Dark Matter Resolution and Critical Density with no Missing Matter

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ABSTRACT
The WMAP and PLANCK missions [3][5][17] measured and analyzed the Cosmic Background Radiation. They published V/R=2.26e-18/sec for the current expansion rate and critical density Rhoc= 9.2e-27 Kg/m^3. Using this density, the indicated composition of nature is about 5% normal matter, 23% dark matter and 72% dark energy.

Insight is great (and why this is important to me). The WMAP team error is now clear. They assumed that Cosmic Background Radiation temperature 2.725 K is scaled back to the equality of mass density/photon mass density and decoupling. Shortly after the beginning neutrons and protons fused to He4 and released energy. Much later stars released energy. Currently the CBR temperature 2.725 K consists of 60% He4 energy and 40% star energy. But stars didn't exist during the equality period. This means that the temperature then was lower than the WMAP assumption for each early expansion radius. The criteria for decoupling and equality are obeyed but they occur earlier in time than the WMAP analysis. With earlier equality, the radius was smaller when mass and photon density were equal. The mass associated with density is consistent with protons only. Since the WMAP data was based on angles they could not discern when the significant events occurred.

This paper compares two expansion analysis that agree with WMAP 9 year data [5]. Both are based on the Hubble constant converted to kinetic energy. The first analysis replicates WMAP data and explains why it requires a high critical density with only 5% baryons. The second analysis is based on three sources of kinetic energy. This analysis is based on protons and there is no missing matter or dark energy. This is detailed in Part 1 of this document.

Part 1 Re-evaluation of critical density for three expansion energy sources
The WMAP [3] and PLANCK [17] missions measured variations in the Cosmic Background Radiation. Data reduction efforts resulted in composition estimates based on what is known as critical density. The derivation for critical density [2][8] is reviewed below:

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
2 ke/M	2 pe/M
v^2	(8/3 pi G rho) r^2
(v/r)=H=	(8/3 pi G rho)^(1/2)

Mass with kinetic energy (expressed as density to make the left-hand side V/R) is the basis of an expansion model known as the Lambda Cold Dark Model (LCDM). The published [3][5][17] Hubble constant V/R= 2.2683e-18/sec determines critical density rhoc= 9.202e-27 kg/m^3. This initiated the searches for "dark matter" and "dark energy".

Ho		2.2683E-18	(1/sec)
rhoC	H0^2/(8/3 pi G	9.202E-27	(Kg/M^3)

The above derivation is for conversion of a single kinetic energy source to potential energy but it leads to major problems. The central question is why is the baryon fraction (protons and neutrons) only about 5% of everything? There appears to be "missing matter". Furthermore, expansion appears to be accelerating leading to the question "is that dark energy?". An alternative is proposed that identifies and solves the above problems.

Why V/R and critical density are important

Expansion rate does not depend on overall radius since it expands proportionally at every scale. This means we can examine the expansion rate of one cell (the volume associated with each proton) and understand expansion (see part 3 title "Scaling large scale gravitational values to the quantum level").

The analysis below is based on the WMAP "Hubble radius" 1.38e26 meters (WMAP terminology for the radius of the universe although they do not use cells and there are many interpretations regarding observability, etc.). An equivalent derivation of V/R is possible using cells and we will use exp(180) for the number of cells.

Radius (m)		1.38E+26
Volume (m^3)		1.09E+79
Ln(vol*1.67e-27/9.2e-27)		180.28

Hubble V/R is outward from the center of a sphere but it can be related to tangential velocities on the surface of a circle.

Note: Pressure expands the cell (and the universe consists of expanding cells) but the kinetic energy of a proton orbiting a cell is equivalent. The way to think about this is mass experiences outward force as it moves around the circle. In three dimensions this outward force is pressure exerted from inside a sphere. Thermodynamics relates the proton kinetic energy to pressure in the cell. Once we know this kinetic energy, we can develop accurate expansion curves with tangential velocity.

The result (Part 3 below) F=mv^2/r*(1/exp(90)) is used to calculate potential energy F*r for each cell. It produces the Newtonian force F=6.67e-11*mass^2/r^2 but can be expressed as 2 fr/m that equals 2 ke/m. Velocity is kinetic energy (ke=0.5*mv^2) and the derivation below is based on equal kinetic energy (ke) and potential energy (pe) (like the conventional derivation).

ke		pe	
ke		Fr	
ke		Fr=mv^2*r/r*(1/exp(90))	
2ke/m		2 fr/m	
		2*v^2m/m*(1/exp(90))	
V^2		2*v^2*(1/exp(90))	
V		1.414*v*(1/exp(45))	
V/R		1.414*v/r*(1/exp(45))	

Note: 1.414 is the square root of 2.

The equation V/R=1.414*v/r*(1/exp(45)) allows one to understand the kinetic energy components that expand the universe. Lower cap v/r is tangential velocity around a cell divided by the radius of the cell.

Total expansion kinetic energy is determined from velocity. The WMAP result [5] for the Hubble radius (1.38e26 meters) gives the radius for the total cell. The conversion is:

R cell= 1.38e26/exp(60)=1.2044 meters. Volume cell= 4/3 pi r^3=7.318 meters^3.

WMAP time: time=1/(V/R)= 1/(2.26e-18)=4.4e17 seconds. The WMAP result 13.74 billion years (4.333e17 seconds) will be used in the calculations below.

The requirements for the values in the right-hand column of the table below are: ke= pe and Force outward= Force inward.

Hubble analysis			
	E total		
V/R (1/sec)	2.27E-18		
rho=(V/R)^2/(8/3*PI()*6.67e-11) kg/m^	9.20E-27		
r=1.38e26/exp(60) m	1.2044		
Volume=4/3*pi*r^3 (m^3)	7.318		
v=V/R*r*exp(45)/1.414 (m/sec)	67.48	2.26e-18*exp(45)/1.414	
ke=0.5*mass*V^2/1.6022e-13 (MeV)	9.57E-10		
ke*r (MeV-m)	1.15E-09		
(match is the goal of pe=ke derivations	V total (m/sec)		
v to match F=F requirement	67.48		
pe=0.5*Fr (MeV)	9.59E-10	ke for 6.735e-26 Kg	
Force outward= mv^2/r*(1/exp(90)) (N	2.09E-61		
Force inward=G*m^2/r^2 (Nt)	2.09E-61		
mass=(F/6.672e-11*r^2)^0.5 (Kg)	6.735E-26		
density =mass/Volume (kg/m*3)	9.20E-27		

Expansion rate V/R=(8/3 pi G rhoc)^0.5 identifies the overall condition where ke=pe at the end of expansion (where V/R=Hubble's constant=2.26e-18 1/sec and rhoc= 9.2e-27 kg/m^3). The velocity value 67.48 m/sec is the Hubble velocity converted to tangential cell velocity.

The right-hand column of the table illustrates why critical density 9.2e-27 kg/m^3 is special. Force inward= force outward= 2.09e-61 Nt and ke=pe= 9.59e-10 MeV. Both are based on mass/cell= 6.735e-26 Kg. When these forces are equal "the universe is flat", meaning that the FLRW (Friedmann-LeMaitre-Robertson-Walker) equations [2] describe expansion for the accepted geometry. This is known as critical density and is the denominator for the composition fractions listed for WMAP. But the mass (6.735e-26 Kg) required to balance the forces is much larger that the mass of one proton (1.67e-27Kg). This result sent many searching for dark matter and dark energy that add up to mass 6.73e-26 Kg (density 9.2e-27 Kg/m^3).

Scaling conditions from now to previous times

The radius and time relationships that underlie conversion of kinetic energy to potential energy during expansion are the basis for scaling conditions from one time to another (co-moving conditions is the terminology often used).

Kinetic E ke	Potential 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	

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

This can be written t=to*(ke0/ke)^(2/3) or t0=t now*(ke now/keo)^(3/2). It also applies to temperature and kinetic energy, i.e. t=2.725*(4.33e17/time)^(2/3) and KE=ke now*(4.33e17/time)^(2/3). These equations are used to scale values between now and earlier conditions.

Review of WMAP

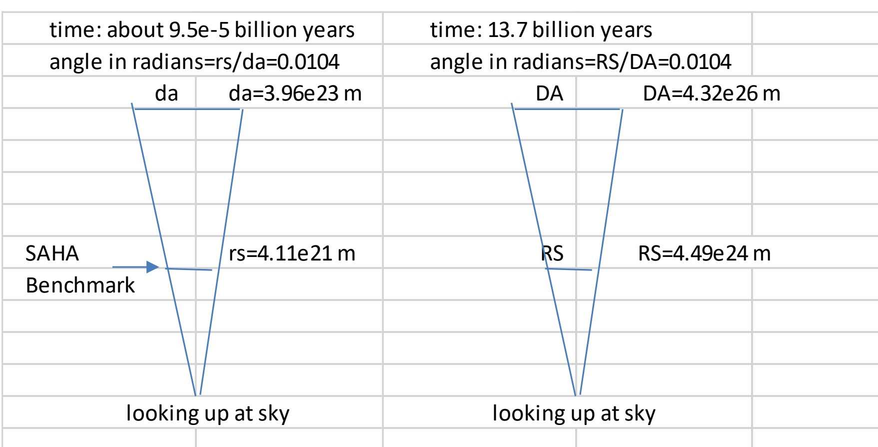
The WMAP team analyzed the high temperature spots in the Cosmic Background Radiation with power spectrums. WMAP measured the change between a condition called decoupling and conditions now. DECOUPLING is the combination of temperature and a number ratio that allows electrons to establish orbits around the protons. They are characterized by the SAHA equation:

Number ratio baryons/photons (b/p), radius r and temperature in degrees K are the variables.

```
b/p=(EXP(180)/(4/3*PI()*(r)^3))/(8*PI()/(1.239e-12)^3*(1.5*8.6e-11*Temp)^3)
SAHA=4*2^0.5/PI()^0.5*1/3.63e20*b/p*(T/0.511)^(3/2)*EXP(1.36e-5/(B*T))
```

At SAHA near unity, the plasma clears and light is transmitted. It contains an exponential, and is very sensitive to temperature, for example SAHA=600 is within error. An earlier condition called equality determines the size of the temperature spots in the CBR. EQUALITY: At equality mass density and photon density are equal. Waves are no longer suppressed by plasma and an acoustic wave is initiated. Its velocity is C/3^.5 meters/second. The distance it travels is = velocity*(t decoupling-t equality)=2.06e21 meters. The wave travels both ways and rs= 2*2.06e21=4.11e21. The value 2.06e21 meters is the key to understanding when equality occurs. The time from equality to decoupling is determined by the travel time below:

Delta time= (rs/2)/velocity= 2.06e21/(3e8/3^0.5)= 1.189e13 seconds. The following diagram helps understand WMAP analysis. The left diagram is for approximately1.5e13 seconds after the start. At the SAHA unity benchmark (equality) a wave is initiated. Based on its travel time (1.2e13 seconds) equality is at 3.11e12 seconds.



The angle 0.0104 is measured by the power spectrum acoustic peak (spot size). The major peak in the power spectrum occurs at acoustic scale=302.4 and pi/acoustic scale=0.0104. The value da can be calculated; da=4.11e21/0.0104=3.96e23 meters. The diagram on the right shows that the relationship between RS and DA is maintained from then to the present time although the universe has expanded. Expansion is predicted by an expansion curve (radius vs time). WMAP used a program based on the Lambda Cold Dark Model (LCDM). Expansion for the conditions above was Z=1090. (Z=(Radius now/radius)-1). With this background, we can understand the WMAP data below with DA=Hubble radius/pi. Remember that the distance the wave travels in each direction is rs/2.

Table 17 page 130 9 yr WMAP							
0.5953	rs/da +/-.0013 in degrees						
0.0104	rs/da in radians						
1090.97	Z+/-.85 at decoupling						
3265	Z+/-100 at equality						
4.3209E+26	DA=14029*3.08e22 meters	3.961E+23	da decoupling=DA/1090.97		1.261E+23	da/pi	
4.4938E+24	RS=DA*0.0104 meters	4.119E+21	rs decoupling=RS/1090.97		2.060E+21	rs/2	
1.3754E+26	R Hubble (meters)=DA/pi()				0.0104	rs/da	
0.0104	RS/DA=rs/da		Co-moving data				
2.2683E-18	h=70+/- 2.2 1/sec		Mparsec	RS	RS/1099		
4.333E+17	time=(13.74+/-.11)*1e9*365*24*60*60 seconc		145.8	5.80E+24	5.32E+21	2.66E+21	rs/2
2.725	Temperature CBR		152	4.68E+24	4.30E+21	2.15E+21	rs/2
6.19E-10	baryon/photon ratio +/-.09						
302.37	Angular scale l=pi()/0.0104						

The WMAP solution

The first step in solving the missing mass problem is to understand WMAP expansion and why it requires the critical mass to be reduced to 0.046*critical mass. The following table gives sets of values for expansion that agree with WMAP. The basis of the table are 9.57e-10 MeV kinetic energy for velocity 67.48 m/sec from the Hubble analysis and critical mass 6.736e-26. (The author checks these results against a 100 step spreadsheet with detailed incremental calculations. The actual expansion curves shown later are based on the large spreadsheet expansion model).

Five critical times are listed across the table, culminating in the NOW calculations related to the Hubble analysis above. There are many relationships in the excel spreadsheet that relate to WMAP measured values. Each column of the table is calculated from time using the equations above that scale NOW conditions with the relationship KE=ke now*(4.33e17/time)^(2/3). The table is called the WMAP solution because the critical values match the WMAP data.

NOW:

The current Hubble radius 1.35e26 is calculated as follows:

Procedure: calculate Vtangential from KE, convert to Voutward and multiply by time. This gives the cell radius and cell radius*exp(60) is the "Hubble radius"

4.33305E+17	time (sec)	
1.352E+26	R=DA/pi=V*time*exp(60) (m)	
2.731E-18	Vo= Vt*1.414/exp(45) (m/sec)	
67.48	V=(2*(KE)/6.736e-26)^0.5	
9.57E-10	KE (MeV)	0.9
2.51E-10	baryon/photon	

The radius for earlier times is calculated using the procedure above with increasing kinetic energy.

With this background, an expansion table is presented that replicates the WMAP data.

	START		He4 fusion	equality	decoupling	Now no lambda	NOW		
time (sec)	0.3606	520	520	3.11E+12	1.500E+13	4.33305E+17	4.33305E+17	time (sec)	
T= CBR temperature (K)	3.08E+12	2.41E+10	2.41E+10	7323.6	2565.5	2.73E+00	2.73E+00		
R =Rcell*exp(60) (meters)	1.036E+14	1.322E+16	1.322E+16	4.355E+22	1.243E+23	1.352E+26	1.352E+26	R=DA/pi=V*time*exp(60) (m)	
	2.515E-12	2.226E-13	2.226E-13	1.226E-16	7.258E-17	2.731E-18	2.731E-18	Vo= Vt*1.414/exp(45) (m/sec)	
	6.21E+07	5.50E+06	5.50E+06	3029.71	1793.18	67.48	67.48	V=(2*(KE)/6.736e-26)^0.5	
ke=ke0*(t/t0)^(2/3)	8.11E+02	6.36E+00	6.36E+00	1.93E-06	6.76E-07	7.18E-10	9.57E-10	KE (MeV)	0.75
b/p=(EXP(180)/(4/3*PI()*(r)^3))/(8*PI()/(1.239e-12)^3*(1.5*8.6e-11*Temp)^3)					3.86E-10		2.51E-10	baryon/photon	
SAHA=4*2^0.5/PI()^0.5*1/3.63e20*b/p*(T/0.511)^(3/2)*EXP(1.36e-5/(B*T))					6.31E+02	da/pi			
constant=8*PI()/(1.24e-12)^3*(1.5*B*T)^3									
massdens=0.06*6.736e-26*1*EXP(180)/(4/3*PI()*R^3) kg/m^3				1.88E-17					
photon mass dens=8*PI()/(HC)^3*(1.5*B*T)^4*1.78e-30 kg/m^3				**1.88E-17**	2.06E+21	rs/2 (meters)			
			ratio m/p	1.00E+00	0.0105	rs/da (radians)			
				3098.6	1084.8	Z=Rf/r-1		3265	

START: Alpha=0.3606 seconds (why this was selected will be explained below).

HE4 FUSION: At about 0.11 MeV (520 seconds) 23% of all baryons are converted to He4 and energy is released. This is not used in the WMAP analysis above but will be useful later. In its place, the cosmic background radiation temperature Now (2.725 K) is scaled back from "NOW no lambda" to previous times.

EQUALITY AND DECOUPLING: In the table above decoupling occurs at 1.5e13 seconds and equality occurs 1.19e13 seconds earlier at 3.1e12 seconds. The calculations are highlighted in yellow in the column. The photon density is calculated based on temperature with the equations shown. This is the time at equality and the mass 6.736e-26 Kg had to be multiplied by 0.06 to give photon mass density/mass density =1.

At equality in the WMAP solution			
radius/cell		3.81E-04	4.35e22/exp(60)
volume cell		2.32E-10	
mass density		1.88E-17	
mass=density*volume		4.37E-27	
ratio mass/tot		0.065	4.47e-27/6.74e-26

It appears that this is the origin of the restriction that the baryon fraction is 0.046 of critical density. WMAP statements [2] indicate that a further restriction comes from the shape of the power spectrum curves.

Compare the values highlighted in red rs/2, rs/da, Rtotal=DA/pi, da/pi, baryon/photon ratio, Z decoupling and Z equality with Table 17 9 yr WMAP [5] data above.

Note: Lambda is taken into account in the WMAP expansion table but it is important only late in expansion. A column labelled "Now no lambda" allows calculations to the left to be solely a function of time. For accuracy, the expansion radius in the table above was matched to the 100 step expansion model radius using the WMAP expansion equations because the lambda component is nil at decoupling (BTW, the lambda contribution to radius expansion is similar to the R3 contribution discussed later). The scaling relationship for temperature is 2.725*(4.33e17/time)^(2/3) and kinetic energy is 7.18e-10*(4.33e17/time)^(2/3).

The above analysis fits the data but creates a missing matter and dark matter problem

The kinetic energy 7.05e-10 MeV is based on 6.736e-26 Kg but the kinetic energy below is key to solving the missing mass problem. It allows the WMAP data to be matched with only the mass of a proton and the measured velocity 67.48 m/sec.

Ke= 0.5* 1.67e-27* (67.48 m/sec)^2/1.602e-13= 2.376e-11 MeV.

Hubble analysis with three energy sources

Hubble analysis						
	E start 10.15	E he fusion	E stars	E total		
V/R (1/sec)				2.27E-18		
rho=(V/R)^2/(8/3*PI()*6.67e-11) kg/m^3				9.20E-27		
r=1.24e26/exp(60) m	1.2044	1.2044	1.2044	1.2044		
Volume=4/3*pi*r^3 (m^3)	7.32	7.32	7.318	7.318		
v=V/R*r*exp(45)/1.414 (m/sec)				67.48	2.26e-18*exp(45)/1.414	
ke=0.5*mass*V^2/1.6022e-13 (MeV)	5.907E-13	1.388E-11	9.257E-12	9.57E-10		
ke*r (MeV-m)	7.11E-13	1.67E-11		1.15E-09		
(match is the goal of pe=ke derivations	Vr (m/sec)	Vhe (m/sec)	V s (m/sec)	V total (m/sec)		
v to match F=F requirement	10.640	51.585	42.119	67.48		
pe=0.5*Fr (MeV)				9.59E-10	ke for 6.735e-26 Kg	
	base cell	He4 E	Star E			
Kinetic energy based on proton mass	5.91E-13	1.390E-11	9.269E-12	2.376E-11	ke for 1.67e-27 Kg	
		0.6*2.32e-11	0.4*2.32e-11	total	Conserved Ke (MeV)	
Force outward= mv^2/r*(1/exp(90)) (N	1.29E-64	3.03E-63	2.02E-63	2.09E-61		
Force inward=G*m^2/r^2 (Nt)	1.29E-64	1.29E-64	1.29E-64	2.09E-61		
mass=(F/6.672e-11*r^2)^0.5 (Kg)	1.674E-27	8.118E-27	6.629E-27	6.735E-26		

There are three sources of expansion energy shown in the left three columns in the table above labelled "Hubble analysis…". The requirements for the source on the left are; ke=pe and F inward=F outward. The tangential velocity that balances this source is 10.64 m/sec. This velocity meets the two requirements with 1.67e-27 Kg mass (r is 1.2 meters and 1.204*exp(60)=1.375e26 meters.)

ke=0.5*mass*V^2/1.6022e-13 (MeV)	5.907E-13
v to match F=F requirement	10.640
Kinetic energy based on proton mass	5.91E-13
Force outward= mv^2/r*(1/exp(90)) (N	1.29E-64
Force inward=G*m^2/r^2 (Nt)	1.29E-64
mass=(F/6.672e-11*r^2)^0.5 (Kg)	1.674E-27

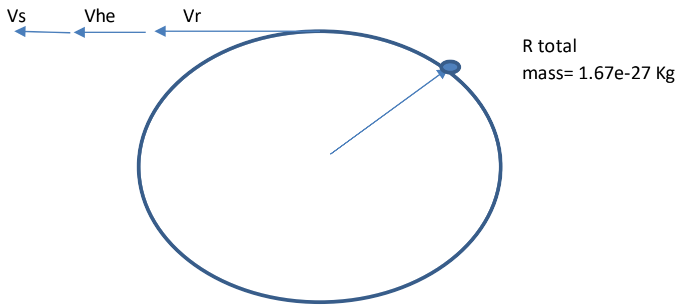
The other two sources of energy split the remainder of the kinetic energy:

(2.376e-11-5.91e-13= 2.32e-11) MeV).

	base cell	He4 E	Star E			
Kinetic energy based on proton mass	5.91E-13	1.390E-11	9.269E-12	2.376E-11	ke for 1.67e-27 Kg	
		0.6*2.32e-11	0.4*2.32e-11	total	Conserved Ke (MeV)	

It will be shown below that these three energy sources and the split (0.6+0.4) match the 9 yr WMAP critical parameter data listed above. The base cell kinetic energy is specified by the proton model but when 23% of all nucleons become He4, energy is released that causes expansion. When stars light up at about Z=8 (expansion ratio), additional energy is released. A three component expansion table (called R1+R2+R3) will be developed below for comparison with the WMAP expansion table.

Tangential velocity for the three kinetic energy components derived from velocity 67.48 m/sec are in the diagram below. They are on the tangent of a 1.2 meters radius.



The value ke*r is a constant due to the following analysis where g is the gravitational constant and m is 1.67e-27 Kg (gmm is a constant).

gmm/r^2=mv^2/r
gmm/r=mv^2
.5gmm/r=.5mv^2
.5gmm=ke*r
7.1323E-13

This allows the radius to be established for the original kinetic energy and time combinations.

Ke=7.13e-13/R1, where ke is in MeV and R1 is in meters.

The separate energy sources for the velocities above are in the red, green and yellow columns below. The Hubble analysis results are in the right-hand column. The columns on the left convert the kinetic energy sources to one common smaller radius (0.079 meters) while conserving ke*r. At this radius, Star ke +He4 ke is equivalent to 2.73 K (total 3.5e-10 MeV) and cell kinetic energy 8.98e-12 MeV is based on time 4.33e17 seconds.

NOW	0.4	2.376E-11
1.41E-10	Star E	9.269E-12
0.07923	ke*r= 4.186e-12	1.20
2.113E-10	He4 E	1.390E-11
0.079231	ke*r= 2.37e-11	1.20
8.979E-12	ke=ke0*(t/t0)^(2/	5.907E-13
0.079229	ke*r= 7.13e-11	1.20
4.3330E+17	time (sec)	V=67.48 m/sec
13.74	Billion years	
3.52E-10	MeV	

Explanation of time scale

According to 9-year WMAP table 17, Now is 4.337e17 seconds (13.74 billion years). Time zero (called alpha below) starts at a low value associated with 10.15 MeV [Appendix 1] and extends to NOW when time = 4.337e17 seconds and kinetic energy now (in the red block on the left) =8.98e-12 MeV. Time decreases as alpha=4.33e17*(ke now/ke start)^(3/2). Ke start (10.15 MeV) comes from the proton model and ke now comes from the Hubble analysis above.

Alpha= 4.337e17*(8.98e-12/10.15)^(3/2)= 0.3606 seconds.

Ke1 for the cell = 10.15*(0.3606/time)^(2/3)

No missing matter requirement

There is a specific requirement for ke1 and its radius called R1. It must be based on a cell that contain one proton. The analysis below is based on a universe with exp(180) cells and exp(180) protons. This is the requirement for no missing matter. The cell radius receives energy from ke1 and ke1 increasing its radius at each specific time. But all the radii change with time.

Requirement associated with measured CBR temperature 2.73K

Another known is the measured current cosmic background radiation temperature 2.725 K. Using the Boltzmann constant B= 8.617e-11 MeV/K, the CBR ke = 2.725*1.5*B=3.52e-10 MeV.

Star E plus He4 E must total 3.52e-10 MeV.

Expansion model for three energy sources

The cell radius R1 expands to R1+R2+R3=Rtotal in an expansion model when it receives additional energy from two CBR sources, increasing its radius to NOW Hubble radius 1.2 meters/cell.

Procedure for calculating expansion radius

The Hubble analysis measured total velocity 67.48 m/sec. This is the velocity associated with ke1+ke2+ke3=2.38e-11 MeV and mass 1.67e-27 Kg. The expansion radius/cell is calculated by converting v to V and multiplying V*time, where time is 4.33e17 seconds.

2.37621E-11	ke total	
1.2044E+00	Rcell=V*time (m)	
4.333E+17	time (sec)	
2.732E-18	V= Vt*1.414/exp(45) (m/sec)	
67.48	V=(2*(ke1+ke2+ke3)/m)^0.5	
9.269E-12	ke3	
1.390E-11	ke2	
5.907E-13	ke1	

The Hubble radius/cell= 1.2044 meters; 1.2044*exp(60) meters=1.38e26 meters.

Expansion calculations

The velocity 67.48 m/sec is associated with kinetic energy from the three sources. Energy ke1 and ke2 were larger at earlier times ke=ke now*(5.33e17/time)^(2/3). But kinetic energy ke3 was lower at slightly earlier times because there were fewer stars. Overall, Cosmic Background Radiation (ke2+ke3) contributes most of the energy for expansion.

START	before He4	He4 fusion	equality	decoupling	Now no lambda	NOW	ke total	2.37621E-11
7.0098E-14	8.9473E-12	1.0440E-10	1.0035E-04	5.6231E-04	1.1096E-01	1.2044E+00	Rcell=V*time (m)	
0.360600	520.000000	520.000000	4.900E+11	6.500E+12	1.800E+16	4.333E+17	time (sec)	
		2.008E-13	2.048E-16	8.651E-17	6.164E-18	2.732E-18	V= Vt*1.414/exp(45) (m/sec)	
4.41E+07	3.90E+06	4.96E+06	5.06E+03	2.14E+03	1.52E+02	67.48	V=(2*(ke1+ke2+ke3)/m)^0.5	
					1.48E-13	9.269E-12	ke3	
		1.23E-01	1.28E-07	2.29E-08	1.16E-10	1.390E-11	ke2	
1.01E+01	7.95E-02	5.23E-03	5.44E-09	9.71E-10	4.92E-12	5.907E-13	ke1	

The following table gives sets of values for expansion that agree with WMAP but do not require dark matter or dark energy. The kinetic energy values above have been scaled to earlier times back to the beginning using the time scale. This allows a detailed analysis for significant events.

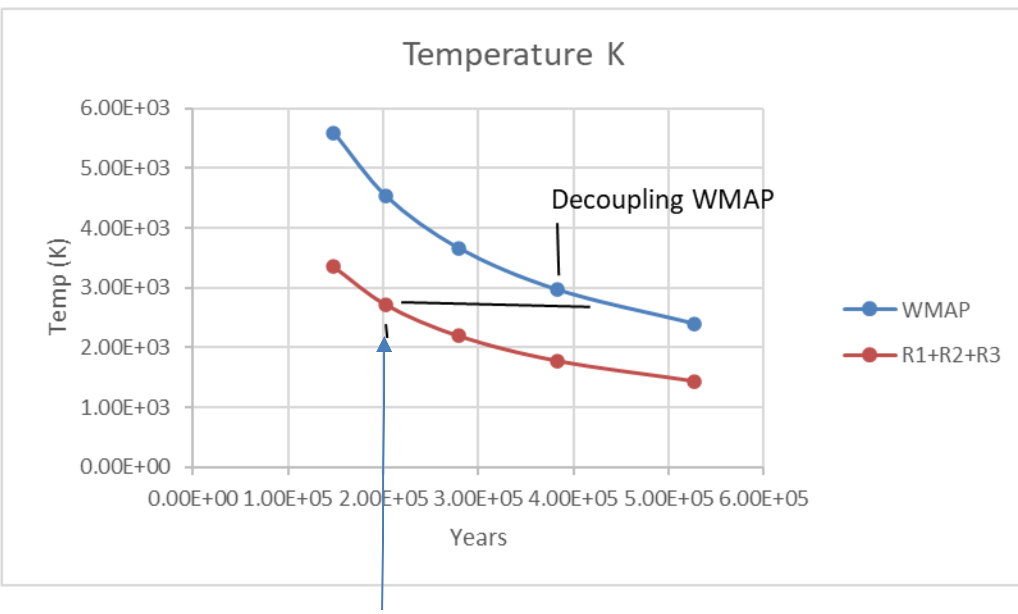
The R1+R2+R3 solution

The Hubble relationship for WMAP critical density does not identify the kinetic energy sources for expansion. According to the analysis below there are three sources. The first source (red) is the original 10.15 MeV from the proton model. But this decreases with expansion and when it decreases to 0.11 MeV, He4 primordial fusion occurs releasing the second source of expansion energy (green). Late in expansion, the force required to expand the universe is low and the energy released by causes late stage expansion and some acceleration. This is the third energy source (yellow).

Five critical times are listed across the table, culminating in the NOW calculations anchored to the Hubble analysis above. Excel spreadsheet values can be compared to WMAP measured values. Time is the primary variable for each critical event. This table is a proposed solution to the missing mass and dark energy problem.

	START	before He4	He4 fusion	equality	decoupling	Star lightup	NOW	0.4	2.376E-11
ke3 stars (MeV)						2.25E-12	1.41E-10	Star E	9.269E-12
r3 stars only (m)							0.07923	ke*r= 4.186e-12	1.20
ke2 He4 transition (MeV)			1.87E+00	1.95E-06	3.47E-07	1.76E-09	2.113E-10	He4 E	1.390E-11
r2 proton model +r He4 transition			8.948E-12	8.600E-06	4.819E-05	0.0095	0.079231	ke*r= 2.37e-11	1.20
ke1 from proton model	10.15	7.95E-02	7.95E-02	8.27E-08	1.48E-08	7.49E-11	8.979E-12	ke=ke0*(t/t0)^(2/	5.907E-13
r1 from proton model	7.010E-14	8.947E-12	8.947E-12	8.600E-06	4.819E-05	0.0095	0.079229	ke*r= 7.13e-11	1.20
Alpha (seconds)	0.360600	520.0	520.0	4.90E+11	6.50E+12	1.80E+16	4.3330E+17	time (sec)	V=67.48 m/sec
Billion years				1.55E-05	2.06E-04	0.57	13.74	Billion years	
CBR energy (MeV)						1.76E-09	3.52E-10	MeV	
T= CBR temperature (K)			1.45E+10	1.570E+04	2.802E+03	1.421E+01	2.73E+00	K	
R =rtotal*exp(60) (meters	8.01E+12	1.02E+15	1.19E+16	1.15E+22	6.42E+22	1.27E+25	1.375E+26	DA/pi=Rcell*exp(60)	
baron/photon N ratio				2.15E-09	2.14E-09		2.38E-10		
b/p=(EXP(180)/(4/3*PI()*(r)^3))/(8*PI()/(1.239e-12)^3*(1.5*8.6e-11*Temp)^3)						da/pi			
SAHA=4*2^0.5/PI()^0.5*1/3.63e20*b/p*(T/0.511)^(3/2)*EXP(1.36e-5/(B*T))					2.20E+01				
mass density=1.67E-27*1*EXP(180)/(4/3*PI()*R^3) kg/m^3				3.95E-16					
photon mass dens=8*PI()/(HC)^3*(1.5*B*T)^4*1.78e-30 kg/m^3				**3.98E-16**	1.04E+21	rs/2 (meters)		co-moving rs data	
		ratio mass dens/photon ma		1.01E+00	0.0103	rs/da (radians)		4.6816E+24	1.03667E+21
		Z=Rf/r-1		12001.45	2140.86	9.85			

The angle 0.0104 radians is a measurement (based on the power spectrum peak at acoustic scale l=pi()/0.0104=320 and must be matched. The temperature at decoupling is a benchmark characterized by SAHA= unity.



Decoupling for the R!+R2+R3 solution.

The radius expansion models for WMAP and R1+R2+R3 are essentially the same. The significant difference is when critical events occur. Decoupling is well before stars and the only CBR at that time was from the He4 transition. The temperature is lower that the WMAP solution at a particular time for R!+R2+R3 because WMAP assumed that 2.73 K was scaled back to decoupling. This means (for R1+R2+R3) that decoupling occurs earlier in time at the benchmark (SAHA) temperature. The angular calculation matches the angular data rs/da= 0.0104= 1.04e21/6.42e22 at an earlier and lower radius. Since SAHA unity (about 2800 K temperature) occurs earlier, equality also occurs earlier when the expansion radius was lower (1.15e22 meters in the table above).

Mass and photon mass density at equality= 3.95e-16 kg/m^3 for the R1+R2+R3 solution:

At equality in the R1+R2+R3 solution		
radius/cell	1.15e16/exp(60)	1.00E-04
volume cell		4.23E-12
mass density		3.95E-16
mass=density*volume		1.67E-27

Compare this solution with Table 17 9 yr WMAP data below, especially the values highlighted in red rs/2, rs/da, Rtot=DA/pi, da/pi, baryon/photon ratio with the SAHA value close to 1.0. The co-moving RS (shown in the 9 yr data). It is rs/2=4.6816e24/(2*2140)=1.09e21 meters where 2140 is Z at equality. This determines the rs/da data at decoupling. The model results from the table agree:

rs	2*1.04e21	2.08E+21	
		rs/da	0.0102
da	6.42E+22*pi()	2.018E+23	

Table 17 page 130 9 yr WMAP				Co-moving data				
0.5953	rs/da +/-.0013 in degrees			Mparsec	RS	RS/2140		
0.0104	rs/da in radians			152	4.68E+24	1.09E+21	2.19E+21	rs
1090.97	Z+/-.85 at decoupling				da/pi	6.42E+22	2.02E+23	da
3265	Z+/-100 at equality						0.0108	rs/da
4.3209E+26	DA=14029*3.08e22 meters		3.961E+23	da decoupling=DA/1090.97		1.261E+23	da/pi	
4.4938E+24	RS=DA*0.0104 meters		4.119E+21	rs decoupling=RS/1090.97		2.060E+21	rs/2	
1.3754E+26	R Hubble (meters)=DA/pi()							
0.0104	RS/DA=rs/da							
2.2683E-18	h=70+/-2.2	1/sec		145.8	5.80E+24	2.71E+21	1.36E+21	rs/2
4.333E+17	time=(13.74+/-.11)*1e9*365*24*60*60 seconds							
2.725	Temperature CBR							
6.19E-10	baryon/photon ratio +/-.09							
302.37	Angular scale l=pi()/0.0104							

Details of the R!+R2+R3 expansion table

START: 10.15 MeV, radius 7.04e-14 radius and alpha=0.3606 seconds. The value 0.3606=4.33e14*(8.98e-12/10.149)^(3/2).

Quark mass (MeV)	Kinetic E (Mev)			Field E (MeV)
101.95	646.96			753.29
	5.08			0.69
13.80	83.76			101.95
	5.08			0.69
13.80	83.76			101.95
	5.08			0.69
Weak E	-20.30			
Weak KE	0.00			
Balance	0.00			
Neutrino ke	-0.67			0.74
ae neutrino	-2.0247E-05			
E/M field	-0.0000272			
938.27	MeV Proton			
	0.0000272			
	-0.6224			
0.5110	0.11			
electron neu	2.02472E-05			
Neutrino ke	0.67			
	0.74			
expansion p	10.15			
expansion k	10.15			
959.99				959.99
Total N values		Sum of yellow=Grav		2.801

The value 10.15 MeV (labelled expansion ke) from the proton model above supplies the initial kinetic energy for expansion. It also establishes and maintains the gravitational constant throughout expansion, tracks energy changes for the cell and keeps time. The field energy 2.801 from the model [14][6][Appendix 3] establishes the initial radius of the universe and fundamental time increments.

r(meters)=hC/E=1.973e-13 MeV-m/2.801 MeV= 7.045e-14 meters
r*exp(60)=8.01e12 meters.
Fundamental time increment = 2*pi*7.045e-14/C

Cells have balanced inward and outward force and maintain G

G=hC/Mm*(1/exp(90)) but we substitute hC= E*r*m/M [part 3 below].
G=E*r/MM*(1/exp(90) (m is conveniently eliminated).
But E=F*r as force F acts through radius r converting kinetic energy to potential energy.
When fully converted the potential energy is E=20.3 MeV and this can be used to calculate G [6].

Example calculation for G:
G=hC/Mm*1/exp(90)= E*r/MM*(1/exp(90))

G= 20.3 MeV*7.045e-14 meters/1.67e-27^2 Kg^2*1.602e-13*(1/exp(90))

G=6.678e-11 Nt m^2/Kg^2

HE4 FUSION: At about 0.11 MeV (520 seconds) 23% of the baryons are converted to He4, releasing about 1.87 MeV/proton. This energy accounts for 60% of the Cosmic Background Radiation.

EQUALITY: Again, equality is the condition where mass density and photon density are equal. In the R1+R2+R3 expansion table above, the mass density is calculated with one proton per cell. The photon mass density is calculated based on temperature with the equations shown. Equality occurs at 4.9e11 seconds. The calculations are highlighted in yellow in the column and both densities are 5.95e-18 Kg/m^3. After equality, an acoustic wave is initiated and travels outward both directions at vwave=C/3^0.5 m/sec yielding rs/da=0.0104. In the table above decoupling occurs at 6.5e12 seconds and equality occurs earlier at 4.9e11 seconds.

DECOUPLING: The SAHA equation near unity predicts the condition that allows electrons to establish orbits around the protons. It depends on the baryon/photon ratio and temperature. Decoupling occurs at 6.50e12 seconds. This light travels to the WMAP sensors modulated by the acoustic waves at this epoch.

NOW: Stars light up (called reionization in the WMAP [3] literature) at about Z=10 releasing energy. At the present time, this is 40% of the CBR temperature and the remainder is due to residual from the He4 fusion event. According to the Hubble analysis above, it is the unbalanced expansion energy that some call dark energy.

Source of the measured baryon photon ratio

WMAP reported a baryon photon ratio of 4.4e-10. The columns labelled baryon/photon ratio (in red) show the results with the following equation.

```
B/P=(EXP(180)/(4/3*PI()*(R)^3))/(8*PI()/(1.23984e-12)^3*(1.5*8.6e-11*T)^3)
```

B/P= 2.38e-10 at the present time is close to the WMAP value. The baryon photon ratio must be on this order of 5e-9 earlier in expansion to be consistent with observation [16] of various primordial (measured everywhere the same) isotope fractions.

Energy released by stars (responsible for R3)

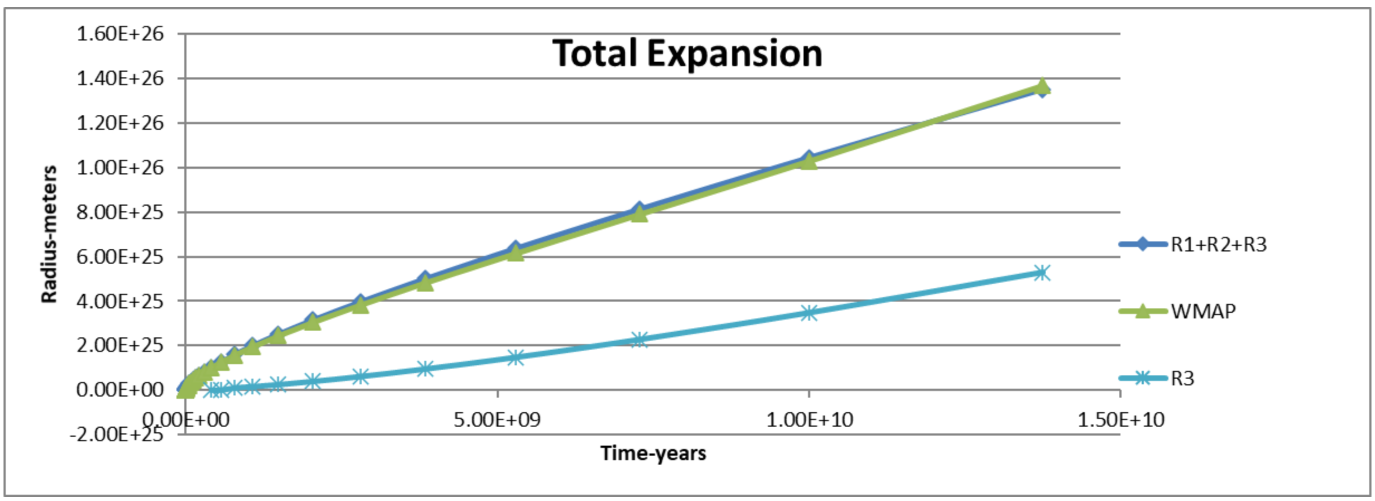
The Cosmic Background Radiation consists of two components. The He4 fusion energy is the largest part but stars releasing energy is significant and contributes to the total radius. The value 1.4e-10 MeV is justified below. It is based on multiplying the energy radiated from the surface of stars at 5778 K times their surface area. In the example below, the energy for each average sized star (5.8e29 Kg) is 3.54e5*3.61e18 m^2*5778^4=1e39 MeV. (The value 3.54e5 MeV/m^2/K^4 is the Stefan Boltzmann constant). For 9e19 stars, the total energy is 9.46e58 MeV. This energy is radiated to the surface area of the universe at radius 1.38e26 meters (area=1.93e53 m^2). K^4= 9.46e58/1.93e53/3.54e5=1.38 K^4. The fourth root is the CBR temperature contribution 1.08 K now from these stars (MeV=1.5*B*T= 1.4e-10 MeV).

6.24E+12	mev/watt sec
3.54E+05	mev/m^2/K^4
4.61E+08	radius of star (meters)
2.67E+18	Surface area of star
5778	Temp star surface K
1.05E+39	mev/sec/star
9.00E+19	Number of stars
9.46E+58	mev for all star: el190
1.24E+26	Radius U of radiation
1.93E+53	Area=4pi r^2
1.38E+00	K^4=(mev/m^2)/mev/m^2/K^4
1.08E+00	K
1.40E-10	1.5*B(K)

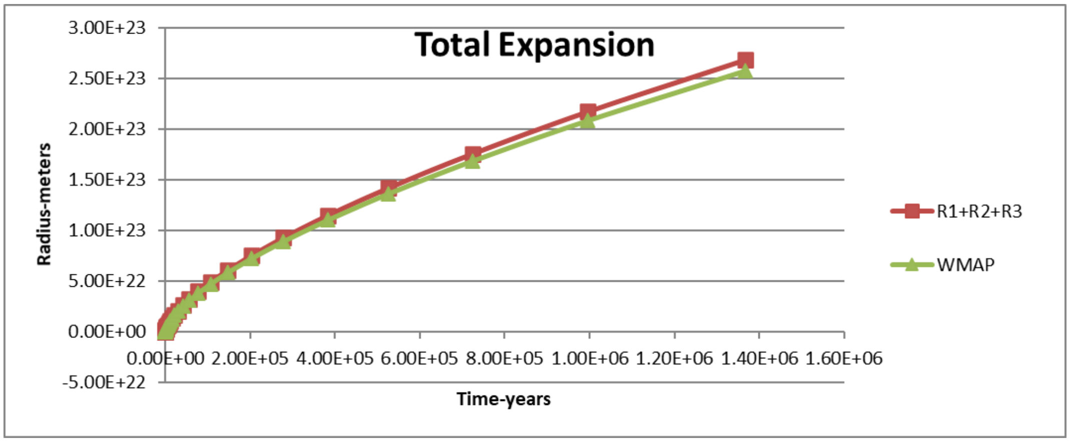
When the universe was smaller there were fewer stars. This is offset somewhat because earlier stars are radiating to a smaller surface area.

Comparison of expansion curves

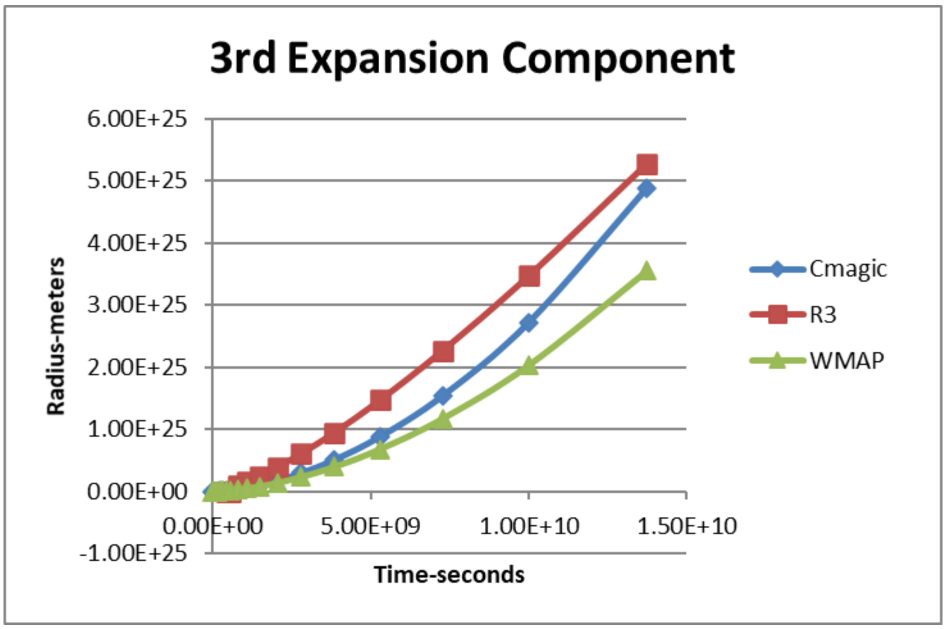
Two solutions were presented, each which matches the WMAP data. The curve labelled WMAP below is also known as the Concordance LCDM model. The curve labelled R1+R2+R3 is the analysis for three energy components (the two curves overlap).



The curves are also close in the equality and decoupling period below.



The WMAP and Cmagic equations [3][4] use a "cosmological constant" for the component that causes flattening/accelerating of the expansion curve. But R3 in the graph below is similar. It is caused by star energy starting at about Z=8. R3 is the component that some call "dark energy". Component energies ke2 and ke3 increase the radius of the R1 cell.



Conclusions for Part 2; zero dark matter and zero dark energy

According to WMAP and PLANCK mission results, the composition of the universe is only about 4.6% normal matter. The remainder is assumed to be dark matter and dark energy. The fundamental equation V/R=(8/3 pi G rhoc)^.5 yields a Hubble constant with the value V/R=2.26e-18/sec leads to a value for rhoc= 9.2e-27 Kg/meter^3, also known as critical density. This is the denominator for composition calculations. This is also the mass density that balances inward gravitational forces F=GMM/r^2 with outward inertial F=MV^2/r required for the universe to be "flat". The value 9.2e-27 Kg/meters^3 opens the question, where is the mass?

Two analysis were presented that are consistent with WMAP observations. The WMAP analysis replicates the "concordance" LCDM expansion curve and data reported at 9 years. A second analysis also replicates the WMAP data but is based on three sources of energy. Both are consistent with Hubble radius 1.37e26 meters at time 4.33e17 seconds but there are two “problems” with the WMAP replication. 1) It depended on mass 6.73e-26 kg (density 9.2e-27 kg/m^3) and leads to the dark matter and dark energy problem. To match WMAP expansion at equality it had to be multiplied by 0.06. 2) The kinetic energy required now for expansion of the large mass was 9.6e-10 MeV/cell. This is larger than any known source.

There was no need for dark matter energy in the second analysis. Again, the WMAP data values da, rs and rs/da were consistent with the R!+R2+R3 solution. The total kinetic energy originates with the Hubble velocity with a mass of (1.67e-27 Kg). The cell had initial kinetic energy but its radius was expanded with two additional energies. The second kinetic energy source is the release of about 1.87 MeV/proton when 23% of the protons fuse to He4 in the early universe and the third source is late stage star energy. He4 energy is now 2.1e-10 MeV/proton and star energy is 1.4e-10 MeV. The cosmic background radiation temperature 2.725 K consists of these two sources. Together these three energy sources contribute to total expansion of the base cell in a way that satisfies the “flat universe” requirement.

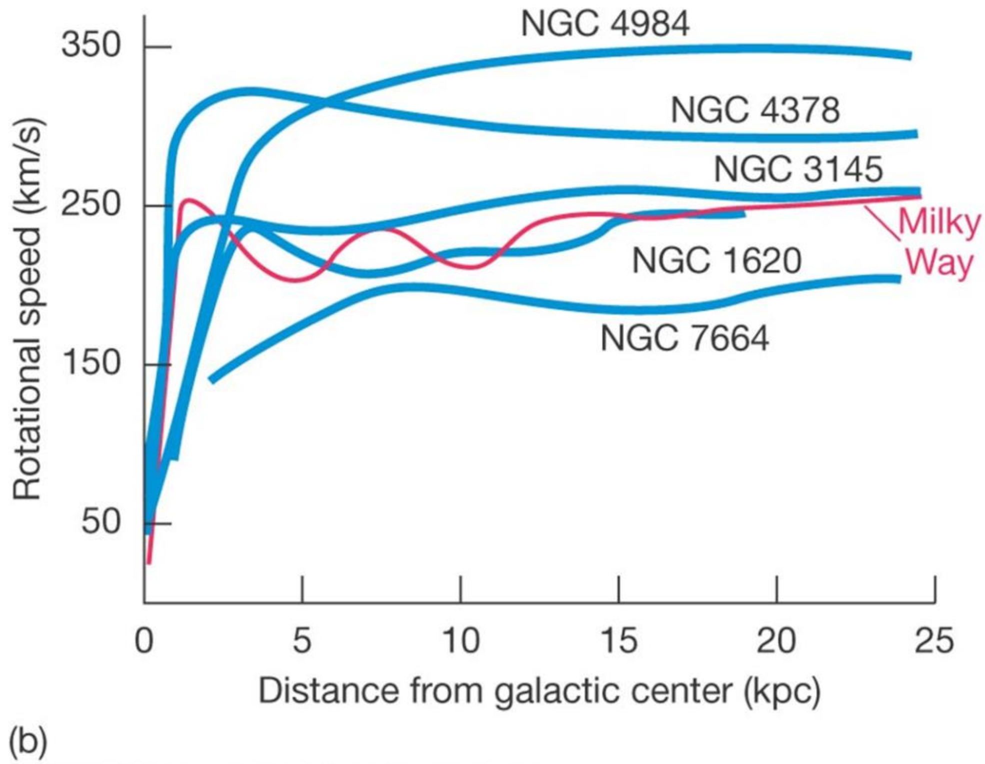
The WMAP team error is now clear. They assumed that Cosmic Background Radiation temperature 2.725 K is scaled back to the equality of mass density/photon mass density and decoupling. Shortly after the beginning neutrons and protons fused to He4 and released energy. Much later stars released energy. Currently the CBR temperature 2.725 K consists of 60% He4 energy and 40% star energy. But stars didn’t exist during the equality period. This means that the temperature then was lower than the WMAP assumption for each early expansion radius. The criteria for decoupling and equality are obeyed but they occur earlier in time than the WMAP analysis. With earlier equality, the radius was smaller when mass and photon density were equal. The mass associated with density is consistent with protons only. Since the WMAP data was based on angles they could not discern when the significant events occurred.

Hindsight is great and the WMAP team error is now clear. They assumed that CBR 2.725 K is scaled back to equality. But the R1+R2+R3 temperature for equality and decoupling occurred earlier because it is based on He4 fusion and is only 60% of the CBR temperature 2.725 K; the stars didn’t light up until well after decoupling. With earlier equality, mass density is based on a smaller radius and is consistent with one proton per cell. Since the WMAP data was based on angles they could not discern when the significant events occurred.

Observations indicate late-stage expansion. This is related to the dark energy issue. Some believe that there may be a “cosmological constant” that becomes increasingly important late in expansion. According to the analysis presented this is energy produced by stars as they “light-up” at about Z=10. Analysis is presented for their energy contribution to expansion. It is enough to cause the expansion curve to remain flat and somewhat upwardly sloped at the present time. This means that the total radius 1.204*exp(60)= 1.37e26 meters at time 13.74 billion years is consistent with observations without either dark matter or dark energy. The universe is flat in this analysis because the base cells are balanced for ke=pe and force outward=force inward. The universe consists of protons with known kinetic energy sources.

Part 2 Explanation of galaxy flat rotation curves with no dark matter
For over a century, measurements of the velocity outward from the center of a galaxy indicates that the velocity remains high. Newtonian mechanics indicates that the velocity should decrease. Some are exploring whether there is "dark matter" in the outer portion of the galaxy that would flatten the velocity profile. The true source of this discrepancy is demonstrated based on the accepted concept of gravitational redshift. Instruments that measure velocity profiles are picking up a signal that is the sum of velocity and potential energy redshift. Since potential energy plus kinetic energy is constant this signal is constant. After accounting for the potential energy signal, it is shown that velocities obey Newtonian gravity. This is detailed in Part 2 of this document.

Flat galaxy rotation curves are unexpected observations.



Most cosmologists today attribute the observed flat rotation curve to a calculated halo of dark matter. But it has not been detected.

Physics for flat galaxy velocity curves is proposed that preserves Newtonian gravitation and explains the flat velocity profiles. The measurements are based on redshift. The proposal shows that there are two components to redshift. One component is the normal Newtonian velocity that decreases with distance from the center of the galaxy. But potential energy increases with distance from the center of the galaxy and the two energy components add to a constant value. Calculations are presented for the velocity doppler effect related to the Lorentz equation and special relativity (SR). It will be shown that if measurements are based on SR, ke/m+pe/m=constant, where m is a proton.

The more conventional wavelength shift is (delta lambda/lambda=v/C). With z=dlam/lam=v/C, there is a velocity v for ke and v for pe that makes dlam/lam+ dlam/lam=constant. The calculation procedure is straightforward and matches data for five galaxy data sets examined. Dark matter is not required in this approach.

Example: Protons have expanded outward during most of the history of the universe. Gravitational accumulation [15] starts with potential energy/particle above the eventual orbit kinetic energy. We will examine a galaxy that orbits stars at 227000 m/sec. This velocity was created from the “fall” into the galaxy from the expansion determined potential energy of the protons. In this example they accumulate into a galaxy of 2e41 Kg central mass. The (test) proton falls toward the central mass M and orbits at V=(GM/R)^0.5. This the proper Newtonian orbit.

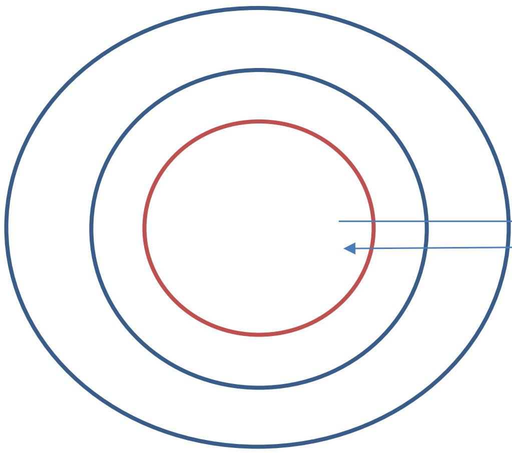
The radius R responds to kinetic energy and the accumulation of mass (Mgalaxy). Radius R=GM/V^2 but we will examine a range of orbits from 1 to 10 times the base orbit of 2.56e20 meters.

M galaxy=2e41 Kg			Fnewt=6.67e-11*2E+41*1.67E-27/Vnewt^2 (Nt)			
Radius R	V=(Gm/R)^2	(MeV)			Finertial=1.67E-27*2.27e5^2/R (Nt)	
	(meters/sec)	ke=.5mV^2		Vmeasured		Ratio
2.56E+21	7.22E+04	2.72E-05	3.40E-39	2.27E+05	3.36E-38	9.89
2.30E+21	7.61E+04	3.02E-05	4.20E-39	2.27E+05	3.74E-38	8.90
2.05E+21	8.07E+04	3.40E-05	5.31E-39	2.27E+05	4.20E-38	7.91
1.79E+21	8.63E+04	3.88E-05	6.94E-39	2.27E+05	4.80E-38	6.92
1.54E+21	9.32E+04	4.53E-05	9.45E-39	2.27E+05	5.60E-38	5.93
1.28E+21	1.02E+05	5.43E-05	1.36E-38	2.27E+05	6.73E-38	4.94
1.02E+21	1.14E+05	6.79E-05	2.13E-38	2.27E+05	8.41E-38	3.95
7.68E+20	1.32E+05	9.06E-05	3.78E-38	2.27E+05	1.12E-37	2.97
5.12E+20	1.61E+05	1.36E-04	8.50E-38	2.27E+05	1.68E-37	1.98
2.56E+20	2.28E+05	2.72E-04	3.40E-37	2.27E+05	3.36E-37	0.99

The base orbit is the bottom row with V= 2.27e5 m/sec. With this velocity a proton will follow curvature caused by the central mass. It is a proper (Newtonian) orbit, and the forces are balanced with F=GMm/R^2=mV^2/R= 3.4e-37 Nt for a test particle of one proton. Its kinetic energy and potential energy are equal at this radius.

There will also be mass in the outer radii, and we would expect the Newtonian velocity to decrease with distance away from the center V=(GM/R)^.5. But measurements indicate that velocity curves around galaxies are flat. The dark matter problem is that as you move away from the proper Newtonian orbit on the bottom, the forces are out of balance by about a factor of 10. Our goal is to understand these measurements.

The analysis below does not assume dark matter, nor does it violate Newtonian gravitation. The diagram below indicates that kinetic energy in the Newtonian orbit (in red) is higher than the outer orbits, but its potential energy is lower.



The kinetic energy column (and associated velocity) is for Newtonian orbits. The potential energy and kinetic energy are equal at the radius but both change with radius. In fact, since there is no friction, the potential energy plus kinetic energy will remain constant.

Measurements of velocity profiles are redshift measurements. First, we will use special relativity equations to predict the energy shift. We evaluate the shift with the equations: 1-gamma1=1-m/(m+ke)= ke/E. But it is well known that light is redshifted by gravitation. Wiki gives the redshift:

Z=rs/re where rs is Schwarzschild's solution [Wiki] (not the same rs from Part 1).

Rs=GM/C^2 (mass in Kg) where G=6.672e-11 Nt m^2/kg^2.

In part 3 below it is shown that, based on one proton, rs is given by:

rs= G*1.67e-27/3e8^2*(exp(90))= 1.5e-15 meter.

The following equation for the gravitational constant G is also in part 3.

G= 20.3 MeV*7.045e-14 m/1.67e-27^2 Kg^2*1.602e-13*(1/exp(90))= 6.67e-11 Nt m^2/Kg^2.

This G equation will be substituted for G in the rs equation.

rs= 20.3*7.045e-14/mass^2* mass/C^2= 20.3*7.045e-14/(mass*C^2)   (the scale factors exp(90)/exp(90) cancel and mass*C^2 becomes E.
With re= 20.14*7.045e-14/pe a lot of terms cancel, and z becomes:
z=rs/re=pe/E

doppler shift =1-(1-(v/c)^2)^.5		
v/c=7.22e4/3e8		
doppler shift		
2.90E-08		
de/E=ke/938.27		
2.90E-08		

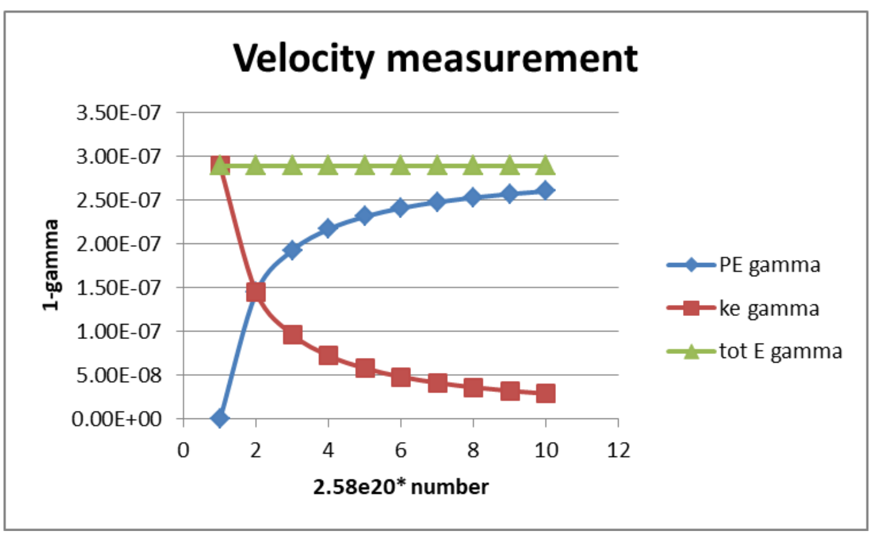
z for the pe/E shift is revealed as a special relativity shift just like de/E above.
The values ke/E and pe/E are incorporated into the table below:

						re=20.3*7.045e-14/pe				
							Rs=6.67e-11*1.67E-27/3e8^2*EXP(90)			
							1.51E-15	meters		
	Radius R	V=(Gm/R)^.5	(MeV)	pe=2.7e-4-ke	1-(938/(938+ke))		redshift	tot doppler	Measured ke	meters/sec
	(meters)	(meters/sec)	ke=.5mV^2	(MeV)	de/E	(meters)	z=rs/re	de/e+dlam/lam	(MeV)	Measured Vel
2.72E-05	**2.56E+21**	7.22E+04	2.72E-05	5.16E-04	2.90E-08	2.77E-09	5.45E-07	5.74E-07	5.39E-04	3.21E+05
3.02E-05	**2.30E+21**	7.61E+04	3.02E-05	5.13E-04	3.22E-08	2.79E-09	5.42E-07	5.74E-07	5.39E-04	3.21E+05
3.40E-05	**2.05E+21**	8.07E+04	3.40E-05	5.09E-04	3.62E-08	2.81E-09	5.38E-07	5.74E-07	5.39E-04	3.22E+05
3.88E-05	**1.79E+21**	8.63E+04	3.88E-05	5.05E-04	4.14E-08	2.83E-09	5.33E-07	5.74E-07	5.39E-04	3.22E+05
4.53E-05	**1.54E+21**	9.32E+04	4.53E-05	4.98E-04	4.83E-08	2.87E-09	5.26E-07	5.74E-07	5.39E-04	3.22E+05
5.43E-05	**1.28E+21**	1.02E+05	5.43E-05	4.89E-04	5.79E-08	2.92E-09	5.17E-07	5.74E-07	5.39E-04	3.22E+05
6.79E-05	**1.02E+21**	1.14E+05	6.79E-05	4.75E-04	7.24E-08	3.01E-09	5.02E-07	5.75E-07	5.39E-04	3.22E+05
9.06E-05	**7.68E+20**	1.32E+05	9.06E-05	4.53E-04	9.65E-08	3.16E-09	4.78E-07	5.75E-07	5.39E-04	3.22E+05
1.36E-04	**5.12E+20**	1.61E+05	1.36E-04	4.08E-04	1.45E-07	3.51E-09	4.30E-07	5.75E-07	5.40E-04	3.22E+05
2.72E-04	**2.56E+20**	2.28E+05	2.72E-04	2.72E-04	2.90E-07	5.26E-09	2.87E-07	5.77E-07	5.41E-04	3.22E+05

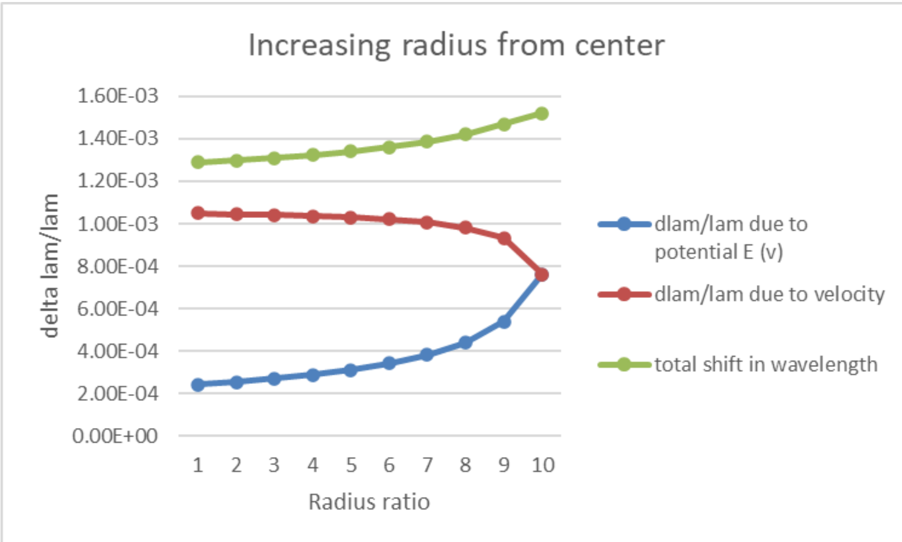
Light must climb out a potential energy field and experiences energy shift pe/E plus it is influenced by the energy shift de/E. When the two effects are added, the predicted velocity is a flat velocity curve. In retrospect this was straightforward since:

If ke+pe= constant = ke/E+pe/E

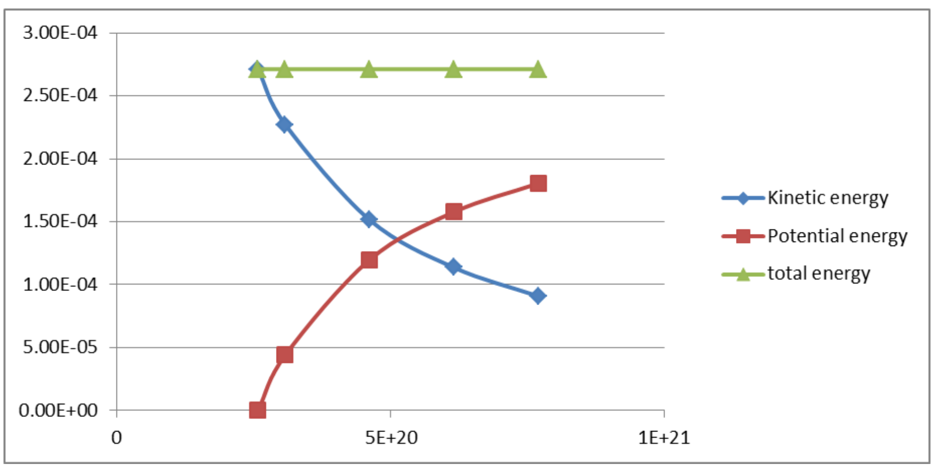
When the test proton (star for this analysis) is in orbit around a distant galaxy we measure gamma not realizing that there are two components. We interpret the signal as a flat velocity curve.



Some will point out that we measure velocity with shifts in wavelength; i.e. (delta lambda)/lam=v/C for velocities well below c. The following graph shows this measurement.



In the graph below, mass has fallen into orbits outside the Newtonian position. But there are many possible Newtonian orbits. The flat velocity associated with the constant kinetic energy agrees with measurements.



The data and analysis above are plotted below. The top line (in green is the flat velocity curve we measure). Appendix 3 contains data and analysis for five galaxies with flat rotation curves. They all follow the physics above and this resolves the flat velocity curves for galaxies. Dark matter is not required.

Galaxy data

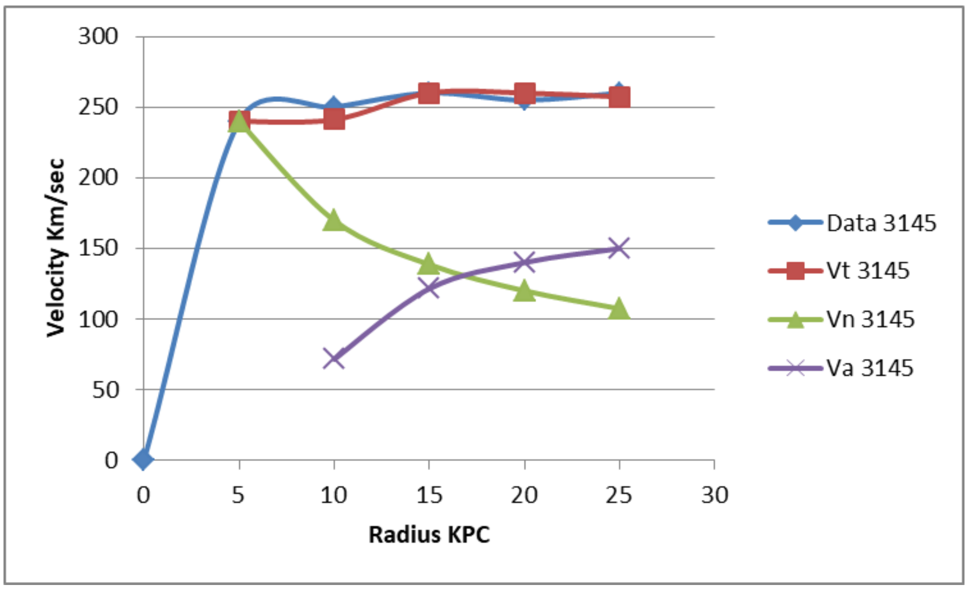
All the following galaxy profiles (search Wiki for galaxy velocity curves) are nearly flat:

Using the procedure above, Data for NGC 7664 is compared with calculations that incorporate potential energy changes. We will calculate and use a velocity that is equivalent to the potential energy called va=(2 pe/1.67e-27*1.6e-13)^.5/1000 to illustrate how the two velocities add to a constant total in km/sec.

Potential energy redshift adjustment upward produces a flat rotation curve

Radius (KPC)	NGC 3145	0	5	10	15	20	25	
Radius (meters)	NGC 3145	0	1.54E+20	3.08E+20	4.62E+20	6.16E+20	7.7E+20	
Data V (km/sec)	NGC 3145	0	3.84852E+15	250	260	255	260	
Vk (km/sec)=(G*1.33e41/R)^0.5/1000			2.40E+02	1.70E+02	1.39E+02	1.20E+02	1.07E+02	Vk
ke=G/2/(1.602e-13*R/((1.33e41)*1.675E-27			**1.8E-04**	**1.5E-04**	**1.0E-04**	**7.6E-05**	**6.0E-05**	ke (MeV)
pe=ke-ke funct r				2.66E-05	7.70E-05	1.02E-04	1.17E-04	pe (MeV)
Va (im/sec)=(2*pe/1.67E-27/6.24e12)^0.5/1000				71.5	121.5	140.0	150.0	Va
Vt (km/sec)=Vk+Va			240.00	241.22	260.11	260.01	257.33	Vt (m/sec)

The flat rotation curve below is a galaxy that has an observed high velocity out to the edge of the galaxy. The calculations above are based on calculating the measurement shift due to potential energy. In the graph below the adjustment upward is stated as a false velocity (Va) that adds to the actual decreasing Newtonian velocity. This keeps the velocity flat which agrees with observations. Four additional galaxies are in Appendix 3.



Problem Resolution; there is no dark matter

In has been known for many years that the velocity of stars out from the center of galaxies are nearly constant (the jargon is flat rotation curves). Some have theorized that there is a halo of "dark matter" causing this non-Newtonian behavior. This paper shows that in fact the velocity decreases with radius as expected. Observations are based on interpreting redshift signals as velocity. Nature keeps potential energy plus kinetic energy constant. Gravitation redshift is well known but it is shown that the gravitational (potential energy) redshift must be considered when interpreting the redshift signal. Calculations indicate that when the offsetting redshift is taken out of the signal, the velocity of stars outward from the center follow Newtonian gravity. When we look at a galaxy, we observe real distances. They have flat velocity curves. The calculations presented are straightforward and allows one to calculate the flat rotation curve. The proposal above explains flat velocity curves without inferring dark matter.

Part 3 Quantum Gravity

Gravity is still an active research area for scientists even though English mathematician Isaac Newton published his work entitled *Principia* in 1667. Some of the best theorists have been working on quantum gravity because there is a basic disconnect at the heart of gravity. The problem is that although Isaac's equations are correct, they describe large scale behavior of objects. Einstein's general theory of relativity is the modern theory of gravity but it describes large scale behavior of objects following paths curved by mass. This leaves small scale (quantum scale) gravity a subject of research. The relationships in Part 3 for quantum gravity build on the best science available but correlates data with tools from the field of information theory. This approach is new and leads to a fresh view of gravity and related cosmology data. The author believes that the proton is a manifestation of the laws of physics. Use of a proton mass model [1][9] and a concept called cellular cosmology allows us to understand gravity and expansion based on the space associated with each proton (called a cell). Gravitational theory is currently based on the Planck scale but three alternative (and equivalent) sources of the gravitational constant at a low energy scale are discussed. Part 3 contains the details.

The conventional Planck scale (candidate #1 for the source of G)

Accepted relationships [10]:

Et/H=1

Where E=Energy (in this documents we will use million electron volts (MeV) and convert it with 1.602e-13 Nt-m/MeV where Nt is force and m is meters.

Mass: M (Kg) =E/C^2, i.e. kg=MeV/C^2= MeV/3e8^2 m^2/sec^2*1.602e-13 Kg/Nt-m.

Time in seconds to travel around a quantum circle of radius r at velocity C

H Plancks constant= 4.136e-21 MeV-sec

h or hbar (reduced Planck's constant)= H/(2*pi)= 6.582e-22 MeV/sec

Derived relationship r=hC/E, also written Er/C=h

If mass is orbiting the circle, the equation is:

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

F=G MM/r^2

Where G= gravitational constant= 6.672e-11 Nt meter^2/Kg^2

M=mass in Kg

r= distance in meters

F= force in Newtons (Nt)

E=Fr

Where E is the energy expended by a force acting through radius r. This leads to gravitational potential energy.

Rs=GM/C^2

Where Rs= Schwarzschild's solution to the metric tensor equations from General Relativity derived by Einstein.

Rs= de Broglie r assumption

This assumption is the basis of the Planck scale radius calculated from G.
The value r is the wavelength associated with the de Broglie wavelength hC/E.
When Rs=r associated with a mass m in the relationship Rs=GM/C^2
Derived relatioship combining Er/C=h with E= GM^2/r: G=hC/M^2
Derived Planck scale mass and energy:
M=(hC/G)^2=(6.5821e-22*3e8/6.67e-11*1.602e-13)^.5=2.176e-8 Kg=1.22e22 MeV.
Derived radius:
Rs=GM/C^2=hC/E=6.58e-22*3e8/1.22e22= 1.6e-35 meters

The value 1.62e-35 meters is known as the Planck scale and is **the accepted source for the gravitational constant G, specifically G= Rs C^2/M.**

The data

Newton 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 (CBR) radiation was discovered around 1950, 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 [7] and PLANCK [17]. Data has given us increasingly accurate estimates of rhoc, the density of the present universe and its radius [2][7][8]. WMAP published Hubble's constant 2.26e-18/sec and from this rho=9.2e-27 Kg/m^3. Furthermore, as discussed below this leads to the "Hubble radius" 1.35e26 meters. Below I will justify the ratio 1.67e-27/9.14e-27 but the number of protons can be estimated as follows (Appendix 1 uses probabilities in development of the proton model that verify this).

Radius (m)		1.38E+26
Volume (m^3)		1.09E+79
Ln(vol*1.67e-27/9.2e-27)		180.28

Cosmology texts [8][3][4] are consistent with the above number.

Quantum gravity based on de Broglie wavelength 1.5e-15 meters (candidate #2 for G)

We are face to face with where gravity originates. If it originates at the quantum circle level like the other forces, there is a huge scale gap. General relativity is the physics of large space. The first step toward quantum gravity is to consider gravity for a single particle like the other forces. This requires identifying the space/neutron. The space would be a circle but three dimensional making it a sphere, specifically its surface.

In general relativity [2] the metric tensor (scholarly matrix equations from general relativity) is based on (ds^2=three distances^2 and (C*time)^2). Note that ds^2 is a surface area and it is this surface that we will break into exp(180) small spheres. Let small r represent the radius of each small cell and big R represent the radius of one large sphere containing exp(180) cells with the same surface area. Position a proton like mass on the surface of each cell. The total energy will be that of one protons/cell plus a small amount of kinetic energy.

Bridging large scale gravity with the quantum scale

Consider large mass M (for our purposes the mass of the universe although the term universe seems a little presumptive) broken into exp(180) small cells [12], each with the mass of a proton labelled lower case m below. The mass (m) of a proton is 1.67e-27 kg. Fill a large spherical volume with exp(180) small spheres we will call cells. Consider the surface area of many small cells as a model of the surface of one large sphere with the same surface area. For laws of nature to be uniform throughout the universe there can be no preferred position. A surface offers this property, but the equivalent surfaces of many small spheres also offer this property if we do not distinguish an edge. We will call the small spheres "cells". As such a surface model equivalent to the surface of many small cells is useful if the fundamentals of each cell are known (and we do). We will evaluate the gravitational constant G of a large sphere and compare it with G of small cells.

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

For gravitation and large space, we consider velocity V, radius R and mass M as the variables (capital letters for large space) that determine the geodesic. With G constant, M=m*exp(180) and the surface area substitution R=r*exp(90), the gravitational constant would be calculated for large space and cellular space as follows (lower case r,v and m below are for cellular space):

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

The extremely small value 1/exp(90) bridges large-scale and small-scale 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".

Proton-space model

The cell properties are in the proton-space model. Using an information-based approach [1][9], energy components were identified that allowed the author to model the mass of a neutron and proton and the space they occupy. The probabilities (information) used to construct the model supports the value exp(180) as the number of neutrons. The proton-space model [14] is a specific list of energy components that add exactly to the measured proton mass 938.272 MeV plus energy associated with the space it is imbedded in. (Appendices 1 and 2 derive and explain the result below). It is a zero total energy model with mass plus kinetic energy in the left-hand side of the table (positive) exactly equal and opposite to the field energy total on the right-hand side of the table (negative). Below the proton mass 938.27 MeV energy values for space are listed. The total energy for both sides at the bottom of the table is 959.99 MeV. Overall 959.99-959.99=0.

Quark mass (MeV)	Kinetic E (Mev)			Field E (MeV)
101.95	646.96			753.29
	5.08			0.69
13.80	83.76			101.95
	5.08			0.69
13.80	83.76			101.95
	5.08			0.69
Weak E	-20.30			
Weak KE	0.00			
Balance	0.00			
Neutrino ke	-0.67			0.74
ae neutrino	-2.0247E-05			
E/M field	-0.0000272			
938.27	MeV Proton			
	0.0000272			
	-0.6224			
0.5110	0.11			
electron ne	2.02472E-05			
Neutrino ke	0.67			
	0.74			
expansion p	10.15			
expansion k	10.15			
959.99				959.99
Total N values		Sum of yellow=Grav		2.801

Calculation of Gravitational constant from the Proton mass model

The proton is thought to be a primary manifestation of underlying laws and as such contains information that determines many aspects of nature. The space part of the model specifies the [14][6] potential and kinetic energy associated with each proton. The initial values are each E=2*2.02e-5*exp(12.431)=10.15 MeV. The total 20.3 MeV is conserved.

Scaling large scale gravitation values to the quantum level

Gravitation according to the general theory of relativity [2] is the geometry of space and time. We can find a radius r=hC/E knowing E. At radius r, the space/neutron of interest is called a cell. It has surface area A=4pi*r^2.

The area substitutions discussed above under the heading "Bridging large scale and small-scale gravity" are used to find the source of gravity for neutron (or proton). The Schwarzschild equation Rs=GM/C^2 is a solution to Einstein's field equations [2][Wiki]. The equations are written for large scale curvature caused by a large mass and Rs is the value 1.24e-54 meters. The radius Rs is adjusted in the relationships below to represent one neutron or proton.

Rs=rs*exp(90) surface area substitution
M=m*exp(180) mass substitution

Scale adjusted Rs will be called rs (lower case).

Rs^2=rs^2*exp(180)	
Rs=rs*exp(90)	
M=m*exp(180)	
G=rs*exp(90) C^2/(m*exp(180))	
G=rs*C^2/m*1/exp(90)	
rs= G m/C^2*exp(90)	

The value rs will be set equal to a one neutron de Broglie radius. The de Broglie radius required is for mass only (excluding the kinetic energy inside the neutron). We know the value of mass through the proton-space model. It is 101.95+13.8+13.8=130.0 MeV (2.32e-28 Kg) (refer to the model in the section below entitled "fundamental space"). This true mass value is the same for the proton and neutron and the remainder is kinetic energy totaling 939.57 MeV (1.675e-27 Kg) for the neutron.

Radius r de Broglie= hC/E=6.58e-22*3e8/130.0= 1.518e-15 meters.
rs (solution to wave equations for one neutron)= GM/C^2*exp(90)= 6.674e-11*1.675e-27 Kg/3e8^2*exp(90) = 1.518e-15 meters.

Calculating the gravitational constant, G
The fundamental that allowed G to be used to determine r for the Planck scale was the assumption that Rs from the Schwarzschild's solution was equal to r, the de Broglie wavelength associated with 1.22e22 MeV. But at the low energy scale:
rs=GM/C^2*(exp(90))=r de Broglie=hC/E where E=mC^2
From this equality, G=hC/Mm*1/exp(90) for one neutron.
Example calc:
M=1.675e-27 Kg (939.57 MeV)
m=2.32e-28 Kg (130.0 MeV)
G=hC/Mm*(1/exp(90))
G=6.58e-22 MeV-sec*3e8 m/sec/(1.675e-27 Kg*2.31e-28 Kg)*1.602e-13*(1/exp(90))
G=6.674e-11 Nt m^2/Kg^2

This is the source of the gravitational constant at de Broglie scale 1.5e-15 meters.

Quantum gravity based on values from the proton model (candidate number 3 for G)
The specific proton model values are hC=E*r*m/M where m=130.0 MeV, M=939.57, E=20.30 MeV and r=7.045e-14 meters.

The proton model [14][6][Appendix 3] above identifies the gravitational field energy= 2.801 MeV.

r(meters)=hC/E=1.973e-13 MeV-m/2.801 MeV= 7.045e-14 meters

G=hC/Mm*(1/exp(90)) but we substitute hC= E*r*m/M.
G=E*r/MM*(1/exp(90) (m is conveniently eliminated).
But E=F*r as force F acts through radius r converting kinetic energy to potential energy.
When fully converted the potential energy is E=20.3 MeV and this can be used to calculate G.

Example calculation for G:
G=hC/Mm*1/exp(90)= E*r/MM*(1/exp(90))

G= 20.3 MeV*7.045e-14 meters/1.67e-27^2 Kg^2*1.602e-13*(1/exp(90))

G=6.678e-11 Nt m^2/Kg^2

The following statements use the gravitational constant G established above. Large scale gravity is the result of a mass m falling into curved space time defined by a central mass M. As mass m loses potential energy it gains kinetic energy and finds a geodesic (orbit) where it feels no force. For large space, the geodesic variables R,V and M combine to give G, the gravitational constant; G=R*V^2/M. Small scale gravity follows the same physics except the curvature is the radius r= 7.045e-14 meters equal to the geodesic radius r in G=r*V^2/m *(1/exp(90). The mass that falls to this radius is mass 1.675e-27 kg. When it achieves an orbit, its kinetic energy has increased to 10.15 MeV and its potential energy has decreased to 10.15 MeV.

Quantum gravity based on inertial force (candidate #4 for G)
The small-scale orbit described above is analyzed in the table below:

GRAVITY		
		neutron
Neutron Mass (mev)		**939.5654**
Proton Mass M (kg)		**1.675E-27**
Field Energy E (mev)		**2.801**
Kinetic Energy/neutron ke (mev)		**10.151**
Gamma (g)=939.56/(939.56+ke)		**1.0000**
Velocity Ratio v/C=(1-g^2)^0.5		**0.0000**
Velocity (meters/sec)		**4.407E+07**
R (meters) =(HC/(2pi)/(E*E)^0.5		**7.045E-14**
Inertial Force (f)=(m/g*V^2/R)*1/EXP(90) Nt		**3.784E-38**
Calculation of gravitational constant G		6.693E-11
G=F*R^2/(M/g)^2=NT m^2/kg^2		**6.69292E-11**
Published by Partical Data Group (PDG)		**6.6741E-11**
R (meters) =(HC/(2pi)/(E*E)^0.5=1.97e-13/2.801		**7.045E-14**

Above it was shown that G=hC/(Mm)*(1/exp(90)) was the source of gravity. But the following relationships shows that this is equivalent to a neutron orbiting a cell radius 7.045e-14 meters with 10.15 MeV of kinetic energy. The relationships below show that this is an equivalent source of the gravitational constant G, the force F in the table above.

F=Gmm/r^2		
F=6.67e-11*1.67e-27^2/(7.045e-14^2)		
3.7836E-38		

Is belief in the Planck scale good science?

There is a historical perspective to this question. When physicists dealt with one electron and its field energy, they knew they were working with the quantum scale and it was normal to calculate de Broglie wave lengths. However, early physicists did not yet understand that gravity is the geometry of space time. When the Schwarzschild solution Rs became known it is admirable that they settled on equating Rs with a de Broglie wavelength. As pointed out above this is a way of deriving an equation involving the velocity of light and the gravitational constant. Rs=GM/C^2. It was reasonable, as a working assumption, to assign a de Broglie wavelength to gravitational mass and calculate a Planck length. But they derived a rather suspicious energy value 1.22e22 MeV (6.18e-8 Kg) by working backwards from a known gravitational constant. The mass did not correspond to the known neutron mass that should have been central to a gravitational theory. In addition, the Planck length 1.6e-35 meters was suspiciously low.

It was recognized that action at a distance was a problem and we are grateful to Einstein for his recognition that space is curved and the associated wave equations. It was unfortunate that the great physicists of the 1900's did not have the advantage of WMAP [3] and Cmagic [4] expansion models, nor did they have the advantage of knowing the approximate number of protons in the universe. Perhaps they could not consider a cellular approach to bridge large scale gravitation with the quantum scale because they lacked information.

Comparison of quantum gravity candidates 2,3 and 4

Candidate 2 used G=hC/Mm*(1/exp(90))= 6.58e-22*3e8/(1.675e-27*2.31e-31)*(1/exp(90))= 6.6976e-11 Nt m^2/Kg^2 where M was 939.565 MeV and m was 129.54 MeV.

Candidate 3 used G=Er/M^2=20.3*7.045e-14/(1.675e-27^2)*(1/exp(90))= 6.6929e-11 Nt m^2/Kg^2

Candidate 4 used G=Fr^2/(M)^2= 3.784e-38*7.04e-14^2/(1.675e-27)^2= 6.6929e-11 Nt m^2/Kg^2

> Candidate 4 agrees with calculating the inertial force:
>
> F=mV^2/r=1.675e-27*4.4069e7^2/7.045e-14*(1/exp(90)=3.784e-38 Nt where V=4.4069e7 m/sec from V=(2ke/m)^.5

I believe candidate 2 is the correct source of the gravitational constant G since it is based on matching the de Broglie wavelength for a true mass with GM/C^2*(exp(90))= 1.523e-15 meters. If the true mass value 129.54 is 130.00 MeV, G is exactly 6.674083e-11 Nt m^2/Kg^2 matching the NIST and PDG [7] value for G. Candidate 3 and 4 are after the neutron falls onto the fundamental radius 7.045e-14 meters. It is quantum at this point but becomes non-quantum as the cell expands. But notice something interesting about the exact same inertial force:

F=mV^2/R*(1/exp(90))= 1.67e-27*4.407e7^2/7.045e-14*(1/exp(90))= 3.748e-38 Nt.

The inertial force is so large for one proton moving at this speed that the force must be reduced by (1/exp(90)) to give the same values as:

F=Gmm/r^2		
F=6.67e-11*1.67e-27^2/(7.045e-14^2)		
3.7836E-38		

This is the force between 2 neutrons because gravity is very weak even for this short distance. The interesting thing about this comparison is that there is no central neutron in F=mV^2/r. Radius r is based on r=hC/E and E is the gravitational field 2.801 MeV. Mass 1.67e-27 Kg is following the curve and the radius of that curve is 7.045e-14 meters.

Quantum gravity candidate #3 is the basis of an expansion model

There is an expansion model for the universe associated with the proton-space model. In this model fundamental space radius r= 7.045e-14 meters increases because the proton associated with each cell has kinetic energy. As the radius of each cell expands the potential energy increases. G remains constant and E*r=20.2*7.045e-14 remains constant. Nature is clever. If E*r were only hC, we would not understand the cause and energy associated with expansion. 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 10.15 MeV of kinetic energy and 10.15 MeV of potential energy. Initially the proton on the cell surface has high velocity (0.146C) 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.

The velocity and kinetic energy components for r=1.09 meters were presented in part 1 of this document.

G=hC/Mm*1/exp(90)= E*r/MM*(1/exp(90))

G is known to be constant. This means that E*r is constant since mass M does not change. All calculations for the expansion table will be based on one cell with one proton/cell. The initial value of E is known from the proton model. It is 10.15 MeV and r0= 7.045e-14 meters. This leads to the relationship:

E0*r0= 10.15* 7.045e-14= rp constant= 7.13e-13 MeV m= e*r

Since mass is always 1.67e-27 Kg, 0.5*mm= constant = Ke*r=7.13e-13 MeV-m; i.e. ke above*1.2=ke*r for the true expansion energy. The kinetic energies above for 1.2 meters will be adjusted upward to reflect their value for lower radii in the expansion model. An expansion model will be constructed that contain ke expansion=ke above*1.2/radius.

The proton model shows kinetic energy plus potential energy is constant

There are two sides to the proton model shown above. A mass side on the left and a field side on the right. They both total 959.99 MeV. The mass side shows energy outside the proton that represents expansion kinetic energy and potential energy. Both are initially 10.15 MeV but when stars form most of the energy is potential energy but as the accumulating mass picks up some kinetic energy (on the order of 2e-4 MeV) that forms orbits around a central mass.

Part 3 Conclusions

The quantum gravitational scale is the Schwarzschild radius GM/C^2=1.24e-54 meters. This is the radius used in the conventional Planck derivation of G. However, this radius is a solution to wave equations for a large scale. This is not the same scale as one neutron imbedded in its own small space. A concept called cellular cosmology corrects the scale problem with the value exp(90). The quantum scale Schwarzschild value is 1.24e-54*exp(90)= 1.57e-15 meters. Like the Planck derivation, a de Broglie wavelength is required that equals 1.57e-15 meters. Wavelength=hC/129.54= 1.57e-15 meets the criteria. The mass (130.0 MeV) is provided by a proton model that indicates the neutron mass 939.57 MeV consists of 130.0 of true mass (m) plus 809.6 of kinetic energy. The gravitational constant is calculated with G=hC/Mm*1/exp(90)=6.674e-11 Nt Kg^2/m^2. The proton model provides two additional values of interest E=10.15 MeV and radius r=7.045e-14. An alternative for G= E*r/(1.67e-27^2)*(1/exp(90)= 6.67e-11. This G definition is the basis of an expansion model where r is the radius of an expanding cell as E*r is held constant.

Quantum gravity mass curves space and a neutron falls into an orbit r called a cell with kinetic energy 10.15 MeV. Gravitational field energy 2.801 MeV from the proton model is consistent with the curvature of space at the cellular level radius r=hC/2.801= 7.045e-14 meters. Large space (R) is defined by gravity at the quantum scale but R=r*exp(60).

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Appendix 1 Information code

The following "information code" was a result of correlating fundamental energy data [7][NIST]. I do not know where this code originated but it is used by nature to anchor energy values. The numbers are natural logarithms. There are four sets and total 90.

Details of the proton model

Probability=1/exp(N) is written below in tabular form. Information = negative natural log(p1*p2*p3, etc.) = 90.1 is written at the bottom of each fundamental N column. With these probabilities, the components become parts of the N=90 information system.

	N	P=1/exp(N)	N	P=1/exp(N)	
Quad 1	15.43	1.99E-07	17.43	2.69E-08	
	12.43	3.99E-06	10.43	2.95E-05	
Quad 2	13.43	1.47E-06	15.43	1.99E-07	
	12.43	3.99E-06	10.43	2.95E-05	
Quad 3	13.43	1.47E-06	15.43	1.99E-07	
	12.43	3.99E-06	10.43	2.95E-05	
Quad 4	10.41	3.02E-05	-10.33	3.07E+04	
	-10.33	3.07E+04	10.41	3.02E-05	
Quad 4'	10.33	3.25E-05	10.33	3.25E-05	
	0.00	1.00E+00	0.00	1.00E+00	
	P1*P2*etc	8.19E-40		8.19E-40	
	ln (Ptotal)	90.00		90.00	

The next level involves placing the probabilities in the Schrodinger equation to produce the neutron and proton.

Probability 1=e0/exp(N). This probability is an energy ratio and leads to the equation E=eo*exp(N). The probability is 1/exp(N) and e0=1 in natural units or 2.02e-5 in MeV units, evaluated from the electron N from the table in Appendix 1.

Energy zero= 0= E-E. Energy is created by a separation but there are two types of energy. Appendix 2 explains how energy separations from zero and probability 1 represent the neutron and proton. Probability 1 represents the other initial condition, zero information. Everything was apparently produced by separations. The components of the neutron and its fields encode the laws of nature. It means that there are particles separated in distance, each with kinetic energy for expansion of the universe.

The work below derives Schrodinger based orbits that obey energy zero. This means there will be positive and negative energy terms created through separation. This E=0 constraint and related P=1 constraint are further defined. There are sets of four probabilities of interest that contain exponential functions 1/exp(N).

Evaluating E

Evaluating E in the RHS requires consideration of overall probability, not just the probability of particles. Initially there was a probability for many neutrons to make up the universe. Specifically, P= 1= probability of each neutron* number of neutrons= 1/exp(N)*exp(N).

1=1/1=exp(180)/(exp(90)*exp(90)) where exp means the natural number e to the power 90, where 90 is a base 10 number (count your fingers).

Information theory probabilities

C. Shannon [10] used S= -ln P to represent information and thermodynamics incorporates similar concepts except it is the statistics of many particles. The author’s N identifies particles such as an electron and components of the electric field and E= e0*exp(N). In this system, dimensionless energy ratio e0/E=P probability. Since wavelength is proportional to 1/E=1/hv (h is Planck’s constant and v is frequency), the probability and a dimensionless wavelength are equivalent.

P=e0/E=(h v0)/(h v)=v0/v=wl/wlo.

p=e0/E=1/exp(N), i.e. E=e0/p.

With p=1/exp(N), E=e0*exp(N).

E1-E1+E2-E2+E3-E3+E4-E4=0
Identify E as E=e0*exp(N), using the same N values as the LHS.

0=eo*exp(13.431)-eo*exp(13.431)+e0*exp(12.431)-e0*exp(12.431)+e0*exp(15.431)-e0*exp(15.431)+eo*exp(10.431)-e0*exp(10.431)

Mass plus kinetic energy will be defined as positive separated from equal and opposite negative field energy. E1 is the only mass term, E3 and E4 are field energy and the remainder is kinetic energy.

E1+(E3+E4-E1-E2)+E2-E3-E4=0 (rearrange)
E1 is mass, (E1+E4-E1-E2)+E2 is kinetic energy.
E3 and E4 are equal and opposite field energies
mass1 + kinetic energy- field energy3-field energy4=0

The four N values discussed in the section entitled "Evaluating E" and their associated energy is called a quad. It is defined as the E values E=e0*exp(N) in a box to the right of each N value. The key to distinguishing mass (E1) from kinetic energy (E2) and two fields is shown below. The positions are not interchangeable.

Mass	Field 3
Kinetic Energy	Field 4 (G)

		mev			mev		
		E=e0*exp(N)			E=e0*exp(N)		
N1	13.43	13.8	E1 mass	N3	15.43	101.95	E3 field
N2	12.43	5.1	E2 ke	N4	10.43	0.69	E4 field

E1=2.02e-5*exp(13.43)=13.79, E2=2.02e-5*exp(12.43)=5.08, E3=2.02e-5*exp(15.43)= -101.95, E4=2.02e-5*exp(10.43)= -0.69 (all in MeV).

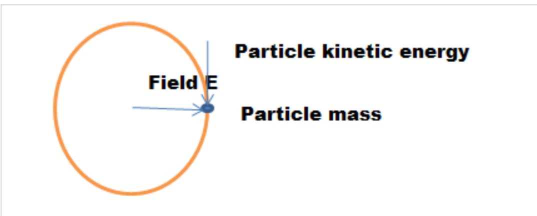
Separation of energy from zero
Overall E1+(E3+E4-E1-E2)+E2- (E3-E4) =0= (E1-E1)+(E2-E2)+(E3-E3)+(E4-E4) obeys the energy zero restriction. I call these diagrams energy zero, probability 1 constructs. They contain energy components of a quark.

Repeating the process for the quark quads and quads that lead to the electron yields the proton model in the text [11][12].

Comparison of proton model and PDG [7] data

Compare the above values for the neutron and proton with measured values.				update feb 2017					
931.4940281	nist		0.510998946	0.510998946					1.30E-07
931.4940955	pdg	548.5799095	0.51099895		0.5110011		-2.15856E-06		2.40E-07
simple cell g67	Data		Data (mev)		Calculation (mev)	calculation	Difference	Difference	measurement
			Particle Data Group		Present model	(amu)	(mev)	(amu)	error (amu)
		(amu)		(an	(mev)				
Neutron	nist	1.008664916	939.5654133	939.5654135	939.5654127	1.0086649	5.629623E-07	8.71281E-10	6.20E-09
Proton	nist	1.007276467	938.2720813	938.2720813	938.2720767	1.0072765	4.620501E-06	4.98855E-09	6.2E-09
Neutron/electron	1838.683662		939.5654133	nist	939.5654127		5.6296233E-07		
Proton/electron	1836.152674		938.2720814	nist	938.2720767		4.6785007E-06		

Total energy is conserved to zero (102.634 MeV-102.634 MeV) using the convention that fields are negative. The numbers represent two orbits. The 13.8 MeV mass orbits with 83.76 MeV of kinetic energy in a 101.95 MeV strong field energy and a 0.69 MeV gravitational field energy component. Here is the strong orbit:



The particle mass 13.8 MeV is one of the quarks in a neutron. The neutron model below adds three quark energies together from quads 1 through 3. When these quads are treated the same way and added they make the neutron of mass 939.57 MeV within measurement error [Particle Data Group and NIST]. Their masses total 130.163 MeV and their kinetic energies total 799.25 MeV.

The proton is thought to be a primary manifestation of the underlying laws and as such contains information that determines many aspects of nature. The Proton mass model is the source of constants for unification of forces.

Appendix 2 Proton model

The Proton table shows the quads and associated energies after the exchange 2 operation.

	Unified.xls cell g191			
	mass	Energy-mev	S field	Energy
Charge	ke		G field	mev
0.667	15.432	101.95	17.432	753.29
	12.432	5.08	10.432	0.69
-0.333	13.432	13.80	15.432	101.95
	12.432	5.08	10.432	0.69
-0.333	13.432	13.80	15.432	101.95
	12.432	5.08	10.432	0.69
	-10.333	-0.62	-10.333	-0.62
	10.408	0.67	10.408	0.67
	10.33	0.62	10.333	0.6224
	0.000	0.0000	0	2.02E-05
	90.000	sum	90.000	

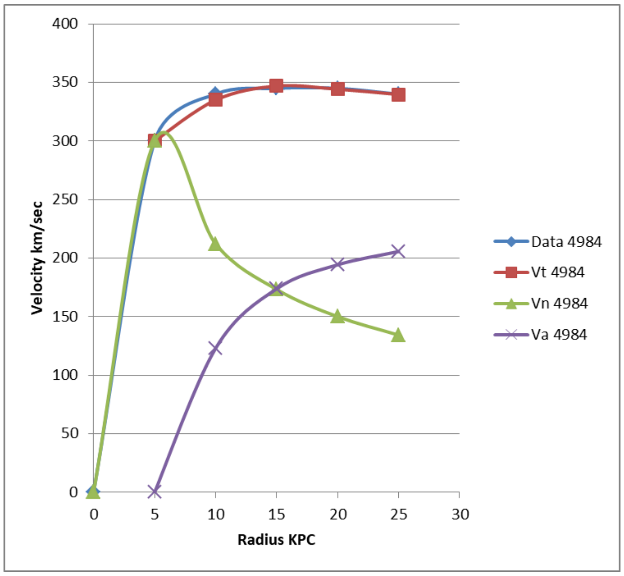
The proton-space model below lists the total mass, kinetic energy and fields associated with the neutron. Quad 4 of the code also gives us the 4th component of the gravitational field energy (-0.671 MeV) which totals -2.801 MeV.

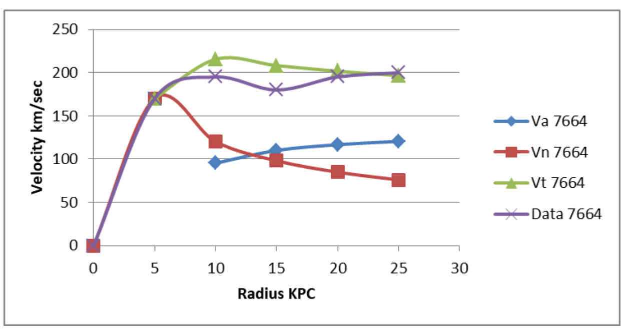
Quark mass	Kinetic E			Field E
(MeV)	(Mev)			(MeV)
101.95	646.96			753.29
	5.08			0.69
13.80	83.76			101.95
	5.08			0.69
13.80	83.76			101.95
	5.08			0.69
Weak E	-20.30			
Weak KE	0.00			
Balance	0.00			
Neutrino ke	-0.67			0.74
ae neutrino	-2.0247E-05			
E/M field	-0.0000272			
938.27	MeV Proton			
	0.0000272			
	-0.6224			
0.5110	0.11			
electron neu	2.02472E-05			
Neutrino ke	0.67			
	0.74			
expansion p	10.15			
expansion k	10.15			
959.99				959.99
Total N values		Sum of yellow=Grav		2.801

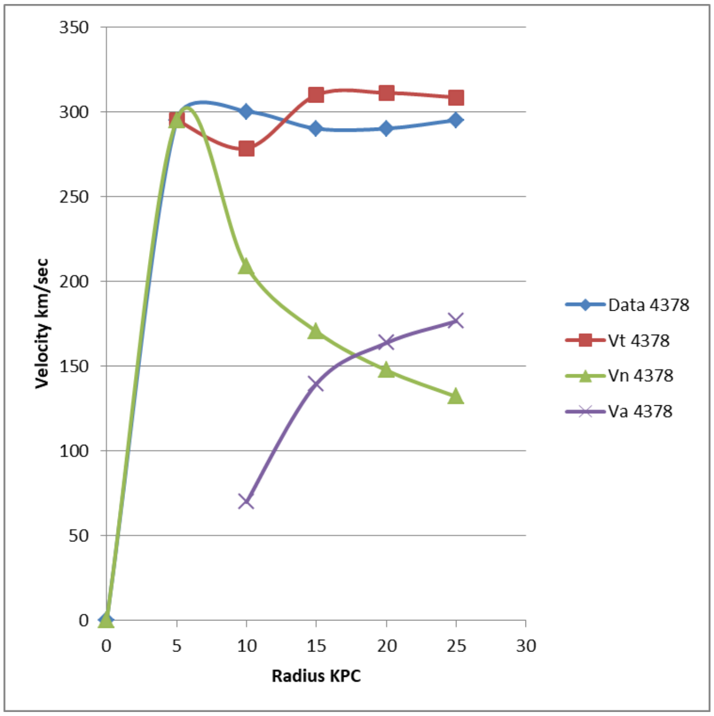
The neutron decays into a proton (above) an electron and a neutrino. This gives the measured proton mass 938.27 MeV. As the proton and electron split, they develop opposite fields of 27.2e-6 MeV. When the electron falls into the proton field it develops 13.6e-6 MeV.

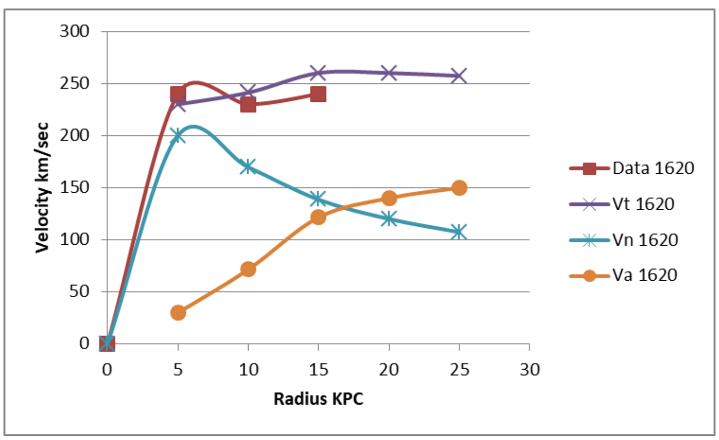
Appendix 3 Further examples of flat rotation curves

The four flat rotation curves for the four galaxies below are based on red shift of potential energy. The potential energy adjustment upward is stated as a false velocity that adds to the actual decreasing Newtonian velocity. This keeps the velocity flat which agrees with observations.









Appendix 4 Energy released by stars

Observations of the universe's expansion created discussion regarding dark energy. Concordance models (WMAP) use Lambda as the second expansion component. Two literature proposals (cosmological constant Lambda and quintessence) attempt to account for this unknown energy source. Lambda is Einstein's famous "mistake—no, wait" but there is an alternative. There is consensus that late stage expansion currently is more linear than the equation R'=R*(time'/time)^(2/3). Since this equation represents conversion of kinetic energy to potential energy and is a curve, data [3] showing that late stage expansion is linear or expanding appears to violate energy conservation and require a dark (unknown) energy source.

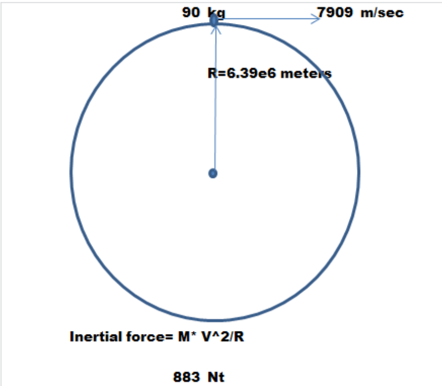
The author's paper entitled "Zero dark matter and zero dark energy" [reference 13]. presents calculations indicating that energy produced by stars causes the linear expansion curve. The analysis draws on the rate of star formation and the energy they release. A calculation procedure for expansion was developed that allows one to add energy and predict its effect on late stage expansion. It was surprising that a small amount of energy has a large effect on expansion. In fact, it will be shown that the energy addition is required to match the current temperature (2.73K) since the above models ended at slightly less than 2.73 K. Energy produced by stars is fusion energy and provides a physical alternative to dark energy. Calculations show that there is enough energy coming from the surface of the stars to contribute energy on the order of 1.4e-10 MeV at the present time (see text above).

Appendix 5 Review of gravitational literature

GRAVITATIONAL FORCE ON THE EARTH

The proverbial apple that Isaac was watching when he conceived of gravity was a bit of pre-Hollywood. He was an observational based scientist that rolled objects down an incline and measured time and distance. But we have high standards for present day physics and should expect someone to find the source of the gravitational constant and its relationship to the other forces. During Newton's lifetime the concept of a small scale was not taken seriously although the idea of an atom came much earlier. The true source of the gravitational constant G is identified at the scale of the proton. During Sir Isaac's lifetime, the concept of a universe was pretty much limited to a solar system. He would not have believed how large the universe is, but he would have been fascinated as we all are about findings in the last 100 years.

The earth pushes up on our feet. Here on earth, the reason we feel force upward is that our velocity is too low to be on an orbit (geodesic) defined by the radius of the earth. A geodesic is a combination of velocity V, radius R and mass M that give G, the gravitational constant; G=R*V^2/M=6.6742e-11 N-m^2/kg^2. Astronauts are in orbit and on a geodesic. We can calculate the velocity V required to be on a geodesic. First, we calculate our acceleration at the surface of the earth. We need to know that the earth's mass is M= 5.98e24 kg and that the radius of the earth R = 6.39e6 meters. This gives us the gravitational acceleration on the surface of the earth a=G*Mearth/Rearth^2=9.8 meters/second^2 (abbreviated m/sec^2). Next, we calculate velocity V= (a*R)^0.5= 7909 m/sec. The force upward on our feet is F=mass*a=m*V^2/R. Your mass in kg is your weight in pounds divided by 2.2. If your weight is 198 lb =90 kg, the earth is pushing up on you with the force F =90*7909^2/6.38e6=883 Newton (Nt). Force upward from the earth is making up for the outward inertial force you are missing because your velocity is too low. The equation could also be written F=mass*(7909^2-Vlow^2)/R. In this equation Vlow is fixed by us being on earth. Inertial force is outward force in an orbit and gravitational forces are inertial forces. The diagram below describes the situation.



Kids feel inertial force when you they are on a merry-go-round and you calculate it by F=m*a where acceleration a= V^2/r. Gravitational force is also inertial force and Newton recognized this because *Principia*, his book on physics also stated that F=m*a. Force is mass times acceleration. But if an astronaut has this velocity, why is she “weightless”? The essence of Einstein’s general theory of relativity (GR) is that mass follows curved space-time and “doesn’t know” about the forces involves. It simply says that the earth curves space-time and the astronaut follows the curve. When the astronaut has the right velocity, V=7909 m/sec in this case, she feels no force. She is falling but also circling the earth fast enough that she never becomes closer to the earth. There is a statement regarding this concept called equivalence of acceleration and gravity. The story goes “if you are in a free-falling elevator, how would you know about the force on you?” Since you do not feel it, you do not measure it.

Kinetic energy is converted to potential energy and visa-versa. The equation that applies is kinetic energy (ke) plus potential energy (pe) is a constant, i.e. ke+pe = constant. Potential energy is force times the distance the force pushes through, i.e. PE=F*R. To find the potential energy from the orbital kinetic energy we must get the origin (initial condition) correct. The origin is the big bang when particles with kinetic energy separate. Gravitation resists expansion and kinetic energy is converted to potential energy. Later when the mass starts its fall, potential energy is reconverted to kinetic energy. It either accumulates in bodies from a position established by expansion of the universe or it establishes an orbit. In both cases it has potential and kinetic energy. At the orbital position (the geodesic) the outward inertial force is balanced. We calculated the inertial force 883 N in the orbit if the astronaut had gained 7909 m/sec from the rocket. Here on earth, we are “off the geodesic”. The earth must push up on our feet to make up for the inertial force that we are lacking. Yes, there is energy of position (potential energy), but this does not produce the gravitational force. Think about climbing the stairs. Where does your energy go as you climb? It goes into overcoming force F and the potential energy is PE=F*R. It is the result of a force moving through a distance (force units are Newtons N and distance units are meters and energy is N-m). To calculate potential energy, you need a conversion factor (PE=F*R (Nt-m)*conversion factor) to know the potential energy in Million electron Volts (MeV). MeV is a convenient energy unit and represents the energy required to move an electron through a one-volt potential (eV) but since it is a small energy, it is multiplied by one million. The conversion 6.24e12 MeV/(Nt-m) is the main conversion used in the document.

Although this explains our gravitational situation here on earth there are still several questions: 1) how did we get on this curve? 2) Why is our kinetic energy low? 3) Deeper yet, where does gravity originate? 4) What is the resisting force that allows the earth to support us?   Overall, we have not gone beyond what Newton wrote and Einstein taught us.

Literature [2][3][Wiki] 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:

α_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 7.045e-14 meters, as proposed above, the force is:

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

If radius r for the conventional physics (Wiki) force calculation is 7.045e-14 meters, as proposed above, the force in Newtons (NT) is:

F=5.9068e-39*hC/R^2				
	hbar		6.58E-22	mev-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/(7.045e-14)^2				
3.76078E-38	NT			

This result agrees with the simple Newtonian force:

F=Gmm/R^2= 6.67e-11*1.67e-27^2/7.045e-14^2= 3.76e-38 Nt

Development of the equation clearly is based on mass with initial kinetic energy being converted to potential energy as the universe expands. But v (and v^2) above is initial velocity and radius r is the point in late stage expansion.

The factor 1/exp(90) is recognized as a bridge between large scale Newtonian physics and the quantum scale since the proton-space model is for one proton. With ke=10.15 MeV and r0=7.045e-14, the equation above can be used to define how the radius of a cell changes with kinetic energy. A cell is the space that the proton-space model defines. With G constant fundamental radius r0 can expand as kinetic energy decreases. Just like the electron's orbit, the proton's cellular orbit can change. In this case the energy is changed from kinetic energy to gravitational potential energy since the proton must do work on the cell to expand it and it resists expansion according to Newtonian gravity. The equation derived above for G with E*R can be re-written to give the change in the cell radius as kinetic energy is converted to potential energy.

G=E*r0/m^2*1/exp(90)
E=2*ke=2*10.15
G=2*10.15*r0/m^2*(1/exp(90))

This means that the E*r form of the equation for G becomes a powerful tool because the original E=2*ke=2*10.15 is known. Since m is always 1.67e-27 Kg, and G is constant the only variable in the equation is r0 and its original value is 7.045e-14 meters. The multiple E*r is fixed but E is inversely proportional to r.

Ke=0.5*mv^2 can be substituted into the equation above.

G=2*0.5*mv^2*r0/m^2*(1/exp(90))= r0*v^2/m*(1/exp(90))

The Newtonian relationship R=GM/V^2 can be combined with the above equation if we know the relationship between the cell v and large V (for example the velocity of an orbit around a galaxy). The following relationships apply with the two substitutions from cellular cosmology.

The relationship between v and V is: v^2=V^2.

The following box combines the relationships above.

Orbital R for galaxy= GM/V^2 where M is the central mass			
substitute G=r0 v^2/m*(1/exp(90))			
R= r v^2/m*(1/exp(90))*M/V^2			
v^2/V^2=1 (cell v and large V equal)			
m/M=m/(m*number of cells in galaxy)			
R= r*(1/exp(90))*M/m			
multiply top and bottom by exp(180)			
R=r*exp(90)*M/(m*exp(180))			
m*exp(180)=Muniverse			
R=r*exp(90)*(Mgalaxy/Muniverse)			
r=r0*10.15/ke=7.04e-14*10.15/ke			
R=7.04e-14*10.15/ke*exp(90)*(Mgalaxy/Muniverse)			
R=r0*10.15/ke*(Mgalaxy/1.67e-27)*(1/exp(90))			

The factor (1/exp(90) in the equation above scales Rs (Schwarzschild's solution to the wave equations) to one proton.

The equation R=r0*10.15/ke*(Mgalaxy/1.67e-27)*(1/exp(90)) is another way of writing R=GM/V^2 because they both yield the radius R of a large orbit around a central mass (M). But the first equation helps understand what curves space for gravitation.

Opinion

In the author's opinion, a solution to the quantum gravity problem was delayed by general acceptance of an old relationship between fundamental constants. Literature states that the gravitational constant (G) originates at the Planck scale. The Planck length L= (h*G/C^3)^0.5 = 1.61e-35 meters where h is Planck's reduced constant (H/2pi) = 6.58e-22 MeV-Sec and C is of course the speed of light. The energy associated with the Planck length is 1.2e22 MeV (6.18e-8 Kg). This energy is far greater than the energy of a proton and the Planck length is incredibly small. Many physicists are reluctant to give up the equation that contains G, h and C in what appears to be a defining relationship. Theorists are exploring alternatives like string theory but have not fully gained acceptance of a new theory describing the origin of the gravitational constant.