Zero Dark Matter and Zero Dark Energy

Subtitle: Cellular cosmology expansion model

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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 declining Keplerian 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 or energy in the universe). There are other difficulties:

Why are baryons only 4.6% of critical density?

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

What caused the temperature anisotropy measured by WMAP and PLANCK?

Astrophysics literature says "the universe is flat"; what does that mean?

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 exactly predicts temperature anisotropy at decoupling and star formation rates.

And even more basic? Where do the laws of physics reside? If they are built into nature, is there any they can be detected besides observing nature and making observations? Actually, the cosmology model provides a huge clue. The core of the cosmology model is inside the proton and it "produces" the universe. The proton describes the cell, including the space around it. 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!

Problem 1; What is Dark Matter?

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 9.87 MeV and orbits a central gravitational field energy with radius 7.22e-14 meters. As kinetic energy decreases and potential energy increases the universe expands (inertial force is related to pressure acting outward on the surface). Important cell energy values originate in a Schrodinger based mass model of the neutron (that decays to a proton) [Appendix 1 and 2].

Cellular Cosmology

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 both surfaces. Velocity V is inside the cell and the velocity it has relative to other cells. In cellular cosmology an operative word is “equivalent” meaning there is a mathematical relationship.

The neutron mass model (Appendix 2) is the source of gravitational field energy -2.73 MeV. The radius of a quantum circle with this field energy is:

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

Above, 1.92e-13 MeV-meters is hC, where h is Planck’s reduced constant (6.58e-22 MeV-sec). The quantum radius 7.22e-14 meters and kinetic energy (10.15→9.87 MeV/proton) from the Proton model are used in the calculations below.

Calculating the gravitational constant G

> Note: The cellular expansion model (The subject of Problem 3) is referred to in the following calculations. The reader may have to move back and forth in this document to understand the results. Also, the work below slightly modifies earlier work by the author regarding gravity [9][13][17].

We will calculate the gravitational constant for the current time 13.8 billion years because we measure it at the current time. The expansion model was used to determine the cell velocity V and radius r for the inertial force (the basis of gravity) f=mV^2/r*(1/exp(90)). The mass is 1.673e-27 Kg (the mass of a proton). Velocity V and cell radius r at 13.8 billion years (4.3e17 seconds) are in the rightmost column. Velocity (from ke) was reduced by expansion to 49.6 meters/sec. The expansion model can determine the beginning gravitational constant including the effect of gamma (g). The gravitational constant is now 6.6743e-11 [23].

GRAVITY			.059 seconds	7.3e17 seconds
			proton	proton
Proton Mass (mev)			938.2721	938.272
Proton Mass M (kg)			1.673E-27	1.673E-27
Field Energy E (mev)			2.732	2.732
Kinetic Energy ke (mev)			10.112	1.284E-11
Gamma (g)=M/(M+ke)			0.9893	1.0000
Velocity Ratio v/C=(1-g^2)^0.5			0.1456	0.0000
R (meters) =(HC/(2pi)/(E*E)^		E=2.732	7.224E-14	5.536E-02
Inertial Force (F)=(M/g*V^2/R)*1/EXP(90)			3.656E-38	6.094E-62
HC/(2pi)=1.97e-13 mev-m				(V=49.6 m/sec)
Calculation of gravitational constant G				
G=F*(M/g)^2/R^2=NT m^2/kg^2			6.6741E-11	6.6745E-11
Published by Partical Data Group (PDG)			6.6741E-11	6.6743E-11

Understanding that the gravitational constant G can be calculated with 10.11 MeV/proton of kinetic energy in a cell of radius 7.22e-14 meters allows further development of cellular cosmology gravitational relationships. The value 9.87 MeV used below is projected back to 0.059 seconds from reduced MeV and increased cell radius at 7.13e17 seconds, where G calculated and G measured match (6.6743e-11). G is almost constant except for small effects related to gamma and expansion rates that are included in the cellular cosmology expansion model and both 10.11 and 9.87 MeV produce the same cosmology.

G remains constant during expansion		
ke0=9.87 MeV/neutron		
r0*V^2/m=r*v^2/m		
(mv/mV)^2= (r/r0)		
ke/ke0= (r/r0)		
r=r0*9.87/ke		

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*9.87/ke=7.22e-14*9.87/ke		
R=7.22e-14*9.87/ke*exp(90)*(Mgalaxy/Muniverse)		
R=r0*exp(90)*exp(Nm)/exp(180)*9.87/ke		

Nm=mass of central body/1.67e-27 kg.

The new relationship R=r0*9.87/ke*exp(90)*Mgalaxy/Muniverse, where r0=7.22e-14 is another way of writing R=GM/V^2 but it provides an understanding of the cosmology involved. The quantum scale r=r0*9.87/ke is the cell radius as the universe expands. Maintaining G equivalence between the large scale and cellular scale requires multiplying small scale values by exp(90). This radius is reduced to the orbital radius of mass in a galaxy when multiplied by Mgalaxy/Muniverse. Gravitational equivalence also requires the orbital radii surface area to consist of exp(90) cell surface areas. Orbital radii for stars in a galaxy are on the equivalent of a large surface area within an even larger expanding surface area (the universe). But the key to understanding flat velocity curves is: The orbital radii surface area consists of many small cell surfaces.

Example for a galaxy of central mass M=2e41 Kg and V=2.29e5 meters/sec (our sun's velocity associated with 2.74e-4 kinetic energy/proton). The mass of the universe is 1.67e-27*exp(180)= 2.49e51 Kg.

R=(7.22e-14*9.87/2.74e-4)*exp(90)*(2e41/2.49e51)= 2.55e20 meters

This gives the orbital radius of a sphere that contains the galaxy mass. The surface areas for this example are:

Number of cells in star= (1.6e31/1.675e-27)= 9.58e57

r=7.22e-14*9.87/2.74e-4=2.6e-9 meters

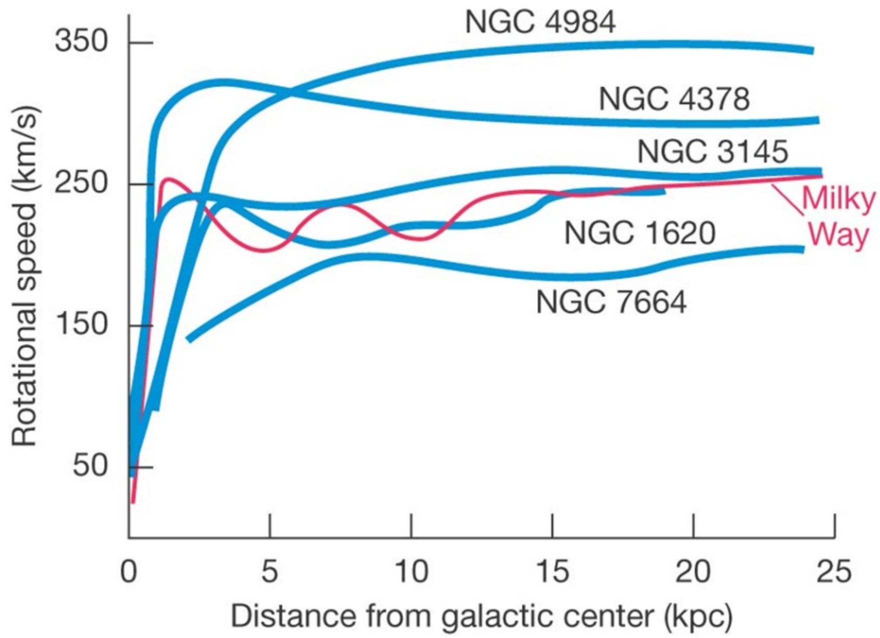
A=4pi*(2.55e20)^2= 4pi*(2.6e-9)^2*9.58e57= 8.15e41 meters^2

Why not just use R=Gm/V^2? Because it doesn't allow us to understand the physics and cosmology involved. From a gravitational viewpoint, the orbiting mass must be represented by the area of a sphere (or the equivalent area of many small spheres). If not it violates the "no preferred position" principle. Each cell is a balanced force radius that does not have to be the observed distance.

r radius cell (M)	r0=7.22e-14*9.872/ke	2.55E-09
kinetic energy (MeV)	ke=9.87*(time/time')^0.5	2.798E-04
gamma	g=938.27/(938.27+ke)	1.0000E+00
Velocity (M/sec)	V=(1-(g)^2)^0.5*C or V=(2*ke/1.67e-27*1.6e-13)^.	2.32E+05
fgrav=mV^2/(r*exp(90)) (	fgrav=(1.673E-27*V^2/(r0*EXP(90))	2.8826E-47
Grav const (Nt M^2/Kg^2)	G=fgrav*r^2/(m/g)^2	6.690E-11
Nt	f grav=6.67e-11*1.67e-27^2/(2.55e-9)^2	2.88E-47

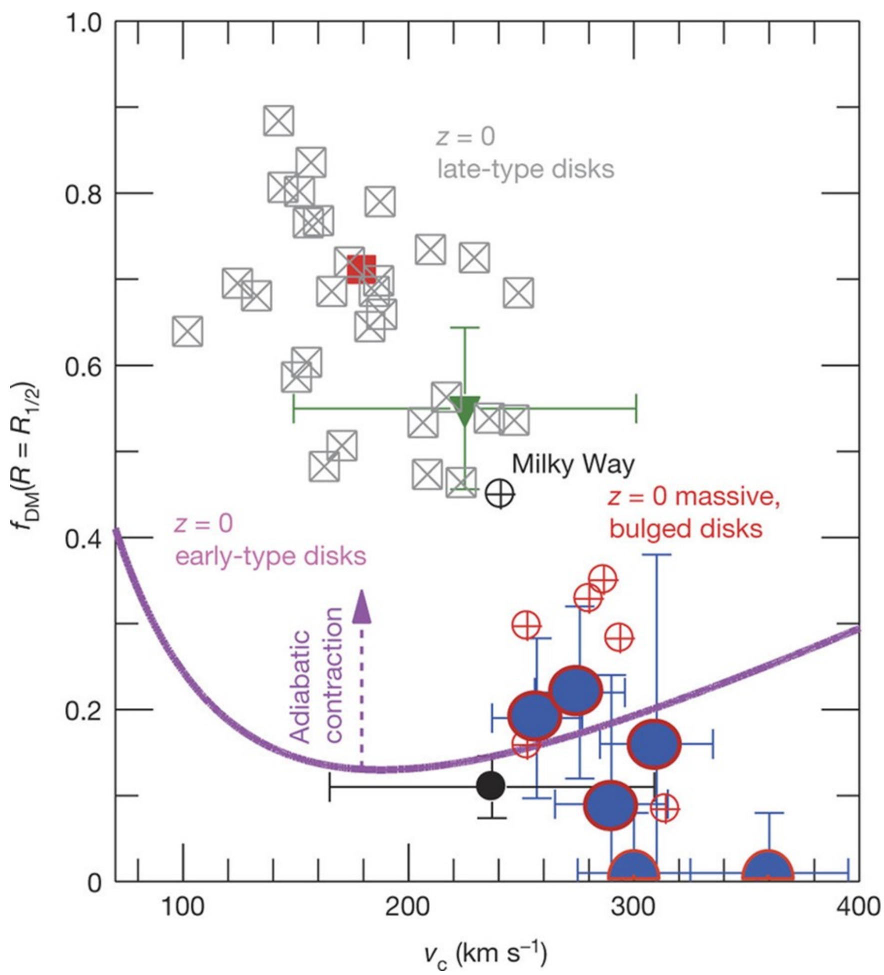
Flat Velocity Curves for Galaxies

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



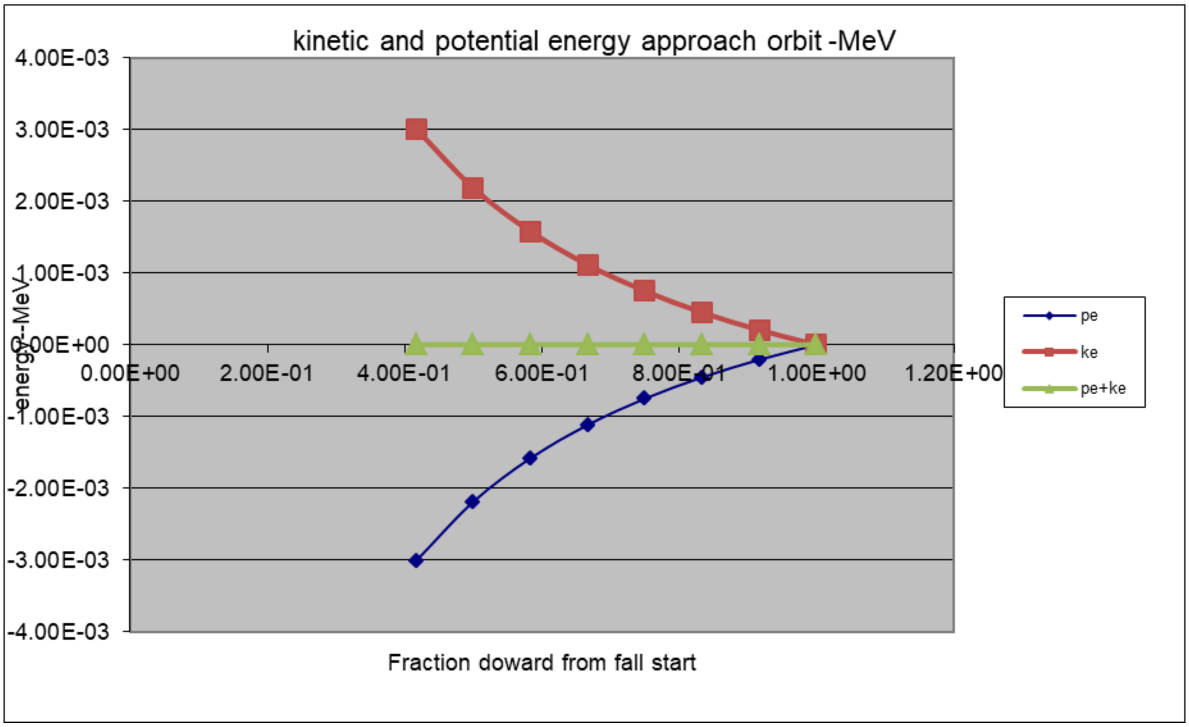
NGC 4984
NGC 4378
NGC 3145
NGC 1620
NGC 7664
Milky Way
Rotational speed (km/s)
Distance from galactic center (kpc)

(b)

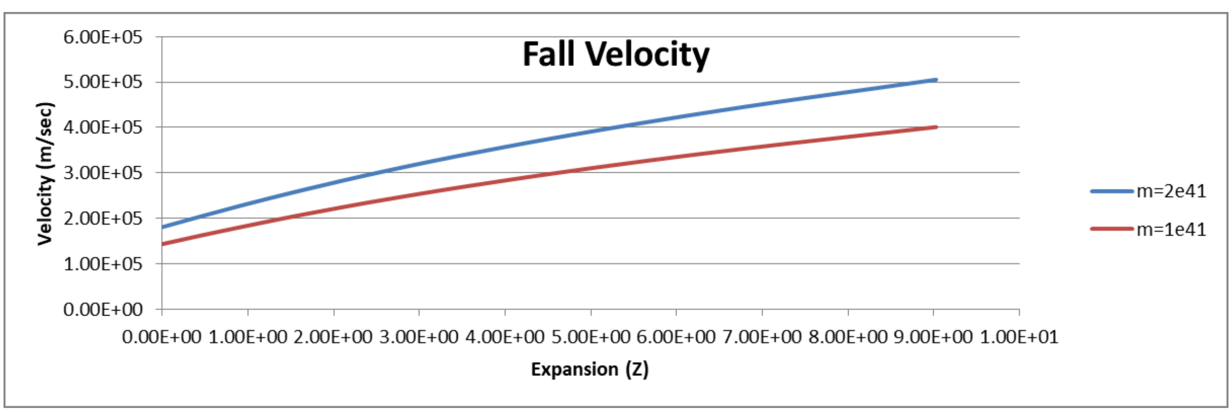


z = 0
late-type disks
Milky Way
z = 0 massive,
bulged disks
z = 0
early-type disks
Adiabatic
contraction
$f_{DM}(R = R_{1/2})$
v_c (km s^{-1})

The kinetic energy and velocity of stars in a galaxy originate from conversion of potential energy to kinetic energy as their mass falls from its expansion determined radius. The fall is initiated by mass accumulation. This is a function of central mass but varies with expansion factor Z=Rf/R-1. Early stars have large fall velocities compared to later one. This is reflected in the above data. The author's expansion model was used to calculate the fall velocity and orbital radius established after the fall as a function of galaxy mass and expansion Z. The fall from the expansion determined radius is stopped when gravitational and inertial forces are balanced. Changes in kinetic and potential are shown below (not for Z=4).



Fall velocity is calculated in the expansion model (Problem 3) with the procedure in appendix 6. Flat velocity profiles measured are related to fall velocity but some energy may have been lost due to interactions of falling mass [12].



Calculating Flat Velocity Curves

The example below is for a galaxy with mass 2e41 Kg. Measurements of observed radius and observed luminosity are available (Wiki but astronomer Sandra Faber (UCSC) and others have 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 and calculate the "should be" orbital velocity with the equation V= (GM/R)^.5 M/sec. Using observed R predicts incorrect low velocities toward the edge. Unfortunately many have suggested a halo of dark matter to explain the measured flat velocity curve.

The author used cellular cosmology and the equations above to calculate the velocity curve.

	I®=I0*exp(-alpha r)							
	alpha=1-5 kpsec							
	m=2pir0^2							
	2	alpha						
0	6.46E-01	1.19E+00	1.78E+00	2.37E+00	2.97E+00	radians		
0	5	10	15	20	25	Radius (kiloparsec)		
	1.54E+20	3.08E+20	4.62E+20	6.16E+20	7.7E+20	Radius Meters		
	1.19023E+39	9.77002E+37	8.02E+36	6.58299E+35	5.40365E+34	Luminosity=I0*exp(-2/r)		
	1.22208E-20	1.653E-21	4.93E-22	2.08017E-22	1.06509E-22			
	1.87E+41	1.53E+40	1.26E+39	1.03E+38	8.49E+36	Kg within each luminosity band		
	1.87E+41	2.02E+41	2.04E+41	2.04E+41	2.04E+41	Central mass for each radius		
	2.85E+05	2.09E+05	1.71E+05	1.49E+05	1.33E+05	V=(G M/R)^.5		
					2.04E+41			
	2.38E+20	2.58E+20	2.59E+20	2.60E+20	2.60E+20			
			R=7.22e-14*9.87/2.746e-4*exp(90)*(central mass/2.4e51)					
	7.74	8.37	8.43	8.43	8.43	R (kparsec)		
0	2.29E+05	2.29E+05	2.29E+05	2.29E+05	2.29E+05	V=(G M/R)^.5 m/sec		

The equation in blue calculates cell radius, projects the radius to a large sphere then multiplies the radius by the mass ratio to determine orbital radius R (R=7.22e-14*9.87/ke*exp(90)*(Mg/Mu)=2.4e20 to 2.6e20 meters because the central mass increases slightly with radius). The flat calculated velocity is 2.29e5 meters/sec. In cellular cosmology velocity of the cell surface is equivalent to velocity on the surface of the galaxy's orbital radius sphere. Cells are defined this way. The orbital radius surface is equivalent to Nstar cell surfaces. The chart below shows constant G between large and small. The cells are moving at 2.29e5 M/sec and forces are balanced *inside* the cell. The observed radius is different than the equivalent gravitational radius.

		Scaling a cell to universe sized space						
R' is the universe size geodesic			R'V^2/M	G=G	r'v^2/m	r' is the cell size geodesic		
			3.23E-37		2.58E-47		1.6E-13	
			m=1.67e-27 kg					
		M=m*exp(	1.99E+41		1.67E-27	kg		
R'=r*('v/V)^2*(M/m)*1/exp(90)		R	2.618E+20		2.69E-09	r'		meters
		V (M/sec)	2.25E+05		2.25E+05	v (M/sec)		
1.00E+00		G	6.67E-11		6.67E-11	nt m^2/kg^2		

Observed distance

The orbital radii surface is a composite of small cells (2.64e-9 M) and cells in space between the stars. The open space is a thin gas with cells on the order of 0.16 M. The chart below explains observed radius on the basis of these cells.

	Radius (M)	
Volume in Radius of universe when galaxy forme	1.80E+25	2.4429E+76
dens cells=exp(180)/(4/3*pi()*1.8e25^4)		6.10E+01
Volume in observed radius =7.7e20	7.70E+20	1.91232E+63
cells in volume of radius=7.7e20= dens*V		1.17E+65
radius of volume measured in cells		3.03057E+21
radius of gas cells around stars	1.58E-01	3.15E-01
Observed radius calculated from cell diameter		9.55E+20

You are observing across a galaxy that is dominated by the large number of cells of large cells. The distance you see is the number of cells*diameter of each cell from the center of the galaxy to the edge. The gravitational radius/cell is inside each cell and cannot be observed.

Orbital Calculations in General

One might suspect that the above equation would not work for orbits for less massive bodies, but in fact, it reduces to the Newtonian equation R=GM/V^2 and could have been used to calculate the correct velocity curve for the example above. But you have to know velocity V. Those that believe there is dark matter in the galaxy are using calculated V, not the measured V. N central below is the natural log of the number of cells.

Orbit	10/ke	Mass Central K	N central	Vel m/sec	ke (mev)	cell r (m)	Orbital R (m)
Sat/earth	3.02E+07	5.98E+24	118.70	7.90E+03	3.32E-07	2.14E-06	6.28E+06
earth/sun	1.97E+06	2.00E+30	131.42	3.09E+04	5.07E-06	1.40E-07	1.37E+11
sun/galaxy	3.65E+04	2.00E+41	156.75	2.291E+05	2.74E-04	2.60E-09	2.55E+20

Problem Resolution; What is Dark Matter?

When we look at a galaxy we observe real distances and real velocities. They have flat velocity curves. There are two main types of cells in the galaxy. The thin gas has cell radii of 0.16 meters but the cells associated with the stars have a gravitational radius of 2.64e-9 meters determined by the kinetic energy/proton associated with orbital velocity. For the example above, the equivalent gravitational radius is R=2.64e-9*exp(90)*(Mg/Mu)=2.55e20 M. The area associated with this radius is equal to the area on the surface of the cells times the number of cells in the star. For this example, the number of cells is determined by the star mass (N=1.6e31/1.67e-27). Forces within the cell are balanced, the velocity on the surface of the cell is equal to the observed flat velocity curve and the cells in the stars are moving at the observed velocity. Cells are fundamental to universe and work that way. Those that calculate declining velocity curves are using observed radius rather than the equivalent gravitational radius. Dark matter is the inferred mass required to correct the calculation error. It doesn't exist.

Problem 2; What is the Cosmic Web?

Observations of light bending show streaks between galaxies. This is also attributed to dark matter. In cellular cosmology, a proton is on the surface of each cell. As mass accumulation occurs cells change their size allowing the protons to form stars, planets, etc. The cell radius in the space between large objects is shown in the above table ranging from 2e-9 to 2e-6. For planets the cells are about 5e-11 meters in size since the electrons repel each other and limit further contraction. Galaxies of central mass of 2e41 Kg have gravitational cell radii of 2.64e-9 M. But the radius of average cells in the thin gas is on the order of 0.2 meters. The cells throughout the planets, stars and their orbits are very small and can't enlarge with time. One can simulate this situation by placing a piece of cloth on a surface and gathering (pinching together) the cloth in spots. Ridges are formed between the pinch points. Space is formed into ridges by differential cell sizes and curved space deflects light. This is being imaged as the cosmic web. If we were not using cellular cosmology, we would assume that stars are formed by protons moving through space. But space is part of each proton and the cell moves through space.

Cosmic Web Resolution

Some things move through space like light and sub-atomic particles. But the proton cells are space. The space they occupy expands with time. However, when mass accumulation occurs the associated space for each proton stops expanding and shrinks as planets or stars are formed. The cosmic web is the image of deformed space. It is often incorrectly assumed that mass moves through space rather than being part of space.

Problem 3; Where is all of the 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. Furthermore 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 with the following capabilities was used to determine cosmological parameters.

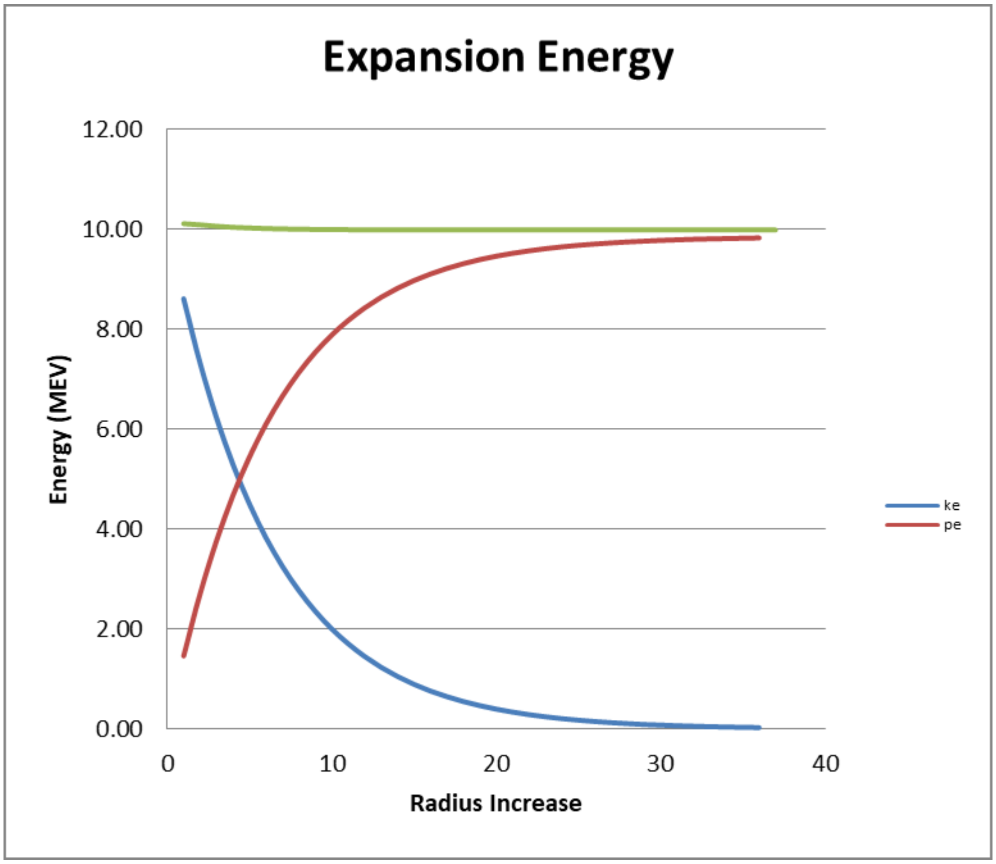
1. Early history of helium formation including Deuterium, Helium3 and Lithium7 residuals.

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. The model places exp(180) spherical cells into a large sphere. The initial radius of each small sphere is, as explained above, r0=7.22e-14 meters. This means that the initial radius is 7.22e-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 below:

G remains constant during expansion		
ke0=9.87 MeV/neutron		
r0*V^2/m =r*v^2/m		
(mv/m V)^2= (r/r0)		
ke/ke0= (r/r0)		
r=r0*9.87/ke		

The proton mass model has initial kinetic energy= 9.87 MeV/neutron associated with the measured value G=6.674e-11 Nt M^2/Kg^2. Expansion converts kinetic energy to potential energy (9.87 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 ke'=ke*(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. Cell radius increases as kinetic energy decreases r'=r*ke/ke'. Combining the relationships above, r'=r*(time'/time)^(2/3). 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).

Note: See Appendix 6 for derivation of force and pressure relationships for cells. Force f (inertial force on the cell surface) can also be converted to pressure by the equation p=f/(4pi*r^2), where r is the cell radius. 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 on one cell

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=7.22e-14 M. The gravitational field energy E=2.732 MeV determines r0. R0=7.22e-14*exp(60)=8.25e12 meters. The Proton model provides the initial kinetic energy=10.15 and slightly later value 9.87 MeV/proton.

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
7.22E-14	Initial radius
1.68E-27	Mass per cell (one neutron)
9.16E-27	Density of cell kg/m^3 (Omega
1.83E-01	Volume=density/mass
0.352	r=((3/4)*volume/pi())^(1/3)
	For exp(60) cells
8.25E+12	Initial radius
4.0211E+25	Radius 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. This includes both expansion components.

Facts from Astrophysics: 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.

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). Fundamental time 7.22e-14*2*pi/3e8=1.5e-21 seconds (nature counts forward as this time repeats). Logarithms will be used to decrease the number of computational iterations. Natural log(4.33e17/1/5e-21)=88.6 will be the current time. Natural log 45 is a good starting point (exp(45)*1.5e-21=0.059 sec). Time in seconds for the x axis will be exp(45+increment)*1.5e-21 seconds. The increment is the number of calculation columns from 45 to 88.6.

Next we will calculate the cell radius (r) as a function of time. The force f on the cell surface is calculated two ways and is equal: f=(m/g)*V^2/r*(1/exp(90))= G(m/g)^2/r^2 where m=1.673e-27 Kg. Gamma g=938.27/(938.27+ke) and velocity=C*(1-gamma^2)^.5 in meters/sec. Each cell is an expanding orbit with ke'=ke*(time/time')^0.5 and r=r0*9.87/ke (primed values mean the next value in an incremental calculation over time) Velocity is calculated from V=C*(1-g^2)^0.5 or V=((2*ke/m)/1.6e-13)^0.5 when g becomes very close to 1.0. G was slightly different at the beginning but calculations near the end of expansion G= 6.6743e-11 Nt M^2/Kg^2.

Initial temperature=9.87/(1.5B)=7.6e10 K, where B=Boltzmann's constant 8.6e-11 Mev/K and T'=T*(R/R'). The calculations below are the first few steps. Lower case letters will be used to represent cellular values and upper case letters will be used for the large sphere (the universe). The equations are shown. If you are following this with an Excel® spreadsheet, copy these equations to 809 seconds. The information in green exists in each proton. The proton provides further cosmology properties as subsequent events occur.

> Note: The reader may have to move back and forth in the document. For example, the finding that this is the proton is discussed further in the section entitled "Conclusions".

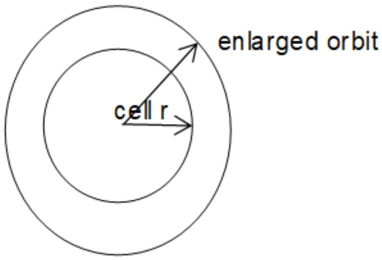
Potential energy + kinetic energy (MeV)	20.30	20.30	20.30	20.31
Potential energy (MeV)=.5FdR/1.6e-13	10.43	12.16	13.59	14.77
r0=7.22e-14*9.872/ke	7.22E-14	8.76E-14	1.06E-13	1.29E-13
ke=9.87*(time/time')^0.5	9.872	8.14E+00	6.71E+00	5.54E+00
g=938.27/(938.27+ke)	**9.8959E-01**	**9.9140E-01**	**9.9289E-01**	**9.9413E-01**
V=(1-(g)^2)^0.5*C	**4.3148E+07**	**3.9238E+07**	**3.5674E+07**	**3.2427E+07**
fgrav=(1.673E-27*V^2/(r0*EXP(90))	3.5702E-38	2.4305E-38	1.6543E-38	1.1259E-38
time (seconds)	5.29E-02	7.77E-02	1.14E-01	1.68E-01
G=fgrav*r^2/(m/g)^2	6.503E-11	6.533E-11	6.558E-11	6.578E-11

Facts from Appendix 5:

Increased radius dR=de/fcell*exp(60) where de is the energy available for expansion/proton. Force resisting expansion is fcell = f grav*exp(90). Pressure inside the cell p=fcell/(4pi*r^2). Temperature (T)= p/(nB) where p is pressure, n is the number density of neutrons and B is Boltzmann constant.

The He4 transition

The calculations for the cellular base with decreasing kinetic energy continue across the time axis until the period below is reached. The calculation column for the He4 transition at 1190 seconds is shown in yellow below. When the temperature decreases to slightly lower than 8e8 K, He4 fuses (due to free neutrons and reduced Deuterium photodisintegration [15]). The He4 fusion energy causes an enlarged orbit without changing the cellular base (the column of calculations below at time 1749 seconds). This is similar to a satellite being launched with kinetic energy increasing the radius.



The equal force increased radius orbit is calculated by increasing potential energy and decreasing kinetic energy.

	Potential Energy (MeV)	0.017
	Kinetic Energy (MeV)	0.017
	Venlarged orbit=(fgrav*R*EXP(30)/1.67E-27	1.28E+06
	Fenlarg=1.67e-27*V^2/(R/exp(60)*(1/exp(90	2.73E-44

Temp=p/(n*B)/1.6e-13 (K)		3.37E+10
Baryon/Photon ratio for T=5.27e10 K and R=5.77e15 M		4.0533E-10
R=R+dR=1.02e15+dE/(2.3e-42*exp(90)*exp(60)*1.6e-13=4.85e15 (M		9.30E+15
	MeV addition from Fusion	1.3
p/n=fcell/(4*PI()*rcell^2)/(exp(180)/(4/3*pi*R^3))		4.64E-13
F enlarged=1.67e-27*V^2/R		2.80E-44
	R=rcell*exp(60) (M)	1.02E+15
Temperature (K)	T=ke/(1.5*8.6e-11)	6.19E+08
r radius cell (M)	r0=7.22e-14*9.872/ke	8.93E-12
kinetic energy (MeV)	ke=9.87*(time/time')^0.5	7.98E-02
gamma	**g=938.27/(938.27+ke)**	**9.9991E-01**
Velocity (M/sec)	**V=(1-(g)^2)^0.5*C or V=(2*ke/1.67e-27*1.6e-13)^.**	**3.9096E+06**
fgrav=mV^2/(r*exp(90)) (	fgrav=(1.673E-27*V^2/(r0*EXP(90))	2.3460E-42
	time (seconds)	809.10
Grav const (Nt M^2/Kg^2)	G=fgrav*r^2/(m/g)^2	6.67E-11

The radius in red is cell radius plus the increase in energy related to fusion R= 8.93e-12*exp(60)+ 1.3*exp(60)/(2.79e-44*exp(90))*1.6e-13=9.32e15 M. (Each proton released 7.07 MeV binding energy= 0.23*7.07= 1.62 MeV available).

Pressure= fcell/(4pi*r^2)=2.05e17 Nt/M^2 and n=exp(180)/(4/3*pi*R^3). At this point in expansion, we know P and n and can calculate T=P/(nB). T= 2.05e17/(4.42e29*8.6e-11)= 6.32e10 K.

The Baryon/Photon ratio is calculated with T=3.37e10 K and R=9.32e15 M.

Baryon/photon=(EXP(180)/(4/3*PI()*9.32e15^3))/(8*PI()/(4.31e-21*3e8)^3*(1.5*8.62e-11*3.37e10e10)^3)=4.02e-10

The WMAP criterion (4.4e-10) is satisfied. We will return to consequences of this calculation but focus on the expansion model. After He4 fusion the radius R is a function of kinetic energy.

After the He4 transition

Refer to the columns of calculation (colored blue above) immediately following the He4 transition. The He4 is an explosion (0.25 of all matter releases fusion energy) and the initial result is an increase in radius but conditions stabilize at 1190 seconds. The value T=p/nB/1.6e-13 is constant before, during and after the transition but p/n is decreased because the radius has increased.

The equation is simply R=7.22e-14*9.87/(ke/6)*exp(60). The value 6 reduces the kinetic because this applies to the outer orbit in the diagram above. (Recall that potential energy increased and kinetic energy increased). The temperature is calculated from T=(p/nB). The radius increases from this point with R'=7.91e15*(time'/time)^(2/3). Temperature reduces directly with radius; i.e. T'=1.71e10*(R/R').

Time (sec)		1189.59	1749.00	2571.48	3780.75
n=1/(4/3*PI()*r^3)					
Temp=p/(n*B)/1.6e-13 (K)		1.71E+10	1.32E+10	1.02E+10	7.92E+09
Baryon/Photon ratio for T=5.27e10 K and R=5.77e15 M					
R=7.22e-14*9.87/(ke/6)*EXP(60)		7.91E+15	1.02E+16	1.32E+16	1.71E+16
p/n=fcell/(4*PI()*rcell^2)/(exp(180)/(4/3*pi*R^3))		2.36E-13	1.82E-13	1.41E-13	1.09E-13
F enlarged=1.67e-27*V^2/R		3.88E-44	2.32E-44	1.39E-44	8.29E-45
	R=rcell*exp(60) (M)	1.32E+15	1.71E+15	2.21E+15	2.85E+15
	time (seconds)				
Temperature (K)	T=ke/(1.5*8.6e-11)	4.78E+08	3.69E+08	2.86E+08	2.21E+08
r radius cell (M)	r0=7.22e-14*9.872/ke	1.15E-11	1.49E-11	1.93E-11	2.50E-11
kinetic energy (MeV)	ke=9.87*(time/time')^0.5	0.062	0.048	0.037	0.029
gamma	g=938.27/(938.27+ke)	9.9993E-01	9.9995E-01	9.9996E-01	9.9997E-01
Velocity (M/sec)	V=(1-(g)^2)^0.5*C	3.4383E+06	3.0238E+06	2.6592E+06	2.3386E+06
fgrav=mV^2/(r*exp(90)) (N	fgrav=(1.673E-27*V^2/(r0*EXP(90))	1.4033E-42	8.3890E-43	5.0179E-43	3.0014E-43
Grav const (Nt M^2/Kg^2)	G=fgrav*r^2/(m/g)^2	6.671E-11	6.691E-11	6.691E-11	6.691E-11

At 4.3e17 seconds, the universe reaches the radius 3.53e25 meters and temperature 2.55 K. This radius will increase to 4.02e25 meters and the temperature will increase to 2.73 K after the second component of expansion is added. This is the subject of Problem 4 below.

Consequences of Baryon/Photon ratio

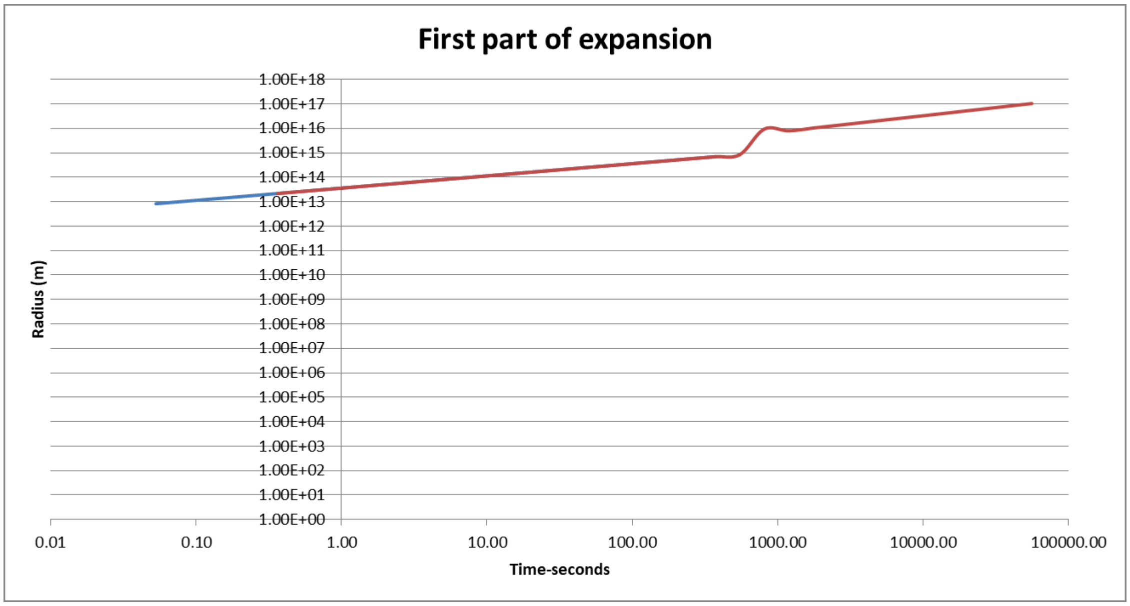
The calculation above at the He4 transition was 4.0e-10. This meets the astrophysical requirement with exp(180) neutrons. This means there is no missing matter. The residuals are formed in proportion to the He4 fraction and are relative fixed (see the discussion on the point in Peebles [1]). The values 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	

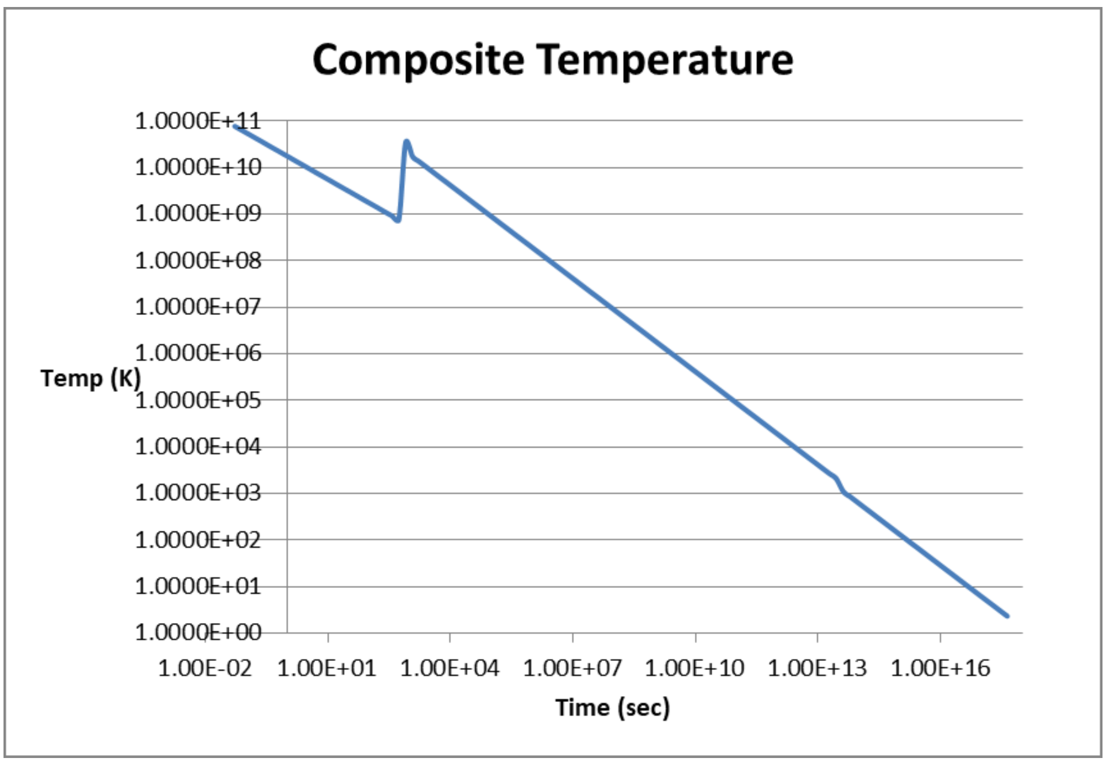
SAHA value=LN(4/3*((1*0.8)/((4.3E+67)/(0.5*EXP(180))))^(3/2))+LN((0.697^2)*(8.16e8/10000000000)^(3/2))-(2.58/(8.16e8/10000000000))

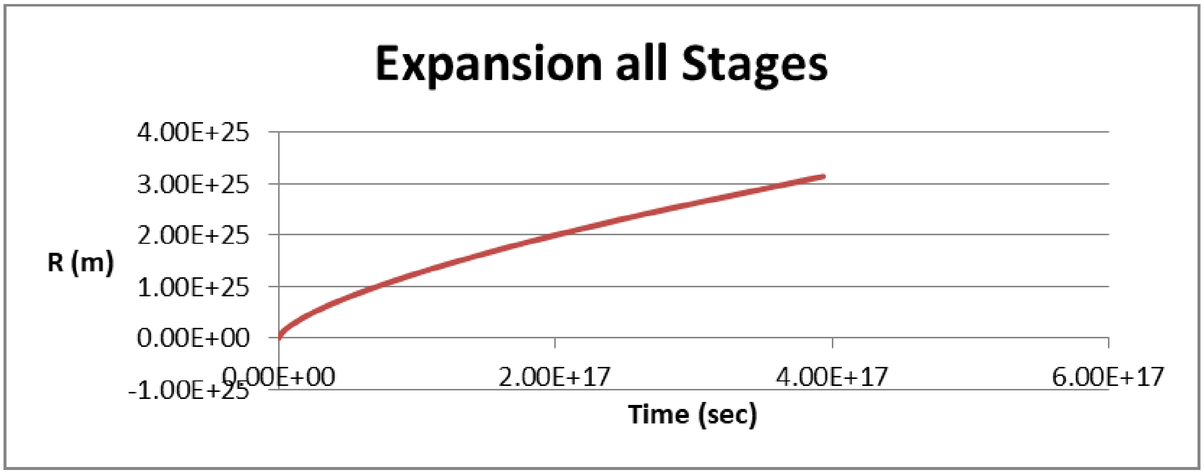
Summary of expansion and temperature history

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 9.87 MeV/proton comes from the proton mass model [1] [10](Appendix 2). Secondly He4 fusion releases 1.3 MeV/proton when He4 forms (called primordial nucleosynthesis in the literature). Finally, stars light up and release radiation energy. The arrows labelled reduced show the change in the energy value/proton due to expansion. The kinetic energy can be calculated from the Boltzmann relationship; ke=1.5*B*T, where B is 8.62e-11 MeV/K.

	Summary of energy releases during expansion					
	Initial Energy	He4 fusion	r=r*t^(2/3)	Star energy start	Expanded now (MeV/proton)	
R meters	8.25E+12	4.80E+15		1.80E+24	3.53E+25	no stars
		reduced		reduced		
MeV/proton	9.87	1.70E-02			1.77E-11	
MeV/proton		1.3	(increases temperature)			
MeV/proton				star addition	3.63E-11	
R delta (meters)					4.94E+24	
R now					4.02E+25	stars

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 (1.7 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.

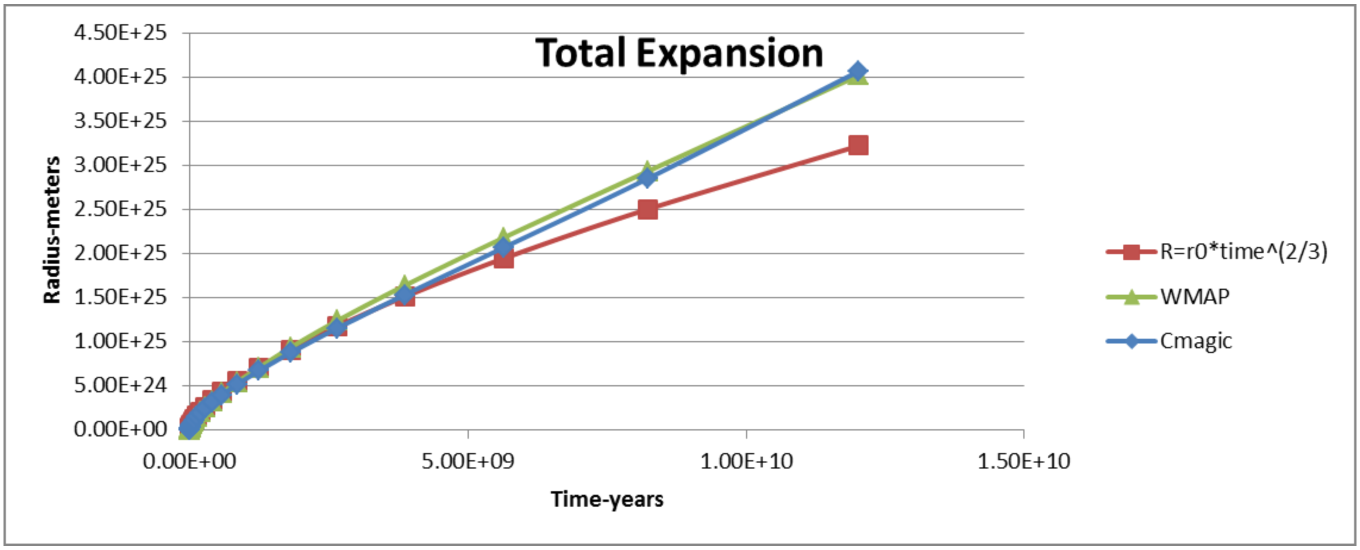
Problem 4; What is Dark Energy?

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

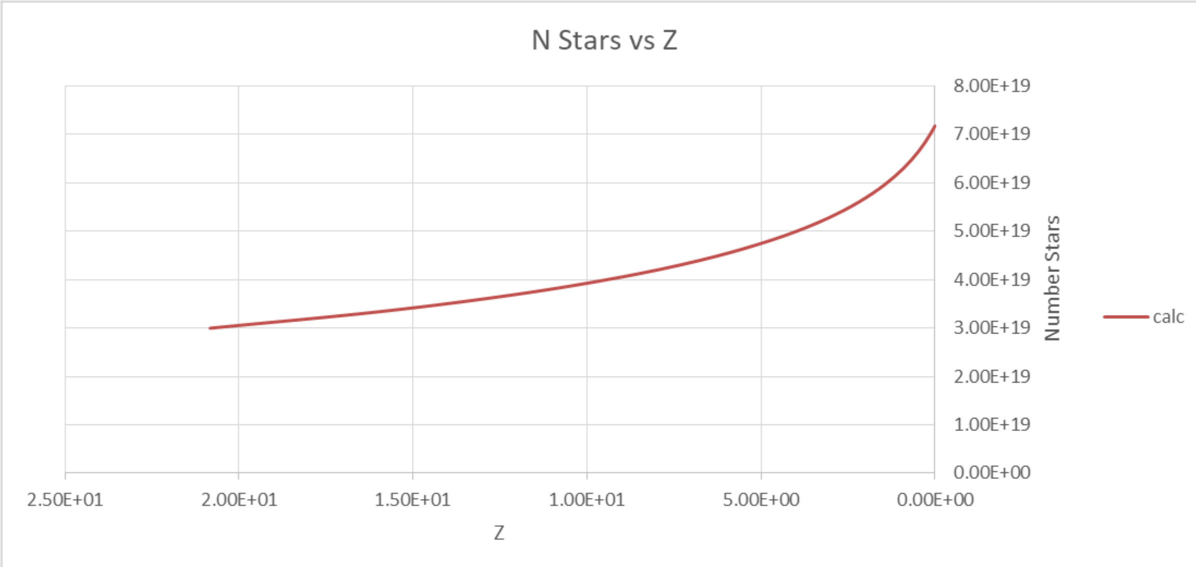
Expansion and cosmology parameters are currently based on differential radiometer projects known as COBE, WMAP [3][7][5], and Planck. They are compared to supernova data from Cmagic [5] that suggest an accelerating universe. Expansion follows R=R'(time'/time)^(2/3) throughout almost all of expansion. 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	

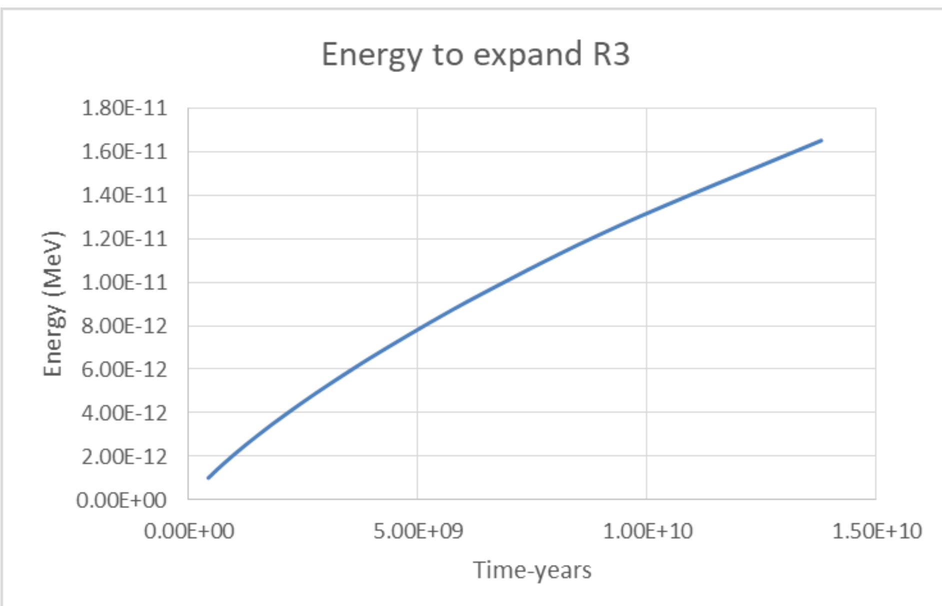
In cellular cosmology all added energy counts and the stars add a significant amount of energy. Delta E is the difference between sky temperature with stars (2.73 K) and the temperature without stars (2.45 K). These values apply to the end of expansion at 4.02e25 M. Delta E= (2.73-2.45)/(1.5*8.6e-11)= 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).

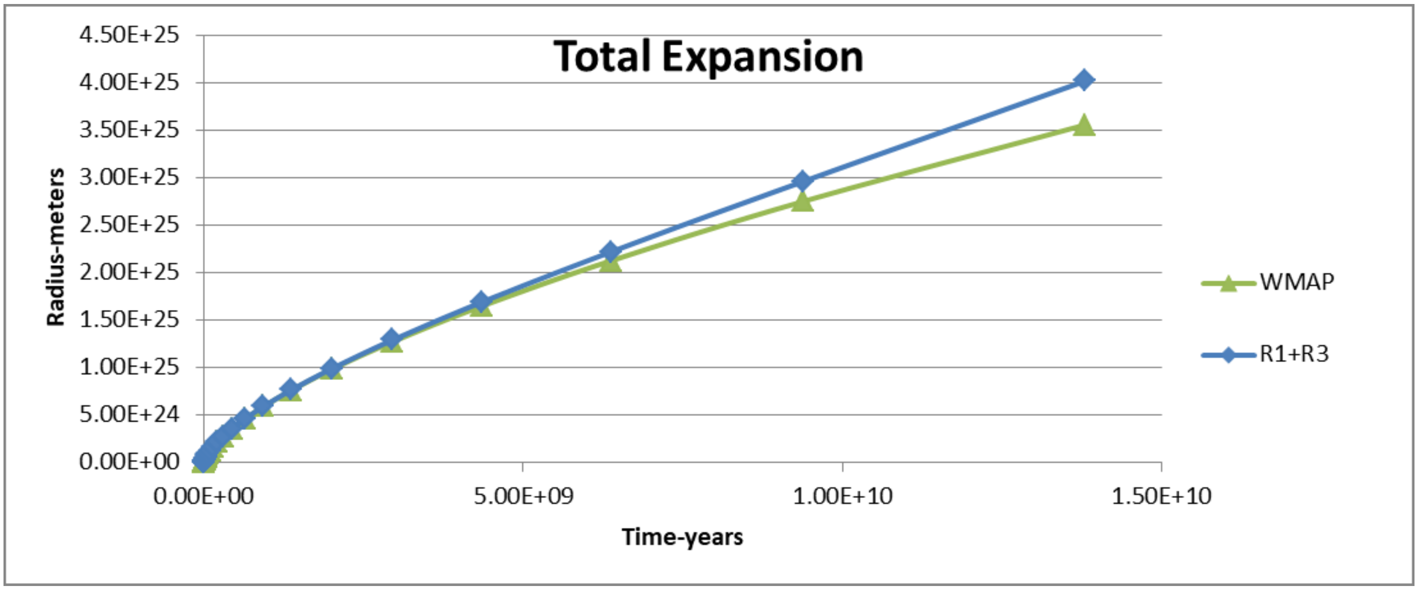
The expansion curve for star energy

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=4.13e25 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.



Hubble Check

We subtract the last two radius column and divide by the last two time constants. 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 5; Baryon fraction at equality

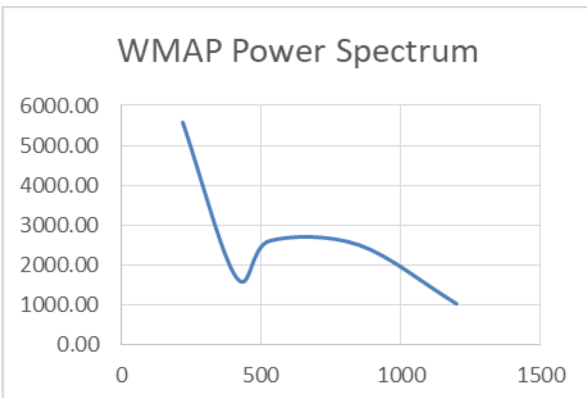
Another limitation is related to the radius and temperature where equality of radiation and mass occurs. The thought was that baryons had to be limited so that equality occurred early enough to allow development of the measured primary hot spot at decoupling. After equality waves occur. Their speed in 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). 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?

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+1)/2pi*cl					
L	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:



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

3.05E+22	3.94E+22
1029.61	15.89
decoupling	
2.52E+03	1.95E+03
4.58E+17	2.12E+17
2.09E-17	9.68E-18
2.66E-19	**9.52E-20**
1.27E-02	9.84E-03
1.30E+21	1.84E+21
0.0136	0.0148

Calculation of dt

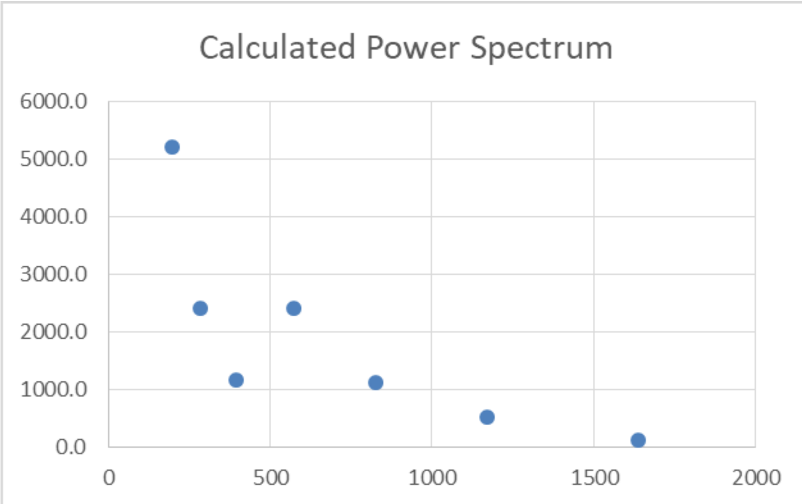
The temperature peaks called dt are in micro degrees (2.730074 K). The thermal peaks are a function of density. There is a misunderstanding that progression of the wave causes densification. In fact the density of the universe (decoupling and slightly sooner) is recorded in the wave. The waves at that point become visible (the plasma clears). That period is recorded by the 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 from first principles!*

wave progres	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	wave R	wave R	L	L*(L+1)/2pi*cl	La	L*(L+1)/2pi	cl	delta temp K
dt (K)	progression	with harmonics	5.1e23/prog	micro K^2	0.735		cl=(dt*1e6)^2/((L*(L+1)/2pi)	
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. Density of the universe and wave progression are the 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 6; 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 velocity=C/3^.5 wave 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 that “reaches out” from (a) and “pulls in” mass during the time period (delta t) is calculated:

R (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 3 allows star formation rates to be calculated. The number of stars is used in calculations for expansion component R3 (Problem 4 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 only 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

WMAP measured a flat universe, what does that mean?

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.

What is space-time?

Space is defined by the Proton model gravitational field r0=hC/2.73=7.22e-14 meters. Initially space is comprised of exp(180) cells, each with the radius 7.22e-14 meters. Each cell contains a neutron (that decays to a proton). The cell radius is a balanced force orbit that establishes and maintains the gravitational constant G=6.67e-11 Nt M^2/Kg^2. The orbital radius is a function of its original kinetic energy and kinetic energy. As kinetic energy is converted to potential energy the cell (and the universe) expands. This is a function of (time/time')^(2/3). Time is measured around the fundamental cell circumference (cycle time=2*pi*7.22e-14/C=1.2e-21 seconds). Time counts forward by repeating this cycle. 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. Space-time expands as kinetic energy (ke) is converted to potential energy. Space-time is very close to space since the only relativity effect is gamma and it approaches 1.0 early in expansion. If particles gain a huge amount of kinetic energy gamma becomes significant (mesons and baryons entering our atmosphere and artificially in high energy accelerators).

There is a Schrodinger based energy=0, probability=1 construct (Appendix 1) associated with orbits defined by the Proton model. These orbits are circular leading to the question what curves space-time? At the quantum level a sine wave varying with time is represented by a circle with one imaginary axis and one distance axis. However, real orbits like those of orbiting stars follow curves because the cells that make up space are curved.

What is quantum gravity?

Gravity is defined and maintained by the neutron and its associated outer orbit (cell). The information we need about gravity is provided by the Proton model, cellular cosmology and the number of initial neutrons determined by probability considerations (1=exp(180)/(exp(90)*exp(90)). The Schrodinger equation is based on quantum theory and the Proton model is based on the Schrodinger equation. The Proton model gravitational field energy 2.73 MeV is a quantum value but cellular cosmology provides a bridge between small and large scales (M=m*exp(180) and R=r*exp(90)).

What does this model imply regarding creation?

The Proton model is anchored by the Schrodinger equation. The equation also appears to anchor properties of all mesons and baryons [14]. This equation described by MIT as unitary evolution [22] is the basis of a broad theory. The equation gives probability P=exp(iEt/H)*exp(-iEt/H) where H= Planck's constant, E is field energy and time t is the time around a quantum circle at velocity C.

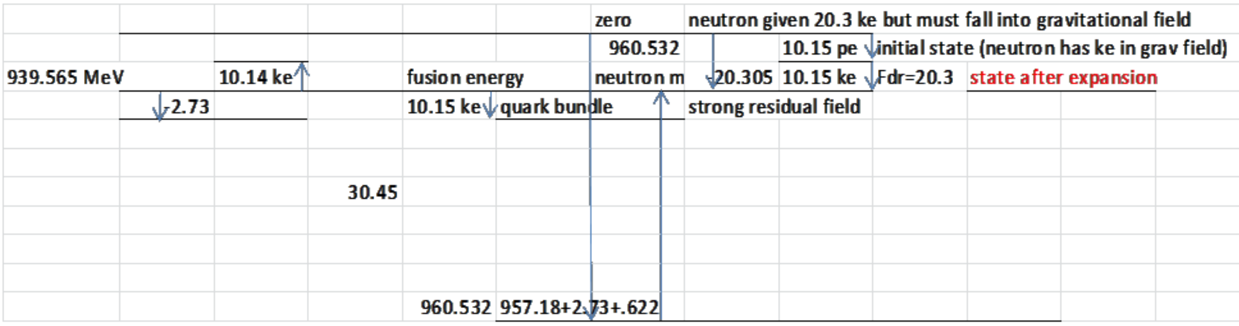
Probability in the left hand side of the Schrodinger equation is related to energy and time in the right hand side of the equation. Probability=1 occurs at the instant of wave function collapse. Historically observation is fundamental to quantum mechanics and the Copenhagen interpretation indicates that we can only describe the probability of an event within certain limits. If we use Shannon's definition of information (Information = -natural logarithm(Probability), the left hand side of the equation yields information. Many associate quantum mechanical probabilities with the process of observation but some authors [20] call it consciousness. Zero energy and probability 1 appear to be initial conditions. This implies that creation is based on separations from zero and 1. The Schrodinger equation requires a proper set of probabilities to represent the Proton model. The probability 1, zero energy derivation naturally transitions from probability sets (p/p'=e/e') to energy sets that describes reality through the Proton model and cellular cosmology.

Where are the laws of nature?

The proton model is a manifestation of the laws of nature. Previously I thought it was static. The core of the cosmology model is repeated below but time and potential energy are added.

Potential energy + kinetic energy (MeV)	20.30	20.30	20.30	20.31
Potential energy (MeV)=.5FdR/1.6e-13	10.43	12.16	13.59	14.77
r0=7.22e-14*9.872/ke	7.22E-14	8.76E-14	1.06E-13	1.29E-13
ke=9.87*(time/time')^0.5	9.872	8.14E+00	6.71E+00	5.54E+00
g=938.27/(938.27+ke)	**9.8959E-01**	**9.9140E-01**	**9.9289E-01**	**9.9413E-01**
V=(1-(g)^2)^0.5*C	**4.3148E+07**	**3.9238E+07**	**3.5674E+07**	**3.2427E+07**
fgrav=(1.673E-27*V^2/(r0*EXP(90))	3.5702E-38	2.4305E-38	1.6543E-38	1.1259E-38
time (seconds)	5.29E-02	7.77E-02	1.14E-01	1.68E-01
G=fgrav*r^2/(m/g)^2	6.503E-11	6.533E-11	6.558E-11	6.578E-11

The following diagram was brought forward from Appendix 3.



Time is around the gravitational orbit R=hC/2.73. Fundamental time=1.5e-21 seconds (from problem 3 above). As time counts forward, kinetic energy decreases by ke'=ke*(time/time')^(2/3).

This provides the startling insight: The information in green above is inside every proton. The gravitational orbit has counted time cycles from the big bang and we experience this as increasing time. Time emanates from inside the proton. The sum of kinetic energy and potential energy remain constant over time. Temperature emanates from kinetic energy in the proton and when it reaches 8e10 K, part of the fusion energy 10.15 is released to increase the radius of the cell. It is now low, close to 2.73K. As stars light up, their fusion energy, again part of the value 10.15 MeV, is released to once again increase the radius of the cell. The proton is the cell. Components of the proton are improbable (1/exp(180)) but there are exp(180) cells is the universe and the universe is huge (rcell*exp(60). Overall, the proton and interactions with other protons creates the universe!

References

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

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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.

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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 7.22e-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. *Current re-analysis indicates that there is no dark energy or dark matter.*

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Appendix 1 Schrodinger Fundamentals of the Proton model

A mass model of the neutron and proton is successful in providing insights into physics and cosmology [17]. The equation E=e0*exp(N), where e0 is a constant, was used to characterize energy. This equation works but Edwin Klingman [the author of reference 20] indicated that it needed a clear derivation. This document presents the Schrodinger based fundamentals of the relationship and an understanding of N values for the proton mass model [14].

Restriction 1: We will deal with probabilities represented by complex conjugate multiples that give probability 1, specifically, P=exp(-i Et/H)*exp(i Et/H)=1 where Et/H=1.

Restriction 2: We will deal with what I call quantum circles that in some cases represent orbits. The time (t) to circle a field at radius R is t=2 pi R/C. The energy in the field will be E and E*t=H where H is Planck's constant (4.13e-21 MeV-sec).

Review of natural logarithms: We will take the natural logarithm (ln) of both sides of an equation. If the equation is p=exp(a)*exp(b), and p=1, the equation becomes 0=a+b. Adding logarithms of values is equivalent to multiplying the values and ln(value)-ln(value) is equivalent to dividing values. Also recall that an exponent changes its sign when it moved from the top of an equation to the bottom of an equation. We will take the anti-logarithm as shown below to recover the original values.

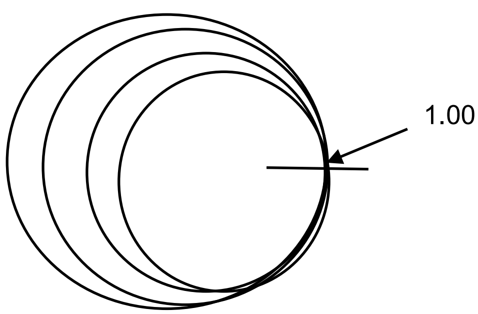
P	p1*p2=exp(-i Et/H)*exp(i Et/H)		
	with Et/H=1		
multiply by adding the logarithms			
ln P	ln(p1*p2)=-i+i=0		
P	exp(0)=1		

Example of exponent sign change:

7.39=exp(2)	7.38906
7.39=1/exp(-2)	7.38906

Components of P=1

P=exp(i Et/H)*exp(-i Et/H)=1 is the version of the Schrodinger equation of interest [22]. The left hand side (LHS) of the equation is P and the right hand side (RHS) is exp(i Et/H)*exp(-i Et/H). P=psi*psic (wave function collapse) occurs at Et/H=1. P will have many components that multiply to 1. If energy is a quantum value the circle represented will be a wave moving through its time cycle. These circle have a vertical imaginary axis and a real horizontal axis and the equation is exp(iw)=cos w +i sin w. If there is mass and kinetic energy in the circles with balanced forces they are orbits with real vertical and horizontal axis. Circles can be different sizes, nested as shown below and represent probability 1/1*1/1=1. Looking ahead, orbits will be meaningfully demonstrated in a proton mass model but we are simply looking deep inside probability 1 to find its exact components.



Specifically, we want probability combinations that obey two principles called the P=1 construct and the E=0 construct defined below.

Probability= 1 construct

Probability 1=p1*p2/(p3*p4).

The probabilities contain exponential functions.
P=1=p1*p2/(p3*p4)=1/exp(13)*1/exp(12)/(1/exp(15)*1/exp(10)).

The exponent changes it sign from positive to negative when it is moved from the bottom to the top of the relationship.

Probability 1 Construct

1=p1*p2/(p3*p4)

N1=13	N3=15
N2=12	N4=10

p1=1/exp(13)	p3=1/exp(15)
p2=1/exp(12)	p4=1/exp(10)

1=1/exp(13)*1/exp(12)/(1/exp(15)*1/exp(10))
This is equal to:
1=exp(13)*exp(-13)*exp(12)*exp(-12)*exp(15)*exp(-15)*exp(10)*exp(-10)=1

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

Energy= 0 construct

Next, we will evaluate energy components that have overall zero energy. This is possible because mass plus kinetic energy will be defined as positive and equal and opposite field energy negative. The example above will be used to extend the probability one construct to create the energy zero construct.

The following code is used to represent the P=1, E=0 construct. The N's on the bottom are probabilities in the LHS of Schrodinger's equation and the E's are in the RHS using the equation E=e0*exp(N). Each N above was rounded down for simplicity, for example 13 is actually 13.431 in one of the quarks.

E1=exp(N1)	E3=exp(N1)
E2=exp(N1)	E4=exp(N1)
N1	N3
N2	N4

Derive the energy zero construct
Use the same N values for the right hand side of the equation
Take the natural log of P=1, ln(1)=0.
exp(13)-exp(13)+exp(12)-exp(12)+exp(15)-exp(15)+exp(10)-exp(10)=0
Multiply each value by e0 where e0=2.02e-5 MeV. The values become energy.
e0*exp(13)-e0*exp(13)+e0*exp(12)-e0*exp(12)+e0*exp(15)-e0*exp(15)+e0*exp(10)-e0*exp(10)=0
E1-E1+E2-E2+E3-E3+E4-E4=0
E1+(E3+E4-E1-E2)+E2-E3-E4=0

The restrictions above apply:
Components multiply complex conjugates eliminating the imaginary number.
The wavefunction collapse is at Et/H=1.

Derivation 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 then 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 model

Number of neutrons in nature

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= 9.87 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.

Proton model review

For reference the Proton 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).

						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							-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							
	10.41	0.67	10.41	0.67				0.671	t neut ke		-0.67
Quad 5	10.33	0.62	10.33	0.62		0.62				-0.62	
	0.00	0.00	0.00	0.00							
	90.00	sum	90.00	sum	129.54	799.87	939.5654133	**0.671**	20.30	-957.81	-2.73
							NEUTRON MASS		Total m+ke	Total fields	
									Total positi\	Total negative	
									960.54	-960.54	
									MeV	MeV	

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

Appendix 3 Orbits **associated with the Proton model**

The Proton model above is a P=1, E=0 construct that defines the quarks and their orbits (unification of strong interactions listed as Orbits 1, 2 & 3 below). Orbit 4 is associated with atomic fusion.

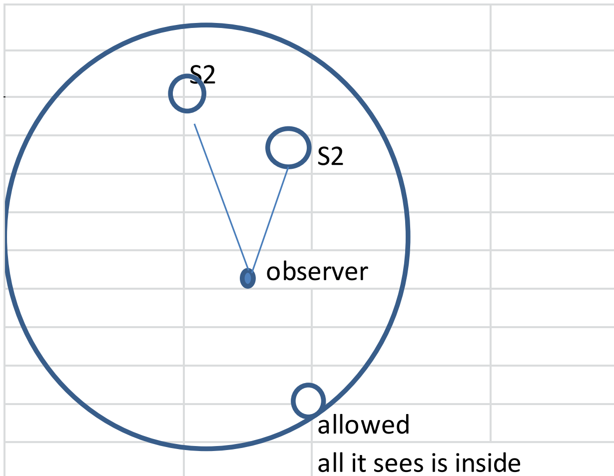
Summary of neutron model orbits		1.02608
Orbits 1,2,3	Three quark orbits are formed by quads 1,2 and 3, each with e*t=h.	
	Next, 30.45 mev of ke taken out of the quark bundle....quarks are now bound by a -30.15 MeV field.	
	(A quark bundle is the three quarks with their kinetic energy. Total=129.54+799.87= 929.41 MeV).	
	The quark bundle has 10.15 mev of kinetic energy (929.41+10.15=939.56 MeV).	
	But the energy zero criteria is 20.3 MeV "short" of being satisfied	
	This creates a -20.3 MeV residual strong field. (-20.3=(939.565+0.622-960.532).	
Orbit 4	The quark bundle mass 929.41 MeV orbits with 10.15 mev in the -20.3 mev field.	
	The energy zero components of this orbit are: 929.41+10.15+0.671-960.532=-20.3.	
	With the addition of 0.111 mev in the presence of a proton, fusion can occur	
	and this releases a portion of the 10.15 mev in the weak orbit.	
	Next, the neutron with 20.3 mev falls into a -2.73 MeV gravitational field. An orbit	
	is established with 10.15 MeV of kinetic energy and 10 PE.	
	(Fdr/2=3.656e-38*7.224e-14*exp(90)*6.24e12=10.06 MeV)	
Orbit 5	The neutron mass orbits with 10.15 mev in -2.73 mev gravitational field (the gravitational field emanates from the quark fields).	
	The energy zero components of this orbit are: 939.565+10.15+10.15+0.671-957.89-2.73=0. (some hidden).	
	The radius of this orbit is 7.22e-14 meters.	
	The attraction between exp(180) protons in the proper geometry creates the gravitational field	
	(see appendix 1 topic "cellular cosmology" and "quantum gravity".)	
	But the 10.15 MeV kinetic energy decreases as the cell expands against gravity converting ke to potential energy.	
	As the 7.22e-14 m cell expands, the universe expands.	
Electron orbit:		
	Separation creates opposite electromagnetic fields in the proton and electron	
	The bohr orbit is formed (electron mass with 13.6 ev of kinetic energy in 27.2 ev field).	
	The field energy is extracted from the proton mass.	

Diagram of Neutron Orbits

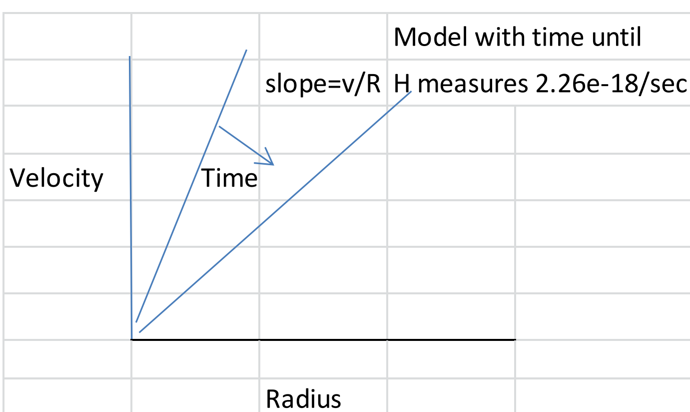
						zero	neutron given 20.3 ke but must fall into gravitational field					
						960.532		10.15 pe	initial state (neutron has ke in grav field)			
939.565 MeV		10.14 ke		fusion energy		neutron m	-20.305	10.15 ke	Fdr=20.3	state after expansion		
	-2.73			10.15 ke	quark bundle		strong residual field					
			30.45									
				960.532	957.18+2.73+.622							

Appendix 4 Measuring Hubble's constant

Are measurements of Hubble's constant reliable? The question comes down to where mass is and how fast it is expanding. Here is a diagram:

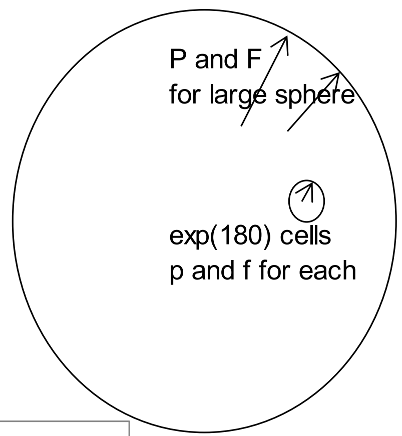


Hubble's constant is measured with the redshift of objects of known distance. Its current value according to the WMAP, Hubble and Planck missions is 2.26e-18/sec [4]. As long as objects are treated gravitationally as the surface of spheres within a larger spherical surface, they still have no preferred position. Gravity always looks inward toward a center. Once the center is established by gravitational accumulation, it is not appreciably influenced by gravity outside. It is not in a preferred position that would cause instability (like all of mass moving toward the center of the larger spherical surface). The Hubble measurements appear to be correct but we must remove the dark energy contribution since it not a result of kinetic energy being converted to potential energy. I use a math model of cellular expansion to determine the current radius of the universe. With time, the velocity of expansion slows and R becomes larger. This means the slope of V/R decreases. When the slope reaches 2.26e-18/sec, the current radius is reached.



It was shown above that the concept of critical density cannot be used for dark energy. However the current density is 9.14e-27 kg/m^3 and this value is related to measurement of the Hubble constant 2.26e-18/sec. WMAP literature parameters [4] are based on Omega 9.14e-27 kg/m^3.

Appendix 5 Derivation of Force and Pressure Relationships



Expansion is caused by pressure but calculated from the equation R’=R*(Time’/Time)^(2/3). The relationships between forces and pressures in the cell and the universe must be thoroughly understood to use cellular cosmology. The derivation uses large cap symbols for the radius of the universe and small cap symbols for 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

		Scaling a cell to universe sized space						
R' is the universe size geodesic			R'V^2/M	G=G	r'v^2/m	r' is the cell size geodesic		
			3.23E-37		2.58E-47		1.6E-13	
			m=1.67e-27 kg					
		M=m*exp(	1.99E+41		1.67E-27	kg		
R'=r*('v/V)^2*(M/m)*1/exp(90)		R	2.618E+20		2.69E-09	r'		meters
		V (M/sec)	2.25E+05	↔	2.25E+05	v (M/sec)		
1.00E+00		G	6.67E-11		6.67E-11	nt m^2/kg^2		

From one calculation column to the next, dR=dE/F.

Combined with the cell definitions, f grav, f cell and p are as follows where f is the balanced gravitational forces in the cell based on the key equation below. But the cells resistance to expansion is inertial force without the coupling constant 1/exp(90). Pressure in the cell is f cell/area.

We want dR		
dR=dr*exp(60)		
We know de/proton		
Key equation for f balance in cell		
f grav=m*V^2/(r*exp(90))		
convert cell values to large space		
r = rgrav*exp(90)		
f cell=mV^2/r		
f cell=f*exp(90)		
dR=(de/fcell)*exp(60)		
with conversion 1.6e-13 MeV/Nt-M		
dR=(de/fcell)*exp(60)*1.6e-13		
Example:		
de=0.79		
f cell=1.62e-42*exp(90)=0.00198 Nt		
dR=(0.79/1.9e03)*exp(60)*1.6e-13 M		
dR=7.29e15 meters		

pcell=f cell/(4pi*r^2)

Pressure inside the cell sphere (p) can also be calculated from thermodynamics. The most straightforward equation is p=nBT, where n is the number density of particles n=1/(4/3pi*r^3), B is Boltzmann's constant 8.6e-11 MeV/K and Temperature is photon energy at that point in the expansion. T= ke/(1.5*B), where Boltzmann's constant =8.6e-11 MeV/K and ke is in MeV.

Appendix 6 Fall velocity (orbital velocity after fall).

1.59E+05	Vorbit (M/sec)=(GM/R)^.5
5.30E+20	Rfall=7.22e-14*10.15*.97/kefall*EXP(90)*(Mg/2.49E+51) (M)
1.32E-04	**kefall=2*6.67e-11*Ngal*1.67E-27^(2)/(rcell)/1.6e-13 (MeV)**
2.43E+45	Ngal=(Mg/1.67E-27)^(2/3)
4.29E-02	rcell (M)

The fall velocity calculation starts with ke= 9.87* (time0/time')^(2/3) MeV. From this calculate rcell=7.22e-14*9.87/ke. Now calculate Rgrav=rgrav*exp(60)*(Mg/Mu)^(1/3), where Mg is the mass of the galaxy (2e41Kg) and Mu is the mass of the universe (2.49e51 Kg). The force resisting expansion is Force=G*1.67e-27*Mg/Rgrav^2. The ke increase for the fall from Rgrav is the potential energy decrease= 2*(Force*Rgrav)/1.6e-13 (the equation above labelled kefall combines F*R into a new equation for kefall). From this calculate Rfall=7.22e-14*9.87/kefall*exp(90)*(Mg/Mu). The orbital velocity is simply=V= (G*Mg/R)^0.5. The fall radius and velocity agree with orbital velocity of stars in a galaxy (the orbital equation introduced in the section above entitled "Calculating Flat Velocity Curves" was used).

These equations applies to cluster, galaxies, stars and planets with different masses. Surprisingly, rcell is the same for all three.

cut

Kinetic energy, F=Gmm/r0^2 Nt and F=mV^2/(r0*exp(90)) Nt inertial force control the radius of the cell as shown below. The colored areas maintain G equivalence and calculations for kinetic energy and cell radius of a cosmology model throughout time.

r0=7.22e-14*9.871/ke	2.39E-09
ke=9.87*(time/time')^0.5	2.984E-04
g=939.56/(939.56+ke)	**1.0000E+00**
V=(1-(g)^2)^0.5*C	**2.3892E+05**
fgrav=(1.675E-27*V^2/(r0*EXP(90))	3.2799E-47
G=fgrav*r^2/(m/g)^2	6.671E-11
fgrav=G(m/g)^2/r^2=G*(1.6753-27/g)^2/r^2	3.28E-47