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?

Respected 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 and the general theory of relativity is large scale gravitational theory. They appear to be incompatible.

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

A neutron mass model and cellular cosmology, both previously reported by the author, were combined into a new cosmology model that resolves these questions. This improves the work reported in reference 18.

Review of previous cosmology documents

A Top-Down Approach to Fundamental Interactions **[**viXra:1307.0082**]** details a model of the proton that provides information pertinent to many aspects of nature. Starting with data from WMAP that allows an estimate of the number of protons in the universe (exp(180)), where exp stands for natural number 2.712^(180) the author explored how this number is used by nature to anchor the energy of fundamental particles. This reference described models for the neutron and proton mass based on Shannon type information theory. In addition, it shows that information from the model unifies the electromagnetic, weak, strong and gravitational forces. ***The Language of Nature*** [viXra:149.8702829] explains the important role of probability.

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. ***Discovery of Quantum Gravity*** [viXra: 1508.0128] contains details.
On Expansion Energy*, *Dark Energy and Missing Mass **[**Prespacetime Journal Vol. 5 No. 5, May 2014, viXra:1307.0089**]** **[**viXra:1307.0089v7 revised February, 2015].

The proton mass model [Appendix 2] is an accurate source of constants for cosmology, including expansion kinetic energy. It gives initial temperatures consistent with He4 formation and specifies the initial kinetic energy. Expansion and associated energy changes were evaluated using a cellular model based on two expansion components. 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 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.

Dark Energy **(**viXra: 1511.0185**)** 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. It now appears that the baryon (proton) fraction is 0.5 and the cold dark matter fraction is 0.5. Justification for the higher baryon fraction considers measured values of primordial deuterium. *Current re-analysis indicates that there is no dark energy or dark matter.*
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 somewhat tentative it presents calculations that match measured decay times and masses for all baryons and mesons based on the neutron model.

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 will not be 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 on the surface. Furthermore, the proton has initial kinetic energy 9.87 MeV and orbits a central gravitational field with radius 7.22e-14 meters (the inertial force is equivalent to pressure acting outward on the surface). As the radius of many identical cells increases, the universe expands. Important cell energy values originate in the mass model [Appendix 2] of the neutron (the decays to a proton). The resulting expansion model is a first principles cosmology model (first principles because values are anchored by the mass model that are anchored by Schrodinger's equation [Appendix 1]).

Cellular Cosmology

Cell radius is 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) that determine the geodesic (the radius with balanced inertial and gravitational force). With G constant the mass substitution is M=m*exp(180) and the surface area substitution is R=r*exp(90). This allows the gravitational constant G to be evaluated and for Gbig= Gsmall (lower case r,v and m below are for cellular space):

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

The extremely small value 1/exp(90) is the coupling constant for gravity. When measurements are made at the large scale as must done to measure G, the above derivation indicates that we should multiply cell scale values (r*v^2/m) by 1/exp(90) if we expect the same G. Geometric and mass relationships give the cell "cosmological properties". Velocity V=V for both surfaces. This allows the cell to move after it falls from an expansion determined geodesic. 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**	

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].

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 (9.87 MeV/neutron) from the neutron model are used in the calculations below. We will determine 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 1.675e-27 Kg. 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. The expansion model can determine the beginning gravitational constant including the effect of gamma (g). The beginning gravitational constant G was 6.50e-11 Nt M^2/Kg^2 but it is now 6.6743e-11 [23].

GRAVITY			
		.059 seconds	**4.3e17 seconds**
Neutron Mass (mev)		939.565	**939.565**
Neutron Mass M (kg)		1.675E-27	**1.675E-27**
Field Energy E (mev)		2.732	**2.732**
Kinetic Energy/neutron ke (mev)		9.872	**0.100**
Gamma (g)=939.56/(939.56+ke)		0.9896	**1**
Velocity Ratio v/C=(1-g^2)^0.5		0.1438	**0.000**
Velocity (meters/sec)		**4.312E+07**	**49.611**
R (meters) =(HC/(2pi)/(E*E)^0.5		7.224E-14	**1.287E-11**
Inertial Force (f)=(m/g*V^2/R)*1/E		3.570E-38	2.653E-52
Calculation of gravitational constant G			
G=F*R^2/(M/g)^2=NT m^2/kg^2		6.5026E-11	**1.5654E-20**
Published by Partical Data Group (PDG)			6.6743E-11

Understanding that the gravitational constant G can be calculated with 9.87 MeV/neutron of kinetic energy in a cell of radius 7.22e-14 meters allows further development of cellular cosmology gravitational relationships. G is almost constant except for small effects related to gamma and expansion rates that are included in the cellular cosmology expansion model.

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		

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		

This new relationship R=7.22e-14*9.87/ke*exp(90)*Mgalaxy/Muniverse is another way of writing R=GM/v^2. But it provides an understanding of the cosmology involved. The quantum scale r0*9.87/ke is the cell radius as the universe expands. Maintaining G (Gsmall=Gbig) equivalence between the large scale and cellular scale requires multiplying 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 equivalence between the large sphere surface area and exp(180) cell surface areas. Galaxy orbital radii 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 large surface can be many small 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. We can also illustrate the surface areas for this example:

Number of cells in galaxy= (2e41/1.675e-27)=1.19e68

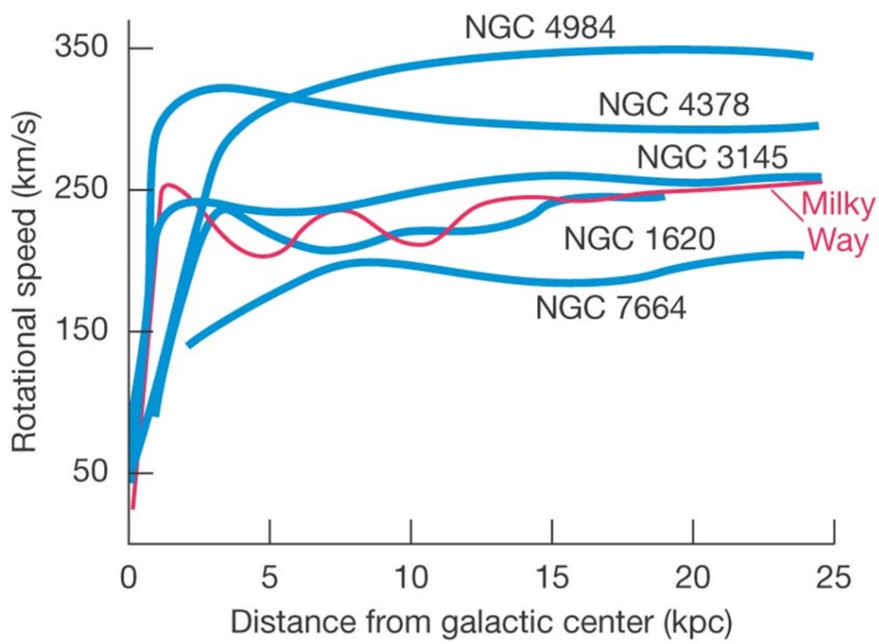
A=4pi*(2.55e20)^2= 4pi*(7.22e-14)^2*1.19e68

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 galaxy must be curved onto the area of a sphere (or the equivalent area of many small spheres) or it violates the "no preferred position" principal. The cells represent a balanced force radius that does not have to be the observed distance. Kinetic energy, Gmm/r^2 force and inertial force control the radius of the cell as shown below:

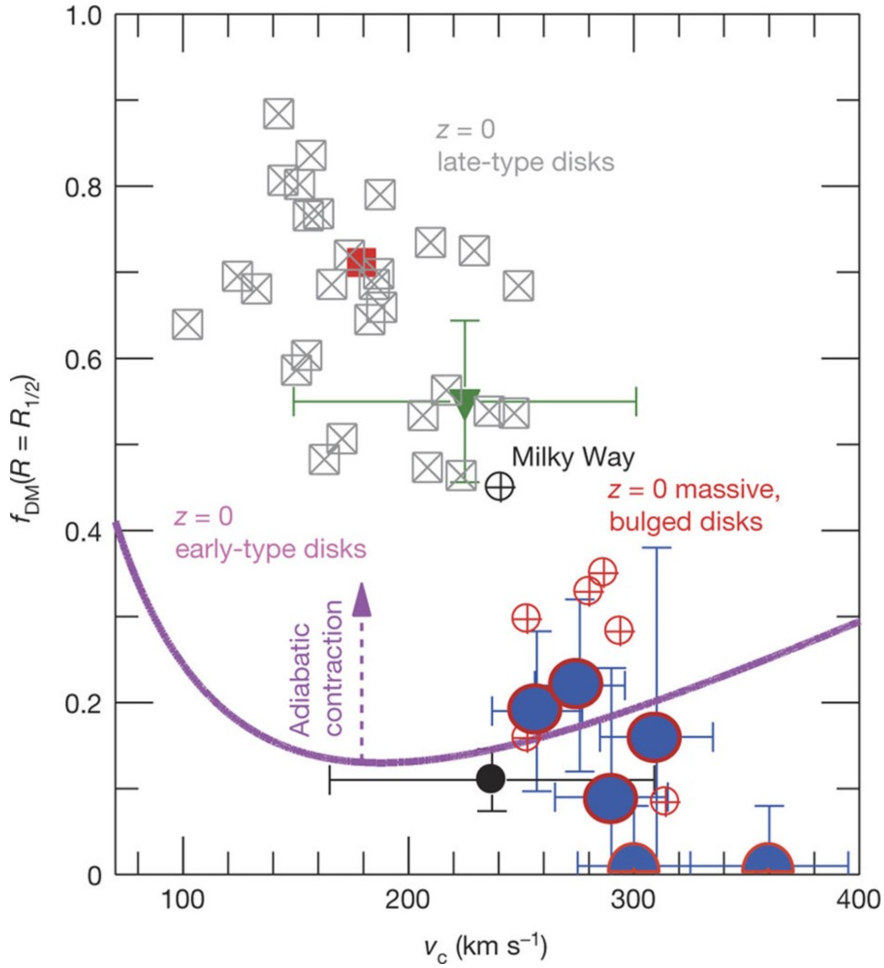
r0=7.22e-14*9.871/ke	2.39E-09
ke=9.87*(time/time')^0.5	2.984E-04
g=939.56/(939.56+ke)	**1.0000E+00**
V=(1-(g)^2)^0.5*C	**2.3892E+05**
fgrav=(1.675E-27*V^2/(r0*EXP(90))	3.2799E-47
G=fgrav*r^2/(m/g)^2	6.671E-11
fgrav=G(m/g)^2/r^2=G*(1.6753-27/g)^2/r^2	3.28E-47

Flat Velocity Curves for Galaxies

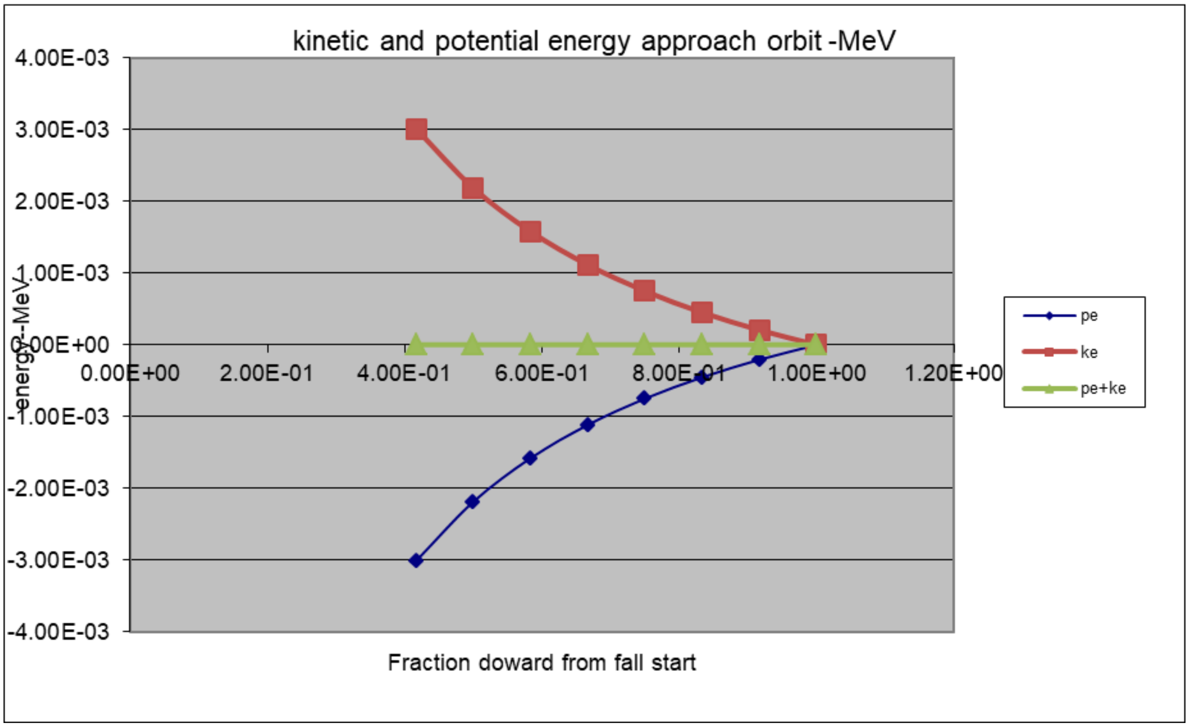
All of these galaxy profiles (search Wiki for velocity curves) are nearly flat:



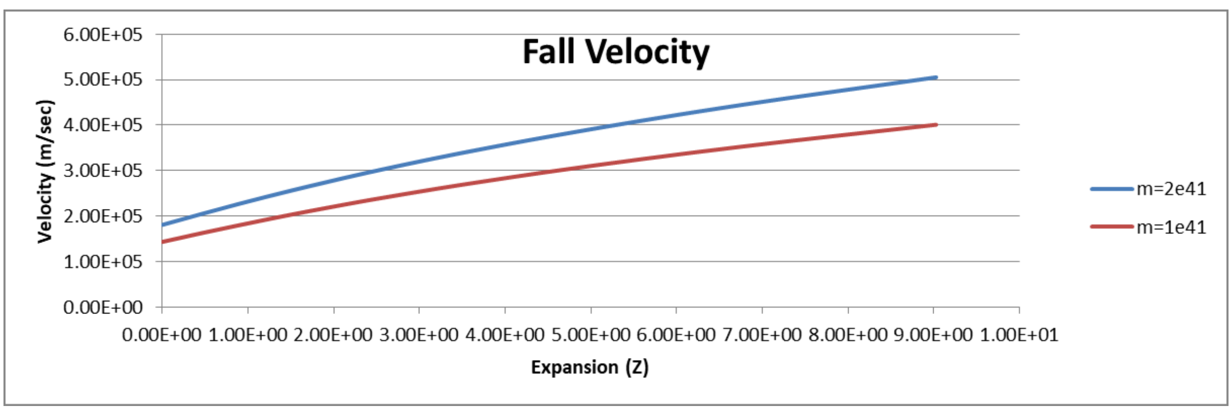
(b)



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 due to mass accumulation. This is a function of their central mass and the 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), V. Ruben 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 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 on the cell surface is equivalent to velocity on the surface of the galaxy's orbital radius sphere. Cells are defined this way. The galaxy's surface is equivalent to N 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 galaxy 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.

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 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 all the cells. The number of cells is determined by the central mass (N=2e41/1.67e-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 defined 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 not associated with stars). 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

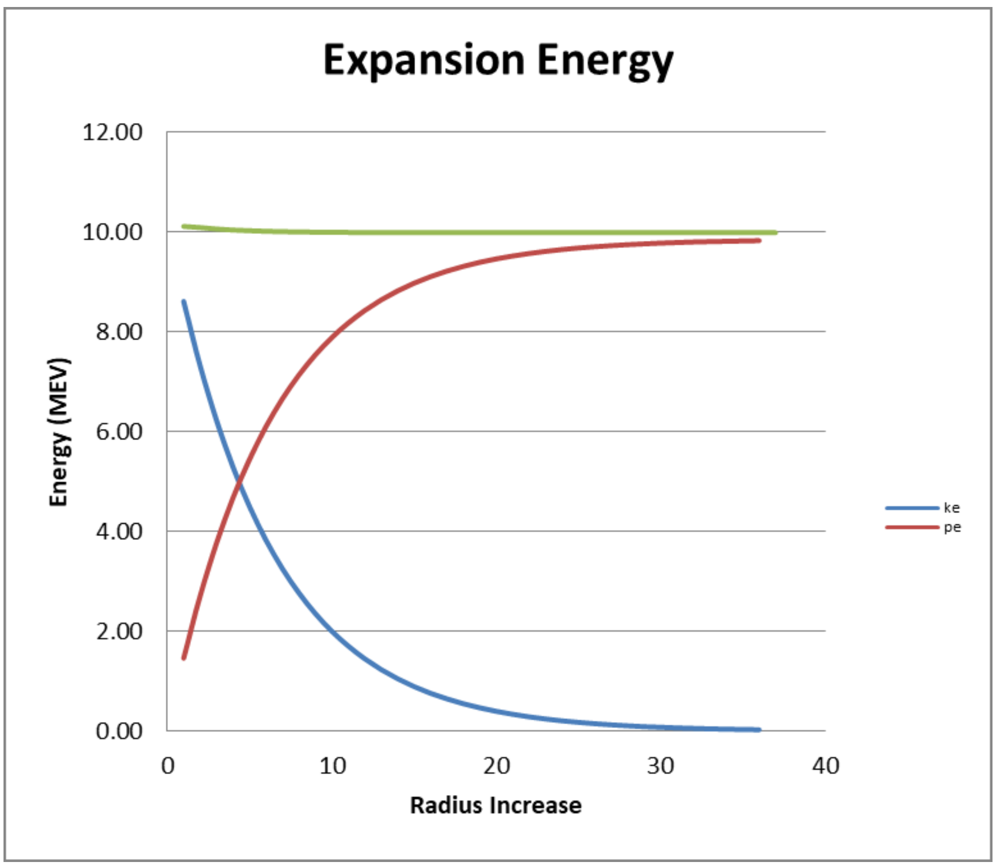
A first principles cellular expansion model with the following capabilities was used to determine cosmological parameters.

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		
(m v/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 Kg^/M^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). 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=F/(m/g)^2*(R)^2/exp(90) is maintained throughout expansion where lower case g= gamma= 939.56/(939.56+ke).
Potential energy=PE+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 using a constant called lambda.

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 Neutron 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 neutron model provides the initial kinetic energy=9.87 MeV/neutron.

Based on probabilities for the neutron components a calculation for the number of neutrons yields the value exp(180). [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 with Omega=9.14e-27 represents the current size of the universe using R=r*exp(60). All exp(180) cells are identical and the cellular expansion model is based on one cell r with occasional reference to R.

	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 size of the cell 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. Gamma g=939.56/(939.56+ke) and velocity=C*(1-gamma^2)^.5 in meters/sec. Each cell is an expanding orbit with ke'=ke*(time/time')^.5 and r=9.87/ke. Velocity is calculated from V=C*(1-g^2)^.5 or V=((2*ke/m)/1.6e-13)^.5 when g becomes very close to 1.0. G was slightly different at the beginning but calculations near the end of expansion yield 6.6743e-11 Nt M^2/Kg^2.

Initial temperature=9.87/(1.5B), 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 1190 seconds. They represent the "cellular base" of the universe (the green cells below). Information from the cellular base determines other cosmology properties when subsequent events occur.

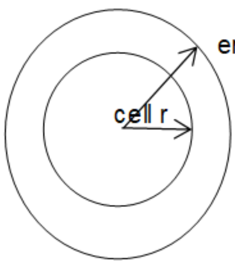
R=rcell*exp(60) (M)	8.25E+12	1.00E+13	1.21E+13	1.47E+13
time (seconds)	0.053	0.078	0.114	0.168
T=ke/(1.5*8.6e-11)	7.64E+10	6.30E+10	5.21E+10	4.29E+10
r0=7.22e-14*9.87/ke	7.22E-14	8.76E-14	1.06E-13	1.29E-13
ke=9.87*(time/time')^0.5	9.872	8.14E+00	6.71E+00	5.54E+00
g=939.56/(939.56+ke)	9.8960E-01	9.9141E-01	9.9290E-01	9.9414E-01
V=(1-(g)^2)^0.5*C	4.3120E+07	3.9213E+07	3.5651E+07	3.2406E+07
fgrav=(1.675E-27*V^2/(r0*EXP(90))	3.5717E-38	2.4302E-38	1.6541E-38	1.1258E-38
G=fgrav*r^2/(m/g)^2	6.50E-11	6.53E-11	6.56E-11	6.58E-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 and fcell = f grav*exp(90) because the coupling constant is not used for inertial force on the cell surface. Pressure inside the cell p=f/(4pi*r^2). T=p/(nB) where p is pressure, n is the number density of neutrons and B is Boltzmann constant.

The He4 transition

The above fundamentals 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. The calculations shown in green represent the cellular base from the neutron model with decreasing original kinetic energy. 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 above at time 1749 seconds). This is similar to a satellite being launched with kinetic energy increasing the radius.



The released energy initially increases the velocity of the enlarged orbit (and pressure). With energy equal to 0.53 MeV the velocity equals 1.01e7 M/sec. This is associated with inertial force 3.5e-29 Nt. The forces in the enlarged orbit should be balanced and we can calculate the energy required to increase the radius from r*exp(60). The energy required is 0.79 MeV and the increased radius R= 1.24e15+0.79/3.5e-29=4.85e15 M. The Pressure is F*exp(60)/(4pi*r^2)=2.71e18 Nt. At this point in expansion, we know P and n and can calculate T=P/(nB). T= 2.71e18/(3.12e30*8.6e-11)= 6.32e10 K. Overall the fusion energy required was 0.79+0.53=1.32 MeV. Each proton released 7.07 MeV binding energy (0.23*7.07= 1.62 MeV available).

The Baryon/Photon ratio is calculated with R=6.32e10 K and 4.85e15 M.

Baryon/photon=(EXP(180)/(4/3*PI()*4.85e25^3))/(8*PI()/(4.31e-21*3e8)^3*(1.5*8.62e-11*6.32e10)^3)-4.3e-10

The WMAP criterion (4.4e-10) is satisfied. We will return to consequences of this calculation but focus on the expansion model.

		0.530			
Time (sec)		1189.59	1749.00	2571.48	3780.75
p=fcell/(4*PI()*rcell^2)		2.71E+18	9.27E+16	3.31E+16	1.14E+16
V grav		1.01E+07	3.12E+06	2.74E+06	2.41E+06
F enlarged=1.67e-27*V^2	1	3.99E-03	2.29E-04	1.36E-04	7.82E-05
			2.37E-04		
n=1/(4/3*PI()*r^3)		3.12E+30	6.57E+29	3.01E+29	1.23E+29
Th=p/(n*B)/1.6e-13 (K)		6.31E+10	1.02E+10	7.98E+09	6.70E+09
Baryon/Photon ratio for T=5.27e10 K and R=5.77e15 M		4.3515E-10	2.1E-08	2.1E-08	1.4E-08
R=R+dR=1.08e-11*exp(60)+dE/4e-3*exp(60)*1.6e-13=4.85e15 (M)		4.85E+15	8.15E+15	1.06E+16	1.42E+16
de/proton	7.90E-01	0.79	8.59E-02	6.65E-02	5.14E-02
f cell=fgrav*exp(90)		4.00E-03	2.40E-04	1.43E-04	8.12E-05
	R=rcell*exp(60) (M)	1.24E+15	1.60E+15	2.07E+15	2.67E+15
	time (seconds)	1.7049E-29	1.9471E-03	1.9471E-03	7.89E+17
Temperature (K)	T=ke/(1.5*8.6e-11)	5.10E+08	3.95E+08	3.05E+08	2.36E+08
r radius cell (M)	r0=7.22e-14*9.87/ke	1.08E-11	1.40E-11	1.81E-11	2.34E-11
kinetic energy (MeV)	ke=9.87*(time/time')^0.5	6.58E-02	0.051	0.039	0.030
gamma	g=939.56/(939.56+ke)	9.9993E-01	9.9995E-01	9.9996E-01	9.9997E-01
Velocity (M/sec)	V=(1-(g)^2)^0.5*C	3.5481E+06	3.1204E+06	2.7442E+06	2.4133E+06
fgrav=mV^2/(r*exp(90)) (	fgrav=(1.675E-27*V^2/(r0*EXP(90))	1.5954E-42	9.5378E-43	5.7082E-43	3.4144E-43
Grav const (Nt M^2/Kg^2)	G=fgrav*r^2/(m/g)^2	6.670E-11	6.674E-11	6.670E-11	6.670E-11

After the He4 transition

Refer to the columns of calculation (colored blue) above immediately following the He4 transition. The value P/(Tn) remains constant during and after the He4 transition but the P, T and n take on different values (adjust). The He4 energy increases the pressure and temperature but this expands the volume, decreasing temperature and pressure (typical for explosions and 25% of all protons "exploded" during the He4 transition). The calculations for the remainder of expansion are identical to the He4 transition after P, T and n adjust. The enlarged orbit energy returns to the kinetic energy for cells (in the green area=0.062 MeV associated with 3.14e6 M/sec). This decreases the Force to 2.08e-29 Nt. The new balanced force orbit is established at R=r*exp(60)+0.085/2.4e-4*1.6e-13*exp(60)= 7.85e15 meters. The radius increases from this point by R'=R*(time'/time)^(2/3).

After the transition, the T=P/(nB) adjustment yields T= 1.02e10 K but then decreases with T'=T*R/R'. At 4.3e17 seconds, the universe reaches the radius 3.14e25 meters and temperature 2.45 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

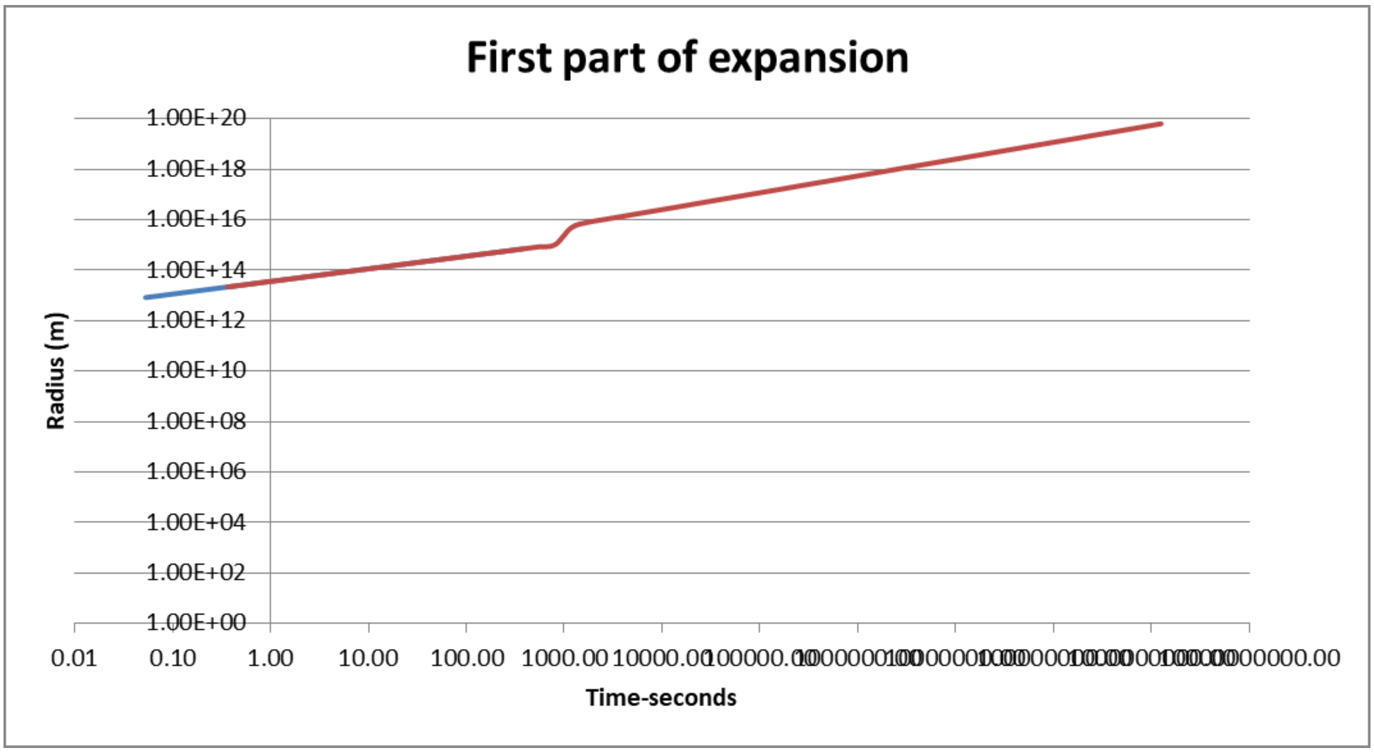
The calculation above at the He4 transition was 4.4e-10. This meets the astrophysical requirement with exp(180) neutrons. This means there is no missing matter. The residuals are formed in proportion to the He4 fraction and are relative fixed (see the discussion on the point in Peebles [1]). The values under the heading Calculated agree with the measured values.

	Time seconds		1186	1743
	Radius (meters)		4.85E+15	7.92E+15
	Temperature (K)	7.60E+08	6.32E+10	9.80E+09
	baryon/photon ratio		4.34E-10	2.67E-08
Measured	Formulas for D, He3 and LI7		Calculated	
2.37E-05	D=4.6e-4*(B/P*1e10)^(-1.67)*1/exp(SAHA)		3.97E-05	4.07E-08
6.65E-05	He3=3e-5*(B/P*1e10)^-0.5	3.3e-5 to 1e-4	1.44E-05	1.83E-06
6.00E-09	Li7=5.2e-10*(B/P*1e10)^-2.43+6.3e-12*(B/P*1e10)^2.43		2.37E-10	4.98E-06
http://cds.cern.ch/record/262880/files/9405010.pdf		-2.17E+00		3.34E+01

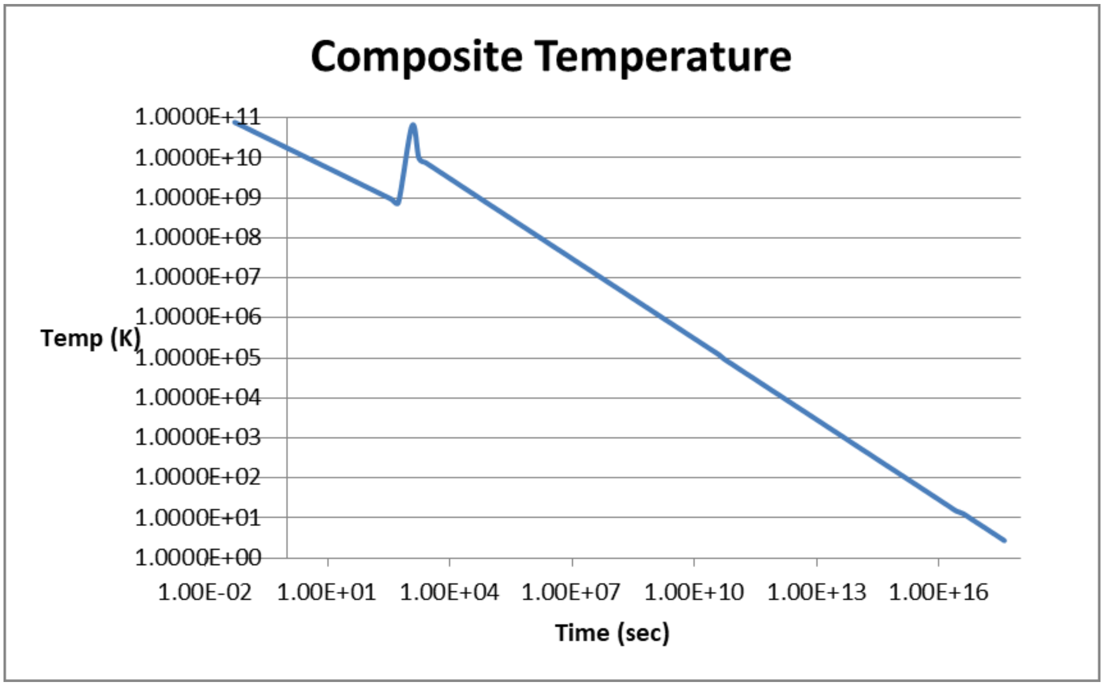
SAHA value=LN(4/3*((1*0.8)/((4.3E+67)/(0.5*EXP(180))))^(3/2))+LN((0.697^2)*(8.16e8/10000000000)^(3/2))-(2.58/(8.16e8/10000000000))

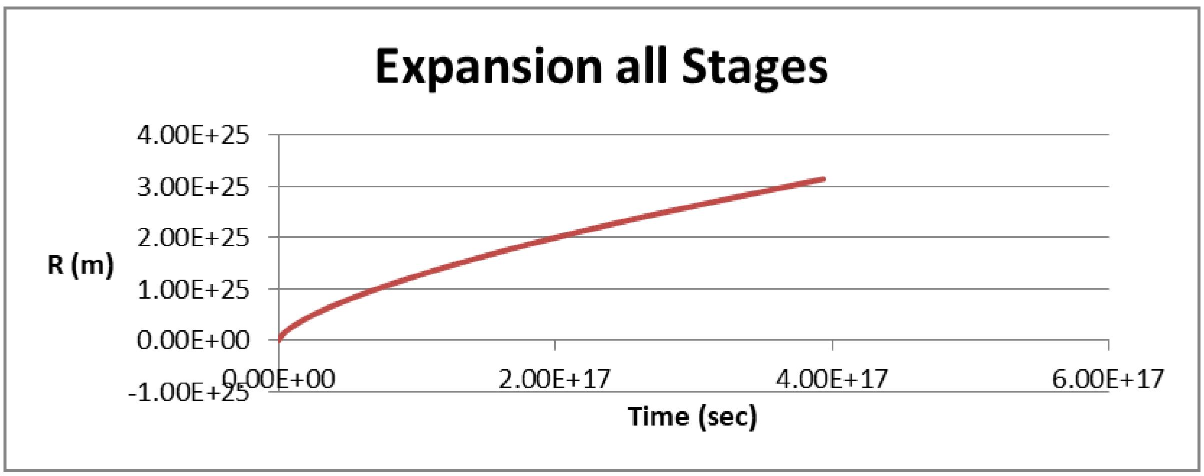
Summary of expansion and temperature history

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). The current energy can be calculated from the Boltzmann relationship; ke=1.5*B*T, where B is 8.62e-11 MeV/K. 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.

	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	3.14E+25	no stars
		reduced →		reduced		
MeV/proton	9.87	1.70E-02	⟶	⟶	1.30E-11	
MeV/proton		1.3	(increases temperature)			
MeV/proton				star addition →	3.63E-11	
R delta (meters)					7.00E+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 combines in a way to 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 should not cause baryons to be severely limited like WMAP [4] and other documents suggest.

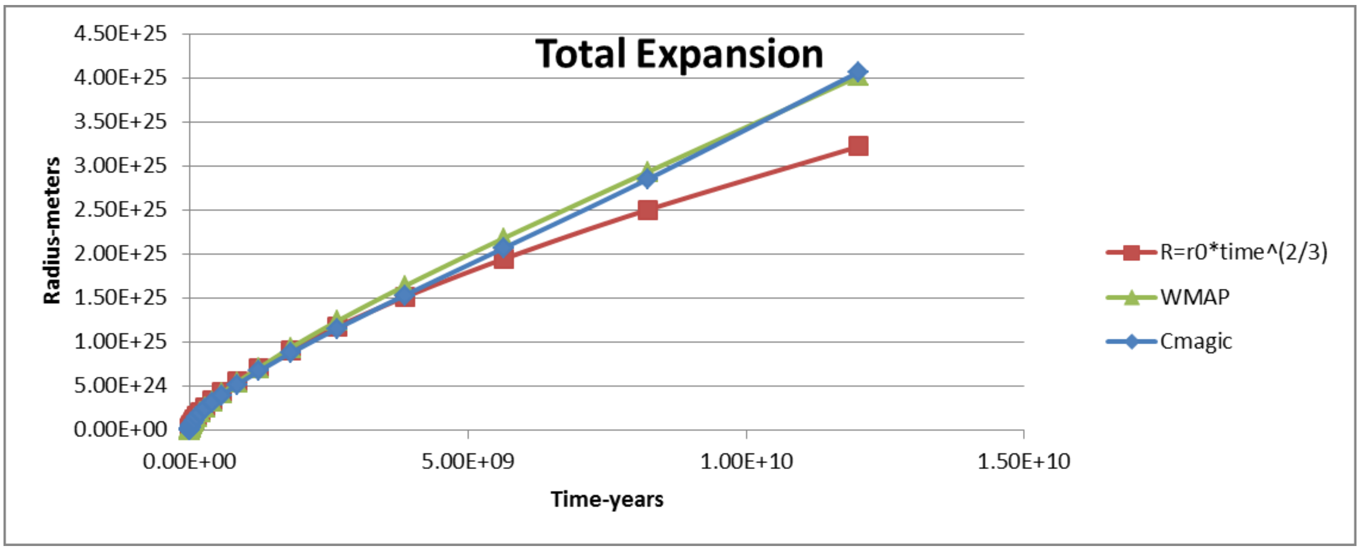
Problem 4; What is Dark Energy?

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 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

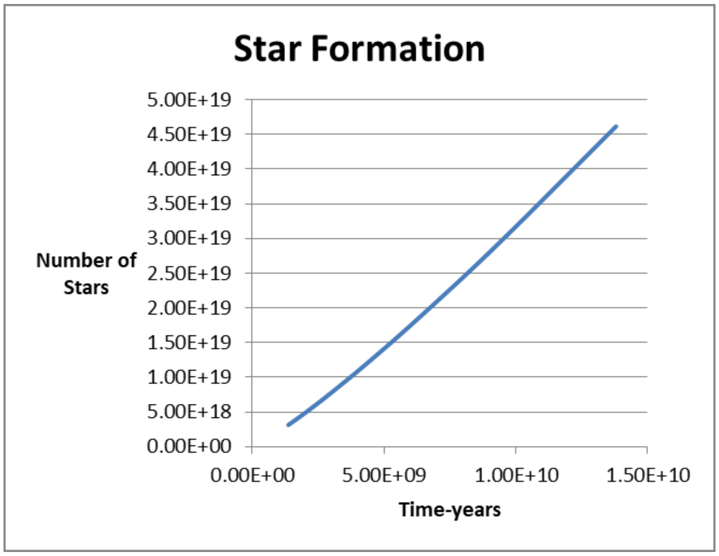
Expansion and cosmology parameters are currently based on differential radiometer projects known as COBE, WMAP [3][7][5], and Planck. They are compared to supernova data from Cmagic [5] that suggest an accelerating universe. Expansion follows R=R'(time'/time)^(2/3) throughout almost all of expansion.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

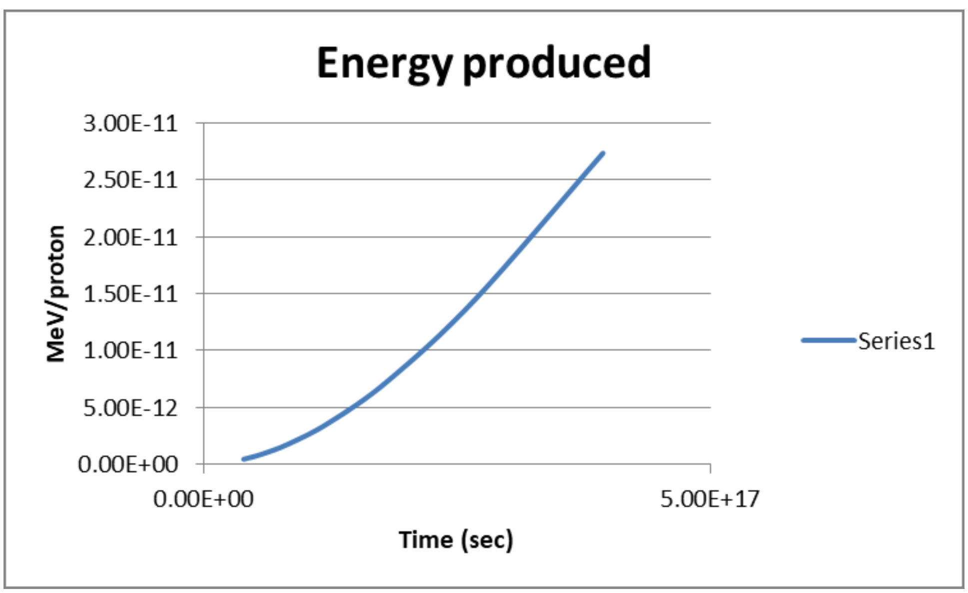
In cellular cosmology all added energy counts and the stars add a significant amount of energy. Delta E is the difference between sky temperature with stars (2.73 K) and the temperature without stars (2.44 K). These values apply to the end of expansion at 4.02e25 M. Delta E= (2.73-2.45)/(1.5*8.6e-11)= 3.63e-11 MeV. 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.

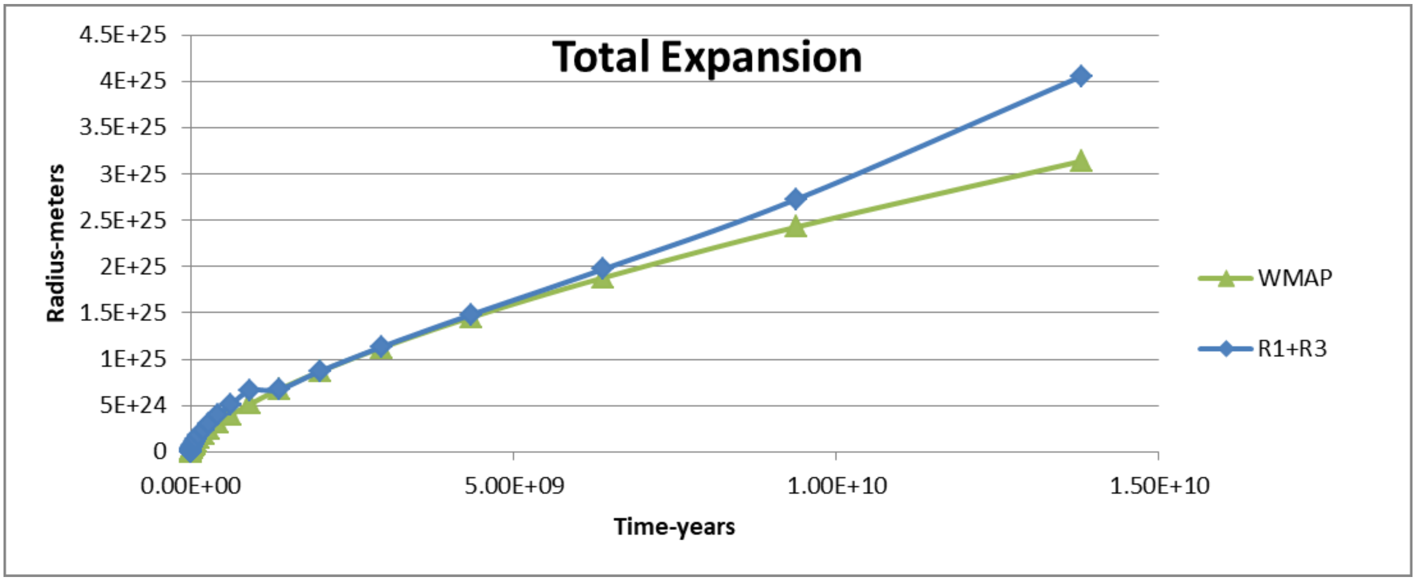
The expansion curve for star energy

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 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 primary hot spot at decoupling. The wave progression radius 2.31e21 divided by 2*pi*Radius R (above in table) equals 0.0106 radians at decoupling [4]. Also WMAP scientists think dark matter started to generate density variations we see in the microwave background radiation. The calculations below show that equality and decoupling combinations of temperature and radius produces the same primary 0.0106 radian hot spot with 1.0 baryon fraction of critical density, not the 0.046 baryon fraction of critical density reported as a baryon limitation.

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

WMAP interpretation that ratio of peaks determines dark/light ratio

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

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

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". But could the disturbances be the instability of Jeans waves (Pebbles [1] thought they were)?

Jeans waves were no longer dampened after equality. Jeans waves are characterized by the following equation (for the .5x wave discussed below).

WL=0.57*3e8/3^0.5/(PI()*6.67e-11*6.24e11*1.783E-30*3e8^2*(baryon density+photon density))^0.5

Calculation of dt

The temperature peaks called dt are in micro degrees (2.730074 K). The thermal peaks are a function of density. The density ratio is a function of current density (9.14e-27 Kg/m^3 which includes dark plus normal mass in this document) and the density shortly after decoupling is 2.44e-18 kg/m^3. The density ratio =1.3*(9.14e-27/2.44e-18)^.5=7.92e-5. At peak wavelength (sin pi/2), densification will be 1. The derivation for dt solves the following equation for dt: Densratio= (1.3*(9.14e-27/2.45e-18)^.5=((2.73+dt)^3/2.73^3-1).

	densratio=(2.730027^3/2.73^3-1)			
	densratio=((2.73+dt)^3/2.73^3-1)			
	densratio+1=((2.73+dt)^3/2.73^3)			
	(densratio+1)^.333=((2.73+dt)/2.73)			
		2.70E-05	check	2.9671E-05
		0.000074	2.74E+00	2.7408E+00
	2.73*(densratio+1)^.333=((2.73+dt))			
	dt=2.73*(densratio+1)^.333-2.73			
	densratio=1.3*(9.14E-27/2.45e-18)^0.5			
	dt=2.73*(1.3*(9.14e-27/2.45e-18)^.5+1)^.333-2.73			
	adjust dt for radius data			
	dt=((densification)*2.73*(1.3*(9.14e-27/2.45e-18)^.5+1)^.333-2.73			
dt	7.28E-05	(72.8 microdegrees with densification=1)		
	densification varies with sine theta			

(Check is verification that a simplifying assumption doesn't affect the result).

A sine wave has a peak of 1 at pi/2 radians. The fraction of the peak is called densification. No densification would be zero and rarefication would be less than 1. The waves don't all peak at once, they follow sine waves, varying through the cycle 0,1,-1,0. The equation for peak dt=(densification)*2.73*(1.3*(9.14e-27/2.44e-18)^.5+1))^.333-2.73. The Jeans waves [1] give the same hot spots listed above but the harmonics of the primary waves are weaker by a factor of harmonic^0.5.

					2.4657E-18	angle (rad)=2*PI()*phase+PI()/2*(wl/WL)				
Wavelength	Wave*harmor	harmonic	dt=harmonic^.5*((sin(angle))*2.73*(1.3*(9.13e-27/2.46e-18)^.5+1)^.333-2.73							
2.31E+21	2.31E+21	1	72.0	7.92E-05	0	1.57079633	1	5183.4	5580.09	**2.319E+21**
3.30E+21		0.375	44.1	7.92E-05	0	1.57079633	1	1943.8	1797.76	**1.238E+21**
2.31E+21	1.15E+21	0.5	50.9	7.92E-05	0	1.57079633	1	2591.7	2601	**9.600E+20**
1.15E+21	5.76E+20	0.5	50.9	7.92E-05	0	1.57079633	1	2591.7	2600	**6.001E+20**
2.31E+21	4.61E+20	0.2	32.2	7.92E-05	0	1.57079633	1	1036.7	1200	**4.251E+20**

Harmonics are sequential divisions of the primary waves listed in the first column. There are two waves of interest, one with primary wavelength 2.3e21 meters and the second with 1.15e21 meters primary wavelength wavelength.

Above, the temperature predictions in the box compare favorably with WMAP data. The specific wavelengths concentrating the density and producing temperature variations are listed in the rightmost column (the wavelengths also agree with the WMAP data shown above). Angle (radians)= 2*pi()*phase+pi/2*(wl/2.3e21). I put the 4 waves in a table, identified where the peaks were and watched the way they add and subtract as a function of L (the horizontal axis that WMAP used). I used excel ® to do power spectrums and it was clear that the second and third peaks were lower like the WMAP data. Details are in Reference 18.

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 can be calculated from the Jeans wavelengths. Density and wavelength are the variables of interest. There is no reference to dark and normal mass in the calculation. The hot spots are Jeans waves and harmonics of Jeans waves that start at equality. The ratio of the first and second spots is

NOT the dark to normal matter ratio. I believe I have characterized the hot spots and they do not limit baryon fraction to 0.046 fraction of critical density.

Cosmological Parameter Comparison

Some details of the WMAP parameters are compared below with the revised parameters presented 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 photons) 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)			8.50E+21	5.15E+22	4.02E+25
						8.70E+24
2.26E-18	H0					3.14E+25
8809	Temperature at equality (K)			2.02E+04		2.73
	Photon mass density					
	Proton mass density					
2973	Temperature (K) decoupling				3.E+03	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)				2.57E+66	2.72E+77
2.814E-01	overall mass density				rhoC	Volume
					9.135E-27	2.72E+77
					mass=rhoC*Volume (kg)	
						2.486E+51

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 is the 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 and is 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 author's earlier work [16] discusses the problem but the present work shows that the reason the universe is flat is that the baryon density is 9.14e-27 KgM^3.

Conclusions

What is space-time?

Space is defined by the neutron model gravitational field. Initially space is comprised of exp(180) cells, each with the radius r0=hC/2.73=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. Its 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 protons gain a huge amount of kinetic energy gamma becomes significant.

There is a Schrodinger based energy=0, probability=1 construct (Appendix 1) associated with orbits defined by the neutron 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 cells. In turn, cells are anchored by the neutron model. The information we need about gravity is provided by the neutron model and cellular cosmology. This theory is dependent of 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 neutron model is based on the Schrodinger equation. In turn, the gravitational field energy 2.73 MeV originates in the neutron model. This is a quantum value but it is combined with large scale non-quantum properties. This provides a bridge between small and large scales.

What does this model imply regarding creation?

The neutron 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 neutron model. The probability 1, zero energy derivation naturally transitions from probability sets (p/p'=e/e') to energy sets that describes reality through the neutron model and cellular cosmology.

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Appendix 1 Schrodinger Fundamentals of the Neutron 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.

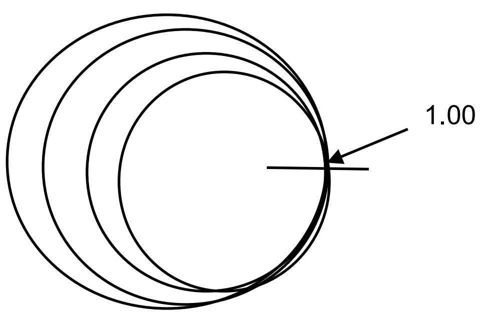
P	p1*p2=exp(-i Et/H)*exp(i Et/H)	
	with Et/H=1	
multiply by adding the logarithms		
ln P	ln(p1*p2)=-i+i=0	
P	exp(0)=1	

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 Neutron 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 neutron model are in Appendix 2 but the table above labelled "Neutron Components" for quad 2 (one of the quarks) is shown below:

The neutron model E values 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.

Neutron model review

For reference the neutron model is shown below. The left hand side defines N values for four probabilities for each of 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 to many significant digits.

Orbits associated with the Neutron Model

The neutron model above is a P=1, E=0 constructs but it contains information that defines more than 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)

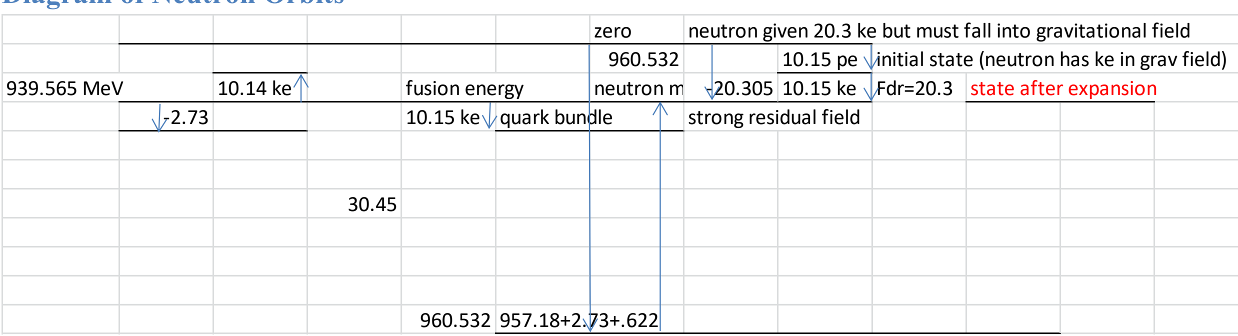
Orbit 5 The neutron mass orbits with 10.15 mev in -2.73 mev gravitational field (the gravitational field emanates from the quark fields).

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:

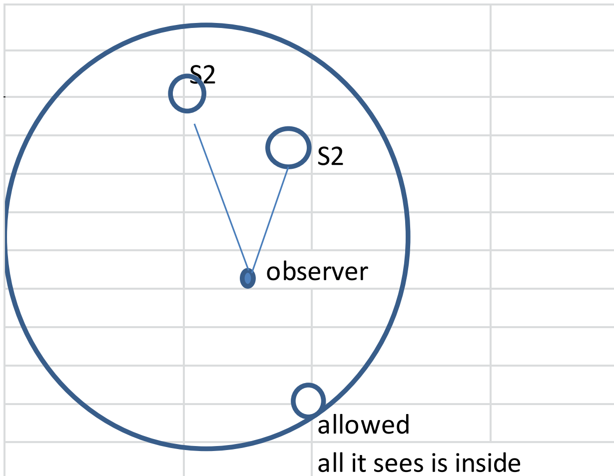
Separation creates opposite electromagnetic fields in the proton and electron
The bohr orbit is formed (electron mass with 13.6 ev of kinetic energy in 27.2 ev field).
The field energy is extracted from the proton mass.

Diagram of Neutron Orbits

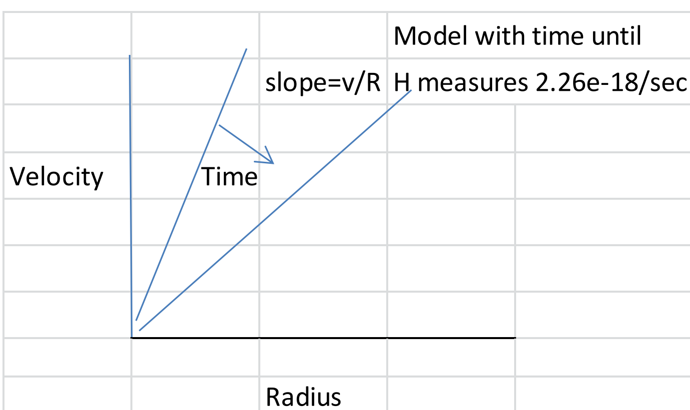


Appendix 4 Measuring Hubble's constant

In view of the cosmology of gravity, 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:

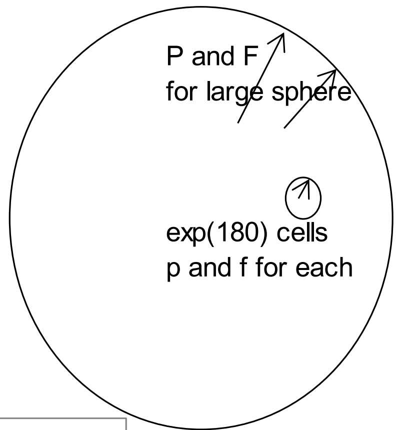


Hubble's constant is measured with the redshift of objects of known distance. Its current value according to the WMAP, Hubble and Planck missions is 2.26e-18/sec [4]. As long as objects are treated gravitationally as the surface of spheres within a larger spherical surface, they still have no preferred position. The reason for this is that 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

						Rgrav=rgrav*exp(60)*(Mg/2.49e51)^(1/3) (M)			
3.89E-04	3.01E-04	2.33E-04	1.80E-04	1.39E-04	1.08E-04	ke=2*(Force for Mg)*Rgrav /1.6e-13 MeV			
1.83E-09	2.37E-09	3.07E-09	3.96E-09	5.13E-09	6.63E-09	cell grav radius (M)=7.22e-14*9.87/ke (M)			
8.97E+19	1.16E+20	1.50E+20	1.94E+20	2.51E+20	3.24E+20	Rfall=(cell grav radius)/exp(90)*Mg/1.67e-27 (M)			
5.19E-38	3.11E-38	1.86E-38	1.11E-38	6.65E-39	3.98E-39	Force for Mg=G*1.67e-27*Mg/Rgrav^2 (Nt)			
6.33E+16	9.31E+16	1.37E+17	2.01E+17	2.96E+17	4.35E+17	Time (seconds)			
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			
4.65E-11	3.60E-11	2.78E-11	2.15E-11	1.66E-11	1.29E-11	ke (MeV)			
3.62E+00	2.56E+00	1.71E+00	1.04E+00	4.73E-01	0.00E+00	Z=Rfinal/R-1	1.21E+00		7.35E+19
8.97E+19	1.16E+20	1.50E+20	1.94E+20	2.51E+20	3.24E+20	Fall Radius (M	1.00E+41		
2.73E+05	2.40E+05	2.11E+05	1.86E+05	1.63E+05	1.43E+05	Fall velocity	2.49E+51	7.46E-05	
8.72E+24	1.13E+25	1.49E+25	1.98E+25	2.74E+25	4.03E+25	R1+R3	9.30E+07	Delta R	

The fall velocity calculation starts with the the original 9.87 MeV that decreases with (time/time')^(2/3). From this calculate small rgrav=7.22e-14*9.87/ke. Now calculate big Rgrav=rgrav*exp(60)*(Mg/Mu)^(1/3). The force resisting expansion is F=GmM/Rgrav^2. The ke for the fall from Rgrav is calculated with the potential energy= 2*(force*Rgrav)/1.6e-13. Rfall=7.22e-14*9.87/ke*exp(90)*(Mgalaxy/2.49e51). The orbital velocity is simply=V=GR^2/Mgalaxy. The left column is Z=3.6 and a galaxy with 2e41 Kg.