universe will collapse. It means that mass will accumulate and kinetic energy is available to form orbits.

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Appendix 1

Two candidates for the correct gravitational energy scale

We will further explore below whether we can call this circle of radius 7.224e-14 meters with mass 939.57 MeV as the scale for quantum gravity.

Candidate #1 the conventional Planck scale

There are tests for quantum gravity: We will compare the Planck scale relationships [2] 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" [search Wiki]. 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.

	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/E	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/h		1.00	
qm test	M/C^2*R^2/t	6.58E-22	mev-sec
qm test/h	M/C^2*R^2/t/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 N 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 N 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. The correct scale for quantum gravity is the radius 7.22e-14 meters not the Planck scale 7.62e-35 meters.

Appendix 2 Proof of non-quantum behavior

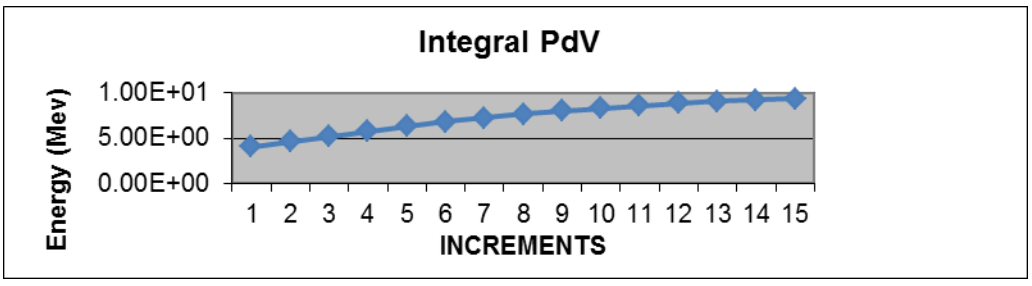
There is a critical concept at stake that needs our understanding. If the particles are non-quantum and the expansion kinetic energy is temperature, it is no longer limited to a surface. Particles with kinetic energy bounce off of one another and create pressure. Is it this pressure that expands the universe? Can the particles fill all of space or are they quantum like and limited in their travel? If we calculate what a gas would do perhaps we can answer the above two questions.

The gas constant R, is 8.317 Joule/K/Mole. (Joule=Nt-m and 1000 Mole/Kg for H). If we assume an ideal gas for hydrogen the gas constant R=8317 Nt-m/K/Kg and the pressure P would be:

Pressure P=8317*density*temperature (Nt-m/K/kg*kg/m^3*K=Nt/m^2) where density is kg/m^3 and temperature is degrees Kelvin (K).

With density based on one proton for half the cells (the other half is probably cold dark matter [13]) and an initial radius of 7.22e-14 meters, the above initial pressure is 2.97e26 Nt/m^2 where initial temperature=7.58e10 K. The following table models integral P*dV (an integral means we add increments together since P and volume change as R increases) for the first few steps in expansion.

Volume/cell (m^3)		1.67E-39	2.72E-39	4.43E-39	7.24E-39	1.18E-38
Density (kg/m^3)		5.02E+11	3.08E+11	1.89E+11	1.16E+11	7.09E+10
Temperature (K)		7.56E+10	1.01E+10	1.08E+10	1.05E+10	9.84E+09
Pressure (NT/m^2)		2.97E+26	2.44E+25	1.60E+25	9.54E+24	5.46E+24
Pressure (lb/in^2)			3.54E+21	2.32E+21	1.38E+21	7.92E+20
Pdv (MeV)			2.11E+00	4.33E-01	4.47E-01	4.28E-01
Integral Pdv (MeV)	6.6		2.11E+00	2.55E+00	2.99E+00	3.42E+00



The integral of P*dv quickly saturates at a level consistent with the initial kinetic energy of 10.11 MeV (the gas is not ideal and the constant is somewhat uncertain). Overall, *pressure* can be considered the driver for expansion. The net effect is the proton receives gravitational potential energy against a resisting gravitational force. For expansion, the kinetic energy term is initially 10.11 MeV of kinetic energy but decreases as integral Pdv increases. Defined this way, we expect the equation 10.11=ke+Pdv to be satisfied. Although the proton model and cellular cosmology define kinetic energy for the cell, it is pressure and temperature that expand the

universe. Rather than being limited to a quantum mechanical orbit, particles are free to move throughout space. An approach to quantum gravity was demonstrated that leads to what appears to be a sphere filled with protons as a model of the universe.

> Aside: The word "appears" is used above because particles and energy fields are also quantum waves. Nature is probabilistic and interaction/interpretation with a brain may be required to convert possibilities to information we understand. I explored this possibility in Reference 21.

After two additional early transitions (equality of photon and mass density and decoupling of electrons [3]), gravitation is locally able to dominate gas pressure. This gas does not act like the one that thermodynamics normally describes. The particles are gravitationally "sticky" and small accumulations of matter grow and eventually form clusters, galaxies, stars and planets [3][10].

Appendix 3 Unification of fundamental interactions

The proton is thought to be a primary manifestation of underlying laws and as such contains information (energy associated with N values) that determines many aspects of nature. The proton model above is the source of constants for unification of forces, the subject of reference 5 and the review in Appendix 5.

	Mass (m)	Ke	gamma (g	R	Field (E
	(mev)	(mev)		meters	(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

This table above gives the mass, kinetic energy and fields for fundamental constants. Gamma is g=m/(m+Ke) and R=hC/(field energy*mass/g)^.5 (small h is Heisenberg's constant sometimes called hbar = H/(2*pi)). The important values for gravity are the mass of the proton with 10.15 MeV of kinetic energy imbedded in a field energy of 2.732 MeV. The residual strong force (related to the weak interaction) is determined by a mass of 928.121 MeV, a kinetic energy of 10.15 and field energy of 20.3 MeV. This field energy is the missing energy required to balance 960.52 MeV with balancing field energies totaling 960.52 MeV. (Overall the energy is zero by being balanced since there are no negative energies). An orbit is formed by a "bundle of quarks" with kinetic energy 10.15 MeV orbiting in field energy 20.3 MeV.

Before considering gravitation more thoroughly, it is instructive to review other interactions supported by information extracted from the proton mass model. An updated table from [3] is reproduced below. The inputs above, intermediate results, forces predicted and literature data are listed by column for four forces.

Unification Table	cell ax74		Strong		Electromagn	Gravity
Higgs energy (mev)			Combined	Strong Residual		proton
***Field coupling to Higgs field Energy						
	Potential energy of proton falling into gravitational field (mev)					20.115
Field Energy E (mev)			957.18	20.303	2.72173E-05	2.732
Mass Coupling to Higgs field energy						
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
					7.250E-09	7.2238E-14
Inertial F	Newtons	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	2.732E+00
*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	

The field energies for three strong (color) interactions and their associated particles are from the proton mass table. They are referenced to the Higgs energy since it is considered by many to be the source of field energies and particle masses. A force coupling constant is calculated to be 1.00 and derived c^2 (E*R) values are presented in MeV-m and joule-m. The lower hierarchy electromagnetic coupling constant is well known and the author's calculations substantially agree.

Strong Force

The strong energy comes from the proton mass table. Together with the R equation, they define quark orbits inside the atoms. The resulting R is on the order of 2e-16 meters. There are actually three variations of the strong force because there are two types of quarks involved and three different kinetic energies. It appears to the author that they combine but there is a concept called confinement that hides the true nature of the "color" forces.

Weak Force

The sum of all the field energies is more strongly negative than the total energy of the proton with its kinetic energy. Energy is missing in each proton but not missing from the total 959.86 MeV. The lack of balance in energy causes an inward force we know as the weak force. The same is true for the neutron. When nuclei bond together in nuclear reactions, the nucleons come close enough together to "see" the deficit. The "weak energy" is 20.31 MEV. With this energy and the neutron mass as the attracted mass used as "R Equation Inputs", a radius of 1.43e-15 meters is calculated. The accepted value for the radius of the atomic nucleus is (1.5e-15). It is evident from the weak deficit holds the nucleus of atoms together. This is of course not new to physics, but the origin of the 20.31 MEV is new and comes from the pattern. The atomic binding energy curve is considered to be a result of the strong residual interaction. Again, the proton mass model provides information. The key value is the kinetic energy 10.151 MeV associated with the proton. The strong residual force F=hC/R^2= 15467 NT requires the coupling constant 0.147 and the derived c^2= 2.9e-14 MeV m is similar to the published value 1.56e-14 MeV m. Also the radius of the proton appears to be credible. Reference 14 describes a simple model using the value 10.15 MeV as the basis for binding energy. In this model 10.15 MeV is the kinetic energy that changes as atoms fuse. (928.121 MeV+10.151 MeV =938.272 MeV).

Electromagnetic Force

The electromagnetic force is the result of N=3* 0.0986=0.296 being lost from the 10.43195 particle to become the electron (10.1361). (10.4319-.296=10.136). This gives the electron its negative charge. The electromagnetic energy of the field attracting the electron is E=e0*exp (0.296) =27.2 eV. This is the published value for the electromagnetic field.

Quantum gravity

Gravity appears to be different that the other 3 interactions but cellular cosmology allows substitutions that lead to a calculation of the gravitational constant (G) from proton mass model information.

Appendix 4 Derivation of time dilation

Show that dt for General Relativity is derived			
from gamma fromSpecial Relativity			
(Derivation for Schwarzschild equation)			
constants from gravity above:			
ke	**10.11**	**MeV**	
m	**1.67E-27**	**kg**	
m	**938.27**	**MeV**	
r	**7.244E-14**	**meters**	**t**
G	**6.674E-11**	**nt m^2/kg^2**	
C	**299792458**	**m/sec**	
gravitational coupling constant 1/exp(90)			
gamma=m/(m+ke)			
gamma=938.272/(938.22+10.11)			
0.9893	**gamma**		**0.145625826**
dt=1/gamma-1			
0.0108	**dt**	**1.010775**	
dt=1/((1-(v/C)^2)^.5-1			
G=Rv^2/m			
v=(Gm/R)^.5			
dt=1/((1-G*m/(R*C^2)))^0.5-1			
dt=1/((1-EXP(90)*G*m/(r*C^2)))^0.5-1			
0.0106	**dt**	**ke=m/(1/(1+dt))-m**	
gamma=1/(1+dt)			
0.9895	**gamma**	**ke=m/gamma-m**	

The above derivation indicates that in cellular cosmology, time dilation and gamma are very similar.

Appendix 5 Review of fundamentals

A logarithmic information code was developed (discovered using information theory [2]) from fundamental particle data and used to model of the neutron, proton and electron. It involves four arithmetic operations, the first of which is simply, divide the N= 90 by 4 to give four values of 22.5 each. Arrows mean a separation has occurred. The "fundamental N" values on the right side of the table are additions across each line in the table. I consider the table as the information anchor for important energy values.

						Fundamental	
		Operation 1				N values	
			Operations 2---------->4				
Bosons		22.5	10.167	5.167	0.099	15.432	set1
			12.333		0.099	12.432	
Bosons		22.5	10.167	3.167	0.099	13.432	set2
			12.333		0.099	12.432	
Bosons		22.5	10.167	3.167	0.099	13.432	set3
			12.333		0.099	12.432	
			0.667		0.075	0.075	set4
Bosons		22.5	11.500				
			10.333			10.333	
Total		90	90			90	

Information Code

One set of information (probability=1/exp(90)) defines each neutron's mass plus kinetic energy and each protons field energy (probability=1/exp(90)) but they both occur simultaneously and probability 1/exp(180)=1/exp(90)*1/exp(90). This is a way of understanding the number of neutrons in the universe if the universe was based on probability 1.0. With each neutron's probability, a duplication process by exp(180) re-establishes probability 1.0=1/exp(180)*exp(180).

The fundamental N values are labelled as sets above. After an interaction particles with kinetic energy are imbedded in fields. Set 2 will be used as an example. The information interaction adds the logarithm 2 to 13.43 to give 15.43 while at the same time the logarithm 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.

Logarithmic N values are converted to energy with the relationship E=e0*exp(N) where e0=2.025e-5 MeV [5]. The defining relationship treats e0/E as a probability P. The constant e0 is evaluated based on N=10.1361 for the electron (0.511 MeV) and used for all other energies.

		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

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).

				Results of logarithmic value 2 exchange				
					(difference ke)			
N1	E1 mass	N3	E3 field1		E3+E4-E1-E2		E3 field1	
N2	E2 ke	N4	E4 field2	E1 mass		E2 ke		E4 field2
	mev		mev	mev	mev	mev	mev	mev
13.432	13.797	15.432	101.947	13.8	83.8	5.1	-101.9	
12.432	5.076	10.432	0.687					-0.7
				Sum of energy from above table				
N1,N2,N3,N4 is defined as quad				E1+difference KE		102.6	E3+E4	-102.6
				Energy is conserved since 102.6=102.6				

This interaction has powerful implications. The interaction involving E1 can be read E1 is given exp(2) of energy to become E3 . Since the numbers (N) are exponents (E=e0*exp(N)), the number 2 can be associated with a divisor 1/exp(2)=0.135 that increases the kinetic energy of E1. 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 (and perhaps the origin of) the concept of gamma in relativity. Gamma is the divisor that increases the kinetic energy of a moving mass involved in the Lorentz transformation. The definition is: ke=m/gamma-m. These may be special case Lagrangians and the energy interaction is similar to a physics qauge transition.

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”. Exchange of the logarithm 2 is the origin of gamma but it is also the source of other important relationships like the famous Einstein energy momentum relationship.

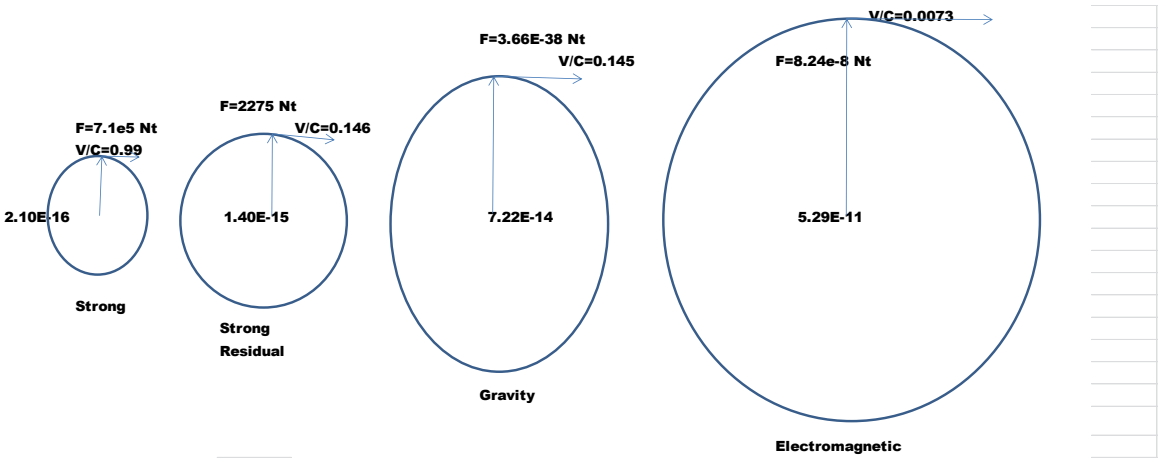
						Mass, Kinetic Energy and Fields for Neutron						
												Gravitational
	N for Neutron Energy Interactions							Residual ke	Expansion			Field
	mass	Energy	S field	Energy	Mass	Difference KE			KE	Strong field		
		MeV	G field	MeV	mev	mev		mev	mev	MeV	MeV	
Quad 1	15.43	101.95	17.43	753.29	101.95	641.88		10.15		-753.29		
	12.43	5.08	10.43	0.69							-0.69	
Quad 2	13.43	13.80	15.43	101.95	13.80	78.69			10.15	-101.95		
	12.43	5.08	10.43	0.69							-0.69	
Quad 3	13.43	13.80	15.43	101.95	13.80	78.69			10.15	-101.95		
	12.43	5.08	10.43	0.69							-0.69	
Quad 4	10.41	0.67	-10.33	-0.62	0.00	0.00		0.6709		-0.62	-0.67	
	-10.33	-0.62	10.41	0.67								
Quad 5	10.33	0.62	10.33	0.62	0.62	0.00						
	0.00	0.00	0.00	0.00								
					130.16	799.25	939.57	0.671	20.30	-960.54	-2.73	
	90.00	sum	90.00				NEUTRON MASS		Total m+ke	Total fields		
	10.41	0.67							Total posit	Total negative		
									960.54	-960.54		
									MeV	MeV		

gamma represents a shift in time dimension	
V/C represents a shift in the distance dimension	
Defined orthagonally:	
(V/C)^2+(g)^2=1	
(sides make a right triangle)	
g=(1-(v/c)^2)^.5	
1=1/g*((1-(v/c)^2)^.5	
(1/g)^2(1-(v/c)^2)=1	
(1/g)^2-(1/g)^2(v/c)^2=1	
(1/g)^2=1+(1/g)^2(v/c)^2	
(m/g)^2=(m)^2+(m/g)^2(v/c)^2	
(m/g)^2c^4=m^2c^4+(m/g)^2v^2c^2	
(mc^2/g)^2=(mc^2)^2+(m/g)^2v^2c^2	
With p=momentum, E=m'c^2 and m'c=p below	
E^2=(mc^2)^2+p^2c^2	

The Einstein momentum energy equation

There are other important foundational features of nature starting with 1 or 0.

The Unitary operator U*Û=1=e^(iHt/h)*e^(-iHt/h) at t=0 is the basis of each quantum circle. H is the Hamiltonian, h is Heisenberg's reduced constant and t is time. This appears to divide mass+kinetic energy from field energy into opposite "charges". Charge, parity and time are conserved. The quantum circles for four interactions are:



The unitary operator and the Einstein energy momentum equation mean that wave/particle duality is fundamental.

Appendix 6 Number of proton like masses in the universe

The left side of the table below summarizes WMAP cosmological parameters and the right side shows for comparison, R1+R3 expansion model results [7][8][17][21]. (The author's cosmology model has evolved slightly over 20 years).

WMAP [7]		WMAP	R1+R3	R1+R3
NOW		decoupling	decoupling	NOW
published				
4.00E+25	Inferred Radius		2.63E+21	4.03E+25
			R1	3.82E+25
2.26E-18	H0			
8809	Temperature at equality (K)			
2.73	Temperature now (K)			2.98
2973	Temperature at decoupling (K)	2254.2	1769	
0.0106	Spot angle (radians)	0.0182	0.0140	
0.254	baryon number density			2.731
5.77E+08	Photon number density			5.80E+08
4.400E-10	baryons/photon			4.71E-09
0.235	Dark matter fraction			0.500
6.57E-27	dark matter density in kg/m^3			2.28E-27
4.2377E-28	baryon matter density in kg/m^3			4.56E-27
0.719	Dark energy fraction			0
9.1351E-27	critical density	2.81E-01		9.13E-27
0.0464	Baryon fraction			0.500
2.69E+77	Overall volume (m^3)		7.65E+64	2.73E+77

We can now calculate the number of proton like masses in the universe. The final density 9.14e-27 kg/m^3 is baryons plus dark matter. The current radius R1+R3 is 4.0e25 meters and this

gives volume 2.72e77 meters^3. Multiplying final density by volume gives the number of proton like masses in the universe compared to exp(180) below. We do not know if dark matter has a proton like mass but this is an interesting number to the author because exp(180) was the starting point for the unifying theory.

rhoC	Volume	rhoC*Volume	exp(180)	rhoC*V/exp(180)
9.135E-27	2.72E+77	1.49E+78	1.49E+78	1.000

The baryon/photon ratio above separates exp(180) into baryons and dark matter. Baryons may be 0.5 and dark matter is 1-0.5=0.5. This differs from WMAP and is further explained in reference 20.