Zero Dark Matter and Zero Dark Energy

Subtitle: Effect of angular velocity on galaxy rotation

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Flat galaxy rotation curves were observed in the 1930's by Dutch Astronomer Jan Oort. Most cosmologists today attribute the difference between observed flat and calculated Newtonian declining velocity curves to dark matter despite decades of failed efforts to identify it. Recent WMAP [4] and PLANCK mission scientists believe it is 23% of critical density (the total mass and energy in the universe). There are other difficulties:

What is dark matter and why are baryons only 4.6% of critical density?

What is dark energy and why is it 72% of critical density?

But even more basic:

What is space-time?

Quantum mechanics applies at the small scale but the general theory of relativity is large scale gravitational theory. Are they incompatible?

These are not easy problems to solve. Any claim regarding different percentages of critical density must address baryon/photon ratios that determine observed fractions of Deuterium, Helium3 and Lithium7. Different claims must also address conditions at equality of photon and mass density and the temperature anisotropy observed at decoupling (where the plasma clears and electrons can orbit protons). Understanding space and gravity more thoroughly than Einstein's general theory of relativity requires bridging small and large scale physics.

A neutron→proton mass model and cellular cosmology, both previously reported by the author, were combined into what the author believes is a first principles cosmology model that resolves these questions. In addition, the model simulates temperature anisotropy at decoupling and star formation rates.

Problem 1: What is Dark Matter?

Cellular Cosmology

If mass is distributed uniformly within a sphere the mass toward the outside will be in a preferred position. Since Newtonian gravity is based on central mass, the mass toward the outside will move toward the center. This is an unstable universe and gravitational laws are not uniform throughout the sphere. A model with no preferred position places the mass on the surface of a sphere. But it doesn't have to be a large sphere. It can be many small spheres that have the same surface area. The author developed a concept called cellular cosmology that defines space as N=exp(180) spherical cells each with a proton. Furthermore, the proton has initial kinetic energy 10.15 MeV and orbits central gravitational field energy 2.80 MeV with radius 7.04e-14 meters. As kinetic energy decreases and potential energy increases each cell expands. Kinetic energy inside each of exp(180) cells is related to pressure acting outward on the surface. This expands the universe. The energy values above originate in a Schrodinger based mass model of the neutron (that decays to a proton) [Appendix 1 and 2].

Cells are defined by equating a large surface area with many small surface areas. This allows cellular cosmology to obey the rule “there can be no gravitational preferred position for mass” because all mass is on the equivalent of a large sphere. The number of cells in large R (representing the universe) is exp(180) [Appendix 2].

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 and lower case r, v and m for cellular space) that determine the geodesic (the radius with balanced inertial and gravitational force). The mass substitution is M=m*exp(180) and the surface area substitution is R=r*exp(90) for G large space= G cellular space.

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

The extremely small value 1/exp(90) is the coupling constant for gravity. When measurements are made at the large scale to measure G, the above derivation indicates that we must multiply cellular scale values (r*v^2/m) by 1/exp(90) for equivalent G. Geometric and mass relationships give the cell “cosmological properties”. Velocity V=V for equivalent surfaces. Velocity V is radial velocity at the radius of the cell. In cellular cosmology “equivalent” means there is a mathematical relationship.

Space and time

The Schrodinger equation described by MIT as unitary evolution [18] has a simple solution: Probability P=1 in the left hand side (LHS) of the Schrodinger equation is equal to the multiple of complex conjugates exp(iEt/H)*exp(-iEt/H) in the right hand side (RHS) where exp(iEt/H) stands for the natural number 2.718 to power (iEt/H), *i* is the imaginary number, H=Planck’s constant, E is field energy and time t is the time around a quantum circle at velocity C. The number 1 has been separated into two expressions that represent waves, but it is a dynamic separation; it repeatedly comes back to unity as time moves forward. When the Schrodinger equation is solved it “computes” probability=1 that contains things we observe about energy. The right hand side contains energy values of interest in its complex conjugates. Sinusoidal waves vary with exp(i theta)=cos theta +i sin theta as theta increases. They are circles with a vertical imaginary axis and a real horizontal axis. Results are restricted to the unitary point where the wave function collapses on a quantum circle with Et/H=1.

The equation Et/H=1 describes a circle:

t= 2*pi*R/C

E (2*pi*R/C)/H=1

R=HC/(2*pi)/E

HC/(2pi)= 1.92e-13 MeV-meters is hC, where h=H/(2pi) is Planck's reduced constant (6.58e-22 MeV-sec).

The value gravitational field 2.801 from the neutron mass model (Appendix 2) is the source of space. The radius of a quantum circle with this field energy is 7.04e-14 meters. The time around the circle at velocity C=1.47e-21 seconds. These values are fundamental to space and time. I believe time advances in increments of 1.47e-21 seconds.

Identify the radius and time for the gravitational orbit with 2.801 MeV
Fundamental radius=hC/E=1.97e-13/2.801=7.04e-14 meters
Fundamental time= 7.04e-14*2*pi()/3e8=1.47e-21 seconds

The value gamma equals (mass+ke)/mass. When performing orbital calculations, the orbital mass is mass/gamma (a result of special relativity). Gamma= (m+ke)/m is related to Schwarzschild dt=1/gamma-1. Time is slowed slightly and in this regard space-time is a proper concept. If particles gain a huge amount of kinetic energy gamma becomes significant (mesons and baryons entering our atmosphere and artificially in high energy accelerators). The special relativity effect gamma approaches 1.0 early in expansion, meaning these are relatively small effects.

Space is curved by the circles defined above and expands relative to fundamental r=7.04e-14 meters as kinetic energy (ke) is converted to potential energy.

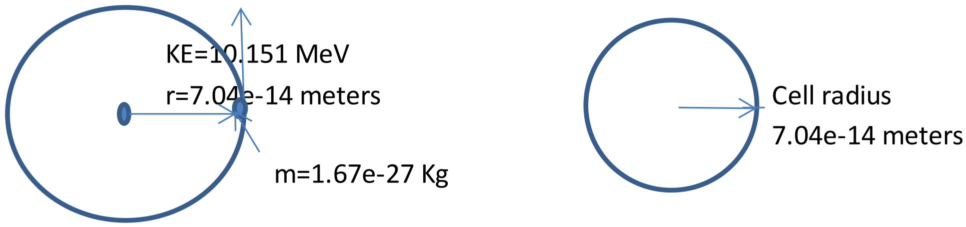
Calculating the gravitational constant G

Coupled with these values kinetic energy (10.15 MeV/proton) from the proton model is used in the calculations below that determine the gravitational constant. (Note: The work below advances earlier work by the author regarding gravity [9][13][17]). The mass is 1.676e-27 Kg (the mass of a neutron).

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-13/2.723	7.045E-14

The gravitational constant is 6.6743e-11 [23].

Another simple relationship was discovered that defines gravity. It involves only the potential energy 2*10.151 MeV from the neutron model and the fundamental radius 7.04e-14 meters.



Both definitions for gravity use cellular cosmology. The two approaches are similar except the new relationship does not rely on the cell capturing the neutron mass. Here is the new relationship (1.602e-13 Nt-m/MeV is a conversion constant):

10.15124436	Potential Energy/2 MeV
1.60218E-13	Nt-m/MeV
7.045E-14	fund R meters
1.67493E-27	Neutron Kg
G=10.15124*2*7.045e-14*1.602e-13/EXP(90)/1.675e-27^2	
6.6929E-11	Grav Const Nt m^2/Kg^2

This equation can also be written as:

G=20.3*1.6e-13*8.59e25/(2.49e51*1.67e-27)

With Et/H=1, the large circle is circumnavigated in exp(90) fundamental time units.

Potential energy 20.3 MeV is the final energy of a neutron that has expanded to radius 8.59e25 against a central mass of 1.67e-27*exp(180)=2.49e51 Kg (all the mass of the universe at one point) attracting a neutron at the large radius. This means that gravity is determined by the large scale and cellular cosmology is the small scale equivalent. This provides an understanding of space and a bridge from the quantum scale. Space is the radius defined by a gravitational field. Time is measured in repeating fundamental units at the quantum level.

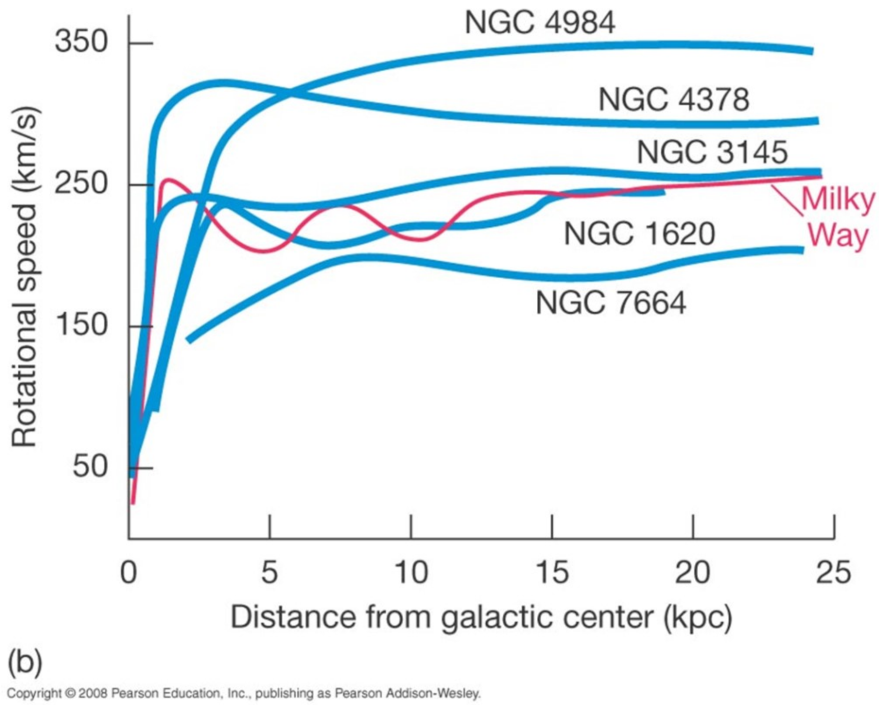
According to first definition of gravity above, the neutron is moving. But is the neutron moving at the large scale?

F=GMm/r^2	
F=mV^2/r	
GMM/r^2=mV^2/r	
GM/r=V^2	
V=(GM/r)^.5	
M=2.49e51	Kg
R=8.59e25	m
4.40E+07	m/sec
V/R=angular velocity	
5.12E-19	1/sec

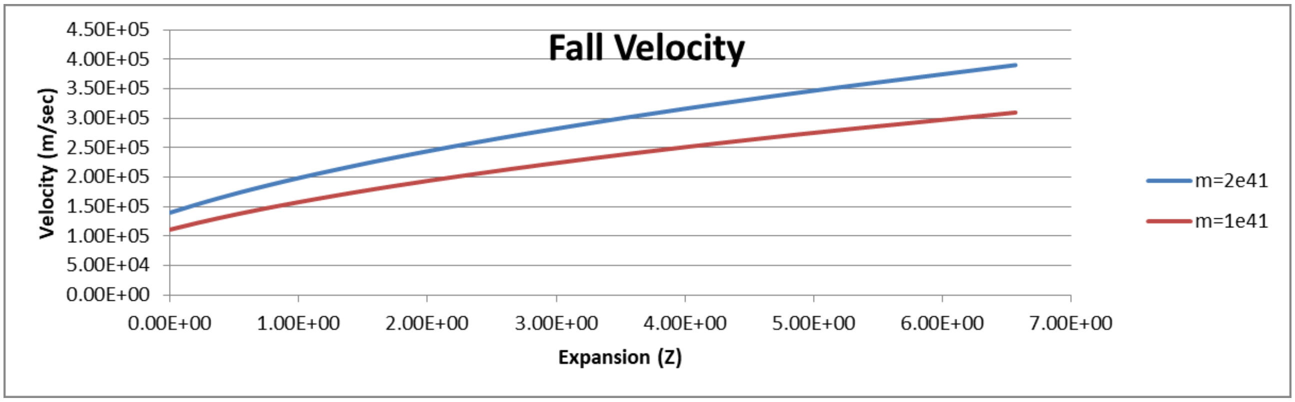
The neutron is moving but relative to what? Its velocity 4.4e7 m/sec is 10.15 MeV. The 10.15 MeV was used up in expanding the proton to the large radius. The whole 20.3 MeV was used in defining gravity by the equations above. I believe the way to resolve this question is to say the neutron's outward force is Newtonian inertial force but relative to spinning space. Relative to this platform, no energy is required and space that spins may be fundamental.

In two dimensions the relationships give G for the radius of orbits.

Flat Velocity Curves for Galaxies
All of these galaxy profiles (search Wiki for velocity curves) are nearly flat:



Calculating flat velocity curves
When the mass of our galaxy of 2e41 Kg started to accumulate and fell from its expansion determined radius each proton developed velocity. In cellular cosmology this is represented by the radial velocity of a proton circling a radius. All the mass fell at about the same time and developed the same velocity and kinetic energy (2.27e5 m/sec or 2.7e-4 MeV). The blue line below indicates that our galaxy velocity developed at about Z=2.6 (11 B years ago).



This energy is conserved and the entire galaxy rotates at 2.27e5 m/sec, exactly what we observe. The cell radius associated with this kinetic energy is r=7.04e-14*10.15/2.7e-4= 2.65e-9 meters. Using relationships from cellular cosmology, the orbital radius of a large central mass can be calculated.

G remains constant during expansion:

ke0=10.15 MeV/neutron

r0*V^2/m=r*v^2/m

(mv/mV)^2= (r/r0)

ke/ke0= (r/r0)

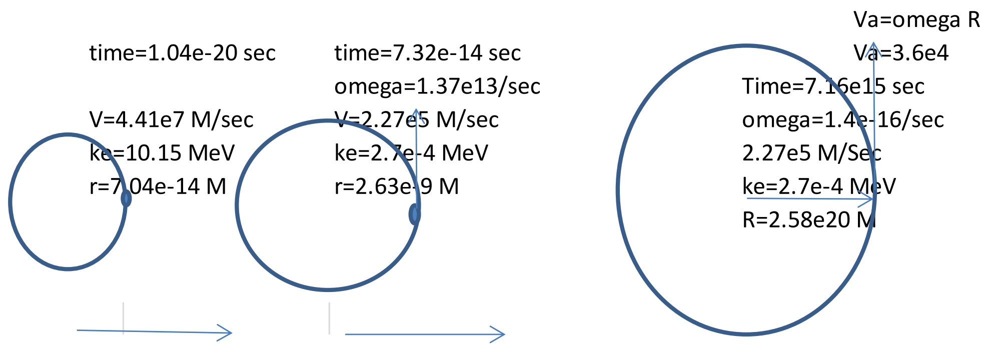
r=r0*10.15/ke

Understanding that the gravitational constant G can be calculated with G=r0*v^2/m*(1/exp(90) with cell radius r= 7.04e-14 meters allows further development of cellular cosmology gravitational relationships (small m below=1.67e-27 Kg).

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))	
R=7.04e-14*10.15/2.74e-4*(2e41/1.67e-27)*(1/exp(90))	**2.55917E+20**

The new relationship R=r0*10.15/ke*(Mgalaxy/1.67e-27)*(1/exp(90)) where r0=7.04e-14 is another way of writing R=GM/V^2 but it provides an understanding of the cosmology involved. From a gravitational viewpoint, the central mass is orbited by one proton (1.67e-27 Kg). The calculated radius 2.5e20 m is associated with one proton orbiting a central mass of 2e41 Kg. R can be considered a large cell that retains the angular velocity of the cell. The time for the proton to circle the galaxy circle once is 7.12e15 seconds and 1/7.12e15=1.4e-16 reciprocal seconds is the angular frequency. Since all the protons and associated large circles (cells) were formed at the same time, the entire galaxy has this angular velocity. The radial velocity of the large cell is 1.4e-16*2.58e20=3.62e4 m/sec.

The small circle on the left below is the quantum scale cell discussed above. Again, it defines small scale space time. The cell diagram in the middle below represents the change of the cell as it expands and takes on the radial velocity from the fall. Cells, no matter how large, are circles. The circle on the right is equivalent to the middle cell below except it is associated with the mass of a galaxy. The definition of cells requires equal radial velocities between large and small.



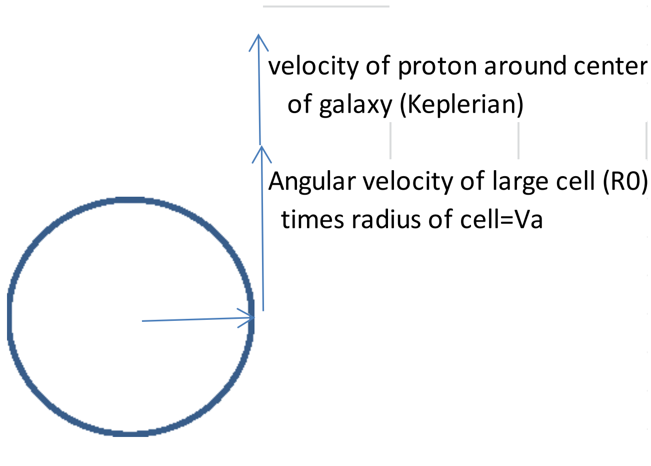
	Fundamental cell		Galaxy cell		Galaxy "cell"	
			Small		Large	
Mass	1.67E-27		1.67E-27		2.00E+41	
Ke=0.5*mV^2/1.6e-1	10.15		2.70E-04			
r=7.04e-14*10.15/ke	7.04E-14		2.65E-09		2.58E+20	
V M/sec	4.41E+07		2.27E+05		2.27E+05	
t=(2*pi()*r)/V	1.00E-20		7.32E-14		7.12E+15	
omega=1/t			1.37E+13		1.40E-16	
Va=1/t*R					3.62E+04	

In the galaxy diagram on the right the rotating proton is circling a huge radius. The angular velocity (Omega) of the large cell is 1.4e-16/sec. This produces Va= Omega*R. One way to understand this is "the large space associated with the cell is rotating". Each proton must have a velocity (Vk) that satisfies Newtonian gravity. This velocity decreases with distance from the center. But we already know the velocity of the protons. It is the observed velocity and fall velocity 2.7e5 m/sec. There are two velocities involved; Va+Vk= 2.27e5 m/sec (almost constant across the radius of the galaxy).

The example below is for a galaxy with mass 2e41 Kg. Measurements of observed radius and observed luminosity are available (Wiki based on published data). The luminosity falls off rapidly with observed radius indicating that there is not much mass toward the outside (luminosity is proportional to mass). Calculations below sum the central mass M (column 1) and calculate the orbital velocity with the Newtonian equation Vk= (GM/R)^.5 M/sec.

0	5	10	15	20	25.0	Radius (kiloparsec)	
	1.54E+20	3.08E+20	4.62E+20	6.16E+20	7.7E+20	Radius Meters	
	1.19E+39	9.77E+37	8.01972E+36	6.58299E+35	5.4E+34	Luminosity=I0*exp(-2/r)	
	1.309E+41	1.535E+40	1.25974E+39	1.03405E+38	8.5E+36	Kg within each luminosity band	
	1.87E+41	2.023E+41	2.03568E+41	2.03671E+41	2.0E+41	Central mass for each radius	
0	2.38E+05	2.09E+05	1.71E+05	1.49E+05	1.3E+05	Vk=(G M/R)^.5	
	2.15E+04	4.30E+04	6.45E+04	8.60E+04	1.07E+05	Va=R gal/time	
0	2.60E+05	2.52E+05	2.36E+05	2.34E+05	2.40E+05	Vk+Va	

A cell scaled to galactic scale has an angular velocity of 1/7.12e15= 1.4e-16 reciprocal seconds. The radius of each galaxy band times the angular velocity is labelled Va above. Adding Va to Vk produces a flat rotation curve matching measurements.



Can space spin?

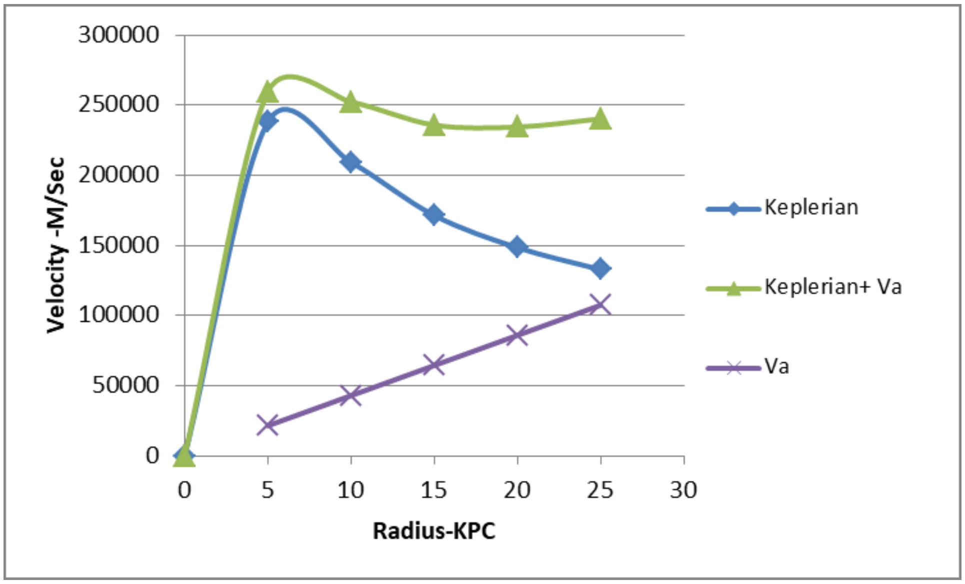
The possibility that space is rotating (Omega) is new and requires careful consideration. We are in a galaxy and the protons in our galaxy are moving at 2.27e5 m/sec. This velocity is apparently a combination of the two velocities above (Vk and Va).

There is reason to believe in convention gravitation. Spinning space may be fundamental as discussed in the section entitled "Space and time". When we understand the energy components of the proton model we know where gravity, space and time come from. Nature repeatedly "computes" the neutron by multiplying complex conjugates discussed above (details are in Appendix 2). The result is probability 1. This computation is relative to us because we are made of protons. We observe the components of probability 1 as "information about energy components of the neutron and its fields". The gravitational components are 2.801 MeV and 20.3 MeV. In a galaxy, expansion kinetic energy has been reduced 2.7e-4 MeV, is associated with the observed velocity and has two velocity components.

Calculations for observed velocity

	Vkepler (m/se	R (meters)	Mass Kg	Time (sec)	Va=R/Time	Vk+Va (M/sec
	2.85E+05	1.54E+20	1.87E+41	7.17E+15	2.15E+04	3.06E+05
central values	2.27E+05	2.58E+20	2.00E+41	7.17E+15	3.60E+04	2.63E+05
	2.09E+05	3.08E+20	1.53E+40	7.17E+15	4.30E+04	2.52E+05
	1.71E+05	4.62E+20	1.26E+39	7.17E+15	6.45E+04	2.36E+05
	1.49E+05	6.16E+20	1.03E+38	7.17E+15	8.60E+04	2.34E+05
	1.33E+05	7.70E+20	8.49E+36	7.17E+15	1.07E+05	2.40E+05

Observed velocity is Vk+Va. With increased radius across the galaxy Vk falls as expected. But space has angular velocity and Va=Rgalaxy band*1.4e-16 m/sec. The Newtonian velocity (Vk) is added to Va, producing the flat velocity profile.



Problem Resolution; What is dark matter?

When we look at a galaxy we observe real distances and real velocities. They have flat velocity curves. Unfortunately many have suggested a halo of dark matter to explain the measured flat velocity curve. If all else fails, believe the data (flat rotation curves). Also believe Newtonian gravity. A huge central mass does not change the definition of space time and cellular cosmology; it scales them to a huge radius. The calculations presented are straightforward and allows one to calculate the flat rotation curve. This represents rotation of space but does not violate laws because they are built into the neutron and proton. They continually renew themselves and are observed in a platform we share. Randomness of galaxy spin axis could allow Mach's Principle to be obeyed overall. Dark matter is the inferred mass required to correct the calculation error. I don't believe it exists.

Problem 2: Where is normal matter (only 4% discovered)?

Cosmologists use measurements and models to understand the first few hundred seconds after the big bang. Specifically, when and under what conditions were He4 and residual isotopes formed? WMAP analysis accepted the astrophysics literature [6] value of 4.4e-10 baryons/photons which is associated with the measured He4, He3 and Li7 fractions (measured uniformly throughout the universe and therefore formed with He4). The baryon/photon density equation [1] is below: Radius R and Temperature T are both to power 3. Further as radius expands temperature is reduced in direct proportion to radius. This means that the baryon/photon density ratio is the same now as it was after He4 was formed. At 2.73 K (the current temperature of the cosmic background radiation) the photon density is 5.77e8/m^3 and the mass number density is exp(180)/(4/3*pi()*4.02e25^3).

Baryon/photon=(x*EXP(180)/(4/3*PI()*R^3))/(8*PI()/(4.31e-21*3e8)^3*(1.5*8.62e-11*T)^3)

WMAP analysis [2][4] reduced the baryon content **X***exp(180) of the universe to a very low value (**X**=0.046) because they did not find combinations of R and T that would meet the 4.4e-10 criteria. The present analysis will show a period when temperature and radius values gives a value similar to 4.4e-10 without reducing the baryon content. This required an accurate expansion model.

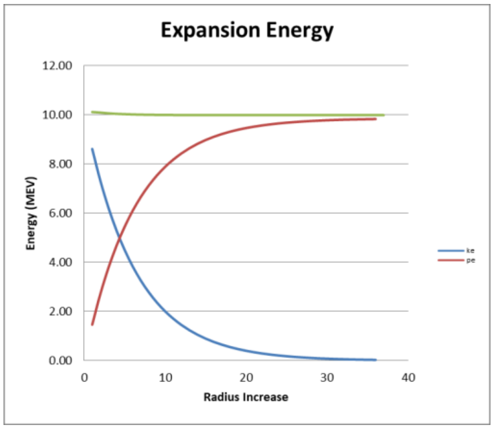
Expansion model

A first principles cellular expansion model based on the proton model was used to predict cosmological parameters. This is important because the laws of physics appear to reside inside the proton, which itself is based on Schrodinger fundamentals. The cosmology model bridges the gap between fundamentals and observations. The proton describes the cell, including the space around it. The model has the following capabilities:

1. Early history of helium formation including Deuterium, Helium3 and Lithium7 residuals.
2. History of the period from equality (matter and photon density) to decoupling (clearing of the plasma and cosmic background radiation pictures).
3. History of energy additions during expansion.
4. Star formation and its effect on expansion.

An expansion model calculates the radius of the universe as a function of time. But components of each proton are improbable (1/exp(180)) and there are exp(180) protons. In three dimensions, cell radius*exp(60) represents the universe. The model places exp(180) spherical cells into a large sphere. The initial radius of each small sphere is, as explained above, r0=7.04e-14 meters. This means that the initial radius is 7.04e-14*exp(60)= 8.25e12 meters (in three dimension, exp(180)/3=exp(60). This same sphere has a surface area =4 pi*r0^2*exp(180)= 4 pi*R^2. The gravitational constant G remains constant throughout expansion. Kinetic energy follows the relationship above, r=r0*10.15/ke.

The proton mass model has initial kinetic energy= 10.15 MeV/neutron associated with the measured value G=6.674e-11 Nt M^2/Kg^2. Expansion converts kinetic energy to potential energy (10.15 MeV total energy/proton is constant). This calculation is made possible by the use of the simple equation f= (mV^2/r)*1/exp(90) and potential energy = integral F*dR, dR is the increase in gravitational radius of each cell.



For convenience cosmologists use r'=r*(time'/time)^(2/3). (Primed values mean the next value in incremental calculations across time). The universe expands because kinetic energy is being converted to potential energy, ke'=ke*(time'/time)^(2/3).

Kinetic E	Potential Energy		
KE	F*r	ke=KE*r/R	
1/2M(v)^2	GMM/r		
1/2M(r/t)^2	GMM/r		
1/2Mr^3/t^2	GMM	ke=KE*r^2/R=GMm	
1/(2GM)*r^3	t^2		
(r/r0)^3 increases as (t/t0)^2			

Combining the relationships above cell radius increases as kinetic energy decreases r'=r*ke/ke'. The gravitation constant G=Fr^2/(m/g)^2 is maintained throughout expansion where lower case g= gamma= 938.27/(938.27+ke). Potential energy (PE)= 0.5*F*(delta R)/(1.6e-13 Nt-m/MeV). Pressure drives expansion but conversion of decreasing kinetic energy to increasing potential energy is used for convenience.

Constructing the expansion radius

There is uncertainty in current literature regarding the initial radius of the universe. Some say it was a point and an exponential expansion known as inflation quickly increased the radius. The WMAP [4] expansion model (called the concordance model or Lambda Cold Dark Matter model) calculates expansion with R'=R*(time'/time)^2/3 plus a second component based on a constant called lambda suggested by Einstein.

Expansion model based cellular cosmology

An expansion model can be constructed with a few facts (results of huge efforts throughout history):

Facts from WMAP and Planck [21]: The current temperature called Cosmic Background Radiation (CBR) temperature =2.73 K. The current Hubble constant =2.26e-18/sec. The Hubble constant is strongly associated with the current density 9.14e-27 Kg/M^2 in a flat universe. This is also considered critical density. The current age of the universe =13.8 billion years.

Facts from Proton model: Values in the neutron mass model determine the starting radius ro=7.04e-14 M. The gravitational field energy E=2.801 MeV determines r0. R0=7.04e-14*exp(60)=8.25e12 meters.

Based on probabilities for the neutron components the number of protons= exp(180) and the mass of the universe= exp(180)*1.673e-27=2.49e51 Kg. [Appendix 2 topic entitled "The number of neutrons in nature"]. Cellular cosmology places N cells in a large sphere. For this calculation we will assume that the critical density is neutrons but this will be checked several ways. This means that one cell of radius r represents the universe with R=r*exp(60). Initially all exp(180) cells are identical and one cell provides a great deal of information if we know the properties of the cell.

	Radius calculation
7.05E-14	Initial radius (m)
1.67E-27	Mass of cell with one proton (kg)
9.14E-27	Omega (Final density of cell) (kg)
1.83E-01	Volume=mass/density
0.352	r=((3/4)*volume/pi)^(1/3)
8.05E+12	Initial radius*exp(60) (m)
4.020E+25	Final radius = r final*exp(60) (m)

At the current time the universe density is 9.14e-27 kg/m^3. The volume that would contain exp(180)*1.67e-27 Kg=2.48e51 Kg is 2.48e51/9.14e-27=2.72e77 m^3. Assuming a sphere, the current radius is 4.02e25 meters if the density of the universe is normal matter (most cosmologists think there is missing matter). This includes both expansion components.

Facts from Astrophysics: Initially the universe is plasma. During expansion the temperature falls to 8e8 K and the SAHA equilibrium value approaches unity where He4 is readily formed [1][5][6][7]. The measured fraction of He4 is in the range 0.23 to 0.27. After this point hot He and H exist. When the temperature drops to approximately 3000K, electrons are captured and low density normal gas fills the universe.

Radius and temperature history from beginning to He4 fusion

First we construct a time scale based on the age of the universe (13.8 billion years =4.33e17 sec).

Next we will calculate the cell radius (r) as a function of time.

I believe that time increases in increments of 1.47e-21 seconds but to match the temperature at the present time calculation needs to start at time0= exp(45)*1.47e-21=0.0516 sec. During expansion time "ticks"; adding repeats of fundamental time units of 1.5e-21 seconds to 0.0516 seconds.

Space expands because kinetic energy exerts pressure inside of cells.   There is originally 10.15 MeV of kinetic energy in the gravitational orbit described above. The universe expands against restraining gravitation converting kinetic energy to potential energy with the value 20.3 MeV conserved.

Early expansion in the plasma phase occurs according to r/r0=(t/t0)^0.5.

Later expansion occurs according to the energy relationships below.

Each cell is an expanding orbit with ke'=ke*(time/time')^0.5 and r=r0*10.15/ke (primed values mean the next value in an incremental calculation over time). Combining these equations, we can simple find the kinetic energy change and calculate radius for r=r0*ke0/ke.

Algorithm for expansion of the plasma that exists between start and the He4 transition; expansion is to power ½:

Ke=ke0*(time/time0)^0.5

Ke=ke0*exp(0.5*ln(time')- 0.5*ln(time0))

Time0= fundamental time *exp(45)=1.48e-21*exp(45)=0.0515 sec

0.5*ln(0.0515)= -1.4826

Algorithm for start to He4 transition: Ke= 10.15*(-1.4826+.5*ln(time))= 0.11 MeV at 483 seconds.

Algorithm for remainder of expansion with power 2/3:

2/3*ln(483)= 4.0561

Ke= 0.11*exp(4.0561-2/3*time)

Initial temperature=10.15/(1.5B)=7.87e10 K, where B=Boltzmann's constant 8.6e-11 Mev/K and T'=T*(R/R'). Initial radius =fundamental radius 7.04e-14*exp(60). The value exp(60) is for exp(180) cells in three dimensions.

	Start	He4 transition	spike	now	R and T considering	
Time (seconds)	0.0515	438.8		4.355E+17	energy from stars	
Expansion algorithm 0-439		ke=10.15*EXP(-1.4826534-0.5*LN(time))				
Expansion algorithm 439-now			ke=0.11*EXP(4.056105-2/3*LN(time))			
Kinetic energy (MeV)	10.1500	0.110	0.110	1.11E-11	3.5217E-10	
Fusion energy release of He4 (MeV)			3.12E+00	3.14E-10		
Temperature spike He4=Wke/(1.5*B)			8.33E+10			
R meters=8.04e12*10.15/(Ke)	8.04E+12	7.42E+14				
Rspike=7.42e14*(Ta/Tb)^0.565			4.91E+15			
Radius final (meters)				3.69E+25	4.00E+25	
Temperature Final (K)				2.43E+00	2.73	
baryon photon ratio			1.82E-10			

The radius after the He4 fusion spike is calculated assuming a semi-isentropic thermodynamic process: vol'/vol=(T'/T)^(Cv/R) with r'/r=(vol'/vol)^.333. Cv/R for the mixture was estimated but 0.56 is reasonable. The temperature after fusion is T=3.12/(1.5*8.6e-11). The 3.12 energy release/proton includes He4 fusion and neutron to proton decay.

The final column reflects calculations for what have been called "dark energy". This is fully discussed in problem 4: What is Dark Energy?

The Baryon/Photon ratio is calculated with T=8.3e10 K and R=4.91e15 M.

B/P=(EXP(180)/(4/3*PI()*(4.91e15)^3))/(8*PI()/(1.23984e-12)^3*(1.5*8.6e-11*8.33e10)^3)= 1.82e-10

The WMAP criterion (<4.4e-10) is satisfied.

Consequences of Baryon/Photon ratio

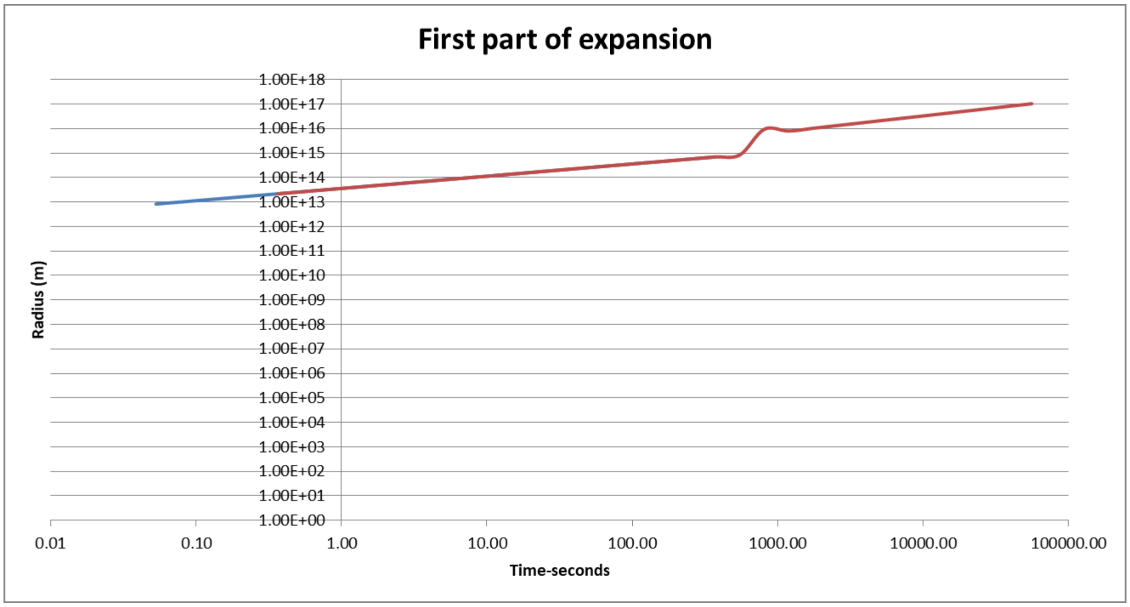
The calculation above at the He4 transition gave a baryon/photon ratio of approximately 4.0e-10. This meets the astrophysical requirement with exp(180) neutrons. The residuals are formed in proportion to the He4 fraction and are relative fixed (see the discussion on the point in Peebles [1]). The values below under the heading "Calculated" agree with the measured values.

	Time seconds				810	1190
	Radius (meters)				9.32E+15	7.91E+15
	Temperature (K)			7.50E+08	3.37E+10	1.71E+10
	baryon/photon ratio				4.02E-10	5.00E-09
Measured	Formulas for D, He3 and LI7				Calculated	
2.37E-05	D=4.6e-4*(B/P*1e10)^(-1.67)*1/exp(SAHA)				4.51E-05	6.68E-07
6.65E-05	He3=3e-5*(B/P*1e10)^-0.5			3.3e-5 to 1e-4	1.50E-05	4.24E-06
6.00E-09	Li7=5.2e-10*(B/P*1e10)^-2.43+6.3e-12*(B/P*1e10)^2.43				2.03E-10	8.48E-08
http://cds.cern.ch/record/262880/files/9405010.pdf				-2.65E+00	3.67E+01	
				SAHA	SAHA	

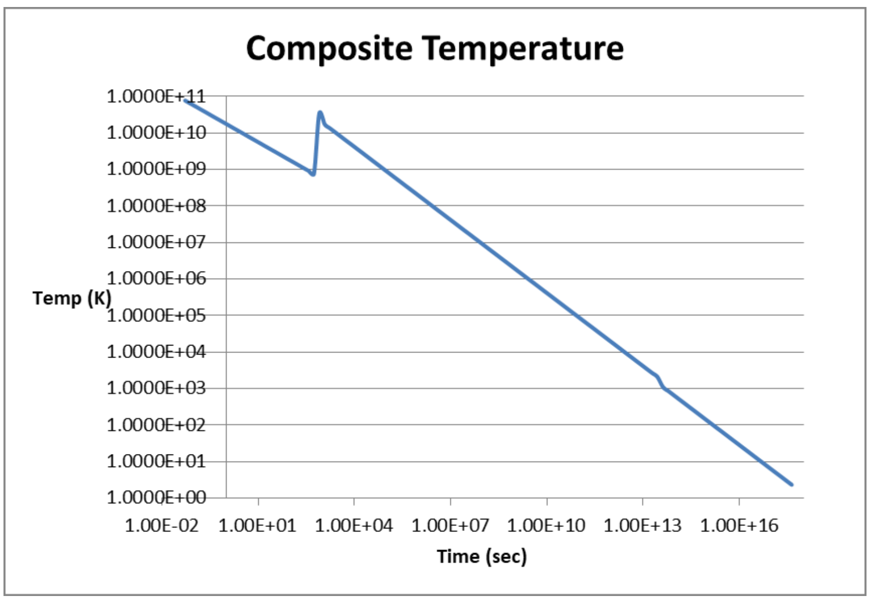
SAHA value=LN(4/3*((1*0.8)/((4.3E+67)/(0.5*EXP(180))))^(3/2))+LN((0.697^2)*(8.16e8/10000000000)^(3/2))-(2.58/(8.16e8/10000000000))

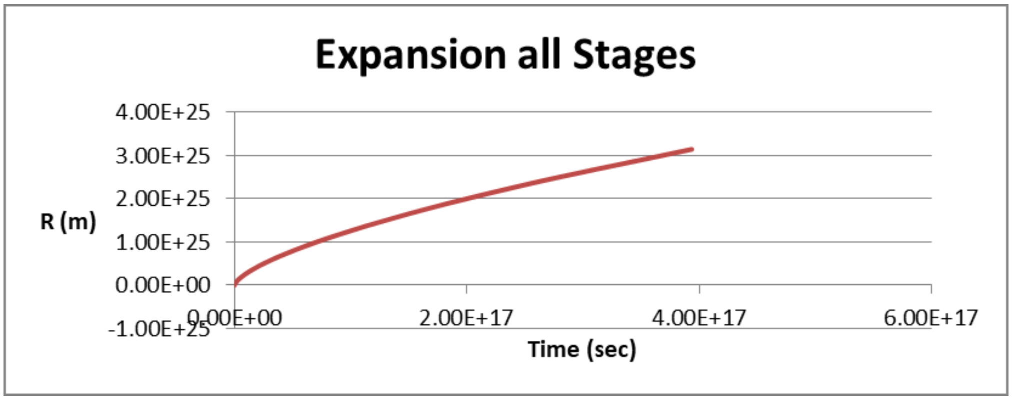
Summary of expansion and temperature history

Overall, the expansion radius and temperature is represented by the following graphs.



The temperature after the He4 transition is due to heat addition from He4 primordial fusion. As expansion occurs the temperature falls as Rh/R and yields 2.73K as the current value. Orbital KE (MeV) determines the temperature (T=KE/(1.5*8.6e-11) K. The slope following the spike is (time/time')^(2/3)





Energy history summary

Energy is available at the beginning and added at two additional places in the expansion curve. The original kinetic energy of 10.15 MeV/proton comes from the proton mass model [1] [10](Appendix 2). Secondly He4 fusion releases 3.12 MeV/proton when He4 forms (called primordial nucleosynthesis in the literature). Finally, stars light up and release radiation energy (on the order of 1e-10 MeV/proton. The kinetic energy can be calculated from the Boltzmann relationship; ke=1.5*B*T, where B is 8.62e-11 MeV/K.

Problem Resolution: Where is all of the normal matter (only 4% discovered)? What conditions existed when residual D, He3 and Li7 formed?

WMAP starts at a different radius and, as far as I can tell, does not add energy to account for primordial He4 formation (3.12 MeV). WMAP analysis used the astrophysics literature value of 4.4e-10 baryons/photons because it explains the measured residual isotopes. But they reduced the baryon content of the universe to a very low value (0.046) to meet the criteria. They didn't have the radius and temperature histories associated with cellular cosmology. Using cellular cosmology, the temperature and radius calculations at this transition combine in a way that yield a baryon/photon density ratio of 4.4e-10 with exp(180) baryons. X is 1.0 in the following calculation, not 0.046. The critical density is exp(180)*1.67e-27 Kg/(4/3*pi*4.02e25^3)=9.14e-27 Kg/M^3.

Baryon/photon=(x*EXP(180)/(4/3*PI()*R^3))/(8*PI()/(4.31e-21*3e8)^3*(1.5*8.62e-11*T)^3)

Overall, the baryon/photon ratio does not cause baryons to be severely limited like WMAP [4] and other documents suggest. (X=1.0 means all neutrons and protons)

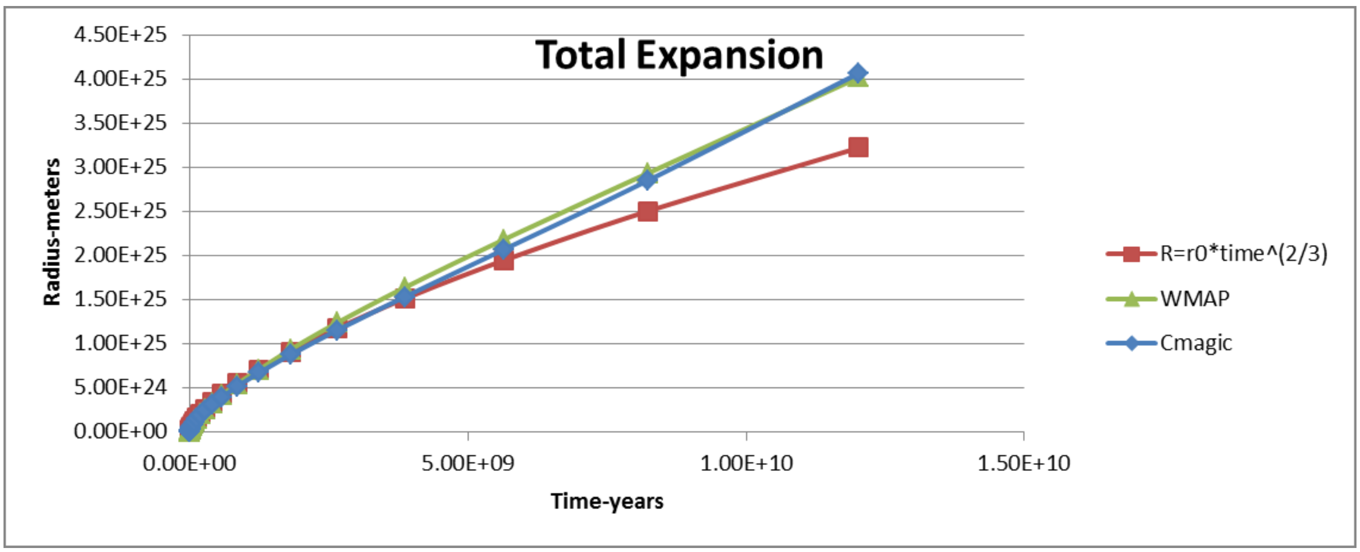
Problem 3: What is dark energy?

Observations of the universe's expansion created discussion regarding dark energy. 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. Two literature proposals (cosmological constant Lambda and quintessence) attempt to account for this unknown energy source.

This paper 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 2.45 K. Energy produced by stars is fusion energy and provides a physical alternative to dark energy. Concordance models use Lambda as the second expansion component but WMAP analysis concluded that there was dark energy and it was a large fraction (0.719) of critical density. The expansion curve, energy release points and associated temperature curve is presented. Analysis shows that although the density is 9.14e-27 kg/m^3, the mass fractions should be all normal matter.

Background

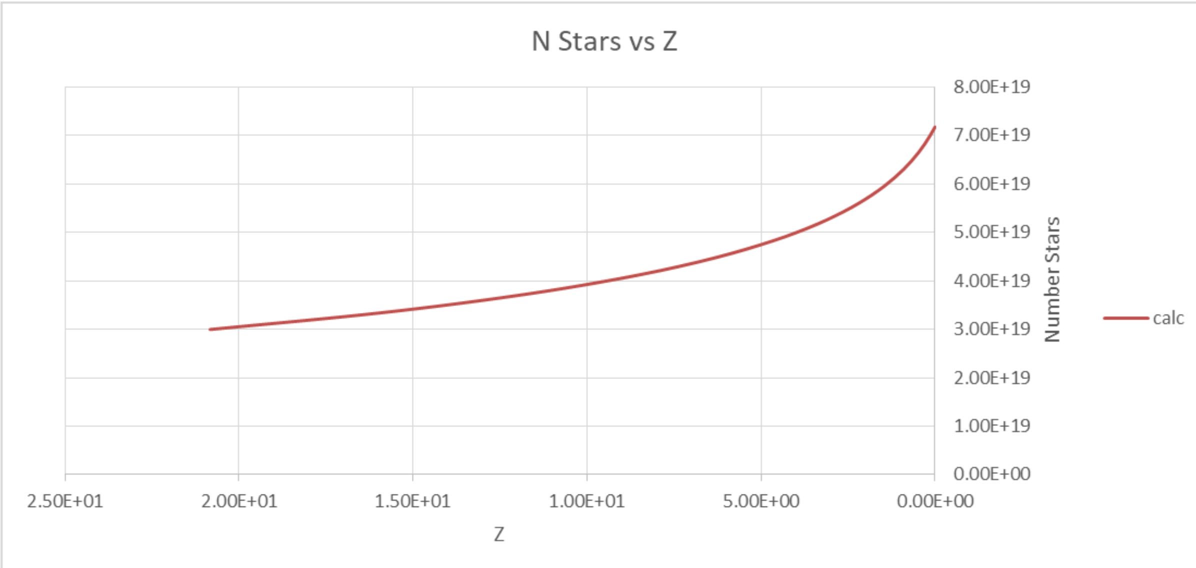
Expansion and cosmology parameters are currently based on differential radiometer projects known as COBE, WMAP [3][7][5], and Planck. They are compared to supernova data from Cmagic [5] that suggest an accelerating universe. Expansion follows R=R'(time'/time)^(2/3) throughout almost all of expansion. But this gives the wrong Hubble constant (slope of the expansion curve/divided by the radius at the present time). The Hubble constant has been accurately measured by many projects and is equal to 2.26e-18/sec [7]). This means that a second expansion component is increasing the radius, but what causes it? The graph below shows the problem. Data suggests the upper curve but this requires an unknown energy source. The concept "dark energy" is a placeholder and the author explored the possibility that energy produced by stars is the unknown energy source.



Exploration

The sky temperature is 2.725K. Star formation starts at about z= 16= (Rf/R-1). The average star is about 5e29 Kg [4] but there are potentially a significant fraction 2.49e51/5e29= 1.2e21 stars if their mass is 2e30 kg similar to our sun (fraction is about 0.1 of potential). The sun emits 2.37e39 MeV/second and has a lifetime of about 10 billion years. Since early star formation many atoms have moved through a well-documented solar burning cycle. Our sun is mainly hydrogen but a supernova in our vicinity produced the heavier elements that make up the earth and other planets. Heavier elements are measured throughout the universe and NIST publishes data regarding elemental abundance.

Our goal is to determine the expansion energy available after stars form. This expansion component will be called R3. The question is can this replace what cosmologists call the Lambda component of expansion? One might think that this energy is redshifted away but in cellular cosmology expansion is driven by energy, energy related to temperature and the energy is inside the cell. We will base our estimate on stars that are similar to our sun. The first step is to determine the number of stars as a function of time.



Star energy is added starting at z=16 where stars light up [Wiki]. Papers also present the rate of star formation. Each has a surface area and in cellular cosmology the surface area is mathematically the surface of a large sphere.

The basic equation for MeV/meter^2=3.54e5*T^4, where T is the surface temperature (K).

The surface area of all the stars with surface temperature 5778 K is giving off photons at 3.54e5*5778^4=3.59e20 MeV/M^2 but the remaining dark sky area is only giving off 3.54e5*2.44^4= 1.25e7 MeV/M^2.

Area overall sky= 4*pi*4.02e25^2= 6.77e51 M^2

Calculate the average temperature = (1.97e7/3.54e5)^.25=2.73 K. The average temperature is a composite of T=5778 K and 2.44 K.

area (M^2)	3.54e5*5778^4 (Mev/M^2)		
3.67E+38	3.95E+20	1.45E+59	area*mev/area
2.03E+52	1.25E+07	2.55E+59	area*mev/area
		6.77E+51	total area
Temp (K)	Temp (K)	1.97E+07	mevtotal/area total
2.44	5778	2.73E+00	(1.97e07/3.54e5)^.25

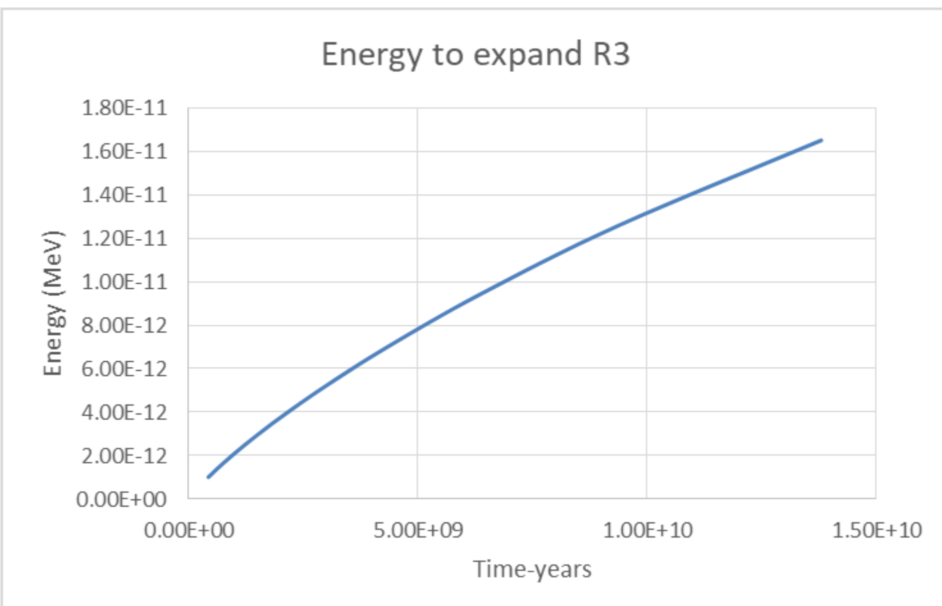
In cellular cosmology all added energy counts and the stars add a significant amount of energy. Delta E is the difference between sky temperature with stars (2.73 K) and the temperature without stars (2.45 K). These values apply to the end of expansion at 4.02e25 M. Delta E= (2.73-2.45)/(1.5*8.6e-11)= 3.63e-11 MeV. This delta E increases the radius. Delta R= Delta E/F*1.6e-13=3.63e-11/6.69e-49*1.6e-13= 8.67e24 M.

The calculations below represent energy released by stars as a function of time. The calculation procedure is an incremental calculation using the force in the cell and the energy addition by stars. Delta R=dE/F*1.6e-13 (1.63e-13 is an energy conversion constant).

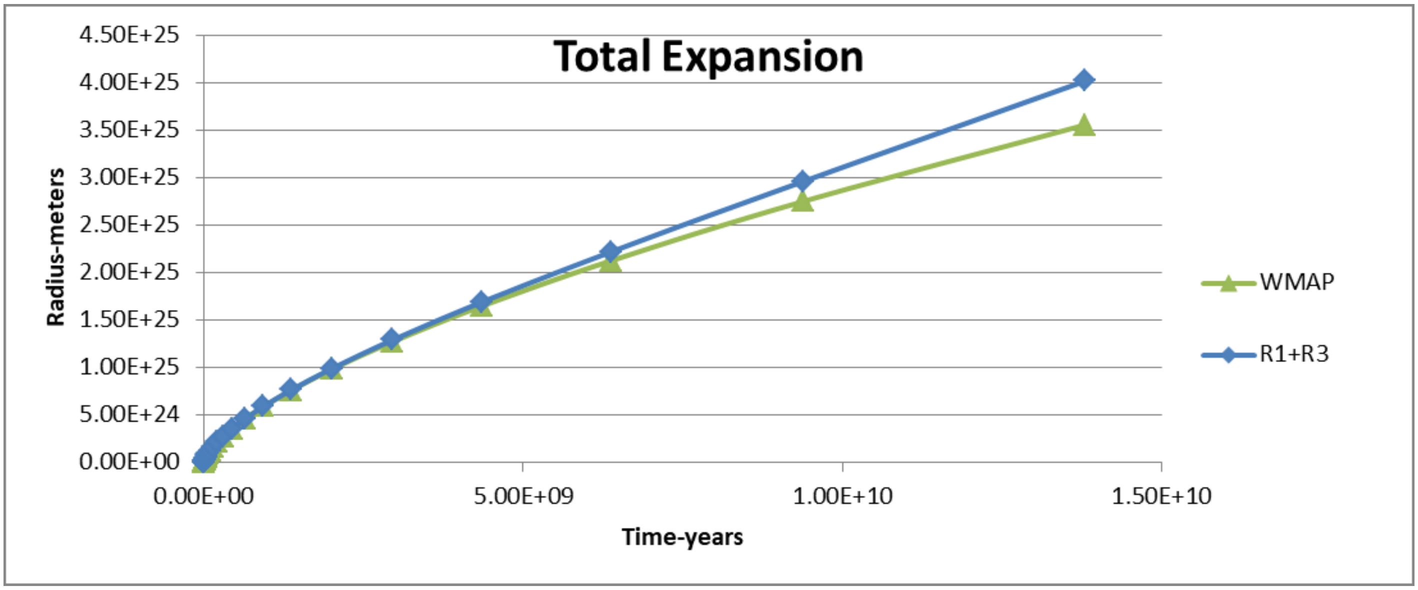
The expansion curve for star energy

1.19E-02	1.53E-02	1.98E-02	2.56E-02	3.32E-02	4.29E-02	5.54E-02	rgrav = 7.22e-14*9.87/ke	
6.01E-11	4.65E-11	3.60E-11	2.78E-11	2.15E-11	1.66E-11	1.29E-11	ke (MeV)	
1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00	gamma	
1.07E+02	9.43E+01	8.29E+01	7.29E+01	6.41E+01	5.64E+01	4.96E+01	Velocity (M/sec)	
1.3306E-60	7.9592E-61	4.7608E-61	2.8476E-61	1.7033E-61	1.0188E-61	6.0941E-62	Fcell=mV^2/r*(1/exp(90))	
6.67E-11	6.67E-11	6.67E-11	6.67E-11	6.6743E-11	6.67E-11	6.6743E-11		
3.67E+00	2.61E+00	1.80E+00	1.16E+00	6.72E-01	2.93E-01	0.00E+00	Z=Rfinal/R-1	1.21E+00
6.73E+24	8.72E+24	1.13E+25	1.49E+25	1.98E+25	2.74E+25	4.03E+25	R1+R3	9.30E+07
1.293E-01	1.000E-01	7.734E-02	5.981E-02	4.626E-02	3.578E-02	2.767E-02	star growth	-1.00E+00
5.82E+18	8.56E+18	1.26E+19	1.85E+19	2.72E+19	4.00E+19	5.88E+19	stars	3.69E+08
6.08E+09	2.18E+09	7.78E+08	2.78E+08	9.96E+07	3.56E+07	1.28E+07	3.54e5*2.73^4	1.00E+00
3.95E+20	3.95E+20	3.95E+20	3.95E+20	3.95E+20	3.95E+20	3.95E+20	3.54e5*5778^4	
9.3006E+50	1.5549E+51	2.5995E+51	4.3460E+51	7.2657E+51	1.2147E+52	2.0308E+52	Area sky w/o stars area	
3.54E+37	5.20E+37	7.65E+37	1.13E+38	1.65E+38	2.43E+38	3.58E+38	Area sky with stars	
1.15E+01	8.87E+00	6.87E+00	5.34E+00	4.19E+00	3.33E+00	2.73E+00	Temp with Stars	
1.14E+01	8.85E+00	6.85E+00	5.30E+00	4.10E+00	3.17E+00	2.45E+00	Temp w/o stars	
9.11E-13	1.73E-12	3.28E-12	6.18E-12	1.15E-11	2.10E-11	3.63E-11	Delta E (MeV)	
1.02E+22	3.25E+22	1.03E+23	3.25E+23	1.01E+24	3.08E+24	8.92E+24	dR=de/f*exp(60)*1.6e-13	

The radius without stars would be R1=3.6e25 meters at the present time if stars did not add energy. The calculations above show Delta E for earlier R where there were fewer stars and the associated Delta R (called R3). Adding R1 and R3 gives expansion with stars as a function of time.



Stars have a significant effect on expansion because the star Delta E (MeV) is a sizable fraction of normal expansion energy. Calculations show that this keeps the expansion curve from following the curve proportional to R'=R*(time'/time)^(2/3) after stars. But considering energy from stars an expansion curve is produced that replaces the Lambda component. It considers the rate the rate of star formation.



The curve labelled WMAP above is without the second expansion component, they call dark energy.

Hubble Check

We subtract the last two radius columns and divide by the difference in the last two times. The check Hubble, we divide again by R. The WMAP Hubble value was 2.26e-18/sec. The values match.

2.74E+25	4.03E+25	R1+R3	9.27E+07	Delta R
2.96E+17	4.35E+17	Delta time	2.31E-18	H=Delta R/R

Dark Energy Resolution

Currently very little energy is required for expansion since most of the original and He4 fusion kinetic energy has been converted to other forms of energy. The energy produced by stars as they light up must be considered in cellular cosmology. Delta R expansion from star energy is on the order of R3= 8e24 meters. The concept of dark energy was a place holder until the true cause was uncovered. Stars produce enough energy to explain observations. Photon energy released by stars flattens (or accelerates) the curve like the WMAP Lambda expansion component or the data reported by expansion model CMAGIC [3].

Problem 4: Baryon fraction at equality

Another limitation is related to the radius and temperature where equality of radiation and mass occurs. The thought was that baryons had to be limited so that equality occurred early enough to allow development of the WMAP measured primary hot spot at decoupling. After equality waves occur. Their speed in the plasma is V= C/3^.5 meters/sec. The wave progression radius R=V*delta time= 2.31e21/(pi*Ru)=0.0106 radians at decoupling [4] (pi is used because they are measuring distance in radians against the radius of the universe at that point).

Results from cellular cosmology model

The calculations below show the period from equality to decoupling with 1.0 baryon critical density. Equality and decoupling occur at the correct radius and temperature combinations and wave progression produces the same primary 0.0106 radian hot spot.

Radius R (meters)	8.54E+21	1.10E+22	1.43E+22	1.85E+22	2.39E+22	3.09E+22	3.99E+22	5.16E+22	6.67E+22
Z=Rf/R-1	4707.77	3640.74	2815.51	2177.28	1683.67	1301.92	1006.68	15.51	11.77
photon density (Kg/m^3)	equality	wmap calcs						decoupling	
Temperature (K)	2.03E+04	1.57E+04	1.21E+04	9.39E+03	7.26E+03	5.61E+03	4.34E+03	3.36E+03	2.60E+03
8*PI()/(H*C)^3*(1.5*B*T)^3	2.38E+20	1.10E+20	5.09E+19	2.36E+19	1.09E+19	5.04E+18	2.33E+18	1.08E+18	4.99E+17
Proton mass dens=1.67E-27*EXP(180)/(4/3*PI()*R^3)	9.54E-16	4.41E-16	2.04E-16	9.45E-17	4.37E-17	2.02E-17	9.35E-18	4.33E-18	2.00E-18
photon mass dens=8*PI()/(HC)^3*(1.5*B*T)^3	**1.11E-15**	**3.98E-16**	**1.42E-16**	**5.09E-17**	**1.82E-17**	**6.51E-18**	**2.33E-18**	**8.34E-19**	**2.98E-19**
dens ratio= proton mass dens/photon mass dens	1.16E+00	9.00E-01	6.96E-01	5.39E-01	4.17E-01	3.22E-01	2.49E-01	1.93E-01	1.49E-01
progression of wave (spot) at C/3^.5	2.26E+20	3.32E+20	4.88E+20	7.17E+20	1.05E+21	1.55E+21	2.28E+21	3.35E+21	4.92E+21
Spot size (radians=spot/(2*pi*R)	0.0000	0.0048	0.0054	0.0062	0.0070	0.0080	0.0091	0.0103	0.0118

With 100% baryons the equality and decoupling point occur at the right places in the R1+R3 expansion curves. In addition, the progression of the wave shows the required spot size at decoupling. There is no need to reduce baryon content to match data.

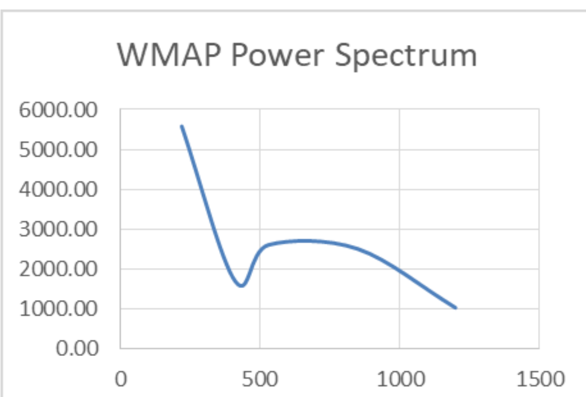
WMAP measured variations in the cosmic background radiation. It was analyzed with Fourier transforms to determine the size and position of hot spots. WMAP data was updated for 9 years as additional data came in [4]. But listen to the language in the report: "The peak at 74.5 micro-degrees K is due to the baryon-photon fluid falling into pre-existing wells resulting from Gaussian disturbances from inflation and dark matter". Really? The calculations below do not require dark matter.

WMAP interpretation that ratio of peaks determines dark/light ratio

The WMAP limitation on baryon fraction was based on the interpretation of hot spots measured by WMAP and refined by PLANCK scientists. We will first review the WMAP data [4][26] reduction (a power spectrum expected from acoustic waves).

L	L*(L+1)/2pi*cl micro K^2	La	L*(L+1)/2pi	cl	delta temp K	radius (meters
		0.735				5.10E+23
220	5580.1	299.32	7738.11	0.72	7.47E-05	2.32E+21
412	1681.0	560.54	27081.17	0.06	4.10E-05	1.24E+21
531	2601.0	722.95	45022.14	0.06	5.10E-05	9.60E+20
850	2500.0	1156.46	213038.79	0.01	0.00005	6.00E+20
1200	1020.0	1632.65	424496.26	2.64E-03	3.34664E-05	4.25E+20

The WMAP power spectrum for the above measurements is shown below:



Calculation of dt

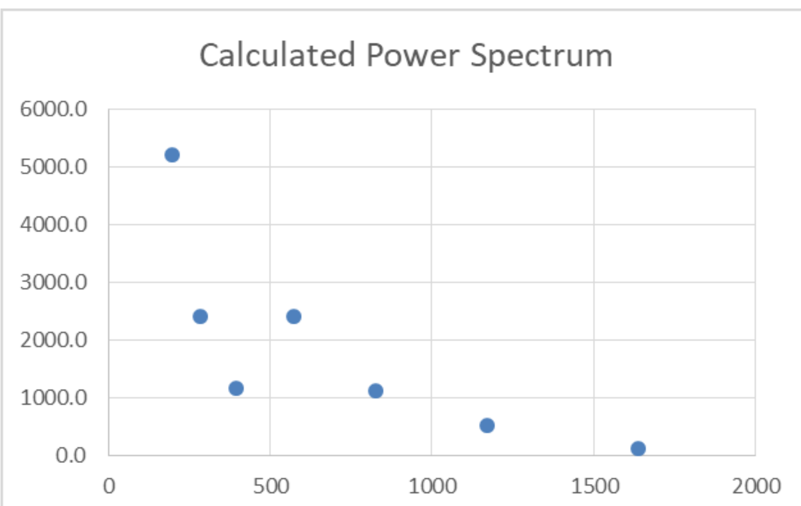
The temperature peaks called dt are in micro degrees (2.730074 K). The thermal peaks are a function of density. There is a misunderstanding that progression of the wave causes densification. In fact the density of the universe (decoupling and slightly sooner) is recorded in the wave. The waves at that point become visible (the plasma clears). That period is recorded by radiometers but the radiation has been highly red shifted to 2.73 degrees,   Density near the decoupling radius is provided by the cosmology model. This density is the key to understanding WMAP temperature anisotropy.

```
dt=2.73*(1.2*(9.14e-27/4.33e-18)^.5+1)^.333-2.73
```

Delta t (dt) is calculated from the density near decoupling compared to the final density (also critical density). Spots inside larger spots are earlier densities that are visible to radiometers in the CMB as time and the wave progresses. The following combinations of wave progression and temperature produce the power spectrum below. The important combination at decoupling yields exactly 74 micro degrees (the value 7.34e-5 in the table below) from first principles!

wave progress	5.30E+19	1.31E+20	2.46E+20	4.14E+20	6.62E+20	1.03E+21	1.56E+21	2.35E+21
radians	0.0015	0.0029	0.0042	0.0055	0.0068	0.0082	0.0096	0.0112
Delta t (dt)		7.299E-06	1.073E-05	1.578E-05	2.320E-05	3.411E-05	5.015E-05	7.373E-05

model result dt (K)	wave R progression	wave R with harmonics	L 5.1e23/prog	L*(L+1)/2pi*cl micro K^2	La 0.735	L*(L+1)/2pi	cl cl=(dt*1e6)^2/((L*(L+1)/2pi)	delta temp K
73.73	2.35E+21	2.35E+21	217	5436.1	295.38	7536.01	→ 0.72	← 7.373E-05
		1.17E+21	434	1156.0	590.75	30074.94	0.04	3.400E-05
50.15	1.56E+21	1.56E+21	327	2514.8	444.31	17025.16	0.15	5.015E-05
50.15	1.56E+21	7.81E+20	653	2514.8	888.62	125816.33	0.02	5.015E-05
34.11	1.03E+21	5.13E+20	994	1163.4	1352.41	291312.81	0.004	3.411E-05
23.20	6.62E+20	3.31E+20	1541	538.2	2096.74	700029.01	0.001	2.320E-05
10.73	4.14E+20	2.07E+20	2463	115.2	3351.22	1787946.28	0.000	1.073E-05
7.30	2.46E+20	1.23E+20	4153	53.3	5650.66	5082714.20	0.000	7.299E-06



Result of possible baryon limitation from hot spot data

The entire equality to decoupling analysis was based of 1.0 baryon fraction of critical. The hot spots measured by WMAP were calculated. The density of the universe and how Jeans waves progress are the two variables of interest. There is no reference to dark matter in the calculation and the ratio of the first and second spots is NOT the dark to normal matter ratio (contrary to a WMAP statement). I believe I have characterized the hot spots and they do not limit baryon fraction to 0.046 fraction of critical density.

Problem 5: Mass accumulation

At decoupling the plasma clears and normal matter can accumulate. The first accumulation is densification into a volume that will form clusters of galaxies. The wave (velocity=C/3^.5) that starts at equality and progresses to decoupling determines the first accumulation. The wave starts as high density and progresses outward. As it reaches decoupling, it determines central mass because matter inside the wavelength radius has more density than the outside radius (all gravitation is based on central mass and this defines what is central). Here is the calculation:

6.67E+22	R decoupling (M)
2.29E+04	N clusters
2.35E+21	Jeans at decoupling (M)
1.09E+47	Avg mass of cluster (Kg)

This determines the number and mass of clusters (N= 2.29e4= (6.67e22/2.35e21)^.33) and mass/galaxy=2.49e51/N=1.09e47 Kg).

Mass accumulation starts at this point and the equation derived below determines acceleration (a) toward the central mass (M) for a time period (t).

Touch down equation
L=at^2/2=1/2*GM/R^2*(2R/at)^2=GM/(at^2)
at^2=2GM/(at)^2
a^3*t^4=2GM
a=(2GM/t^4)^.333

Mass M can be cluster central mass 1.09e47 Kg, galaxy central mass or star central mass.

Next, the radius (L or Reach) that "gravitationally reaches out" through acceleration (a) and "pulls in" mass during the time period (delta t) is calculated:

Reach=a*(delta time)^2/2.

From this the volume (4/3piR^3) multiplied by the density available determines the developing central mass for this time period.

Mass moved to center= volume*density.

The calculation is repeated, adding mass as time progresses (line 2):

4.24E+46	6.91E+46	1.09E+47	M Cluster	1.70E+02
3.67E+44	7.37E+44	1.28E+45	Mc accumulation=M+dM	
9.35E-18	4.33E-18	2.00E-18	density	
2.65E-05	1.87E-05	1.30E-05	touch dwn	
1.85E+20	2.73E+20	4.01E+20	Reach	
3.70E+44	5.44E+44	8.00E+44	Vol*dens	

However, for clusters the reach is limited to R=Vdt where V is limited to 4.4e7 m/sec (the kinetic energy of the fall cannot exceed 10.15 MeV). In addition, reach is later limited to 2.35e21 meters since that determined the central mass at decoupling. Clusters do not densify mass because they do not create an orbit. For stars, once a stable orbit is reached, expansion within the orbit stops. Recall that expansion is pressure driven. If there is no orbit, the pressure (and density) will everywhere be the same.

Galaxy mass Accumulation

Galaxies form by the above process except the Jeans wavelength drops. The wave progression velocity was C/3^.5 before decoupling but after the plasma clears the speed drops to the speed of sound and the Jeans wavelength falls to approximately 1.9e19 meters.

2.4E+21	R decoupling (M)
1.8E+06	N galaxies in cluster
1.9E+19	Jeans for galaxy (M)
6.0E+40	Avg mass of galaxy (Kg)

This determines the number and mass of galaxies (N=(2.4e21/1.9e19)^.33) and mass/galaxy=1e47/N=6e40 Kg because the Jeans wavelength determines the boundary of the central mass. Mass accumulation is from "virgin density" (2.49e51/total volume).

Star mass accumulation

The process again repeats determined by waves determining the volume of central mass. The fractional Jeans wavelength (empirical) 4e15 meter determines the average mass of the stars.

1.9E+19	R Jeans for galaxy (M)
1.0E+11	N stars in galaxy
4.1E+15	Jeans for stars (M)
5.2E+29	Avg mass of star (Kg)

Detailed WMAP ratios give number of clusters & stars				Ratio		Mass (kg)		
					1.67e-27 kg*exp(180)	**2.5E+51**	Kg Universe	
Taking values from table		R1+R2	6.67E+22					
Number of clusters/universe			**2.3E+04**	((4.72e22)/1.62e21)^3=2.6e4	divide by 2.6e4	**1.1E+47**	Kg Cluster	
		spot (m)	2.35E+21	(Radius/spot)				
		spot*2 (m)	2.35E+21					
Number of galaxys/cluster			**1.8E+06**	((3.17e21)/2.67e19)^3=1.7e6	divide by 1.7e6	**6.0E+40**	Kg Galaxy	
	Jeans lo speed	1.93E+19	1.93E+19	(Spot/Jeans length)		4.1E+10	numb galaxies	
		red-empirical				6.031E+40	data galaxy count	
		Jeans lo (m)	1.93E+19			data	http://universe-review.ca/F05-galaxy.h	
stars/galaxy			**1.2E+11**	(2.67e19/5.6e15)^3=1.1e11	divide by 1.1e11	**5.2E+29**	star mass	compare data
	Jeans fraction		3.95E+15	(Jeans length/Jeans fraction)		4.8E+21	number stars	3.17E+29
http://en.wikipedia.org/wiki/Jeans_instability					stars/universe=clusters/universe*galaxys/cluster*stars/galaxy			

Star formation rates

The cosmology model developed above in Problem 2 allows star formation rates to be calculated. The number of stars is used in calculations for expansion component R3 (Problem 3 Dark Energy). The calculation uses the number of clusters, galaxies and stars listed above.

Stars= sum(2.3e4*(Mc/1.1e47)*1.8e6*(Mg/6.0e40)*1.2e11*(Ms/5.2e29)).

The ratios (Mc/1.1e47), (Mg/6.0e40), and (Ms/5.29e29) are lower than 1 because R (reach=a*t^2/2) calculated with acceleration (a) from the touchdown equation is limited to the Jeans wavelength since the central mass was established at earlier points in expansion (Z). As the universe expands, the central mass associated with the wavelength does not change. This leaves some mass out of reach. As stars develop, star number= sum(stars formed per time increment).

1.14E+47	1.14E+47	1.14E+47	1.14E+47	1.14E+47	M Cluster	1.70E+02
2.07E+46	2.07E+46	2.07E+46	2.07E+46	2.07E+46	Mc accumulation=M+dM	
2.80E-25	1.25E-25	5.46E-26	2.29E-26	9.08E-27	density	
1.55E-10	9.29E-11	5.56E-11	3.33E-11	1.99E-11	touch dwn	
2.35E+21	2.35E+21	2.35E+21	2.35E+21	2.35E+21	Reach	
6.33E+40	6.33E+40	6.33E+40	6.33E+40	6.33E+40	M Galaxy	
4.83E+39	4.83E+39	4.83E+39	4.83E+39	4.83E+39	Mg accumulation=M+dM	
2.80E-25	1.25E-25	5.46E-26	2.29E-26	9.08E-27	dens	
2.26E-12	1.35E-12	8.11E-13	4.85E-13	2.90E-13	touch dwn	
1.90E+19	1.90E+19	1.90E+19	1.90E+19	1.90E+19	Reach	
1.54E+05	1.35E+05	1.19E+05	1.05E+05	9.22E+04		
1.78E+20	2.30E+20	2.98E+20	3.85E+20	4.96E+20		
2.05E-22	9.47E-23	4.38E-23	2.03E-23	9.45E-24		
5.42E+29	5.42E+29	5.42E+29	5.42E+29	5.42E+29	M Star	
3.76E+28	3.76E+28	3.76E+28	3.76E+28	3.76E+28	Ms accumulation=M+dM	
2.80E-25	1.25E-25	5.46E-26	2.29E-26	9.08E-27	dens	
4.67E-16	2.80E-16	1.67E-16	1.00E-16	5.99E-17	touch dwn	
4.10E+15	4.10E+15	4.10E+15	4.10E+15	4.10E+15	Reach	
5.78E+19	6.13E+19	6.48E+19	6.83E+19	7.17E+19	Sum stars	
				3.48E+18	Stars for dt	
Stars= 1.15*sum(2.3e4*(1.37e46/1e47)*1.9e6*(3.32e39/6e40)*1e11*(2.3e28/5.2e29))						

The star numbers calculated above are used (yellow below) for calculating temperature and expansion due to star energy addition (R3). The value 1.15 is in very good agreement with the energy required to raise the temperature from 2.45 K to 2.73K and accelerate expansion. This model indicates that stars developed earlier than observations, perhaps as early at 2e6 years. But the current time is only 13.8 billion years and stars can burn for 10 billion years. Starting early still allows two generations.

4.20E+07	1.50E+07	3.54e5*2.73^4
3.95E+20	3.95E+20	3.54e5*5778^4
9.3906E+51	1.5699E+52	Area sky w/o stars area
1.71E+38	1.80E+38	Area sky with stars
3.43E+00	2.73E+00	Temp with Stars
3.30E+00	2.55E+00	Temp w/o stars
1.35E-11	1.77E-11	Delta E (MeV)
2.26E+24	4.94E+24	dR=de/f*exp(60)*1.6e-13

Another interesting value from the cosmology model is; Velocity=a*time calculated with acceleration (a). It shows that the velocity produced by the star central mass and planet central mass is not enough to establish an orbit. This means that “solid” objects form. (Mass densification associated with clusters and galaxies form orbits from which stars develop but they themselves are not solid objects.)

Successive densification and black holes

The cosmology model indicates that stars normally develop from virgin density (2.49e51 Kg/(Volume of universe). Densification occurs when stars falls into orbits (see Appendix entitled “Fall Velocity”). Successive densification can occur where galaxies form. Taking Z=20 as the reference point (where early mass accumulation has been observed), a galaxy can contain high density. New or interacting bodies can develop from the high density matter. This accelerates mass accumulation and may promote black hole development.

Z=20	Radius	Kg	Density		
R universe	1.62E+24	2.49E+51	1.40E-22	virgin (Kg/M^3)	
Rfall Galaxy	2.28E+19	6.33E+40	1.28E-18	galaxy (Kg/M^3)	

Summary: Cosmological parameter comparison

WMAP parameters are compared below with the revised parameters from this document summarized in the rightmost column. The total mass/volume is exp(180)*1.67e-27 kg/1e79=9.14e-27 kg/m^3. Baryon density is given by exp(180)/volume at each of the radius values with no dark matter. Cosmological parameters with dark energy removed (and replaced with star photon energy) are shown below. The table shows normal matter fraction of critical density (1.0), dark matter fraction of critical density (0) and dark energy fraction of critical density (0).

WMAP					
			THIS PAPER		
NOW		equality	decoupling	NOW	
published					
4.02E+25	Inferred Radius (m)	3.89E+21	5.08E+22	4.02E+25	= R1+R3
				4.94E+24	= R3
2.26E-18	H0			3.53E+25	= rR1
8809	Temperature at equality (K)	3.48E+04		2.73	
	Photon mass density				
	Proton mass density				
2973	Temperature (K) decoupling		2668	2.73	
0.0106	Spot angle (radians)		0.0109		
0.254	baryon number density			5.473	
5.77E+08	Photon number density			5.77E+08	
4.400E-10	baryons/photon			4.00E-10	
0.235	Dark matter fraction			0	
6.57E-27	dark matter density in kg/m^3			0	
4.24E-28	baryon matter density in kg/m^3			9.14E-27	
0.719	Dark energy fraction			0	
9.14E-27	critical density			9.14E-27	
0.0464	Baryon fraction			1.000	
2.72E+77	Overall volume (m^3)		2.46E+65	2.72E+77	
2.814E-01	overall mass density		rhoC	Volume	
			9.135E-27	2.72E+77	
			mass=rhoC*Volume (kg)		
				2.486E+51	

Conclusions

The Newtonian gravitational constant G is defined by the neutron

The information we need about gravity is provided by the neutron/proton model, cellular cosmology and the number of initial neutrons. The neutron model gravitational field energy 2.80 MeV is a quantum value and cellular cosmology provides a bridge between small and large scales (M=m*exp(180) and R=r*exp(90)).

Values from the neutron model define the gravitational constant (1.602e-13 Nt-m/MeV is a conversion constant):

10.15124436	Potential Energy/2 MeV		
1.60218E-13	Nt-m/MeV		
7.045E-14	fund R meters		
1.67493E-27	Neutron Kg		
G=10.15124*2*7.045e-14*1.602e-13/EXP(90)/1.675e-27^2			
6.6929E-11	Grav Const Nt m^2/Kg^2		

Space-time is defined by the gravitation field energy 2.80 MeV

Space is defined by the Proton model gravitational field r0=hC/2.801=7.04e-14 meters. Initially space is comprised of exp(180) cells, each with the radius 7.04e-14 meters. Each cell contains a neutron (that decays to a proton). Time is measured around the fundamental cell circumference (cycle time=2*pi*7.04e-14/C=1.2e-21 seconds). Time counts forward by repeating this cycle.

Flat velocity profiles do not infer dark matter

Observed flat velocity profiles are simulated when the expected Newtonian velocity decrease with galaxy radius is added to the angular velocity of the space it is imbedded in. Angular velocity is developed as mass falls from its expansion determined radius. Cellular cosmology scales to the size of a galaxy and allows the angular velocity to be calculated and understood.

The density of the universe is 9.14e-27 Kg/M^3 (all baryons)

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

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

Ho		2.26E-18	(1/sec)
rhoC	8/3 pi G/Ho^2	9.124E-27	(Kg/M^3)

Historically, the equations are written to be consistent with geometric models of the universe involving metric tensors that characterize a four dimension universe where ds^2= three distances^2 and (C*time)^2. If the overall density equals critical density the universe is considered to be flat. The term flat refers to possible shapes (hyperbolic, etc.) but also means that kinetic energy is converted to potential energy (a fact that most agree on). The model is also known as the Lambda Cold Dark Matter model or the concordance model. Lambda stands for the famous Einstein constant related to the concept of dark energy. WMAP scientists believes that Hubble's constant gives the critical density 9.14e-27 Kg/M^3. They believe in a flat universe but added lambda, dark matter and dark energy to make the total 9.14e-27.

The present work shows that the reason the universe is flat is that the density is actually 9.14e-27 KgM^3 but it is 100% baryons.

Dark energy is expansion from energy released by stars

Very little energy is required late in expansion. The energy produced by stars as they light up must be considered. Using cellular cosmology expansion from star energy is on the order of R3= 8e24 meters. The concept of dark energy was a place holder until the true cause was uncovered. Stars produce enough energy to explain observations. Photon energy released by stars flattens (or accelerates) the curve like the WMAP Lambda expansion component or the data reported by expansion model CMAGIC [3].

References

Some references can be downloaded at http://vixra.org/ or http://academia.edu. Search at top of page Gene H Barbee.

1. Peebles, P.J.E., *Principles of Physical Cosmology*, Princeton University Press, 1993.
2. Bennett, C.L. et al. *First Year Wilkinson Microwave Anisotropy Probe (WMAP) Observations: Preliminary Maps and Basic Data*, Astrophysical Journal, 2001
3. A. Conley, et al, (*THE SUPERNOVA COSMOLOGY PROJECT), Measurement of Omega mass and Omega lambda from a blind analysis of Type1a supernovae with CMAGIC*.
4. Hinshaw, G. et.al, *Nine Year WMAP Observations*, draft June 5, 2013. http://arxiv.org/pdf/1212.5226v3.pdf Table 2.
5. Bergstrom, L. and Goobar, A., *Cosmology and Particle Astrophysics*, 2nd Edition, Springer-Praxis Books in Astrophysics and Astronomy, 2004.
6. http://cds.cern.ch/record/262880/files/940501.pdf Review of work by N. D. Schramm.
7. Patrick Peter, Jean Philippe Uzan, Primordial Cosmology, OUP Oxford, Feb 14,2013.
8. Barbee, Gene H., *A Top-Down Approach to Fundamental Interactions*, FQXi essay, June 2012 and vixra:1307.0082 revised Nov, 2014. Reference Microsoft ® spreadsheet Unifying concepts of nature.xls. This paper details a model of the proton that provides information pertinent to many aspects of nature. Starting with data from WMAP that allows an estimate of the number of protons in the universe (exp(180)), where exp stands for natural number 2.712^(180) the author explored how this number is used by nature to anchor the energy of fundamental particles. This reference described models for the neutron and proton mass based on Shannon type information theory. In addition, it shows that information from the model unifies the electromagnetic, weak, strong and gravitational forces.
9. Barbee, Gene H., *On the Source of the Gravitational Constant at the Low Energy Scale*, vixra:1307.0085, revised Feb 2014. Prespacetime Journal Vol. 5 No. 3 March 2014. The proton model provides the energy value of a field that allows the gravitational constant to be calculated from fundamentals. This document summarizes arguments for a low energy gravitational scale and offered an understanding of the weak and long range character of gravitation. Physics has struggled with the reconciliation of general relativity with the other fundamental interactions (strong force, weak force and electromagnetic force). The reason for the difficulty is that in general relativity gravitation is the large scale geometry of space and time and the other forces originate at a quantum level. The author offered scaling relationships called cellular cosmology that appears to resolve this conflict. With this understanding the four interactions are very similar.
10. Barbee, Gene H., *Baryon and Meson Mass and Decay Time Correlations* **[**viXra:1307.0133**]** The purpose of this document is to extend the approach used to develop the proton mass model to data gathered for the hundreds of mesons and baryons observed at high energy labs. Although the work is tentative it presents calculations that match measured decay times and masses for all baryons and mesons based on the Proton model.

11. Barbee, Gene H., *THE LANGUAGE OF NATURE*, Kindle Books, ISBN 0971278202, May 31, 2014, *Unification*, viXra: 1410.15028, October, 2014. This document emphasizes the important role of probability.
12. Barbee, Gene H., *Cosmology, Thermodynamics and Time*, vixra:1407.0187, September, 2014.
13. Barbee, Gene H., *Discovery of Quantum Gravity*, viXra:1508.0120, Aug 15 2015.
14. Barbee, Gene H., *Schrodinger Fundamentals for Mesons and Baryons*, October 2017, vixra:1710.15306v1.
15. Barbee, Gene H., *The Effect of He4 Fusion on Primordial Deuterium*, viXra:1404.0465, May 2014, viXra:1404.0465v5, February 2017.
16. Barbee, Gene H., *The Flatness Problem*, viXra:1606.0263v2, January, 2017.

17. Barbee, Gene H., *Nature and Information*, http://www.vixra.org/pdf/1611.0302v1.pdf, December 2016. http://prespacetime.com/index.php/pst/issue/view/91

18. Barbee, Gene H., *On Expansion Energy*, *Dark Energy and Missing Mass*, Prespacetime Journal Vol. 5 No. 5, May 2014. viXra:1307.0089v8, February 2017. The proton mass model [Appendix 2] is an accurate source of constants for cosmology, including expansion kinetic energy. It gives the initial kinetic energy and later temperatures consistent with He4 formation. Expansion and associated energy changes were evaluated using a cellular model based on two expansion components, but the second component is not Lambda from the WMAP LCDM model. In this model, there is one orbiting proton like mass/cell and all cells are formed by identical laws. The author believes that space is created by exp(180) cells each with an initial radius of 7.04e-14 meters expanding to universe size space. The model predicts that a large radius of 4.02e25 meters characterizes the universe. The fusion kinetic energy released at the He4 primordial event is enough to expand the cells to their present radius/cell of 0.352 meters against gravitational resisting force (kinetic energy is converted to potential energy). Based on the author's current WMAP re-analysis, equality of matter and energy density occurs with 1.0*exp(180) protons/m^3.

19. Barbee, Gene H., *Dark Energy*, viXra 1511.0185v4, January, 2017. This document proposes that dark energy is the energy produced by stars. Information is presented that revises the WMAP conclusion that only 0.046 of the universe is normal protons.
20. Edwin Klingman, private communication
21. https://web.archive.org/web/20130323234553/http://www.sciops.esa.int/index.php?project=PLANCK&page=Planck_Published_Papers
22. Search "MIT22 Evolution of Function Chap 6".
23. D. E. Groom et al. (Particle Data Group). Eur. Phys. Jour. C15, (2000) (URL: http://pdg.lbl.gov).

Appendix 1 Schrodinger Fundamentals of the Proton model

The work below derives relationships that obey energy zero and probability one initial conditions. Everything will be created through separation. One result is a model of the neutron, proton and electron that provides insights into physics and cosmology.

Restrictions: P=exp(-i Et/H)*exp(i Et/H)=1 where Et/H=1. This means we deal with the unitary point where the wave function collapses on a quantum circle. The time (t) to circle radius R=HC/(2piE) is t=2 pi R/C, where E is field energy and H is Planck's constant (4.13e-21 MeV-sec). We are dealing with circles that represent spheres, not translation of particles (x,y and z) like the Dirac equation.

Components of P=1

The RHS of the Schrodinger equation will have pairs of complex conjugates exp(iEt/H)*exp(-iEt/H). Each pair of components will represent waves moving through time cycles. A sinusoidal wave is represented on a circle with a vertical imaginary axis and a real horizontal axis (exp(i theta)=cos theta +i sin theta). If there is mass and kinetic energy in the circles with balanced forces they are orbits with real vertical and horizontal axis. Looking ahead, four orbits in the proton mass model represent four fundamental interactions. The P=1 constraint and the E=0 constraint are further defined below.

Probability= 1 constraint

The probabilities contain exponential functions exp(N). The fraction 0.431=1/3+ln(3)-1.

Probability 1 Constraint

1=p1*p2/(p3*p4) but each probability=1/exp(N)

N1=13.431	N3=15.431
N2=12.431	N4=10.431
p1=1/exp(13.431)	p3=1/exp(15.431)
p2=1/exp(12.431)	p4=1/exp(10.431)

1=1/exp(13.431)*1/exp(12.431)/(1/exp(15.431)*1/exp(10.431))

These N values represent P=1, but it has four probability components.

Review of natural logarithms: Multiply probabilities by adding logarithms. Find the result with the anti-logarithm (exp(0)=1).

P	p1*p2=exp(-i Et/H)*exp(i Et/H)	
	with Et/H=1	
multiply by adding the logarithms		
ln P	ln(p1*p2)=-i+i=0	
P	exp(0)=1	

Example of exponent sign change:

exp(2)=7.39=1/exp(-2)

Evaluate the RHS of the Schrodinger solution

Energy= 0 constraint

Apply the constraint: Energy components have overall zero energy. Mass and kinetic energy are positive and field energy is negative. It will be shown that the Schrodinger equation becomes relativistic, like the Dirac equation with P=1 and energy=0. The example math below is similar to Dirac's development with Et/H=1. It allows us to separate energy terms from time terms.

Constrain Energy to zero

1=exp(itE/H)*exp(-itE/H)
take the natural log and divide boths sides by i
0=itE/H-itE/H
0=t/H*E-t/H*E
take the square root. Since Et/H=1, E=1/(t/H)
0=(E-E)*(t/H-t/H)
0=E1-E1

Example:

a=1/b	a=.5	b=2
ab-ba		0
(a-a)*(b-b)=0	(0.5-0.5)*(2-2)=0	

The example math above is expanded to give the energy =0 constraint with four components, each with matching complex conjugates.

1=exp(itE1/H)*exp(-itE1/H)*exp(itE2/H)*exp(-itE2/H)*exp(itE3/H)*exp(-itE3/H)*exp(itE4/H)*exp(-itE4/H)

The natural log of the RHS is:

0=(itE1/H)+(-itE1/H)+(itE2/H)+(-itE2/H)+(itE3/H)+(-itE3/H)+(itE4/H)+(-itE4/H)

Using the square root procedure above with each t/H=1/E, we only need the energy terms that are equal and opposite. The square root also has a (t/H-t/H)= 0 solution that contains inverted terms.

E1-E1+E2-E2+E3-E3+E4-E4=0
E1+(E3+E4-E1-E2)+E2-E3-E4=0

Evaluating E

Next evaluate E. Looking ahead, there is another meaning associated with P=1. Overall the initial condition of the universe is probability 1, meaning it does indeed exist. There are many protons, each with mass that make up the universe. Specifically:

P= 1= probability of each proton* number of particles=1/exp(N)*exp(N). The probability of each proton is 1/exp(N). The proton itself is made of improbable components like quarks. We can evaluate the probability of particles that makes up the proton if energy is itself a probability, i.e. p=e0/E=1/exp(N), where e0 is a small constant.

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(-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

Probability 1 in the LHS gives the probability of finding mass1 with kinetic energy at the collapse point on the circle defined by exp(iE1t/H)*exp(-iE1t/H)*exp(iE2t/H)*exp(-iE2t/H), etc,.

Summary

The E= 0 construct was derived using the N's from the P= 1 construct. We then took the natural log of both sides of the equation. The (LHS) natural log of P=1 equals 0. The RHS natural log converts the values to additions and subtractions, depending on their sign. We then multiplied each value by e0 which gives E=e0*exp(N) for the eight matched energy values. We rearranged the N values. We define a probability component p =e0/E where e0 is a constant and has the same units as E. This means energy is increased by a low probability, i.e. E=e0/p. Schrodinger's equation shows exp(iEt/H) with the imaginary number i. Using complex probabilities on both sides of the equation eliminates imaginary numbers. The LHS imaginary numbers are eliminated because the four complex probabilities multiply with their four conjugates (1/1*1/1=1). The RHS imaginary numbers are eliminated because the imaginary probability multiples with iE (iE*i/P). This gives E= i^2 eo*1/(-exp(N))=eo*exp(N). Energy E=e0*exp(N) can be high since it follows an exponential relationship but Et/H=1 is maintained because each time t is corresponding low.

Appendix 2 The proton and neutron models

There have been several missions (COBE, WMAP [5], HSST, and PLANCK) and earlier work [15][4] that yield a great deal of information about the universe. Measurements and models allow astronomers, astrophysicists and cosmologists [1][5] to estimate the number of neutrons in the universe.

Neutron components

The author found N values for neutron components based on the way three quark masses and their kinetic energies add to the neutron mass. The related information components total N=90 for the neutron. They are listed in Table 1 below.

	Neutron particle and kinetic energy N			Neutron field energy N
Quad 1	**15.43**	quark 1	**17.43**	strong field 1
	12.43	kinetic energy	**10.43**	gravitational field component
Quad 2	**13.43**	quark 2	**15.43**	strong field 2
	12.43	kinetic energy	**10.43**	gravitational field component
Quad 3	**13.43**	quark 3	**15.43**	strong field 3
	12.43	kinetic energy	**10.43**	gravitational field component
Quad 4	**10.41**		**-10.33**	
	-10.33		**10.41**	gravitational field component
Quad 4'	**10.33**	pre-electron	**10.33**	
	0.00		**0.00**	
	90.00	Total	**90.00**	Total
	Table 1		Table 2	

There is a remarkable relationship between the natural logarithms 90 and the natural logarithm 180. Information (N) is a measure of how improbable an event is. It is very improbable that a single proton will form with exactly the N values listed in table 1. The probability that it will contain the particle and kinetic energy N values is: P=1/exp(N)=1/exp(90). Likewise, it is highly improbable that the proton will contain fields with the N values of table 2. Again the probability P=1/exp(90). Probabilities multiply and the probability of a neutron with these particles *and* field energies is P=1/exp(90)*1/exp(90)=1/exp(180).

But we know that neutrons exist. When we know something for certain, its probability is 1.0. Mass plus kinetic energy is equal and opposite field energy. Both exist and together they make up neutrons. Nature apparently creates mass equal to exp(180) to maintain probability=1 as an initial condition.

P=1=1/exp(180)*exp(180), where the probability of one mass with kinetic energy and its field is very low but there are many neutrons and fields.

The "big bang" duplicates the zero based neutron many times. Neutrons decay to protons, electrons and neutrinos in space.

Schrodinger's wave functions for the neutron

Details of the Proton model are in Appendix 2 but the table above labelled "Neutron components" specifies quad 2 (one of the quarks) below:

The Proton model energy values (E) are the exponents in the MIT unitary evolution equation [22] with four parts:

The E=0 construct is below with E= 2.02e-5*exp(N) MeV:

		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)=5.07, E3= 2.02e-5*exp(15.43)=101.95, E4= 2.02e-5*exp(10.43)= 0.69 (all in MeV).

Energy zero construct					
	E3+E4-E1-E2				
E1 mass	ke	E2 ke	E3 field1	E4 field2	Esum
mev	mev	mev	mev	mev	
13.80	83.76	5.08	-101.95	-0.69	0.00

Overall, above: E1+(E3+E4-E1-E2)+E2-E3-E4=0=(E1-E1)+(E2-E2)+(E3-E3)+(E4-E4)

Surprisingly this means mass E1 with kinetic energy (E3+E4-E1-E2) orbiting field E3 and mass+ke also orbiting field E4 with kinetic energy E2. The energy E2+E2= 10.15 MeV is fundamental to atomic fusion and expansion.

Schrodinger equation Left Hand Side:

P= 1= (1/exp(13.43)*1/exp(12.43))/(1/exp(15.43)*1/exp(10.43))

Schrodinger equation Right Hand Side:

P (RHS)=exp(ie0*exp(N1) t/H)*exp(ieo*exp(N2) t/H)*exp(-ie0*exp(N3) t/H)*exp(-ie0*exp(N4) t/H)

N1= 13.43, N2= 12.43, N3= 15.43 and N4= 10.43 and e0= 2.02e-5 MeV.

For reference the Neutron model is shown below. The left hand side defines N values for four probabilities associated with three quark (quads 1, 2 and 3) and N values that lead to the electron (quads 4 and 5). The right hand side of the table below describes the Energy=0 construct. This model shows 129.54 for the mass of the quarks. Study of mesons and baryons [17] indicated that 129.5 MeV transitions to 9.34 MeV + kinetic energy. The quark masses agree with Particle Data Group (PDG) [23] data, one with 4.36 and two with 2.49 MeV (multiples of 0.622 MeV from Quad 5).

				1.33E-06		Mass, Kinetic Energy and Fields for Neutron=0					
	N for Neutron Energy Interactions								Expansion		Gravitational
	mass	Energy	S field	Energy	Mass	Difference I	Weak KE		KE	Strong field	Field
	ke	MeV	G field	MeV	MeV	MeV	MeV	MeV	MeV	MeV	MeV
Quad 1	15.43	101.95	17.43	753.29	101.95	652.03				-753.29	
	12.43	5.08	10.43	0.69			753.98				-0.69
Quad 2	13.43	13.80	15.43	101.95	13.80	88.84				-101.95	
	12.43	5.08	10.43	0.69							-0.69
Quad 3	13.43	13.80	15.43	101.95	13.80	88.84			10.15	-101.95	
	12.43	5.08	10.43	0.69		-30.45	10.15		10.15		-0.69
Quad 4	-10.33	0.00	-10.33	0.00				0.740	v neut ke		-0.74
	10.51	0.74	10.51	0.74							
Quad 5	10.33	0.62	10.33	0.62		0.62				-0.62	
	0.00	0.00	0.00	0.00							
	90.10	sum	90.10	sum	129.54	799.87	939.5653460	0.740	20.30	-957.81	-2.80
							NEUTRON MASS		Total m+ke	Total fields	
							939.565346		Total positi	Total negative	
									960.61	-960.61	

The neutron energy 939.5654 MeV is constant and agrees with the PDG [23] data within many significant digits.

With the right amount of mass, kinetic energy and field energy circular orbits are formed with real axis. The author looked for orbits related to the neutron and proton.

	1=exp(itE/H)*exp(-itE/H)				
	E		E		
	Mass plus		Strong Field Energy		
	Kinetic Energy		Gravitational Field Energy		
	MeV		MeV		
Down Quark	4.36		-753.29	Down Strong Field	
Kinetic E	739.470		-0.687	Grav Field component	
Up Quark	2.49		-101.95	Up Strong Field	
Kinetic E	89.993		-0.687	Grav Field component	
Up Quark	2.49		-101.95	Up Strong Field	
Kinetic E	89.993		-0.687	Grav Field component	
E-E match	0.000				
Fusion KE	10.151				
ke	0.622		-0.622	field	
data			-0.740	Grav Field component	
939.565346	939.565346	Neutron mass (MeV)		-2.80114	
t neutrino	0.740			Grav Field Total	
Expansion PE	10.151				
Expansion KE	10.151				
Fusion release					
Total M+KE	960.608	Total Field	-960.608		

The column of energy values on the left originate in a mass model of the neutron (that decays to a proton, electron and anti-electron neutrino). Mass and kinetic energy components inside the neutron add to the neutron mass 939.5653 MeV. The column of energy values on the right are the fields for the neutron. Mass of various kinds and their associated fields form quantum orbits.