

A Unified Theory August 2025

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1. Introduction

Some are wondering if a unified theory will converge using ideas of the 20th century. Scientists use quantum mechanics but say it is incomplete. Cosmologists use general relativity but are frustrated with attempts to reconcile large scale gravity with small scale physics. Astronomers and astrophysics continue to gather data with missions like WMAP, PLANCK and James Webb. But there are unresolved problems related to early observation of fully formed galaxies and Hubble measurements. There is no consensus regarding dark matter and dark energy. We know that nature is very precise and mathematical, but there is much to learn. Scientific American [8] published a review of the status of physics in their Millennium Special Issue. The article by the late Steven Weinberg was titled “*A Unified Physics by 2050?*” Unfortunately waiting is not very satisfying. Many want answers to fundamental questions about our existence.

This paper proposes requirements and progress toward a unified theory to help researchers work toward a common vision [5]. A unified theory will gain acceptance if it satisfies these requirements:

Agrees with particle data reported by the Particle Data Group [20][26], maintained by University of California at Berkeley and NIST (National Institute of Standards and Testing).

- Accurately models the mass of the neutron and its decay to a proton, electron, and anti-electron neutrino.
- Provides a source of constants for the four forces.
- Unites quantum mechanics and Newtonian gravity.
- Models atomic binding energy data.
- Models measured abundances of the elements.
- Models mass for short lived baryons, mesons, and their decay times.
- Explains the Standard Model of Particle Physics.
- Explains the origin of energy.
- Explains time and space.
- Provides the number of neutrons in nature.
- Explains the Heisenberg and Pauli principles.

- Explains the double slit experiment.
- Consistent with EPR measurements.
- Presents the correct cosmology expansion curve.
 - Explains accumulation of mass in clusters, galaxies, and stars.
 - Explains early black holes, dark matter, and dark energy.
- Provides a basis for progress regarding life's enduring questions.
 - Explains perception.
 - Explains evolution of life and development of the body.

Why should a unified theory explain evolution? We need a plausible creation "story" even if we don't know its origin. If physics theory is inconsistent or even agnostic regarding life, it doesn't recognize one of nature's products. Another "soft" requirement has to do with nature's purpose. Science is a potential source of answers regarding difficult questions and society needs a firm philosophical foundation. Everyone seeks meaning and if science is not going to provide it, society will seek it elsewhere.

Models and measurements.

Even one disagreement between prediction and measurement can discredit a theory. Features of nature have been measured for centuries. Instruments have become more sophisticated and more accurate. The Particle Data Group and NIST listings are impressive and voluminous. Nature primarily consists of stable neutrons, protons, and electrons and their masses have been measured to within $1e-6$ MeV (million electron volts). High energy experiments have been carried out at labs throughout the world characterizing short lived mesons and baryons. So many particles have appeared that they are known as the "particle zoo" but only a correct theory can correlate the data. Experiments produce data consistent with particles known as bosons, Higgs, Z, W+, W- etc. but their place in nature needs to be identified.

A great deal has been learned and progress toward a unified theory occurred when scientists discovered that fundamental particles occur in families according to their properties, how they interact and decay. This standard model is reviewed in Appendix 5. Dr. Richard Feynman [2] and more recently Dr. Frank Wilczek published information about "entities" in the Standard Model [66]. The model indicates that there are three quarks inside each neutron and proton. Gluons are force carrying entities for the four interactions (forces of nature). A credible unified theory must be consistent with the standard model. Currently the Dirac equation is used for force unification. It is relativistic but contains a lot of empirical constants,

This document is a compilation of work by the author over many years building toward a unified theory. It is written at the college level like an engineering report and takes some effort to understand. Published work by physicists, astrophysicists and cosmologists is referenced. A practical approach is used that attempts to simplify nature. Data based computer modeling was used to simulate processes. Of specific interest are the topics of force unification, cosmology and creation. It also addresses topics at the forefront of astrophysics like dark energy and dark matter.

The author addresses how physics supports life and what is reasonable to believe regarding philosophy's "enduring questions." The human mind is a creative part of nature, and we are often reminded that it is difficult to separate our perceived reality from reality itself. We are presented with a puzzle, and a unified theory must make it clear that the pieces fit together, and the picture is whole.

Summary of unification topics.

Sections 1-3 focus on several topics that are basic to science. The first goal of section 1 was to discover laws that could be used to calculate the mass of particles and fields.

1. Particle data was correlated leading to the discovery of an information level that underlies energy. The discovery process involved information theory developed by Claude Shannon [29] and others [1]. Simply stated, nature's particles and fields are information-based. This is a level lower than Leucippus and Democritus who originated atomistic theory and also a level lower than the Standard Model.
2. Information level correlation with energy is the basis of neutron and proton mass models with net zero energy. The idea that creation was based on separations is supported.
3. Energies values inside a model of the neutron, proton and electron encode nature's laws. Space and time are defined by the model's gravitational field, and the proton itself has kinetic energy for expansion .

Section 4 reviews and extends the field of cosmology. Easy to understand equations are involved and agree with data being developed by NASA programs. An alternative expansion model [74][77] to the Lambda Cold Dark Matter is reviewed. The alternative agrees with recent James Webb telescope findings regarding early formation of black holes at the center of galaxies. A review of the critical density concept is presented that explains why WMAP concluded there that there is missing matter and dark energy. The concept is not supported by the cosmology presented. Section 5 also explains that flat galaxy velocity profiles are a measurement problem caused by local expansion effects. Section 6 extends fundamentals to life itself. Current knowledge about DNA leads to the critical question "How does it construct our physical and mental reality?" It is proposed that mind is part of an underlying information system I call Mind. Color vision is shown to follow Feynman absorption equations [2] for light emitted by steps associated with an information pattern. But the brain's ability to display it as color information tells us something about our viewing point in nature. This section also discusses the mind-body problem and theorizes that the proton underlies a neural network.

Section 7 presents work that unites fundamental forces and gravity. It demonstrates that the neutron model contains values that unite the strong, weak, electromagnetic, and gravitational forces.

Section 8 discusses relativity and explains what really causes space-time curvature.

Section 9 consists of atomic binding energy and elemental abundance modeling using a probabilistic approach consistent with the proton model.

Section 10 presents unification concepts. There appear to be two levels in nature. (a) An underlying information level that creates and (b) a space and time level that we perceive around us. They are parts of a dynamic system that we call the universe.

2. Energy

Science should help us understand what the universe is made of. It is made of energy, but it is logical to ask, “where did that come from?” There are a class of questions like this. For example, it is logical to ask “what is the universe expanding into? What came before the big bang? These questions are difficult because the only thing our brain experiences is things in space and time. We need a different perspective of nature to answer them.

Many thinkers and writers have reminded us that perception is central to what we know. Our brain uses senses and information networks to create sophisticated models of reality. These models operate at an information level below the energy level. We gain new perspective when we understand that information is fundamental to nature.

Energy data correlation with information.

The author discovered an information pattern in the data below that allows the mass of the neutron, proton, electron, and other fundamental particles to be calculated. It led the author to assign information values called N for mass and energy components in a math model of the neutron. Sources of the data are listed.

		Particle Data	Energy Es	N details
Identifier		Group energy	Es=e0*exp(N)	
v means neutrino	N=ln(E/e0)	E (MeV)	(MeV)	e0=2.025e-5 MeV
taon v		<15.5		
electron v		2.20E-06	0.048	
N component	0.0986			ln(3)-1
N component	0.16667			.5/3
muon v		< 0.17	0.0695	
E/M Field E	0.296	2.720E-05	2.72E-05	3*.0986=.296
ELECTRON	10.136	0.51099891	0.511	10.136=10.432-3*.0986
N component for qua	10.333		0.6224	10+1/3
N component for W	10.408		0.671	90-remainder
Grav field compc	10.432		0.687	10.432=10+1/3+.0986
Grav field compc	10.507		0.740	10.408+.0986
Energy difference Neutron-Pro		1.293		0.622+0.671=1.293
Graviton	10.432 & 10.507	6.00E-26	2.801	3*0.687+.74
Up quark Mass	13.432	2.16	2.490	4*0.622 MeV
Kinetic Energy fo	12.432		5.076	10.432+2
Down quark Mas	13.432	4.67	4.357	7*0.622 MeV
Down quark KE	15.432	93	92.507	101.947-9.44 (quarks)
Down Strong Fie	15.432		101.947	
Charmed Quark	17.432	1275	1273.37	15.432+2
Strange Strong f	17.432		753.291	
Bottom Quark M	19.432	4175	4175.27	17.432+2
Top Quark Mass	21.432	17276	17261.00	19.432+2
W+,w- Boson	22.106	80445	80668.71	22.5-4*.0986
Z Boson	22.234	91188	91757.6	22.5-.0985-.167
HIGGS Boson	22.530	125300	123340.7	22.5+2*.0986-.167

Figure 1 Particle data comparisons with model N values.

The values of N (column 2) form an easy to identify series. Column 3 is data from accepted sources and column 4 uses the relationship $E=2.02e-5*exp(N)$ to correlate N with the data. It supports an exponential relationship between particle or boson energy E (MeV) and $N=ln(E/e0)$ where e0 is 2.025e-5 (MeV). The value e0 is derived from the mass of the electron, 0.511 MeV ($e0=0.511/exp(10.1362)=2.02e-5$ MeV). The electron is $N=10.413-0.296=10.1362$ (refer to data above). Many N values contain the fractional value $xx.431= 1/3+0.0986$. The value $0.0986 = ln(3/e)$, where e is the natural number 2.718. The symbol exp(power) is the natural number $e^{(power)}$ not to be confused with e0, a pre-exponential.

3. The neutron and proton models.

Information values N, discovered in the original data above, were used to construct math models that match nucleon (neutron and proton) mass within experimental errors. The models are based on two constraints, probability one and zero energy. They show

component relationships and details of neutron decay to a proton, electron, and anti-electron neutrino. There are four fundamental forces in the models conceptualized as particles orbiting fields.

Probability=1 constraint

Evaluating energy requires consideration of overall probability, not just the probability of particles. The probability of each particle is extremely low but when duplicated a vast number of times they become certain. Specifically:

$$P= 1= \text{probability of each neutron} * \text{number of neutrons} = 1/\exp(N)*\exp(N).$$

Neutron and proton energy components

The conventional equation for energy is $E=hv=1/t$. $H=$ Planck’s constant= $4.14e-21$ MeV-second. $h=H/(2\pi)$ is Planck’s reduced constant [Wiki]. In the model that follows $Et/H=1$. We only need energy terms that are equal and opposite. Involving time, t in the model would be redundant. The mass models of the proton and neutron are based on overall zero energy and probability=1. The defining relationship between energy and probability is $P=e^0/E=1/\exp(N)$. This yields the relationship between energy and N , $E=e^0*\exp(N)$.

Quarks

Nucleons (protons and neutrons) consist of components called quarks. The table below shows one of the three quarks with kinetic energy attracted to two fields. Each quark has four N values and four correlated energy (E) values, $E=e^0*\exp(N)$. Energy units are million electron volts (MeV). The table positions for mass, kinetic energy and two fields are not interchangeable.

Position code from mass, kinetic energy, and fields.

mass	E1		field1	E3
kinetic energy	E2		field2	E4
mass=E1			field1	E3
Kinetic energy =E2+(E3+E4-E1-E2)			field2	E4

Values of N from fundamental data in Figure 1 are inserted below:

	N	$E=e^0*\exp(N)$	N	$E=e^0*\exp(N)$
kinetic energy	12.43195	5.075635	Field1	10.43195 0.686913
mass	15.43195	101.9469	Field2	17.43195 753.2911
Difference KE		646.9555		
		753.978		753.978

N values for the quark strong field is $N=2$ higher than quark mass N (for each of 3 quarks).

Probability =1 and overall energy =0.

E1 is the only mass term, E3 and E4 are field energy, and the remainder is kinetic energy. Overall, above: $E1+(E3+E4-E1-E2)+E2-E3-E4 = 0$.

The model starts with splitting $N=90$ into four parts. It is converted into two Higgs particles ($N=22.53$), a Z boson ($N=22.235$) and a W boson ($N=22.106$) in the second column. According to the Standard Model, the Higgs particle ($N=22.530$) is the source of field energy.

Higgs=22.53		Z components	
Z=22.235		W components: Action of W-	
Split 90/4	W=22.106		
22.500	22.530		
	-0.1972		0.197
	0.167		5.167
22.500	22.530		
	-0.1972		0.197
	0.167		3.167
22.500	22.235	-10.4316	
	0.0986	10.507	0.197
	0.167	10.333	3.167
22.500	22.106	-10.4316	
	0.3944	10.408	
		10.432	
			12.092
90.000	90.00	22.50	
		22.50	

The bosons are split into subsets of four values like $N=10.432+17.432=12.432+15.432$. The neutron and proton models below consist of four sets of these subsets that add to $N=90$ at the bottom of the model.

Neutron				Proton			
N values for mass	E=e0*exp(N)	N values for fields	E=e0*exp(N)	N values for mass	E=e0*exp(N)	N values for fields	E=e0*exp(N)
12.4319	5.076	10.432	0.687	12.432	5.076	10.432	0.687
15.432	101.947	17.432	753.291	15.432	101.947	17.432	753.291
12.432	5.076	10.432	0.687	12.432	5.076	10.432	0.687
13.432	13.797	15.432	101.947	13.432	13.797	15.432	101.947
12.432	5.076	10.432	0.687	12.432	5.076	10.432	0.687
13.432	13.797	15.432	101.947	13.432	13.797	15.432	101.947
Z components		Z Field		W components		W field	
-10.432	E=e0*exp(N)	-10.432	E=e0*exp(N)	-10.432	E=e0*exp(N)	-10.432	E=e0*exp(N)
10.507	0.740	10.507	0.740	10.408	0.671	10.507	0.740
10.333	0.622	10.333	0.6224	10.136	0.511	10.333	0.622
				0.296	2.72E-05		
90.000		90.000		90.0000		90.000	

The probabilities for the four sets of four subset N values are:

$$1=(1/\exp(12.43)*1/\exp(15.43)/(1/\exp(10.43)*1/\exp(17.43))$$

$$1=(1/\exp(12.43)*1/\exp(13.43)/(1/\exp(10.43)*1/\exp(15.43))$$

$$1=(1/\exp(12.43)*1/\exp(13.43)/(1/\exp(10.43)*1/\exp(15.43))$$

$$1/EXP(-10.432)*1/EXP(10.408)*1/EXP(10.136)*1/EXP(0.296)/(1/\exp(10.33)*1/\exp(10.408)*1/\exp(10.33))=1.$$

The probabilities are multiplied down through the vertical axis of the table. With each subset p=1, overall P=1*1*1*1=1.

Each quark with kinetic energy (E2+E3+E4-E1-E2) is separated from field energy E3+E4. Field energy E4 is a component of gravitational field energy.

Energy values from the table (E=e0*exp(N)) above are arranged into columns below for clarity. The components above total the mass of the neutron and proton below marked in red below (accuracy vs PDG data is shown). It is a particle-space model because it includes initial neutron expansion kinetic energy 10.15 MeV and expansion potential energy 10.15 MeV. The energy E2+E2= 10.15 MeV is fundamental to atomic fusion and expansion of the universe. The neutron decays to a proton, electron, and anti-electron neutrino shown on the right.

		MeV		MeV		MeV		MeV
		Neutron Mass	Components	Neutron Field	Components	Proton Mass	Components	Proton Fields
		101.947	Mass	753.291	Strong Field E	101.947	Mass	753.291
		13.797	Mass	101.947	Strong Field E	13.797	Mass	101.947
		13.797	Mass	101.947	Strong Field E	13.797	Mass	101.947
		5.076	Ke	2.801	Gravitational Field	5.076	Ke	2.801
		646.955	Difference KE			646.955	Difference KE	
		83.761	Difference KE			83.761	Difference KE	
		83.761	Difference KE			83.761	Difference KE	
		10.151	Fusion KE			10.151	Fusion KE	
		-20.303	Weak Field E			-20.303	Weak Field E	
						-0.622	minus quark mass	
	accuracy vs PDG	0.622	adds to quark mass		accuracy vs PDG	-0.048	ae neutrino	
	-7.18546E-09			-0.118	-0.0000096	-5.44E-05	Em Field +2	-0.118
	939.5654133	939.565413	Neutron mass		938.2720814	938.27209		
	PDG				PDG	2.72E-05	EM Field -1	
						0.511	Electron	
						0.671	.622+.048	
						0.11141	Kinetic E	
		10.15127081	KE Expansion			10.15	KE Expansion	
		10.15127081	PE Expansion			10.151	PE Expansion	
		959.8680		959.8680		959.8679		959.8680

The table below also summarizes the above energy values for the neutron and proton, except it shows the quark masses in their low energy mode. The left-hand side computation for each particle above is for mass plus kinetic energy. The right-hand computation is for fields. There are two field energy values for each quad sub-component, the strong field energy that confines its quark and a second field that is a gravitational field energy component. The components add to the Neutron mass and Proton mass in red. The total gravitational field energy= 2.801 MeV. The neutron decays to a proton, electron, and anti-electron neutrino in the columns for the Proton. The total energy for the entire information table is at the bottom of each column. It is 959.8680 MeV. The energy below the values in red is outside the particle itself. This makes the table a neutron-space and proton-space model. The KE expansion and PE expansion values were used to model cosmological expansion.

Each horizontal box is zero net energy and probability 1. For example, zero energy for the top box is: 101.95+5.08+646.96-753.29-0.69 = 0 MeV. The arrows point to the fourth set of zero net energy and probability 1 components. The total energy on the left-hand side includes the initial kinetic energy of expansion 10.15 MeV, and 10.15 MeV of

potential energy. $P=1$ at the top of the table represents neutrons and protons embedded in space and time. The neutron transitions to a proton and electron in the figure below. Each energy has an N value and probability = $1/\exp(N)$. They multiply to $p=7.4e-40$. The Down and Up quarks [26] [4] agree with Particle Data Group data after they shift to a lower energy while conserving mass+ kinetic energy.

Neutron Model				Proton Model			
	Mass plus Kinetic Energy MeV	Strong Field Energy Gravitational Field Energy MeV		Mass plus Kinetic Energy MeV	Strong Field Energy Gravitational Field Energy MeV		
Down Quark	4.36	-753.29	Down Strong Field	Down Quark	4.36	-753.29	Down Strong Field
Kinetic E	739.470	-0.687	Grav Field component	Kinetic E	739.470	-0.687	Grav Field component
Up Quark	2.49	-101.95	Up Strong Field	Up Quark	2.49	-101.95	Up Strong Field
Kinetic E	89.993	-0.687	Grav Field component	Kinetic E	89.993	-0.687	Grav Field component
Up Quark	2.49	-101.95	Up Strong Field	Up Quark	2.49	-101.95	Up Strong Field
Kinetic E	89.993	-0.687	Grav Field component	Kinetic E	89.993	-0.687	Grav Field component
neutrino ke	-0.671						
Fusion KE	10.151			Fusion KE	10.151		
E/M field	-2.722E-05			ke	0.622	0.000	field
ae neutrino	-2.025E-05	-0.740	Grav field component	data	939.565346	-0.740	Grav Field component
data	938.272013			939.565346			
E/M field	2.722E-05		outside	t neutrino	0.118		
electron	0.511		neutron	Expansion PE	10.151		
Kinetic E	0.111	0.000	field	Expansion KE	10.151		
v neutrino	0.671			Fusion release	0.000		Grav Field Total
t neutrino	0.118			Total M+KE	959.986	Total Fields	-959.986
Expansion PE	10.151						-2.80114
Expansion KE	10.151						
Fusion release			Grav Field Total				
Total M+KE	959.986	sum m+ke	-959.986				-2.801

Figure 2 Neutron and proton models.

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

Figure 3 Comparison of models with PDG [20] and NIST [26] data.

The author’s mass model of the proton provides new insight into how nature creates and accounts for energy. In the model, energy is created through an information-based separation process. This satisfies one of the criteria for a unified theory. The neutron and proton are manifestations of underlying laws and contain sub-component energy values that determine many aspects of nature including constants for unification of forces.

Comment: The agreement is excellent. All N values are either integers, the value $1/3$ or $\ln(3)-1$. There is no way that these three values could represent the details of the particles by “fudging.” The models are strictly based on energy data and two criteria: overall energy zero and overall probability one.

Time and space.

No one can doubt the famous Einstein relativity equation $E^2=M^2+(PC)^2$ where PC is momentum. But $mass^2$ and PC^2 are on the left-hand side on the model above. There is another equal term; the right-hand side (RHS) total field energy E^2 (because $E^2-E^2=0$). Energy overall is zero (proton mass+ kinetic energy+ potential energy equal

negative field energy) and we cannot separate the proton from the total energy of the bottom-line energy, 960 MeV. It is a proton-space model [60].

$E t/H=1$ with $t= 2\pi r/C$ leads to $r= HC/(2\pi)/E= hC/E$. $r=$ probabilistic position of the quantum particle. $H=$ Planck’s constant= $4.14e-21$ MeV-second. $h=H/(2\pi)$ is Planck’s reduced constant [Wiki].

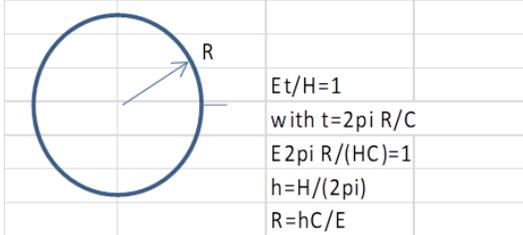


Figure 4 Derivation of equation $R=hC/E$

Time and space are defined below with the equation $R=hC/E$ where $E =$ gravitational field = 2.801 MeV (field components from the model above = -0.69+ -0.69+ -0.69+ -0.740 = -2.801 MeV). This defines time and space. $R=$ quantum circle radius= $HC/2\pi=1.973e-13/2.801=7.045e-14$ meters.

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

The gravitation constant G , the subject of Section 4, depends on this radius. Energy is inverse time; i.e., $E t/H=1$ since H is a constant. The author’s cosmology expansion model [Section 5] indicates that time progresses by repeating increment $t= 1.47e-21$ second. The proton model represents protons in time and space with kinetic energy plus potential energy conserved in a way that $P=1$ overall. Expansion is based on exchanging kinetic energy for potential energy. The implications are discussed in section 5 entitled “Cosmology”.

Probability =1 recovery with improbable components.

Overall, the N values of the left-hand side neutron components equal 90. Written as a probability $p= 1/\exp(90)$. The equal but opposite left-hand side components are also $p= 1/\exp(90)$. They occur at the same time, multiplying the probability to $1/\exp(180)$. To re-establish $P=1$ for such an improbable particle, there must be a huge number. Specifically, $P= 1=$ probability of each neutron* number of neutrons= $1/\exp(180)*\exp(180)$. Referring to the concept of wholeness, one can consider the universe being constructed of duplicates. Duplicated components give it space-wise and time-wise connections inside a $P=1$ system, explaining some of the weirdness of quantum mechanics.

We evaluated energy with the equation $E= e0*\exp(N)$ with $p= 1/\exp(N)$. After neutron decay, the electromagnetic field separates into equal opposite charges for the proton and

electron. Protons fuse into neutrons and protons inside atoms that have sophisticated electron orbitals.

4. Gravity.

Gravity is different than the other three fundamental forces reviewed in section 7 because it is long range and weak. It affects everything with mass and its cumulative force is pervasive. Science struggles with quantum gravity. The problem is that forces are described by bosons in quantum theory, but do they carry the ‘action at a distance’ gravitational force. General relativity deals with the problem by stating that the geometry of space-time is responsible for gravity. The Planck scale is currently accepted as the source of the gravitational constant. Literature reviewed below [10] describes the Planck scale.

Action for planck length				
	Constants			
h	6.582E-22	MeV-sec	reduced Planck	
E	1.22E+22	MeV	Planck Energy	
M	2.18E-08	kg	Compton mass	
G	6.67E-11	Nt m^2/kg^2	gravitational constant	
C	3.00E+08	m/sec		
	1.60E-13			
Relationships				
	L=G*M/C^2	Compton wavelength		
	L=G*M/C^2	6.67e-11*2.18e-8/3e8^2	1.62E-35	meters
22E+22	L=C*h/E	3e8*6.58E-22/1.	1.62E-35	meters
	L=h/(M*C)		1.61E-35	meters
	G=h*C/M^2	6.58E-22*3e8/2.	6.67E-11	Nt m^2/kg^2

Figure 5 Nomenclature review and the Planck scale.

When physicists dealt with one electron and its field energy, they knew they were working with the quantum scale, and it was reasonable to assign an electromagnetic like Compton mass and wavelength. However, early physicists may not have yet understood that gravity is the geometry of space time. It was unfortunate that the great physicists of the 1900’s did not have the advantage of expansion models, nor did they have the advantage of knowing the number of protons in the universe described by $\exp(180)$. Perhaps they couldn’t scale gravity to the quantum level because they lacked information.

https://www.nasa.gov/mission_pages/planck

Cellular cosmology.

The author developed a concept called cellular cosmology [15] that breaks one large volume into many small volumes (cells) with a proton in each volume. Gravitation for the cell is defined by the proton-space model. Gravity is different because all particles influence one another. Compare this to an electron and the electro-magnetic force. This force falls off quickly with distance and does not influence distant electrons like gravity influences distant mass.

The gravitational field energy, 2.801 MeV is the basis for quantum gravity with fundamental radius 7.045e-14 meters. The gravitational coupling constant 1/exp(90) scales the quantum level to Newtonian G and weakens the effect of gravity since it is shared between exp(90) = 1.49e78 particles. This causes gravitation to be a long-range force.

Gravity is an inverse squares phenomenon meaning that the force varies with 1/radius². One proton is receiving a small gravitational flux from all the other protons in nature. The proton model contains constants that define gravity, but there is a correction for the effect all the other protons have one proton. This means the overall flux must be divided by the total number of protons. The proton-space model is based on probabilities that indicate M total= proton mass*exp(180). Flux for one proton= total flux/exp(180). Since flux is r², the relationship is:

$$r^2 = R^2 / \exp(180)$$

$$r = R / \exp(90) \text{ radius substitution}$$

$$M = m * \exp(180) \text{ mass substitution}$$

For gravitation and large space, we consider velocity V, radius R and central mass M as the variables (capital letters for large space and lower-case r, v, and m for quantum space) that determine the geodesic. A geodesic is the curved surface where an orbiting body obeys the Newtonian equation $R = GM/V^2$ where G is the gravitational constant. G large space= G for quantum space with mass substitution $M = m * \exp(180)$ and radius substitution $R = r * \exp(90)$. Gravitational relationships define geodesics as surfaces where particles orbit.

At any time during expansion		
Large space		Cellular Space
		With substitutions:
		R=r*exp(90) and M=m*exp(180)
R*V²/M=	G=G	r*exp(90)*V²/(m*exp(180))
R*V²/M=	G=G	(r*v²/m)/exp(90)

Figure 6 Origin of (1/exp(90)) for gravity.

This is the source of 1/exp(90)= 4.2e-40. This can be called a coupling constant and compares with published value 5.9e-39 but physicists admit that they don't have a theory for quantum gravity. When measurements are made at the large scale, as must done to determine G, the above derivation indicates that we should multiply large scale values (RV²/M) by 1/exp(90) if we expect the same G. Geometric and mass relationships give

the cell “cosmological properties”. The extremely small value $1/\exp(90)$ is the scale value (coupling constant) for gravity. Velocity $V=v$ for small scale and large-scale proton orbits.

Calculating the gravitational constant, G.

The Schwarzschild equation $R_s=GM/C^2$ is a solution to Einstein’s field equations [Wiki]. The equations are written for general relativity curvature caused by mass. The radius R_s is adjusted to r_s (lower case) in the relationships below to represent one neutron. The geometry described as cellular cosmology is the basis for the adjustment. The fundamental that allows G to be calculated is the equality between the de Broglie wavelength and the Schwarzschild solution r_s .

The defining condition for gravity is below with velocity= C.

$R_s^2=r_s^2*\exp(180)$	
$R_s=r_s*\exp(90)$	
$M=m*\exp(180)$	
$G=r_s*\exp(90) C^2/(m*\exp(180))$	
$G=r_s*C^2/m*1/\exp(90)$	
$r_s= G m/C^2*\exp(90)$	

$r_s=GM/C^2*(\exp(90))=r$ deBroglie= hC/E where $E=mC^2$
 From this equality, $G=hC/Mm*1/\exp(90)$

The de Broglie radius required is for mass only (excluding the masses kinetic energy). The proton is a manifestation of fundamental laws and as such contains basic information about four interactions. Would you be surprised if we refer to the proton-space model for the source data?

	Mass (m)	Ke	R	Field (E)
Interaction	(mev)	(mev)	meters	(mev)
Gravity	129.541	10.151	7.0445E-14	-2.801
Electromagnetic	0.511	1.36E-05	5.2911E-11	-2.72E-05
Strong	926.885	957.185	2.0615E-16	-957.18
Strong residual	939.565	10.151	1.4211E-15	-20.303

Figure 7 Neutron model data for gravitation.

The gravitational energy fields total $3*0.687+0.671= 2.801$ MEV.
 The quark mass of the neutron = $101.95+13.8+13.8=129.54$ MeV = $2.3e-28$ Kg. [proton-space model].

Radius r de Broglie= $hC/E=6.58e-22*3e8/129.54= 1.523e-15$ meter.

$M=1.675e-27$ Kg (939.57 MeV)
 $m=2.31e-28$ Kg (129.54 MeV)

$$G = hC / Mm * (1 / \exp(90))$$

$$G = 6.58e-22 \text{ MeV-sec} * 3e8 \text{ m/sec} / (1.675e-27 \text{ Kg} * 2.31e-28 \text{ Kg}) * 1.602e-13 * (1 / \exp(90))$$

$$G = 6.678e-11 \text{ Nt m}^2 / \text{Kg}^2$$

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

An alternative way of calculating G.

Because this is new and uses coupling constant = 1/exp(90) that connects the quantum level with large scale gravitation, several approaches are presented.

The gravitational constant is calculated below [15] and again agrees with the published constant. $G = F * R^2 / M^2 / \exp(90)$. In the example below, a proton orbits at the fundamental radius 7.045e-14 meters with initial kinetic energy 10.15 MeV. The second column demonstrates that the gravitational constant remains the same during expansion. Expansion involves exchanging kinetic energy of a proton for potential energy. This allows small volumes, each with a proton to maintain G and represent large scale cosmology through the coupling constant 1/exp(90).

GRAVITY		0.028	expanded
		neutron	
Neutron Mass (mev)		939.5654	939.565
Neutron Mass M (kg)		1.675E-27	1.675E-27
Field Energy E (mev)		2.801	2.801
Kinetic Energy MeV $Ke = 10.15 * r / 7.045e-14$		10.151	0.001
Gamma (g) = $939.56 / (939.56 + ke)$		0.9893	1.0000
Velocity Ratio $v/C = (1 - g^2)^{0.5}$		0.1458	0.0015
Velocity (meters/sec)		4.372E+07	4.41E+05
R (meters) = $(hC / (2\pi)) / (E * E)^{0.5}$		7.045E-14	7.045E-10
Inertial Force (f) = $(m/g * v^2 / R) * 1 / \exp(90)$ Nt		3.763E-38	3.784E-46
Calculation of gravitational constant G			
$G = F * R^2 / (M * m / g) = NT \text{ m}^2 / \text{kg}^2$		6.657E-11	6.693E-11
Published by Partical Data Group (PDG) [10]			6.674E-11

Figure 8 G calculation for initial and expanded condition.

Calculating the gravitational constant from potential energy and radius.

Above we used $G = hC / Mm * (1 / \exp(90))$ to determine G, but $hC = E * r$ and the proton-space model identifies potential energy E and radius r. E's value is 10.15+10.15= 20.3 MeV shown. The bottom left-hand side of the model in figure 4 and r is related to the proton model's gravitational field energy 2.801 MeV [14]. The value $hC = 1.973e-13$ MeV-meter.

$$\text{Radius. } 73e-13 \text{ MeV-m} / 2.801 \text{ MeV} = 7.045e-14 \text{ meters}$$

$$G = hC / Mm * 1 / \exp(90) = E * r / MM * (1 / \exp(90)) \text{ where } M = 1.67e-27 \text{ Kg.}$$

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

$$G = 6.678e-11 \text{ Nt m}^2 / \text{Kg}^2$$

Gravity is weak and long-range because it has a coupling constant, $1/\exp(90)$. This value is a probability in the proton model understood as the relationship between large scale space and cellular space.

Fundamental space and time are defined in the proton model by the gravitational field energy 2.801 Mev. Fundamental space is $r=hC/2.801$ and fundamental time is the time around this quantum circle at velocity C. Its value is $1.47e-21$ seconds. The easiest way to calculate G is the equation $G=2*10.138*7.045e-14/1.67e-27^2*1.602e-13*(1/\exp(90))=6.68e-11$ nt-meter²/kg².

5. *Cosmology*

The author uses the volume/proton called a cell [Section 4] to describe gravity, space-time, expansion kinetic and potential energy. It is useful because the associated proton model provides kinetic energy around the cell circumference that expands the universe. The proton model also provides the number of protons.

Original $P=1$ can be recovered if $P= 1/\exp(180)$ is multiplied by $\exp(180)$.

This gives $\exp(180)= 1e79$ neutrons in nature.

This agrees with the Eddington number [Wiki]: “Plunging all these numbers into formula gives us $\approx 10^{80}$ protons in a visible universe”.

Using a small cell of radius r to simulate a large radius R is critical to understanding cosmology (literature calls large R the Hubble radius or “the radius of the universe”). The proton model tells us that the universe consists of $\exp(180)$ cells. In three dimensions $R=\exp(60)$ is the Hubble radius R . In the previous section, the author calculated a fundamental radius $r=7.045e-14$ meters for gravity. The author believes that the space we walk around in is expanded from $\exp(180)$ cells of this initial radius. Also, the proton-space model contains the expansion energy, 10.15 MeV. Expansion is based on converting this kinetic energy to potential energy against the gravitational force.

Inflation and expansion.

The sequence of events surrounding the beginning is summarized below.

1. According to conventional cosmology, an inflationary period (perhaps no longer than a fraction of a second) allowed areas to remain uniform that lose contact. Some also felt that it would prevent an immediate collapse because gravity is strong when particles are close together. The author believes that inflation is a proton and cell duplication process filling the universe with identical cells. But in the straight-line expansion model presented later in this document, time and space are fundamental and expansion is the expanding distance between protons. Since protons can gain kinetic energy by falling into structures like galaxies, the distance between protons varies and the cosmological principle is not supported. In conventional Lambda Cold Dark Matter (LCDM) cosmology the universe is expanding at superluminal velocity (larger than C).

2. This paper offers straight line expansion as an alternative to LCDM cosmology. In the beginning, information operations separated the logarithmic value 90 into components identified by N values that add to 90. Values of N are a pattern we recognize as neutrons, protons and electrons that are net zero energy because field energy is equal and opposite mass plus kinetic energy. The P=1 is fundamental and places $\exp(180)$ particles adjacent to one another obeying the Pauli principle that no two fermions can occupy the same space. The equation $R=hC/E$, where E is the gravitational field energy 2.801 MeV defines the initial radius= $7.045e-14*\exp(60)$, filling a 3-dimensional universe with cells, each containing a proton like mass. Half of these particles are dark matter.
3. Each cell initially has 10.15 MeV of energy from the proton mass model. Primordial nucleosynthesis occurs at kinetic energy 0.111 MeV/proton at about 180 seconds into expansion. The nucleosynthesis process explains why about 25-29% of the observed elements are He4.
4. Gravitational accumulation occurs after the plasma subsides, resulting in clusters, galaxies, stars, and planets. These stars eventually “light up” under heat and pressure. Stars light up and release fusion energy.
5. The present observable size (limited by the speed of light) is 1.36e26 meters.

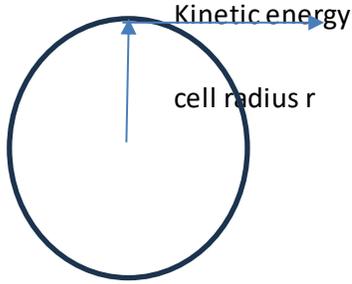
[https://en.wikipedia.org/wiki/Inflation_\(cosmology\)](https://en.wikipedia.org/wiki/Inflation_(cosmology))

The straight-line expansion model.

The author’s cosmology model is based on the inflation phase being identical to duplication of the particles by $\exp(180)$. It is based on thermodynamics and traceable energy values. It does not involve velocities larger than the speed of light (superluminal velocity) but of course as all cells expand, cells far from one another are carried away from each other at superluminal velocity. This is an advantage over the Lambda CDM model. Hubble measurements and the magnitude of Type 1A Supernova provide data for the expansion curve [67]. The WMAP and PLACK missions measured temperature variations in the Cosmic Microwave Background (CMB). The straight-line model explains CMB observations as star density variations in the cosmic web. Expansion is throughout a volume, characterized by time and consistent with kinetic energy being converted to potential energy. The total of all the mass remains 959.99 MEV, balanced by 959.99 MEV of field energy. During expansion, energy is conserved, and the sum of kinetic energy and potential energy are constant.

An alternative to the Lambda CDM expansion model.

When NASA sent payloads to the moon the rocket pointed up and around the earth into an orbit. Consider the possibility that nature uses a particle with decreasing tangential kinetic energy (cells) to increase the size of the universe. This work below extends the proton model to a straight-line cosmology expansion model based on zero net energy.



$$G = RV^2/M = rv^2/M$$

$$(vM/VM)^2 = (r/R)$$

$$ke/KE = r/R$$

$$ke = KE \cdot (r/R)$$

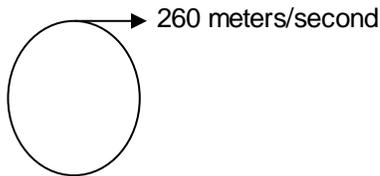
$$KE \text{ initial} = 10.1 \text{ MeV}$$

$$R \text{ initial} = 7.045e-14 \text{ meters}$$

$$r = 10.1 \cdot 7.045e-14 / ke \text{ also written as } ke = 10.1 \cdot 7.045e-14 / r.$$

$E/h = 1$ reduces to $r = (h/(2\pi) \cdot C)/E$ with time around a circle r at velocity C . The value $E = 2.801 \text{ MeV/proton}$ from the proton model. The initial $r = hC/E = 1.973e-13/2.801$ meters $= 7.045e-14$ meters. Time increments around this circle $= 2 \cdot \pi \cdot 7.045e-14/C = 1.48e-21$ seconds. This does not mean that the outside of the universe is rotating, instead it means that many expanding cells expand the universe. This provides an alternate way of exchanging kinetic energy for potential energy. Appendix 7 provides thermodynamic evidence that nature uses tangential velocity as the basis of an expansion. Expansion is caused by pressure. The pressure inside a cell is equivalent to the inertial force of the tangential velocity divided by surface area of the sphere.

Currently the orbit has 260 meters per second of tangential velocity associated with CMB temperature 2.73K at the end of expansion. The radius of the cell (a proton orbiting the space it encloses) is 1.2 meters and $\exp(60) \cdot 1.2 = 1.23e26$ meters.

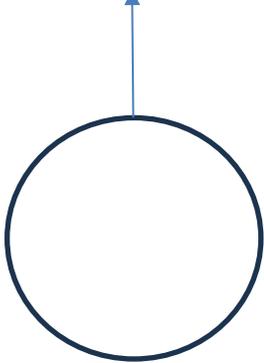


The Lambda CDM model uses the following derivation for critical density:

$KE = 1/2 \cdot M \cdot V^2 = PE = F \cdot R = (G \cdot M^2/R^2) \cdot R$		
$V^2/R^2 = 2 \cdot G \cdot M/R^3$		
$(V/R)^2 = 2 \cdot G \cdot M/R^3 \cdot (4/3 \cdot \pi) / (4/3 \cdot \pi) = 8/3 \cdot \pi \cdot G \cdot \text{Rho}$ where $\text{Rho} = M / (4/3 \cdot \pi \cdot R^3)$		
$\text{Rho} = (V/R)^2 / (8/3 \cdot \pi \cdot 6.67e-11)$		
$\text{Rho} = (V/R)^2 / (8/3 \cdot \pi \cdot 6.67e-11 \text{ Nt m}^2/\text{kg}^2)$		

But this derivation is for outward expansion velocity (like throwing a stone into the air) rather than enlarging an orbit with decreasing tangential velocity).

Outward expansion velocity



The kinetic energy of the cell is $\frac{1}{2} M V^2$ with $V=R/T$ but in the tangential model, velocity V is around the cell perimeter. It is only remotely related to $V_{outward}$. The derivations R 's cannot be combined. The concept of critical density is incorrect for tangential based expansion.

In addition for tangential velocity, when the R 's are combined, outward radius does not increase with $(\text{time}/\text{time}')^{2/3}$. (For LCDM, $(R/T)^2/R^2=2 GM/R^3$ reduces to $R^3=GM*T^2$. With GM a constant, $R/R=(T/T)^{(2/3)}$) for an "outward expansion strategy).

The straight-line expansion model [74][77] with zero net energy (ZNE).

The author has been developing and publishing the model of the proton [24] described above. It is based on two initial conditions, zero net energy and probability=1. Mass plus kinetic energy is equal and opposite field energy, expressed as net $E-E=0$. Components of the proton are divided into sub-probabilities that multiply and divide to $P=1$. The relationship between information and probability makes the model an information model [16]. Data correlates information and energy which suggests that both are fundamental.

James Webb telescope observations are challenging current cosmology. Fully formed galaxies are being observed well before they were predicted. Some stars are observed that formed under conditions thought to be un-favorable for mass accumulation. Current cosmology is also having difficulty with WMAP conclusions that most of the density in the universe is dark matter and dark energy. The LCDM expansion model [Appendix 6][6][11][34 used by the WMAP mission is being questioned. The straight-line expansion model are close to the WMAP [34] values for age (13.7 billion years) and radius ($1.3e26$ meters). But it has higher density throughout expansion. This accelerates star and galaxy formation rates. In addition, no missing matter is required.

The author uses an exponent called N to advance time across the circle's radius; $\text{time}=\exp(N)*1.48e-21/2\pi*\exp(N)$. The radius is proportional to time and $r=7.045e-$

14*exp(N). Starting at N=60 and ending at N=90.359 gives a straight-line expansion model. This is summarized in the following diagram.

Straight-line cosmology		cell bJ162		beginning	beginning	current expansion	current expansion
				Mass+Ke		Mass+Ke	
N exponent	for number of time cycles				60		90.359
Field Energy E (MeV)					2.8011		2.8011
time around circle=H/E =4.136e-21/2.801 (seconds)					1.47644E-21		1.47644E-21
r across circle=hC/E=1.97e-13/2.801=7.045e-14 meters							
E*t/H=1	2.801*1.476e-21/4.136e-21				1.00E+00		1.00E+00
time across radius=time around/(2 pi)*exp(N) seconds					2.68E+04		4.11E+17
R=7.045e-14*exp(N) meters					8.05E+12		1.2310E+26

The initial radius = exp(60)*7.045e-14= 8.05e12 meters, the final radius=1.23e26 meters. The model maintains the gravitational constant G with the equation above, kinetic energy ke= 10.15*7.045e-14/r. Since ke is inversely proportional to r, kinetic energy is also linear. The model is also zero net energy.

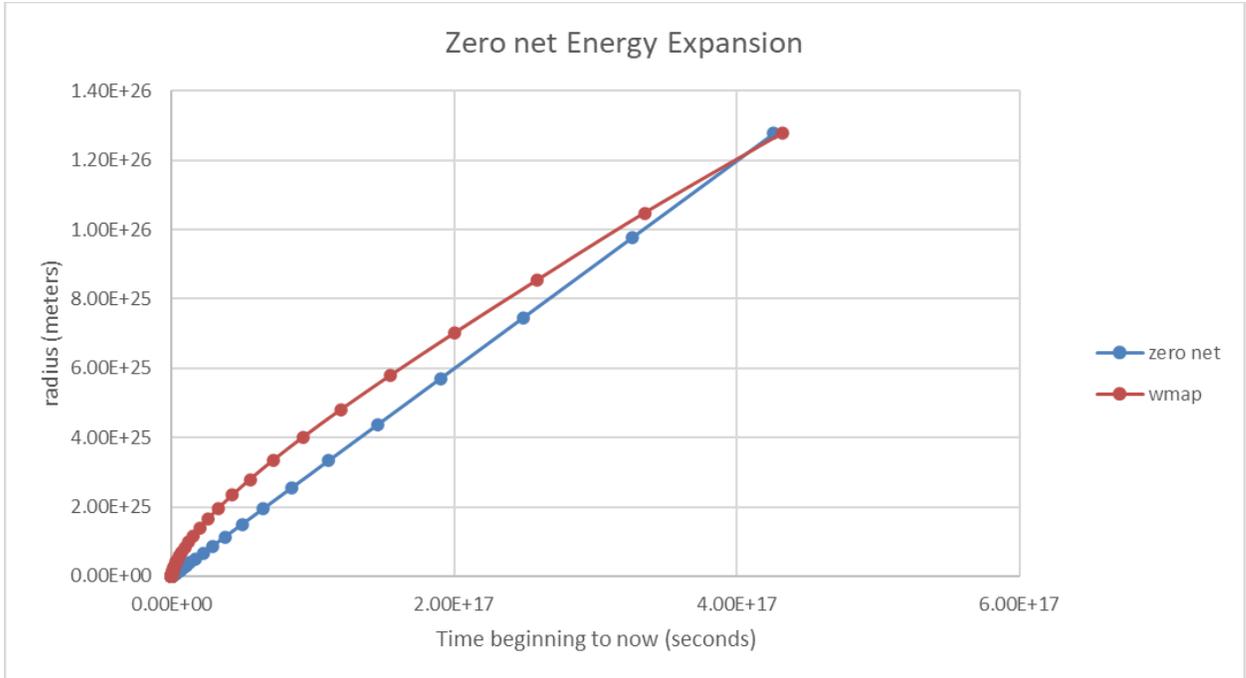
Particle Mass (MeV)		939.57	958.57	939.57	958.57
Kinetic Energy (MeV)	KE=7.045e-14*10.138/R	10.1030		6.60E-13	
		0.05	1.293		1.293
conserved E=PE+KE (MeV)		10.153		20.3	
Total energy in column (MeV)		959.87	959.87	959.87	959.8680

There are two columns for the beginning. The column on the left is mass plus kinetic energy and the column on the right is the field energy. The zero net energy concept requires these energies to be equal and opposite (959.96-959.86= 0). The beginning is high temperature and nucleons are primarily neutrons. They decay to protons, energy 1.293 MeV/neutron is released. The other change is that 10.1 MeV/proton of kinetic energy is converted to 1e-13 MeV/proton. The total ke+pe=20.3 MeV/nucleons is constant.

The current age and Hubble's constant are in the rightmost column. Why the value exponent 90.359 was chosen will be discussed below.

Time	4.11e17/365/24/60/60/1000	13.022	B years
Hubble	1/4.11e17	2.44E-18	1/sec

WMAP and PLANCK [11][32] mission analysis was based on the Lambda CDM expansion model. It is shown below in red compared to the zero net energy (ZNE) expansion model [74].



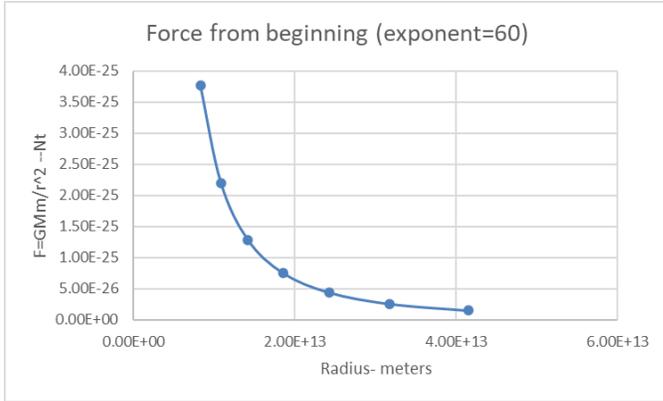
The current temperature is the measured value 2.725 K. This temperature is partially due to solar radiation kinetic energy ($2.725 = 1.5 * 8.62e-11 = 3.52e-10$ MeV). The other part is the remainder of 10.15 MeV/particle.

Forces during expansion.

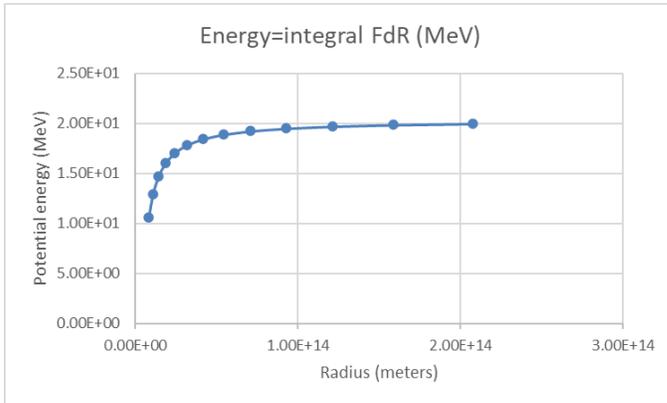
The bottom of the zero net energy expansion table shows the force resisting expansion at the beginning (exponent= 60). Force is calculated several ways.

Unification Table	cell bj162	beginning	beginning	partially expanded	partially expanded
		Mass+Ke	Field Energy	Mass+Ke	Field Energy
exponent				60	90.372
Field Energy E (MeV)	$E=2.801/EXP(exponent)$		2.5E-26		1.6E-39
R (meters)	$R=hc/E=1.97e-13/E$		8.05E+12		1.25E+26
R cell= $7.045e-14 * 10.138/KE$		7.04E-14		1.09E+00	
$V=(6.67e-11 * 1.67e-27/R)^{0.5}$		4.41E+07		1.12E+01	
$F=6.6742e-11 * (M * 1.67e-27)/R^2$; Nt	cell	4.01E-25		1.66E-51	0.00
$F=6.6742e-11 * (M * 1.67e-27)/R^2$; Nt		4.01E-25		1.67E-51	0.00
$F=2 * 10.3/7.045e-14 * 1.6022e-13/exp(60)$		4.04E-25		1.68E-51	0.00
Inertial F=m * V^2/R	Nt	4.04E-25		1.68E-51	0.00

With this force, the integral of force*delta r produces the increase in potential energy as the universe expands. From the proton model, KE+ PE= 20.3 MeV. At the beginning condition the PE is 10.15 MeV but integral F*delta r increases potential energy and kinetic energy decreases. This is shown in the graph below for the first few increments of the zero net energy expansion model.



The increases in potential energy quickly approaches 20.3 as kinetic energy decreases.



Dark energy and star fusion.

Dark energy is the place-holder name for the cosmological constant. It is a large part of the Lambda CDM WMAP critical density system. There is another explanation. In the thermodynamic approach we are able to identify the kinetic energy value 10.15 MeV that expands the universe rather than relying on the critical density concept. Another contributor to expansion is star fusion. Stars light up at about $Z= 14$ releasing energy. In the zero net energy model, the temperature at $1.23e26$ meters radius would not be 2.725 K without fusion energy. The calculation for sky temperature is based on multiplying the energy radiated from the $5.03e18$ m² surface area of stars at surface temperature 5778 K times. In the example below, the energy for each star is $3.54e5 * 3.19e18$ m² * $5778^4 = 3.56e33$ MeV. (The value $3.54e5$ MeV/m²/K⁴ is the Stefan Boltzmann constant). For $2.6e21$ stars, the total energy is $9.25e54$ MeV. This energy is radiated to the surface area of the universe at radius = $1.23e26$ meters (area= $1.93e53$ m²). $K^4 = 9.25e54 / 1.93e53 / 3.54e5 = 48.583$ K⁴. The fourth root is the required star fusion contribution, 2.725 K.

WMAP cosmological parameters and critical density.

Satellite missions (COBE, WMAP, PLANCK) have thoroughly mapped the cosmic background radiation discovered in the 1950's [6]. Power spectrum analysis [11] of the acoustic variations found absorption patterns associated with normal matter and dark

matter (at 4X normal matter density). Dark matter is also called “cold dark matter” (CDM). WMAP used the concept of critical density to calculate its value $9.5e-27 \text{ kg/m}^3$ from the measured Hubble constant. They reported critical density components. Cosmology parameters updated by 9-year data [34] are $\Omega_{\text{total}} = 1$, consisting of 0.718 dark energy, 0.235 dark matter and 0.0464 baryons. The alternative expansion model questions these values.

Key events in the straight-line expansion model.

Reference 19 analyzed the conditions a few minutes after the beginning known as primordial nucleosynthesis. The paper identified a 4X density particle reported by WMAP as He4.

Later in expansion ($Z = 3.4e6$ and $R_{\text{Hubble}} = 3.6e19$) a condition known as equality [4] [10] occurred where the mass of photons equaled the mass of baryons [78]. Thereafter, the number of photons decreased and mass dominated over photons. A gas derives its properties, especially its pressure by particle collisions. A plasma consists of charged relativistic particles with electromagnetic barriers. But if a particle does not have kinetic energy, all it can do is gravitationally “stick” to other particles of the same type rather than bounce because it has no electromagnetic repulsion. A slight variation of the proton model suggests that a particle without kinetic energy can exist and has the properties of dark matter. With no kinetic energy, it can not produce pressure. At equality, zero kinetic energy particles can accumulate according to the Jeans criteria that pressure resists accumulation. At equality perturbations exist in the normal matter. Essentially, the zero kinetic energy particles are swept into Zel’dovich pancakes [10] to form the cosmic web. Dark matter accumulates inside the lanes and form black holes. This preserves the expanding cosmic web structure. Once a black hole forms mass it becomes very dense and has a large effect on the surrounding gas. The gas surrounding the black hole is densified by its presence.

Example of black holes.

Galactic black hole	stellar BH	gro j1655-40
1.2E+37 m 87 mass	1.08E+31 mass	
1.78E+10 $rs=2GM/C^2$	1.60E+04 $rs=2GM/C^2$	

The Schwarzschild radius $= 2GM/C^2$ is a solution to Einstein’s field equations [Wiki][Appendix 1]. The equations are written for general relativity curvature caused by mass.

Formation of stars around the black hole.

De-coupling is the condition where the plasma clears, electrons settle into orbits around atoms. It is widely accepted that normal mass accumulation can start if the Jeans criteria is met. The following table shows de-coupling at $Z=9321$ and $R_{\text{Hubble}}=1.35e22$ meters.

	Rhubble	1.35E+22	1.76E+22	2.30E+22
saha=4*2^0.5/PI()^0.5*1/3.63e21*7.5e10*(T/0.511)^(3/2)*EXP(13.6e-6/(8.62e-11*R))				
	deccoupling	→		
	SAHA	3.02E-03	5.86E+03	1.12E+12
	Z	9321.8	7124.2	5444.6

Figure 9

Conditions for back hole formation.

In the author’s work, there is dark matter. It is a one-half of all original particle but it is without kinetic energy which is the source of pressure that can normally resist accumulation. The calculation below is the start of mass accumulation for dark matter into black holes. It starts with a single proton mass at equality and progresses with time [79].

Z		3.45E+06	2.64E+06	6.88E+05	5.26E+05	4.02E+05	3.07E+05	2.35E+05
Hubble radius (meters)		3.63E+19	4.75E+19	1.82E+20	2.39E+20	3.12E+20	4.08E+20	5.34E+20
mass star (Kg)		1.67E-27	3.91E-08	4.57E+25	1.63E+27	1.67E+28	7.85E+28	2.30E+29
vol=m/dens (m^3)		1.35E-19	7.08E+00	4.67E+35	3.73E+37	8.54E+38	9.01E+39	5.92E+40
Velocity=(2*(expansion ke)/1.673E-27*\$AC\$63)^0.5 m/sec		8.69E+01	7.60E+01	3.88E+01	3.39E+01	2.97E+01	2.59E+01	2.27E+01
R=(3*vol/(4*pi()))^(1/3) meters		3.18E-07	1.19E+00	4.81E+11	2.07E+12	5.88E+12	1.29E+13	2.42E+13
delta mass=rho*area*velocity*delta time kg		3.91E-08	2.80E+05	1.59E+27	1.50E+28	6.18E+28	1.52E+29	2.72E+29
Galaxy mass=star mass*4.9e10 kg		8.18E-17	1.92E+03	2.24E+36	8.00E+37	8.16E+38	3.85E+39	1.13E+40
				hidden cells				
density	Kg/m^3	1.237E-08	5.524E-09	9.795E-11	4.373E-11	1.952E-11	8.715E-12	3.890E-12
density of cell at temperature 2.73K		4.87E-20	4.87E-20	4.87E-20	4.87E-20	4.87E-20	4.87E-20	4.87E-20
density ratio			8.81E-12	4.97E-10	1.11E-09	2.49E-09	5.59E-09	1.25E-08
dT=(2.725*(1*(5.48e-20/(density))^0.5+1)^(1/3)-2.725)*1e6			2.70	20.25	30.31	45.36	67.89	101.60

Figure 10

Observation of red spots.

The table above may have been confirmed by observation. Currently James Webb is observing red spots that existed shortly after the dark ages. They probably consist of black holes with high temperature accretion disks. One recent observation at Z=20 [Utube] needs to be confirmed at this writing but its discovery supports the work in this document that black holes formed exceedingly early (this document placed their formation at equality only 10 years after the beginning).

At the point when the black hole reaches 1e40 kg the Jeans length is 5.4e19 meters as shown in the following table:

		1.01E+26	1.16E+26	Radius of Universe 1.32E+26
Angle in radians	$A = \text{jeans}/(\pi \cdot R_u)$	0.0084	0.0096	0.0110
Jeans length*Z		3.30E+24	3.78E+24	4.32E+24
time (million years)		9.68E-02	1.27E-01	1.66E-01
R= Hubble radius during expansion meters		9.15E+20	1.20E+21	1.57E+21
Expansion ratio Z =Rf/R-1		1.37E+05	1.05E+05	8.01E+04
rho=density of hydrogen gas (kg/m^3)		7.75E-13	3.46E-13	1.55E-13
Sound velocity Cs=3e8/3^0.5 (m/sec)		1.73E+08	1.73E+08	1.73E+08
sound crossing time= R/Cs shorter to be in equilibrium		5.28E+12	6.91E+12	9.04E+12
gravity free fall time=1/(G rho)^0.5		1.39E+11	2.08E+11	3.11E+11
Jeans length= gravity free fall*Cs		2.41E+19	3.60E+19	5.40E+19
Temperature (K)		5.E+04	4.E+04	3.E+04

Figure 11

At the point on the right-hand side of the table above, the Jeans wave subtends the angle 0.0104 radians=Jeans/(pi*R). This radius is key to our understanding of Cosmic Background Radiation (CMB). The reason that Jeans length 5.4e19 is important is that when WMAP measured the angle 0.0104 radians, they should have known the radius of the universe (if they used the author's cosmological expansion model). As expansion occurs the distance between galaxies will increase with expansion.

$$R_u \text{ now} = 5.4e19 * Z_{\text{expansion}} / (0.0104 * \pi) = 1.32e26 \text{ meters}$$

Properties of the CMB.

The work below is derived from WMAP [11][34] documents. The diagram below is the power spectrum reported by WMAP.

With the data in their documents, the following graph was constructed.

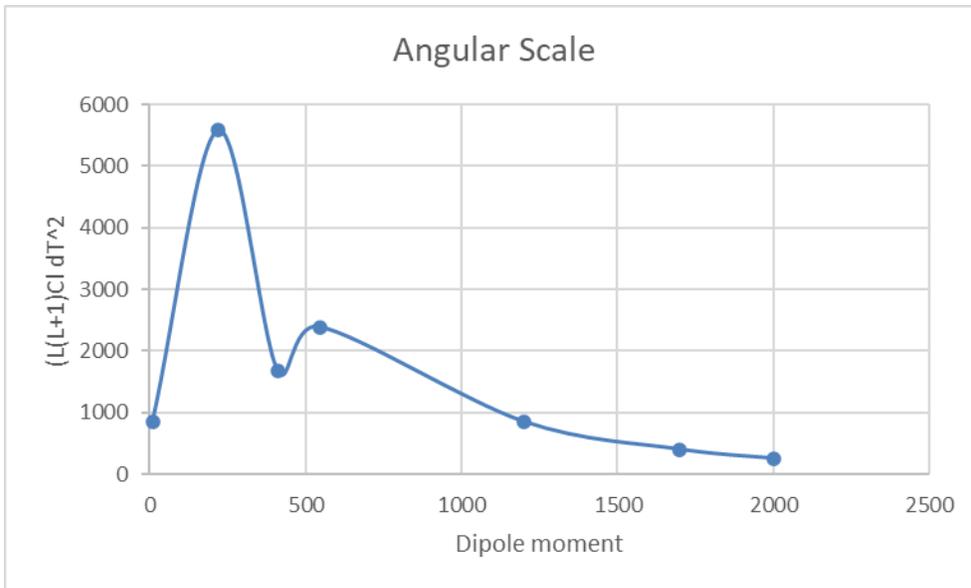


Figure 12

The x axis of the power spectrum gives the relationship between the measured angle 0.0104 radians and the multipole moment at the Hubble Radius 1.32e26 meters.

R hubble meters	Radians Angle	R at Z=8e4 Rcurrent/8e4	R current R=angle*pi*Rhubble	Multipole=Hubble*PI()*phase/Rcurrent	phase
1.26E+26	0.0104	5.15E+19	4.12E+24	220	0.735
9.59E+25	0.006616	2.49E+19	1.99E+24	411.7	0.867
7.33E+25	0.004494	1.29E+19	1.03E+24	546	0.781
5.60E+25	0.002591	5.70E+18	4.56E+23	850	0.701
4.28E+25	0.001626	2.73E+18	2.19E+23	1200	0.621
3.27E+25	0.001000	1.28E+18	1.03E+23	1700	0.541
2.50E+25	0.000724	7.11E+17	5.69E+22	2000	0.461

Figure 13

The table below is a major clue regarding what WMAP measured. It allows one of the multiple moments in the CMB to be associated with a galaxy of radius $R=1.85e17$ meters (see table above). The key chain of calculations is at $Z=8e4$ and $R_{\text{hubble}}=1.57e21$ meters where the Jeans length $5.4e19$ subtends the angle $0.01=5.4e19/(\pi*1.57e21)$. The Hubble volume is $1.64e64 \text{ m}^3$. The volume associated with clusters is Hubble volume divided by $2.2e5$ (the number of clusters in the Hubble volume. This volume is reduced again by $2.2e5$ to obtain the volume of a single galaxy (the number of galaxies in a cluster is $2.2e5$. This gives a volume of $3.72e53 \text{ m}^3$. The radius of this volume is $8.9e17$ meters. This compared with the radius at multipole moment 2000. The values match and are both about $7e17$ meters. **This means the small scale CMB is a single galaxy in the cosmic web.**

Z at early angle=0.01 radians		8.01E+04	This table is early at Z=8.01e4						
Jeans length at angle 0.01 radians		5.40E+19	short galaxies	long between	short filaments	long filaments	walls	voids	clusters
Multipole moment		2000	1700	1200	850	546	411.7	220	
Radius R at Z=8.01e4		7.10E+17	1.28E+18	2.73E+18	5.69E+18	1.29E+19	2.16E+19	5.14E+19	
Hubble volume	Vol H=4/3*PI()*Ru^3	Rh=1.57e21 m	1.61E+64						
Jeans volume	Vol J=4/3*PI()*Rj^3	Rj=5.4e19	8.22E+58						
Nclusters=Hubble vol/Jeans vol			2.21E+05						
Ngalaxies/cluster=4.9e10/2e5=2.21e5			2.21E+05						
Galaxy volume=Jeans vol/2.21e5			3.72E+53						
Radius of galaxy volume	Rg=(3/(4*PI()))*galaxy volume^(1/3)		4.46E+17						
Width of spot at Z=8.01e4	Rwidth=2*Rg		8.92E+17						

Figure 14

At this point, the larger scale multipole moments can be assigned to filaments, walls, voids, and clusters in that order. The large scale at multipole moment 220 is associated with a radius of $4.12e24$ meters at the present time. The other radii at the present time are listed in the table below with their correlation with cosmic web features.

galaxies	between	short filaments	long filaments	walls	voids	clusters	
2000	1700	1200	850	546	411.7	220	Multipole moment
5.6871E+22	1.0274E+23	2.1859E+23	4.5580E+23	1.0344E+24	1.7276E+24	4.12E+24	Radius R meters

Figure 15

The Y-axis of WMAP power spectrums re-interpreted.

The WMAP documentation gave the measured dT values in the CMB. The units on the variations were in micro-degrees K. dT^2 is the Y axis. These are variation is the sky temperature 2.725K.

15.8	20.0	29.2	50.0	48.8	41.0	74.7	dT data from WMAP CMB analysis
2000	1700	1200	850	546	411.7	220	Multipole moment
250	400	850	2500	2381	1681	5580	dT^2 (the Y axis of CMB analysis)

Figure 16

It is clear that WMAP and PLANCK were measuring the sky temperature. But they used density criteria associated with primordial waves to interpret the variations. Rather than depend on density, why not just use the measured sky temperature variations associated with clusters, voids, filaments, and galaxies? The source of sky temperature variations are stars. Each star is hot and radiates heat. But there is a lot of space around each star and the sky temperature is reduced to a value near 2.725 K. The sky temperature is calculated below based on the number of stars in cluster, voids, etc. The variation in stars is shown in the top line below.

galaxies	between	filaments	filaments	walls	voids	clusters		
0.0023	0.0029	0.0043	0.0073	0.0072	0.0060	0.0110	0.006	sky dT/T (%)
5.196E+07	2.146E+08	1.416E+09	1.056E+10	5.309E+10	1.655E+11	1.287E+12		delta stars
2.240E+12	7.311E+12	3.310E+13	1.439E+14	7.411E+14	2.750E+15	1.174E+16		Stars to give 2.725
15.8	20	29.1547595	50	48.8	41	74.7		dT (micro-degree K)
2.240E+12	7.311E+12	3.310E+13	1.439E+14	7.412E+14	2.750E+15	1.174E+16		Stars to give 2.75+dT
2000	1700	1200	850	546	411.7	220		10 Multipole moment
7.73E+08	7.73E+08	7.73E+08	7.73E+08	7.73E+08	7.73E+08	7.73E+08		Radius of star=6.96e8*(Mstar/Msun)^(1/3)
7.51E+18	7.51E+18	7.51E+18	7.51E+18	7.51E+18	7.51E+18	7.51E+18		area of star surface (meter^2)
5778	5778	5778	5778	5778	5778	5778		Temp of Star surface (K)
8.37E+33	8.37E+33	8.37E+33	8.37E+33	8.37E+33	8.37E+33	8.37E+33		Area*Temp^4
1.88E+46	6.12E+46	2.77E+47	1.20E+48	6.20E+48	2.30E+49	9.83E+49		Stars*area*Temp^4
5.69E+22	1.03E+23	2.19E+23	4.56E+23	1.03E+24	1.99E+24	4.12E+24		Ru=Sky radius (m)
4.06E+46	1.33E+47	6.00E+47	2.61E+48	1.34E+49	4.99E+49	2.13E+50		4.19E-01
55.134	55.134	55.134	55.134	55.134	55.134	55.134		4.19E-01
2.725	2.725	2.725	2.725	2.725	2.725	2.725		Measured temperatur

Figure 17

The table above is based on a cluster mass of 8.8e45 Kg. With each average star mass = 7.6e29 Kg, there are 1.17e16 stars/cluster. Each star has a surface temperature of 5778 K and radiated from its surface area 7.5e18 m^2. The sky has a surface area=9.83e49 m^2 at the multipole moment 220 (R=4.12e24 meters). The sky temperature equals:

$$((\text{stars} \times \text{star surface area} \times 5778^4) / (\text{sky area}))^{.25} = 2.725 \text{ K.}$$

The number of stars associated with WMAP reported CMB temperatures is calculated in the line above. The sky ((stars0-stars)/stars0) percent variation is near the top of the table for each multipole moment. The result is graphed below.

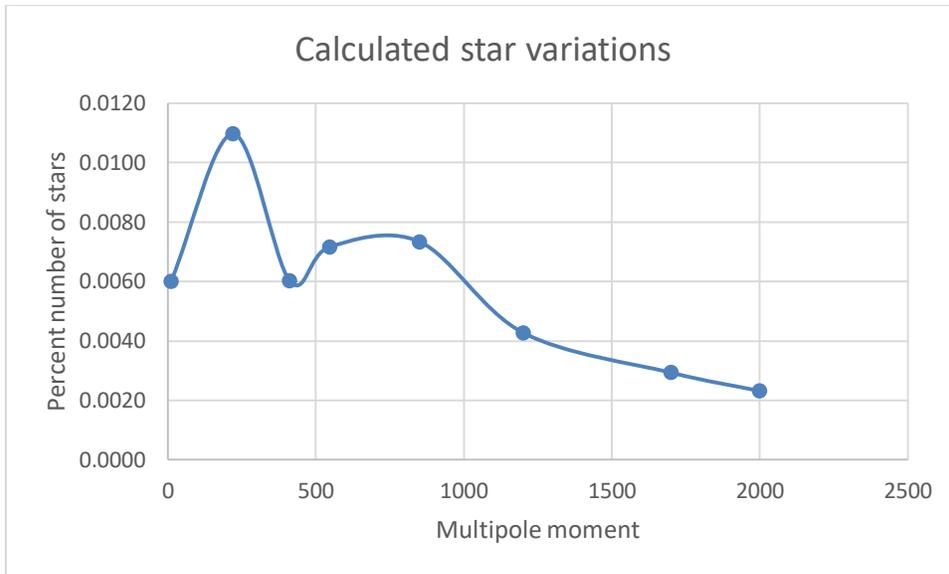


Figure 18

The peak is the hot clusters. To its immediate right is the relative cool area of the voids. But the filaments contain a lot of stars, and they are also relatively hot. The amount of radiation coming from the galaxy at multipole moment 2000 is relatively cool. I believe this is the CMB measured by WMAP. It is a reinterpretation of data. As they concluded, it originates as a wave, and it is the Jeans wave measured at $Z=8e4$ of wavelength $9.5e19$ meters. It became the Cosmic Web filaments, voids and smaller features. The spacing between these features expanded with the universe and they are now measurable as star heated areas of the sky.

Formation of stars around primordial black holes.

The goals of the calculations below are to understand where stars form in a galaxy and determine their number and size. The calculations need to match two criteria 1) accumulation into stars will start at the point in the expansion curve that the Jeans length equals the sound crossing time 2) ideally it should predict the distribution of mass and total mass of the galaxy it produces.

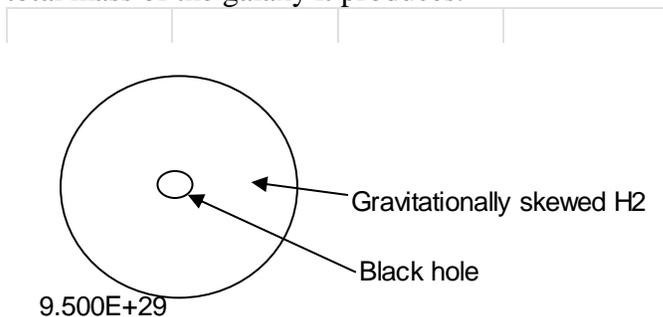


Figure 19

Influence of the black hole.

The calculations below calculate the gravitational influence of the black hole on the gas around it. Pressure and temperature are increased by its presence. The derivation of gravitational energy is below:

$$F = GMm/R^2$$

$$U = F \cdot R = GM \cdot 1.67e-27/R = \text{gravitational energy.}$$

Gravitation energy is equal to the kinetic energy associated with temperature throughout expansion. The black hole is at the center, and the black hole is influencing the conditions nearest the center the most. Galaxy radius R is in the bottom of the equation and U gets smaller across the radius. Gravitation energy U is proportional to temperature and pressure is related to temperature. The gravitational influence of the black hole (BH) on pressure is shown in the graph below.

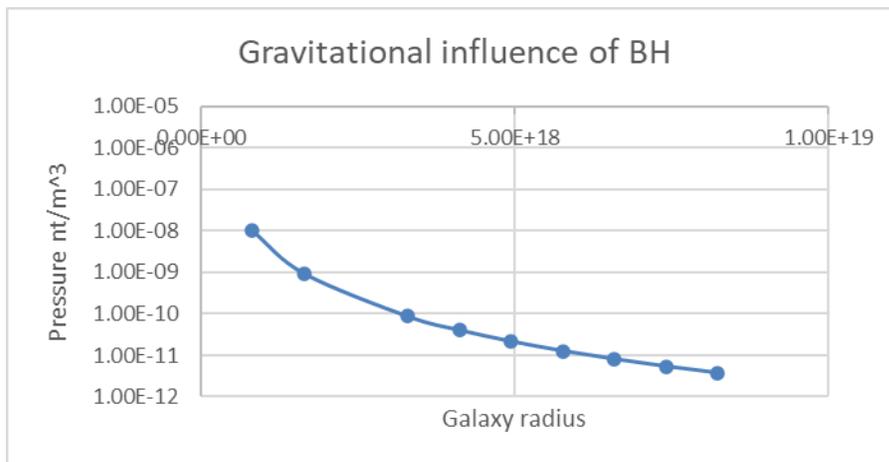


Figure 20

Determining the number of stars and their distribution across a galaxy.

The unstable radius of gas surrounding the black hole is $8.24e18$ meters from Table 7. Mass that surrounds the black hole has a higher temperature (T) than mass further away from the black hole (t). The gravitational energy $U = GMm/R$ is equal to the kinetic energy (ke) at each expansion radius. The temperature profile is calculated from $T = ke/(1.5B)$, where B is Boltzmann's constant. Since temperature is a function of R , the galaxy will be broken into orbits down toward the center where the black hole resides. The isentropic [20] formula $P = p \cdot (T/t)^{(1.41/0.41)}$ is used to calculate the pressure profile from the temperature profile and the density profile across the galaxy $\rho = P/(8257 \cdot T)$ where 8257 is the gas constant for H_2 . Once temperature and density ρ are known the speed of sound can be calculated $(cs) = 1.41 \cdot 8.62e-11 \cdot \text{temperature}/\text{density}$. Next, gravity free fall time (fft) can be calculated with the relationship $fft = 1/(G \cdot \text{density})^{0.5}$. This leads to Jeans length (meters) $= cs \cdot \text{gravity free fall time}$.

Table 1

R of galaxy	U=GMm/R	Temp K		P/P=(T/T)^1/0.2907		Sound		Jeans=cs *ff
		U/(1.5B)	P	rho=P/(RT)	speed (cs)	free fall time		
8.24E+18	5.41E-10	4.19	3.73E-12	1.08E-16	2.16E+03	1.18E+13	2.55E+16	
7.42E+18	6.01E-10	4.66	5.37E-12	1.40E-16	2.01E+03	1.04E+13	2.08E+16	
6.59E+18	6.76E-10	5.24	8.05E-12	1.86E-16	1.84E+03	8.98E+12	1.65E+16	
5.77E+18	7.72E-10	5.99	1.27E-11	2.58E-16	1.67E+03	7.63E+12	1.28E+16	
4.94E+18	9.01E-10	6.99	2.16E-11	3.75E-16	1.50E+03	6.32E+12	9.47E+15	
4.12E+18	1.08E-09	8.38	4.05E-11	5.86E-16	1.31E+03	5.06E+12	6.65E+15	
3.30E+18	1.35E-09	10.48	8.73E-11	1.01E-15	1.12E+03	3.85E+12	4.31E+15	
1.65E+18	2.70E-09	20.96	9.48E-10	5.48E-15	6.79E+02	1.65E+12	1.12E+15	
8.24E+17	5.41E-09	41.91	1.03E-08	2.97E-14	4.13E+02	7.10E+11	2.93E+14	
averages	1.56E-09	12.09	1.27E-09	4.21E-15	1412.61	6.26E+12		

The bottom of the table contains averages. The average energy $U=1.27e-9$ MeV compares with the table above at $Z= 5444$. Table 8 is the radius dependent accumulation starting point and the Jeans length is the key to understanding the dynamics of star formation.

The remainder of Table 8 is below, but first a derivation:

Nature consists of volumes within other volumes. For example, the universe consists of volumes that divide into galaxies clusters, galaxy clusters divide into galaxies and galaxies consist of stars. We often want to know the size of the structures and the distance between them. The calculation involves determining the large volume of radius R , i.e., $V=4/3*\pi*R^3$ but if there are $4.9e10$ galaxies within this large volume, we divide $V_g=V/4.9e10$. To determine the distance between galaxies, you calculate the radius of the smaller volume, i.e., $R_g=(3/(4*\pi)*V_g)^{1/3}$. But the same result is obtained using the relationship: $R_g=R/N^{1/3}$. The relationship can also be written $N=(R/R_g)^3= 4.9e10$ if you know the radius values.

Several observations about stars within this galaxy are explained in the table below.

Firstly, the Jeans length in each orbit R determines the number of stars in the orbit, i.e., $N_{stars} = N_j$ in orbit $= (R/J)^3$. For the outer radius (top line of the table below) $R=8.28e18$ meters, there are $N_j=3.37e7$ stars of mass $7.5e29$ Kg = $3.2e37$ kg.

The distribution shows that there is more mass toward the inside of the galaxy. This is the second key observation that Table 9 below explains. It is known that the inside of galaxies radiates more light (and associated mass from the stars) coming from the center. The mass distribution is empirically correlated with the traditional power law mass which takes the following form [4].

$$M=2*\pi()*2.5E+38*EXP(-R\text{parsec}/4)*5\text{parsec}^2$$

Jeans length $N_j*9.5e29$ Kg in the right-most column gives the mass distribution predicted from Table 7. This can be compared with the column labelled “Power law mass.” The column labelled power law compares favorably with the mass in each of the orbits which is $N_j*9.5e29$ Kg/star. This is an important correlation since the cause of mass distribution across a galaxy had been unknown.

Table 2

R of galaxy	Jeans= $c_s \cdot t_{ff}$	m/sec	sound crossing			Power law	mass dist
		$V=(Gm/r)^{.5}$	$r_s=R/c_s$ (m)	$N_j=(J/R)^3$	$N_s=(R/r_s)^3$	Mass dist	$N_j \cdot \text{constant}$
8.24E+18	2.55E+16	4.93E+05	3.81E+15	3.37E+07	1.01E+10	4.89E+37	3.20E+37
7.42E+18	2.08E+16	5.19E+05	3.70E+15	4.54E+07	8.08E+09	9.54E+37	4.31E+37
6.59E+18	1.65E+16	5.51E+05	3.58E+15	6.32E+07	6.27E+09	1.86E+38	6.01E+37
5.77E+18	1.28E+16	5.89E+05	3.45E+15	9.21E+07	4.70E+09	3.63E+38	8.75E+37
4.94E+18	9.47E+15	6.36E+05	3.30E+15	1.42E+08	3.37E+09	7.10E+38	1.35E+38
4.12E+18	6.65E+15	6.97E+05	3.14E+15	2.38E+08	2.27E+09	1.39E+39	2.26E+38
3.30E+18	4.31E+15	7.79E+05	2.95E+15	4.46E+08	1.40E+09	2.70E+39	4.24E+38
1.65E+18	1.12E+15	1.10E+06	2.43E+15	3.15E+09	3.14E+08	1.03E+40	2.99E+39
8.24E+17	2.93E+14	1.56E+06	2.00E+15	2.23E+10	7.02E+07	2.01E+40	2.11E+40
				sum	sum		sum
				2.65E+10	3.66E+10	Star mass sur	2.515E+40

Mass of the black hole and mass of the stars within the galaxy.

The number in red is the mass of the galaxy= $\text{sum}(\text{stars in all orbits})$. The number of stars in each orbit varies but the sum of all the stars times $9.5e29$ Kg equals the galaxy star mass= $2.5e40$. The H and He stars orbiting the $2.5e40$ Kg black hole equals the mass of the black hole in the center.

In summary, Tables 8 and 9 are the solution to many criteria:

1. The effect of the black hole on gravitation energy and the associated Jeans length is a “plan” for the galaxy that will develop after mass falls into the unstable gas.
2. The number of stars in each orbit times star mass is the mass distribution across the galaxy. The mass (and light distribution) obeys the observed power law.
3. The galaxy has $2.5e40$ Kg of stars which is the sum of the stars in the orbits.

The gravitational influence that produced this galaxy by $U= G \cdot 4e46 \cdot 1.67e-27/R$ MeV.

Star and Galaxy mass accumulation in the straight-line expansion model [77].

The Jeans length partitions total mass into galaxy clusters, galaxies, and stars.

According to Wiki, the approximate value of the Jeans length may be derived through a simple physical argument. One begins with a spherical gaseous region of radius, mass, and gaseous sound speed. The gas is compressed slightly, and it takes a time (called crossing time) for sound waves to cross the region and attempt to push back and re-establish the system in pressure balance. At the same time, gravity will attempt to contract the system even further, and will do so on a free-fall time.

It is important to understand the concept of gravity free fall time. The derivation follows:

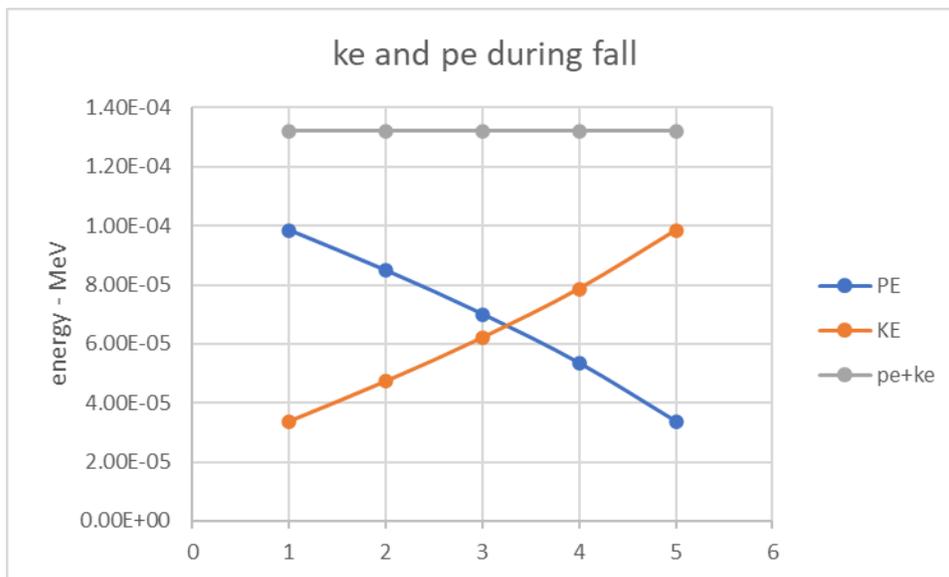
Equation 1

$V=at$	
$a=V/t=F/m=Gm/R^2$	
$a=V/t=F/m=GR*\text{density}$	
$a/R=G*\text{density}$	
$V/(tR)=G*\text{density}$	
$V=R/T$	
$(R/T)/(tR)=G*\text{density}$	
$1/t^2=G*\text{density}$	
$t=1/(G*\text{density})^{.5}$	
$J=R/t*t=R$	

If a particle starts falling it will accelerate and fall a distance r in gravity free fall time t . The Jeans length is $R/t*t=R$, where R/t is the velocity of sound. A volume of gas has sound waves crossing it. If it is stable, the sound wave exerts pressure on the particles that keep the particles from falling. When gravity dominates, the Jeans length will exceed the length that the sound wave can traverse in time t (called sound crossing time) and the unstable volume will collapse and accumulate.

Mass accumulation.

Black holes and a “rapid cosmic evolution process” [68] were used to model star and galaxy formation. Individual protons expanded outward during most of the history of the universe. A star that forms from these protons has gravitational potential energy. The kinetic energy and velocity of stars in a galaxy originate from conversion of potential energy to kinetic energy as their mass falls from their expansion determined radius. They fall into an orbit. Changes in kinetic and potential energy are shown below for the fall described above. In the zero net energy expansion model, any increase in kinetic energy is offset by a decrease in potential energy.



Acceleration of the stars falling into their orbits is calculated from the touchdown equation.

Touch down equation	
$L=at^2/2=1/2*GM/R^2*(2R/at)^2=2GM/(at)^2$	
$.5at^2=2GM/(at)^2$	
$a^3*t^4=4GM$	
$a=(4GM/t^4)^{.333}$	

Mass must travel inwardly distance L to just reach the accumulation surface. As mass gets closer, its acceleration increases because gravity is an inverse square phenomenon. The acceleration and mass M causes mass to traverse L toward the center in delta tim. . Mass inside distance L (volume $4/3*pi*L^3$) will accumulate to a point if not stopped. For mass falling into orbits, the equation becomes $a=(2GM/t^4)^{(1/3)}$. Accumulation of mass into stars starts at expansion ratio $Z=5446$. The flow calculated below follows the collapse of a gas cloud with radius R_j . Accumulation starts from a single proton but the large cloud of gas around the black hole is unstable. The flow $\Delta mass = \rho * area * velocity * \Delta time$. Delta mass adds across time until each star achieves about $9e29$ Kg for the inner orbit and $6e32$ kg for the outer orbit. Of course, the density of remaining mass falls off as it is consumed by the star formation process. Accumulation for the inner orbits are separate calculations because they start at different densities due to the influence of the black hole.

mass cluster (kg)=gal mass*2.2e5	1.81E-11	2.67E+04	4.44E+14	1.76E+41	4.19E+41	9.87E+41	2.30E+42	5.32E+42	1.22E+43	2.80E+43	6.36E+43	1.44E+44	3.26E+44	7.31E+44	1.63E+45	3.55E+45
mass galaxy (kg)=star mass*4.9e10	8.18E-17	1.21E-01	2.01E+09	7.97E+35	1.90E+36	4.47E+36	1.04E+37	2.41E+37	5.53E+37	1.26E+38	2.88E+38	6.52E+38	1.47E+39	3.31E+39	7.36E+39	1.61E+40
Expansion Z	5444.6	4160.9	3179.8	24.2	18.2	13.7	10.2	7.6	5.6	4.0	2.8	1.9	1.2	0.7	0.3	0.0
Density (Kg/m^3)	7.55E-15	7.53E-15	7.51E-15	7.44E-15	7.30E-15	6.99E-15	6.28E-15	4.72E-15								
Star Mass Kg in high orbit	3.28E+29	1.67E-27	2.47E-12	4.10E-02	1.63E+25	3.87E+25	9.12E+25	2.13E+26	4.91E+26	1.13E+27	2.58E+27	5.87E+27	1.33E+28	3.01E+28	6.75E+28	1.50E+29
	4.00E+29	3.79E-05	4.27E+00	1.08E+04	7.77E+12	1.04E+13	1.38E+13	1.83E+13	2.42E+13	3.19E+13	4.21E+13	5.54E+13	7.29E+13	9.63E+13	1.28E+14	1.73E+14
dmlrhoAVdt (kg)	5.29E+43	2.47E-12	4.10E-02	3.43E+05	2.25E+25	5.24E+25	1.21E+26	2.79E+26	6.38E+26	1.45E+27	3.29E+27	7.44E+27	1.67E+28	3.74E+28	8.27E+28	1.78E+29
Density (Kg/m^3)	2.08E-12	2.07E-12	2.08E-12	2.04E-12	1.99E-12	1.88E-12	1.63E-12	1.10E-12								
Star Mass Kg of low orbit	1.42E+34	1.67E-27	1.63E-11	5.63E+00	9.35E+29	2.24E+30	5.29E+30	1.24E+31	2.86E+31	6.58E+31	1.51E+32	3.42E+32	7.73E+32	1.72E+33	3.78E+33	7.81E+33
	8.00E+33	3.45E-05	1.23E+00	8.57E+03	4.61E+13	6.16E+13	8.20E+13	1.09E+14	1.44E+14	1.90E+14	2.50E+14	3.30E+14	4.34E+14	5.71E+14	7.55E+14	1.01E+15
dmlrhoAVdt (kg)	3.85E+45	1.63E-11	5.63E+00	3.57E+08	1.30E+30	3.05E+30	7.07E+30	1.63E+31	3.72E+31	8.48E+31	1.92E+32	4.30E+32	9.51E+32	2.04E+33	4.05E+33	6.39E+33

Figure 21

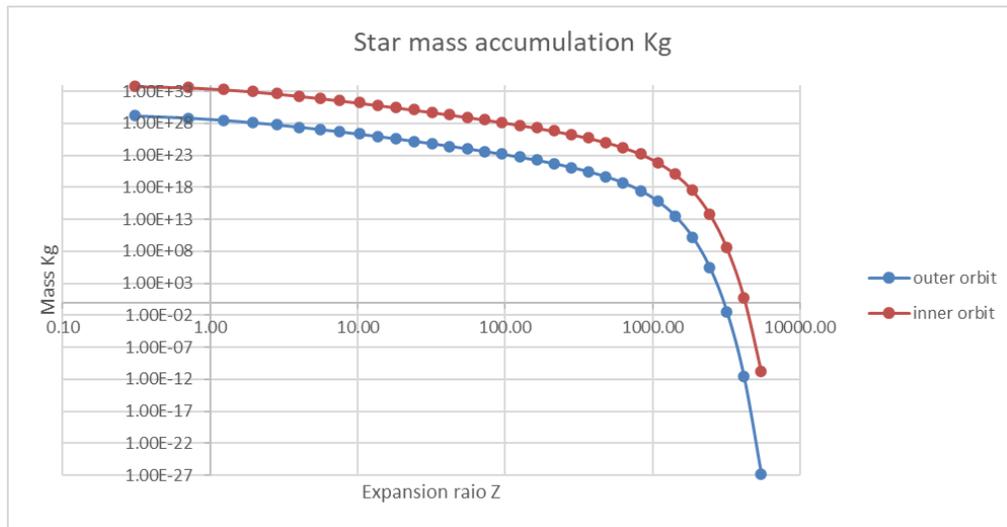


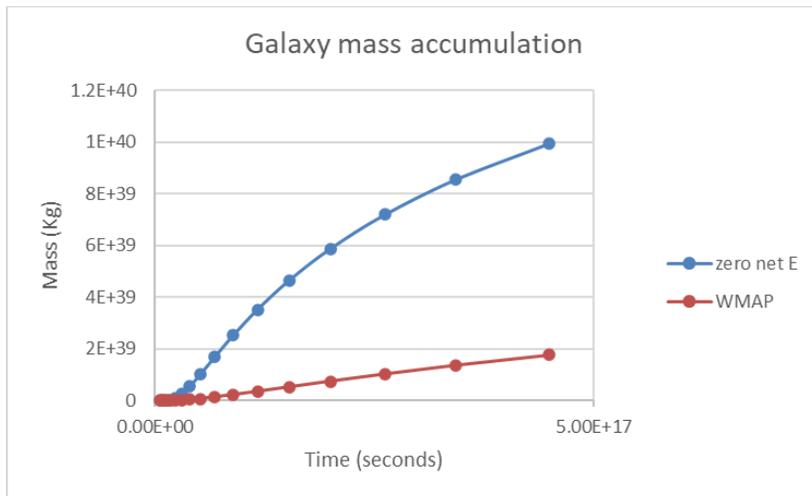
Figure 22

The flow calculated below follows the collapse of a gas cloud with radius R_j . The flow $\Delta \text{mass} = \rho \cdot \text{area} \cdot \text{velocity} \cdot \Delta \text{time}$. Delta mass adds across time until each star achieves about $9e29$ Kg.

Mass accumulation summary.

Fully formed galaxies are being observed in the early universe before they are predicted. This paper proposes that there is a particle that doesn't have kinetic energy required to produce pressure and resist accumulation. We know about this particle because it is originally at the center of a small orbit that underlies calculations for the gravitation constant G . Early accumulation can be explained if black holes formed as early as equality. Equality, where mass density and photon mass density are equal, occurs very soon after the beginning. Black holes begin to form at equality where mass density dominates photon mass density. Normal matter perturbations cause Zel'dovich pancakes and dark matter is pushed into lanes that become the cosmic web. The gravitational influence of the galactic black hole partitions mass into stars and determines their number and distribution across a galaxy.

Jeans concepts [Wiki] were used to determine the mass accumulation starting point, $Z=5444$. In the zero net energy expansion model, accumulation starts comparatively early because the density is higher than the WMAP expansion curve. A comparison of accumulation for the two different expansion models is shown below:



The angular size (0.0104 radians) of the WMAP CMB micro-temperature spots measured how mass is partitioned between galaxy clusters, clusters, and stars. Their power spectrums gave the size of the dominate spot. It subtends an angle of 0.0104 radians against the sky. The calculations below relate the spots to clusters of galaxies. The spot is $\text{area} = \pi \cdot R_s^2 = 5e49 \text{ meter}^2$ and the surface area is $4 \cdot \pi \cdot R_u^2 = 1.9e53 \text{ meters}^2$. The ratio $3.75e3$ is the number of spots and the number of galaxy clusters. The CMB features correspond to the major features of the cosmic web. The processes described above determine partitioning at the galaxy and star level of organization.

Black holes and a “rapid cosmic evolution process” were used to model star and galaxy formation. Early accumulation with the straight-line model helps explain recent observations by the James Webb telescope. It is quite possible that there is no gap between these predictions and early observations of stars and fully formed galaxies. The processes described are average and huge variations occur from galaxy to galaxy.

Number of stars.

The number of stars is based on the current CMB temperature, 2.725 K. Stars release energy. In the zero net energy model, the temperature at 1.23×10^{26} meters radius would not be 2.725 K without fusion energy. The calculation for sky temperature is based on multiplying the energy radiated from the $5.03 \times 10^{18} \text{ m}^2$ surface area of stars at surface temperature 6096 K times. In the example below, the energy for each star is $3.54 \times 10^5 \times 5.03 \times 10^{18} \text{ m}^2 \times 6096^4 = 4.38 \times 10^{33} \text{ MeV}$. (The value $3.54 \times 10^5 \text{ MeV/m}^2/\text{K}^4$ is the Stefan Boltzmann constant). For 2.4×10^{21} stars, the total energy is $1.05 \times 10^{55} \text{ MeV}$. This energy is radiated to the surface area of the universe at radius = 1.23×10^{26} meters (area = $1.93 \times 10^{53} \text{ m}^2$). $\text{K}^4 = 1.05 \times 10^{55} / 1.93 \times 10^{53} / 3.54 \times 10^5 = 55.2 \text{ K}^4$. The fourth root is the required star fusion contribution, 2.725 K.

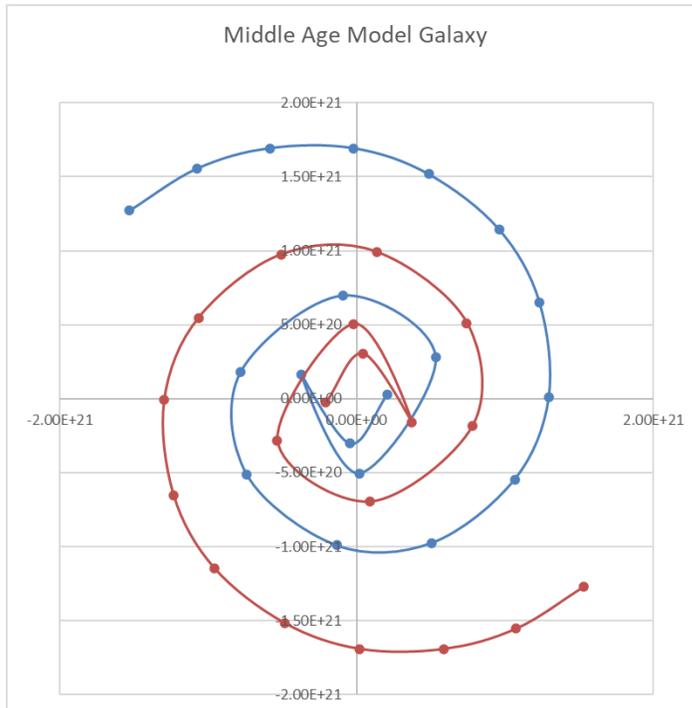
Based on the proton model, the total mass of the universe is $\exp(180) \times 1.67 \times 10^{-27} = 2.49 \times 10^{51} \text{ kg}$. At this point 73% of the universe mass $2.49 \times 10^{51} \text{ kg}$ has been converted to stars, the galaxy cluster mass is $1.82 \times 10^{51} / 3.73 \times 10^3 = 4.87 \times 10^{47} \text{ kg}$. The star mass is galaxy cluster mass $4.87 \times 10^{47} / 6.43 \times 10^{17} = 7.57 \times 10^{29} \text{ kg}$. In the table below $4.9 \times 10^{10} = 3.73 \times 10^3 \times 4.87 \times 10^{47} / 3.71 \times 10^{40}$. The galaxy mass is 4.9×10^{10} times the star mass = $4.9 \times 10^{10} \times 7.57 \times 10^{29} = 3.71 \times 10^{40} \text{ kg}$.

9.44E+29	Star mass (Kg)	
3.13E+57	Star cloud vol=m/dens (Meters ³)	
9.08E+18	$R=(3 \times v / (4 \times \pi))^{1/3}$	
6.50E-13	ke of each proton MeV	
1.23E+00	Velocity= $(2 \times \text{ke}) / 1.673 \times 10^{-27} \times 63^{0.5}$	
1.74E+28	delta mass= $\rho \times \text{area} \times \text{velocity} \times \text{delta time}$	
1.098E+00	Gravity cell=R/exp(60)	2.728E+00
1.85E+21	Number of stars	0.71
1.00E+00		
5.43E+08	Radius of star= $6.96 \times 10^8 \times (M_{\text{star}}/M_{\text{sun}})^{1/3}$	
3.70E+18	area of star surface (meter ²)	
5778	Temp of Star surface (K)	
4.12E+33	Area*Temp ⁴	
7.61E+54	Stars*area*Temp ⁴	
1.25E+26	Ru=Sky radius (m)	
1.98E+53	Sky area (m ²)	
38.504	$(\text{Stars} \times \text{area} \times \text{Temp}^4) / (\text{Sky area})$	
2.722E+00	Measured temperature (K)	
3.52E-10	solar ke	
0.00203	Cell r= $7.045 \times 10^{-14} \times 10.138 / \text{ke}$ (meters)	
1	Compression	
4.77E-20	Cell density= $1.67 \times 10^{-27} / (4/3 \times \pi \times r^3)$ (kg/m ³)	

The mass of the black hole attracts a volume of gas. The gas expanded from equality, but its temperature, pressure and density become higher near the black hole's gravitational influence. This establishes the radius and mass of average galaxies. It also explains the fact that most stars form near the center of galaxies. Mass accumulation is summarized below [21].

	Ratios	Mass (kg)
Total mass		2.49E+51
Total star mass	0.79	1.97E+51
numb galaxy clusters=stars/(stars/cluster)	2.21E+05	8.89E+45
Galaxy mass		3.71E+40
number galaxies/cluster	2.21E+05	
stars/galaxy cluster	1.17E+16	
galaxy number	4.90E+10	
star mass		7.57E+29
stars	2.60E+21	

Plot of galaxy radius and velocity.



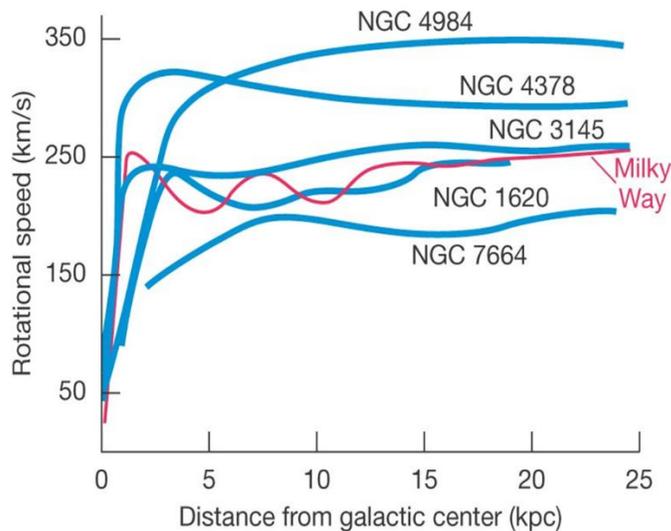
The number of turns in the galaxy is empirical in the graphs above.

Explanation of galaxy flat rotation curves with no dark matter [62].

For over a century, measurements of the velocity outward from the center of a galaxy indicate that the velocity remains high. Newtonian mechanics indicates that the velocity should decrease. Some are exploring whether there is “dark matter” in the outer portion of the galaxy that would flatten the velocity profile. The true source of this discrepancy is demonstrated based on the accepted concept of expansion redshift. Instruments that measure velocity profiles are picking up a signal that is the sum of velocity and local expansion redshift. After accounting for the effect of local expansion, it is shown that velocities obey Newtonian gravity.

Galaxy velocity and luminosity profiles.

The orbital velocity measurements of stars in a galaxy (2.2e5 meter/sec for our sun in the Milky Way) are consistent with Newtonian calculations inward toward the center of the galaxy, but the velocities remain high across the galaxy.



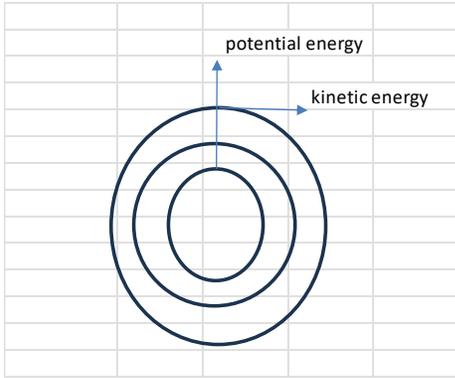
(b)

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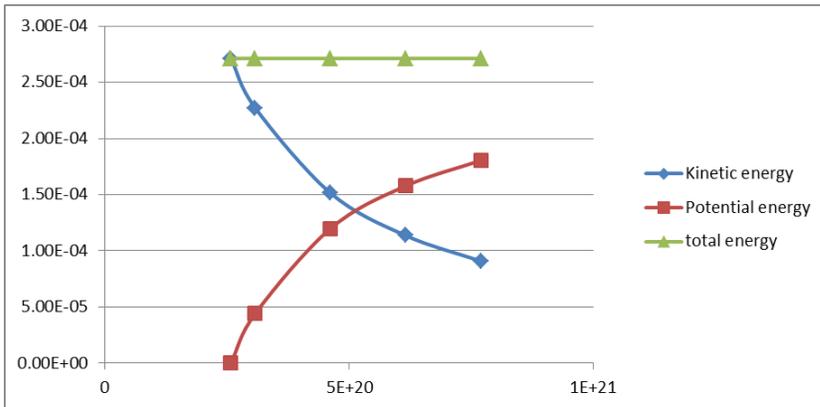
Flat galaxy rotation curves

The kinetic energy and potential profile across a galaxy are plotted below. Gravitation causes a proton to gain kinetic energy as it falls from its expansion determined radius toward a galactic center. The gain of kinetic energy is offset by a loss of potential energy. If the proton falls to the radius where the velocity is $V=(GM/R)^{0.5}$ it is Newtonian orbit.

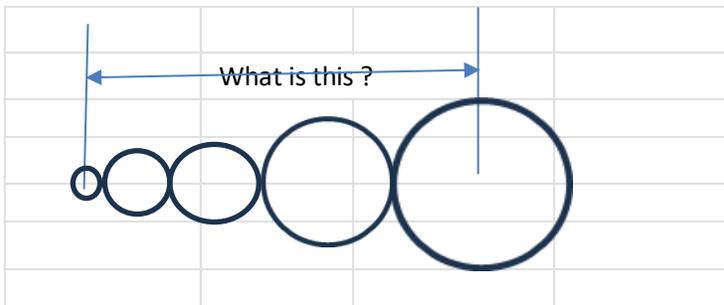
The orbits are diagrammed below:



Velocity is tangential and the circles above represent orbiting stars.



Galaxies are formed from the inside out. Modeling indicates that inner orbits are formed about a factor of expansion ratio $Z_{inside}/Z_{outside} = 3$ sooner than the outer orbits. In addition, it is well known that there is a power law relationship between the mass of the inner orbits and the outer layers. The outer orbits may have only a few percent of the total galaxy mass. It would be reasonable to use the Hubble law, $H_0 * R$, to evaluate the redshift between the inner and outer orbits. But there is a more direct relationship that can be used to interpret galaxy velocity profiles. The high kinetic energy nearer the center is associated with smaller cells according to the equation $r = 10.15 * 7.045e-14 / ke$. The cells across the galaxy look like this for the orbits across the galaxy.



The answer to “what is this” is; cell radius increase is expansion. This “local expansion” should be treated with a Hubble law the same way that expansion of the universe is treated. Redshift is used to measure velocity. For expansion of the universe, redshift ratios are

related to expansion ratio Z. Back in time means higher Z, higher velocities, higher redshift, higher kinetic energy, and lower cell radius. Distant stars expand away from us and redshift to our instrument is Z for expansion of the universe plus local expansion Z. The past is redshifted but light from the inner stars in a galaxy is extra redshifted. Here is a procedure that corrects flat velocity curves based on local expansion:

Column 1	Column 2	Column 3	Column 4	Column 5	Column 6	Column 7	Column 8	Column 9
Radius R (meters)	Galaxy Mass (Kg)	Kinetic Energy (MeV)	$V_d = \text{const} * K_e$	Peculiar Z	Z local	V measured meters/sec	$V * Z$ local corrected	$V = (Gm/R)^{.5}$ meters/sec
1.15E+21	1.58E+40	4.78E-05	4.78E+00	1.59E-08	3.19E-01	3.00E+05	9.58E+04	9.58E+04
9.19E+20	1.58E+40	5.98E-05	5.98E+00	1.99E-08	3.57E-01	3.00E+05	1.07E+05	1.07E+05
7.28E+20	1.58E+40	7.54E-05	7.54E+00	2.51E-08	4.01E-01	3.00E+05	1.20E+05	1.20E+05
5.73E+20	1.58E+40	9.59E-05	9.59E+00	3.20E-08	4.52E-01	3.00E+05	1.36E+05	1.36E+05
4.47E+20	1.58E+40	1.23E-04	1.23E+01	4.10E-08	5.12E-01	3.00E+05	1.54E+05	1.54E+05
3.47E+20	1.58E+40	1.58E-04	1.58E+01	5.28E-08	5.81E-01	3.00E+05	1.74E+05	1.74E+05
2.67E+20	1.58E+40	2.06E-04	2.06E+01	6.86E-08	6.62E-01	3.00E+05	1.99E+05	1.99E+05
2.04E+20	1.58E+40	2.69E-04	2.69E+01	8.96E-08	7.57E-01	3.00E+05	2.27E+05	2.27E+05
1.55E+20	1.58E+40	3.54E-04	3.54E+01	1.18E-07	8.69E-01	3.00E+05	2.61E+05	2.61E+05
1.17E+20	1.58E+40	4.69E-04	4.69E+01	1.56E-07	1.00E+00	3.00E+05	3.00E+05	3.00E+05

Columns 1 and 2 are the galaxy's radius and mass.

Column 3 is kinetic energy ($0.5mV^2$).

Column 4 uses the local Hubble law that distant local velocity V_{distant} (V_d) = Constant*kinetic energy (higher kinetic energy is a proxy for distance). The earlier and lower galaxy radii have higher velocity V_d in the table above. The constant is arbitrary because ratios cancel it in column 6.

Column 5 is the accepted formula for peculiar velocity. [Doppler effect - Wikipedia](#). The inner orbits have higher redshift.

$$Z_{\text{peculiar}} = \frac{(1 + V_d/3e8)}{(1 - V_d/3e8)}^{0.5} - 1$$

Column 6: Local Z ratio = ($Z_{\text{peculiar}}/1.56e-7$).

Column 7: The velocities shown in Column 6 is the flat velocity profile "data" that we are trying to interpret.

Column 8: Hubble law $V = \text{constant} * k_e$ was applied by multiplying column 6 by Z ratio in column 7. The corrected velocity in column 8 compares favorably with Newtonian velocity in column 9.

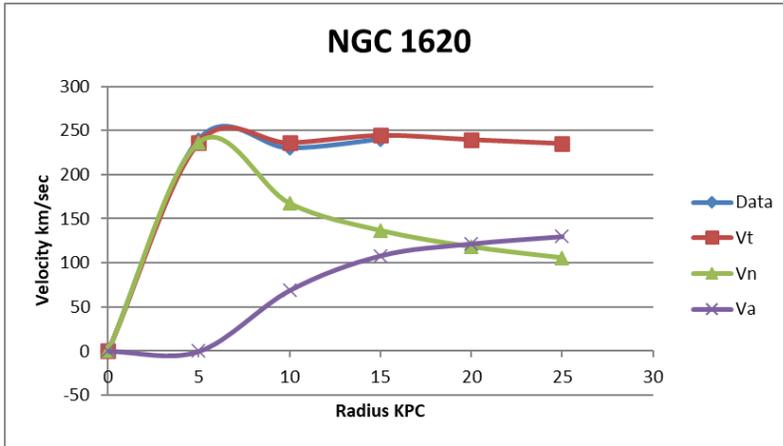
Column 9: This column is Newtonian $V = (GM/R)^{0.5}$.

The galaxy rotation curve below was interpreted using the procedure above.

[Show me the data](#)

Using the procedure above, Data for 5 galaxies were compared with calculations that incorporate expansion redshift in reference 62.

NGC1620 flat rotation curves components



Cosmology summary [74][77][78].

The straight-line (zero net energy) expansion model uses input from the proton model to establish the current radius and age of the universe. Early formation of galaxies is possible in the relatively high densities of the straight-line expansion model and the concept that dark matter black holes start to form at equality (dark matter cannot resist accumulation because it cannot produce pressure). Dark matter is pushed into Zel'dovich pancakes by perturbations in normal matter. This results in the cosmic web and explains the micro-temperature perturbations measured as the CMB. The cosmic web explains how mass is partitioned between galaxy clusters, voids, walls, long and short filaments and galaxies.

WMAP presented cosmology parameters for their belief that an acoustic wave was responsible for the CMB spot they measured as 0.0104 radians. If their acoustic wave explanation is faulty, their percentages for baryon, dark matter and dark energy are incorrect.

Cosmology parameters from the zero net energy model:
 Zero dark matter, zero dark energy and 100% baryons.
 Radius of the universe=1.231e26 meters and age=13.02.

Time	4.11e17/365/24/60/60/1000	13.022 B years
Hubble	1/4.11e17	2.44E-18 1/sec

Hubble Ho data is available from several programs [12][34].
 Comment on “current crisis in cosmology”. The present work favors Cepheids as the best way to measure Ho.

2.17E-18	67 CMB
2.2681E-18	70 Red Giants
2.3977E-18	74 Cepheids

WMAP radius was 1.3×10^{26} and 13.6 billion years. The Hubble H_0 9 (WMAP 9 year result) was 2.26×10^{-18} /sec.

1. The straight-line expansion model explains many troubling observations. The concept of critical density is not supported by this model. This negates the odd percentages of baryons, dark matter, and dark energy documented by WMAP.
2. The proton model contains the kinetic energy value that explains expansion. It is augmented late in expansion by star fusion.
3. The concept of dark matter halos appears to be incorrect. There is a Z local effect similar to the Hubble concept ($V=H \cdot D$) that must be accounted for. Local expansion is masking true Newtonian behavior of stars velocity. Galaxies form with most of their mass and light emission near the center of the galaxy. The cause of this distribution is the gravitational influence of black holes on galaxy formation. Based on this, there does not appear to be any missing matter.
4. The source of the cosmic web was discussed, and it was concluded that its features are being measured as the cosmic microwave background (CMB).

6. Life from information.

Nature is adept at building systems [9]. Below we explore the possibility that life sciences use information systems like the ones discussed above. The author will explore a theory that explains some aspects of functional genomics [7] (how DNA does what it does) and explains the connection between our brain and the “illusiv” mind within it. We explore what life is and seek answers to some of the most basic mysteries of science, which in the author’s view are:

1. What is the organizing principle of life?
2. A popular thought in some books is that there is a deep connection between life and quantum mechanics. Is there evidence for this view?
3. What is the physics behind information structures like DNA that store and use store information?

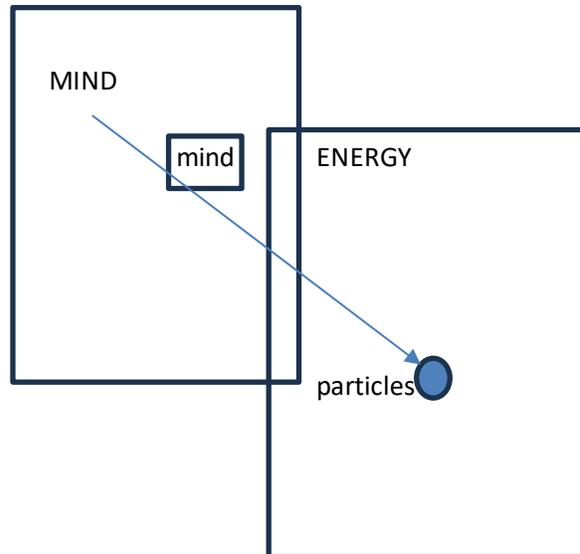
EXTRACTING INFORMATION FROM THE NEUTRON AND PROTON MODELS.

Time enters nature through the simple relationship $E=h \cdot 1/t$. The value $1/t$ is frequency. Probability, $P=e_0/E$ and $E=h/t$, gives $P=t/t_0$. Everything is probability= energy ratios= time ratios. This is a clue regarding creation. Component time increments were shortened against a standard time (t_0), creating a low probable. This was repeated for all components but overall $P=1$ when the probabilities for opposite energies are divided. There are alternative models of orbiting particles, imaginary numbers, and waves. But this model allows information that creates the universe to be extracted. This is possible only at $P=1$.

Simply stated, nature’s particles and fields are information-based. This is a level lower than Leucippus and Democritus who originated atomistic theory and also a level lower than the Standard Model.

OUR POSITION IN NATURE.

The concept of mind in Mind [59] is that both exist in an information level. In the diagram below, we are the small box labelled mind. The Mind of the creator used information to separate energy in the beginning. This created an energy level for particles. Our senses allow us to perceive the energy level where our body and brain evolved. But the information we perceive is associated with mind.



PARTICLES CREATE STRUCTURE.

There are only protons, neutrons, electrons, light, bosons, and a few anti-particles in nature. Nature appears complex because these few particles are duplicated an incredible number of times. Short lived mesons and baryons produced in high energy colliders are combinations of proton components.

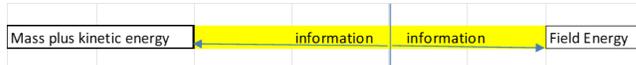
After evolution, we exist as mind in Mind and have an energy-based body. It is useful to view our body and brain at the information separation point for mass and fields. Our brain operates at an electrochemical level, but the molecules and electrons of the brain must be placed properly in a hierarchy of structures capable of supporting its operation. Subsequently the body evolves and supports a brain that deals with energy around it. The brain eventually recognizes that there is another side of nature, information that we can call mind in Mind.

The proton model helps us understand the universe. The diagram below shows the purpose of proton components and the structure they create.

Purpose	Component	dimension	Mass	MeV	MeV
			MeV	Kinetic E	Field Energy
↑	Down Quark	X	4.36		753.29
	Kinetic E		547.621	202	0.69
Structure x,y,z	Up Quark	Y	2.49		101.95
	Kinetic E		95.069	5.07563504	0.69
↓	Up Quark	Z	2.49		101.95
	Kinetic E		95.069	5.07563504	0.69
Create atoms	Strong residual KE		10.151		
	neutrino ke		-0.671		
↑	Weak Field E	fusion	-20.3025	0.00	
	E/M field		-5.44E-05	0	
Life processes	Proton M	proton	938.27		
	E/M field		2.72E-05		
↓	electron	orbit protc	0.511		
	Kinetic E		0.111		
Life processes	v neutrino		0.671	0.118	
	P match		2.02E-05	-0.740	0.67
Large scale space	ae neutrino+ematch		0.049		
	Expansion KE	cosmology	10.103		
Large scale space	Expansion PE	cosmology	10.151		
	Total M+KE		959.8683	211.529	959.8683

Purpose #1 X,Y,Z dimensions.

The top of the proton model is responsible for placing us in a three-dimensional universe. Our viewing position is at the information/energy separation point diagrammed below. At this point, the mind information we have is the Mind information that defines three dimensions (dimensions are information, not energy).



Below I speculate that there are memory protons that store and recall images based on our position at the information/energy separation point.

Note: This may not seem correct, but quantum mechanics recognizes that P=1 is special and that “collapse of the wave function” is fundamental. The model was based on probability 1 and zero net energy, and information extracted from the model is fundamental to the universe.

Purpose #2 Create of atoms.

The purpose of the weak field energy (-20.3 MeV) is to allow protons and electrons to fuse, creating atoms with sophisticated electronic orbits. Part of the 10.15 MeV energy inside the proton is released as fusion energy.

Purpose #3 life processes and brain networks.

The electron and the electromagnetic field are in the middle of the diagram. This part of the proton is responsible for life processes at the level of the cells and neurons.

Purpose #4 Large scale space around us.

The bottom part of the proton is the kinetic energy and potential energy that the proton itself possesses. Each proton is duplicated a vast number of times and possesses energy that expands the universe and creates structures associated with planets, stars, and galaxies.

The following processes occur sequentially.

1. In the beginning particles are duplicated $\exp(180)$ times.
2. As expansion occurs gravitational kinetic energy is converted to potential energy.
3. Particles fall into each other's gravitational field and create galaxies and stars.
4. As stars form, protons fall into each other's strong residual fields and release energy. Atoms with complicated electronic structures form and a supernova eventually scatters carbon, silicon, nitrogen, oxygen, etc. that form planets.
5. Chemistry becomes complex and stable carbon atoms lead to life supporting amino acids.

Details of purpose #3 Life processes.

OBSERVATION AND THE ELECTRON

Changes in the electromagnetic field energy are associated with absorption and emission of light. This occurs as the electron orbits change by quantum amounts. Color vision [83] is an excellent example of how our brain perceives energy changes. The $E=0$ and $P=1$ constraints in Appendix 4 show what happens as kinetic energy is changed by $E=2.02e-5 \cdot \exp(N)$, where N is 1,2,3 or 4 times 0.0986. The result is a series of peak wavelengths related to color vision. Electron orbits are slightly changed by light absorption and create a probability ratio called P_f/P_F in the graph below. The equation [2] is from a famous physicist, R. Feynman. This allows us to mathematically simulate color vision with our computer. The peak responses and off-peak responses are shown below compared with color vision data [33] on the human eye.

Color perception is the information created when molecules in the eye absorb light and collapse this wave function.

$p_f/p_F = (\sin((f-F)t/2))^2 / ((f-F)t/2)^2$ Where f =frequency and t =time interval.

The absorption equation can also be written in terms of distance ($D=C t$), instead of time. With $MC=f-F=C (1/wl-1/WL)$ and $t/2=2D/C=1/(1/dwl-1/wl)$ where dwl is the width of the response curve, wl is the incoming wavelength and WL is the peak wavelength. The same equation in terms of D and M follows with $(f-F) t/2= M \cdot C/C \cdot (2D) = 2DM$. (C , the speed of light, cancels).

$p_f/p_F = (\text{SIN}(2DM))^2 / ((2DM)^2$ with $M=(1/wl-1/WL)$

Example calculations for red light at wavelength (wl) 400 nanometers (nanometers are meters with decimal place moved 9 places to the left):

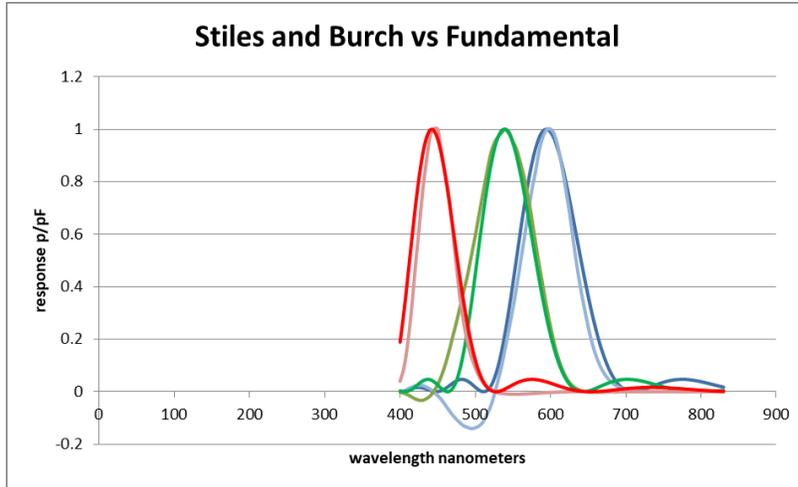
$M=1/400-1/594.3=8.17e5$ meters⁻¹ and $D= 1e-9/ (1/55.8-1/594.3)=5.73e-6$ meters (573 nanometers) when the peak wavelength (WL) for red light is 594.3 nanometers and the width of the curve (dwl) is 55.81 nanometers.

Example color calculation for pf/pF				
55.81158	dwl			
594.3342	WL			
$pf/pF=(SIN(2*D*M))^2/(2D*M)^2$				
$D=1e-9/(1/(WL-dwl)-1/WL)=5.73e-6$				
$M=1e9*(1/wl-1/WL)$				
wl	M	D	2*D*M	pf/pF
400	817444.9	5.73E-06	9.376	2.75E-05
405	786580.7	5.73E-06	9.022	1.89E-03

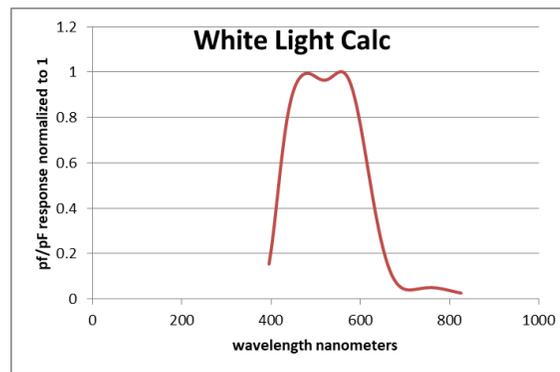
The function above peaks at unity when the wavelength approaches 594. Our eye is tuned to respond to light. The N value series 0, 0.0986, 0.197, 0.296, 0.394 (1, 2, 3, and 4 times 0.0986) is important. $N=3*0.0986$ is exactly N for the electromagnetic field, $2.72e-5$ MeV. $N=0.0986=\ln(3/e)$ where e is the natural number 2.71.

Series N	Energy MeV	$P=e0/E$ $e0=2.02e-5$	Meaning	Color (nm)
0.000	2.02472E-05	1	→	652.05
0.099	2.23456E-05	0.906094	→	590.82
0.197	2.46614E-05	0.821006	→	535.34
0.296	2.72173E-05	0.743909	→	485.07
0.394	3.0038E-05	0.674051	→	439.52

Stiles and Burch (UCSB)[33] measured the response of the eye to colored light. The measured response compares favorably with the Feynman equation for absorption of light using the N series 0.0986. The graph below plots the calculated Feynman equation pf/pF for the three color peaks 594, 538 and 442 nanometers. The associated data width series 61, 55 and 41 nm respectively for red, green and blue responses is based on differences between the primary frequencies. This match is important because it is a link between something we observe internally and an information series. It indicates that quantum level interactions are operational in the eye and brain.



Adding probability neatly represents white light when three colors are combined.



The mental experience of color vision is proof of a link between perception and energy. This is important because it shows that energy changes cause specific meaningful experiences inside the brain. We knew that everything was information based on separations and energy ratios, but we did not know that the brain uses the same information values (N) that define energy separations ($N=1,2,3$ or $4 \cdot 0.0986$ are part of the code that underlies the neutron/proton).

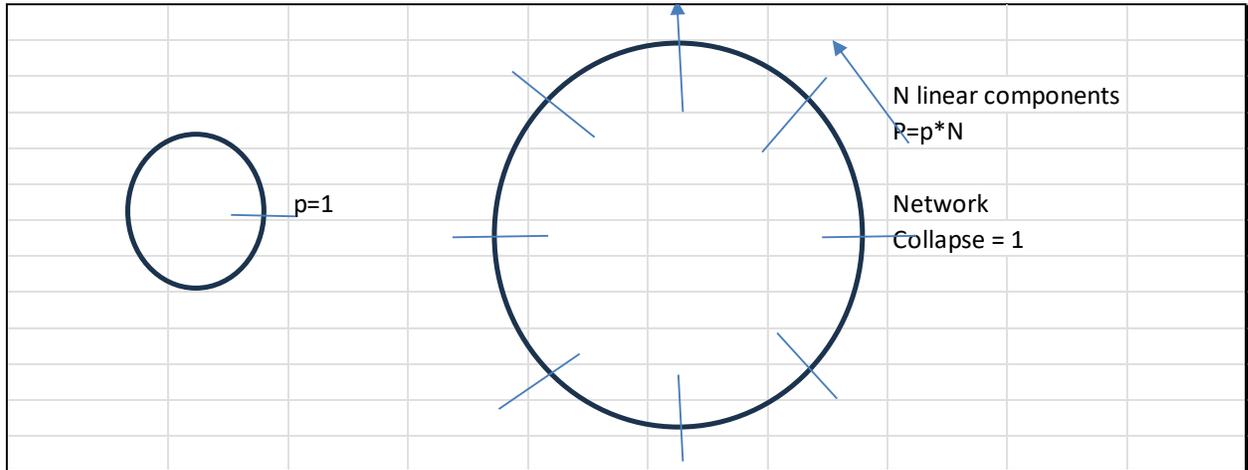
Your mental experience of color vision is proof of a link between the Feynman probability Pf/PF and perception. This is important because it shows that quantum mechanical computations are associated with specific meaningful experiences inside the brain. We found probabilities for the proton model, but we did not know that color vision is a similar system, using the same probability code (N) to modify and store wavelength. The value $N=0.0986$ is a component of the neutron and vision (i.e., they use the same system). Probability $P=0.906=1/\exp(0.0986)$ and 0.906^n are the modifiers. It also uses width 61.2 nm associated with $e_0=2.02e-5$ MeV in the Feynman equation. This is a huge clue regarding nature.

Information from the rhodopsin molecule is transmitted to the brain via coded pulses that fire sequentially along nerves. Our brain's position in 3-dimensions creates the experience of living in a color filled space. The network uses the Feynman wave-function

collapse to compute P_f/P_F matches but the white light calculation above proves that the information is additive.

Information networks produce our reality.

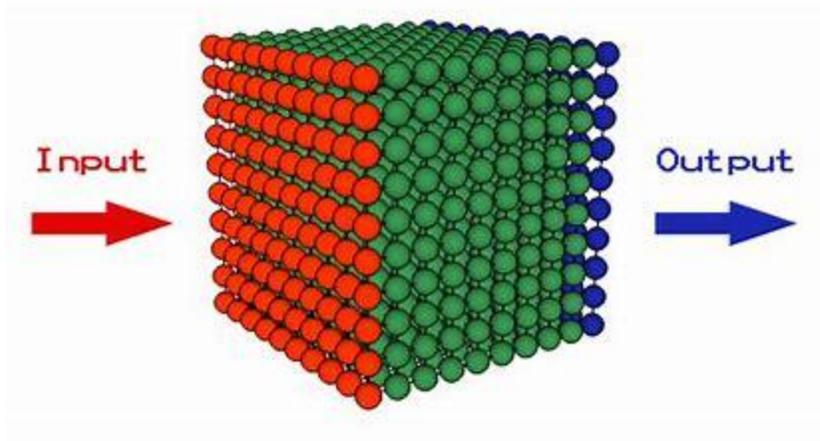
Each proton is a network that connects to other protons and neutrons [64]. The entire perceptual system is like the color vision example above. The brain adds many information components and perceives a composite result associated with $P=1$.



Arrays of molecules serve as proton/neutron networks. Life begins when neutron and proton information becomes a functioning “body/mind” network. The criterium for network acceptance is that they survive to pass on the body/mind network to the next generation. Memory and communication in the network are key. The network can be one cell, systems of cells or specialized cells that sense and use information to survive. The network becomes complex because it develops survival strategies in a challenging environment. The perceptual experience of the evolving brain/mind is an information rich network that is repeatedly updated as time moves forward.

Nature found ways of using information to create complex structures. Supporting structures and functional information networks are key. Memory of previous generations, chance additions and replication supported evolution. An adult human has approximately 1.1×10^{29} protons. Individual protons on their own have a low probability of becoming a functional human body and mind. The replication steps can be simplified to 1) about 10^{15} DNA memory protons from the previous generation specify the X Y Z position of the 10^{14} cells 2) body cells develop according to DNA information for that location 3) cell mitosis and replacement occurs to develop and support the organism 4) specialized brain cells develop to create diversity, 4) replication of the entire process if successful.

The cortex creates the internal image based on firing of its neurons. The visual cortex network might look like an X, Y, Z matrix consisting of neurons placed by the proposed proton storage in DNA.



Vision gives the developing organism a competitive advantage. And input from a brain that can compare images and call on experience to warn the organism of danger provides further advantage. This requires memory. The visual cortex matrix may be recording time ordered sets of Pf/PF matches (represented by 1's and 0's below) like the color vision example above.

1---1---0---1---0 for X

0---0---1---0---1 for Y.

0---1---1---1---0 for Z.

If needed, images can signal electrochemical signals for action. A great deal of our consciousness deals with images and image interpretation associated with avoiding danger.

IMAGES

Nature is amazing. Flowers and babies develop before our eyes. When a flatworm is cut in half, it generates two flatworms. Where is the frog image stored [80] when nature decides that a tadpole must now form a frog? Nature's process is almost perfect, and we say, "well it's their DNA." But exactly how does DNA perform this incredible task without an image of what it is producing? Reference 70 reported an attempt to find "mysterious missing" images associated with plants and animals (described in this document as memory protons). Memory of previous generation cell positions would help understand where cellular protein structures are placed.

Decoding DNA

What do ATG&C codes mean? According to literature, codes close to genes are promoters and switches that control gene expression. But there must be information that operates the system.

According to this proposal, information is one level down inside the ATG&C molecules. Why would nature not use information that underlies the proton mass model. The information is inside DNA atoms and DNA is in every cell.

STORING AND REPRODUCING CELL LOCATIONS.

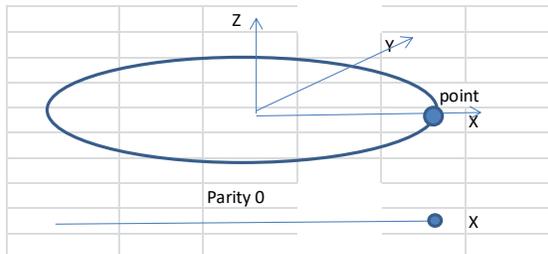
Details of Purpose 1 X,Y and Z.

Reconciliation of Standard Model and neutron/proton model.

The neutron/proton models are consistent with the Standard Model of particle physics [Appendix 8] described by F. Wilczek. The e (electron) and ν (neutrino) control the configuration of the quarks.

Parity is handedness, a combination of the charge's direction and motion in the circle. In the neutron model time is a variable. Its direction could also be clockwise or counter-clockwise. Physicists use a concept called CPT invariance (Charge, Parity and Time add to a constant). Charge is field energy but as a property it is positive or negative one. Parity is dependent on the perspective of the observer and the diagram above can be viewed looking down or looking up. This switches L and R like looking in a mirror. Perspective cannot change a field, and this means that orientation is itself a property. Our perspective of a circle changes to a line if the diagram is observed from the edge and time direction cannot be discerned. The circle represents a sinusoidal field.

There are three values inside the proton model like this. Somehow DNA stores 3-dimensional images. Think about the possibility that there are memory protons that can store and recall images with dimensions, directions, and planes.



PROPERTIES

X, Y, Z

REVERSE X,Y,Z

PLANES XY, YZ AND XZ

AROUND CIRCLE LEFT AND RIGHT ---TIME

HANDEDNESS (PARITY)

CHARGE UP or DOWN

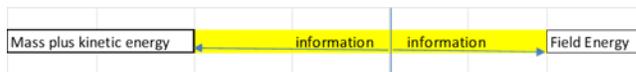
SPIN

Hox clusters.

DNA contains clusters of Hox genes that represent features of the body. Features of the body like the backbone appear in linear order along the gene and are expressed as the body develops. It is clear that DNA contains enough information [82] to re-produce the body, including where to place specific cells. Successful bodies of plants and animals evolve and end up with specific cells in specific locations. The living organism must somehow record this information for future generations.

Proton				
N values for mass	E=e0*exp(N)	N values for fields	E=e0*exp(N)	
12.432	5.076	10.432	0.687	X
15.432	101.947	17.432	753.291	
12.432	5.076	10.432	0.687	Y
13.432	13.797	15.432	101.947	
12.432	5.076	10.432	0.687	Z
13.432	13.797	15.432	101.947	
W components	E=e0*exp(N)	W field	E=e0*exp(N)	
-10.432		-10.432		
10.408	0.671	10.507	0.740	2.801
10.136	0.511	10.333	0.622	
0.296	2.72E-05			
90.0000		90.000		

The diagram above is an excerpt from the proton model showing normal values 15.431, 13.431, etc. It was proposed that our viewpoint is at the information/energy interface associated with X,Y and Z. I suspect that there is a specific location in the center of the body that serves as a reference point.



There are about 1e15 protons in DNA and about 1e15 cells that require placement to re-create the body and plant anatomy. Body images could be stored in DNA by living organisms and reproduced in offspring if N is programmable. I call protons with this flexibility DNA memory protons. Once located, memory protons contain the details that produce the proper cell structure for that location.

Analogy with cosmological cells.

Cosmology cells (distinct from plant and animal cells) are the space surrounding each nucleon. The size of the universe is (Nprotons)*cell radius for X, Y and Z . In the cosmology model cell radius is a function of the nucleon kinetic energy. The gravitational field energy (3*0.687+0.740=2.8011 MeV) defines space and time. Fundamental space radius =1.97e-13/2.8011=7.045e-14 meters and fundamental time circle = 2*pi*7.045e-14/2.998e8= 1.48e-21 seconds. Cosmology cells start with 10.15 MeV and as the cell expands against gravity it exchanges kinetic energy for potential energy, expanding from 7.045e-14 to 1.09 meter presently.

The distance relationship for body cells and cosmology cells could be the same, i.e., $\exp(N) \cdot \text{cell radius}$ for each of the three dimensions. Cells have a diameter of approximately $2e-5$ meters.

Memory protons and stored positions X, Y and Z.

The proton model kinetic energy value $N = 12.431$ could store distance 1.84 meters if N is changed to 11.431 below.

	N	$E=e0 \cdot \exp(N)$	N	$E=e0 \cdot \exp(N)$	
change in N	1	5.5E-05			
kinetic energy	11.43195	1.867223	Field1	10.43195	0.686913
mass	15.43195	101.9469	Field2	17.43195	753.2911
Difference KE		650.1639			
		753.9781			753.978
			cell radius	Distance in proton memory	
		$\exp(N)$	meters	meters	
kinetic energy	11.43195	92221.26	2.00E-05	1.84	

Compare the original dimension with the new value. Rather than 5.076 MeV for the quark kinetic energy component it has changed to 1.867 MeV and its N codes for a stored human height $= \exp(11.432) \cdot 2e-5 = 1.84$ meters. This does not change the mass of the proton. The formula for E difference ($E3 + E4 - E1 - E2$) ensures that mass in this quad is 753.978 MeV. It also remains a zero-energy system because the equal and opposite field energy is 753.978 MeV.

This proposal would allow the DNA protons in one generation to store N values and make them available to position cells for the next generation. N values for cell placement in the human body are in the range $N=6$ to 11.

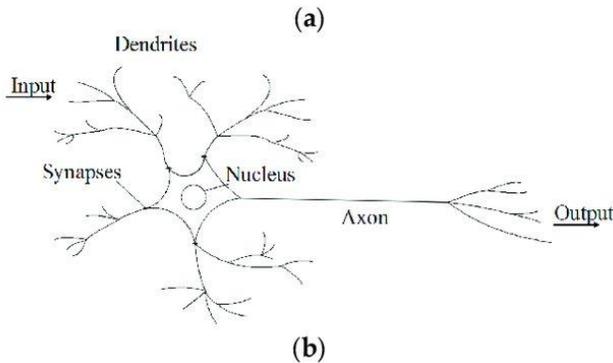
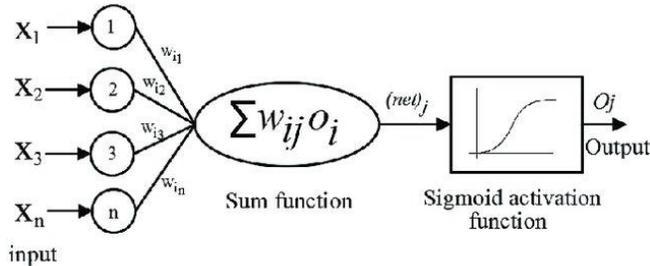
Creation and perception

The models above describe the creation of many neutrons that decay to protons, etc. from zero energy and probability one through separations. Forward time by several billion years and gravitation has created galaxies of stars and planets. Protons and neutrons have become atoms and atoms are now bonded into chemicals. Electrons orbit the atoms. There are now places where life can exist.

Reality to us is what our brain perceives. This is a bootstrap problem because the brain we are using had to evolve. A proton information level memory/retrieval system helps resolve this conflict. Early cells absorbed light for energy and information but there was no brain at that time. Molecules formed that could store information leading to DNA replication. Specialized networks evolved into the visual cortex and brain. But the system requires a body interface built on evolving images with bio-electric control to thrive and reproduce. The Standard Model coordinate system and proposed memory protons helps understand how DNA performs its magic and makes it easier to understand how biology becomes functional and creative at several levels.

Our brain constructs reality with information from limited senses like sight, sound, touch, taste, and smell. Probability is involved because reality is compared to everything else,

we have or could experience. Our brain is a network. Networks are one of the few places in nature that create information. When your eyes receive a signal, your brain uses network layers that involve probabilities to identify the person in your view. The search allows alternatives to be considered. Networks assign and recall meanings that underlie of our ability to remember, think, and anticipate the future. The learned meanings build on one another and we develop contextual models that interpret observations. We are creative. The more unlikely or the harder the new concept is, the more information is created. One definition of intelligence is seeing differences.



There can be several layers of connections and nodes. Artificial intelligence (AI) neural analogs show addition of input at nodes, followed by a sigmoid function that assigns weight to the result. This is consistent with the color vision model above except the sigmoid function is a full probability function. The sensor (retina) is outside the influence of AI because we depend on color vision and our other senses to accurately represent light. But the interpretation of the image can be partially understood with an AI analog called graphs that can interpret images consisting of many pixels. AI is a useful concept, but computers are very weak compared to our brains.

Cognition in the waking state involves integration and processing of meaningful signals that support survival. Local storage is attributed to a vast number of connections. But the neurons might process pulse like signals in a network like the 1's and 0's above with a brain that extends to our information-based mind.

[Search software.](#)

Searching our brain is like a Google search. We access information with search software. Meaningful memories and experiences are stored by networks. Thoughts control a goal directed search through memory. If there is a vague recollection, match probabilities are low. But with memory work, your network assembles enough information to clarify and

assign meaning. Animals like deer often have more muscular control at birth than humans. Their ability to walk is “genetic.” It is reasonable to believe that some networks are pre-programmed. This is used by biological systems at several levels. We may not even be aware of search software accessing and controlling pre-programmed cellular processes.

Life process summary.

We know that we are “late comers” and that our concepts of nature are limited. This paper is based on data that shows an information correlation with energy. It supports the concept that the universe is information-based. Based on a model of nucleons[Section 3], I suspect that creation involved separations from probability 1 and zero energy by an intelligent operation. There is enough information in $\exp(180)$ protons to create our energy space and time universe.

Life began shortly after structures formed that could support information networks. Our brain uses senses to gain information about energy reality. A simulation of color vision was presented that proves that our senses and brain use some aspects of quantum mechanics. Remarkably the separation of colors uses the same information value ($N=0.0986$) that appears in proton model N values. Our brains evolved neural networks that can create and parse information [2][5][31][84]. The concept of mind in Mind suggests that we may be an intended, connected sub-set of mind (not a new thought and reminiscent of religious texts) that participates in ongoing creation.

Observation based on brain networks connected to network information inside protons provides new insight regarding the mind-body problem. We think we are peering out at reality with brain neural networks, but we could be peering out from the mind within these networks. Creation appears to have been an intelligent (network) act that created energy by separating it from zero and we are using a sub-network to create our own reality. This may be why observation from our specific perspective is so important. (For example, observation of light interference from two slits depends on measurement from our position at one slit.)

Eastern concepts regarding one-ness based on thoughts and meditation appear to be compatible with the western concept that everything consists of atoms. The mind within our body is our observation platform. It is necessary for survival even if net energy is zero (separated from zero by information). The mind survives because DNA molecules contain fundamental information that can exert bio-electric network control of body development. The key to this understanding was the discovery that a proton is information-based. [Section 3][1][2][3][4].

Creation appears to have been an intelligent act based on separation. Neural networks may be fundamental, and we may be observing nature using a network encoded in, what appears to us, protons, and electrons. Fundamental level networks could be performing operations that represent reality around us. It would explain why we perceive objects constructed of atoms throughout a three-dimensional universe. We apparently arrived at this point by evolving successful realities. Observations by the brain seem strange and are

a source of difficulties with quantum mechanics. Information based reality helps explain why quantum mechanics is probabilistic.

Meaning is assigned to a network output.

When your eyes receive a signal, your brain uses network layers that involve learned probability surfaces like AI. If there is a vague recollection, the signals and probabilities do not match. But with memory work, your network assembles enough information to clarify the identity and assign meaning. The search allows alternatives to be considered. Networks that have been assigned meaning may be the source of our ability to remember, think, and anticipate the future. But the probability of network selection and neuron firing is ultimately information. The information builds on contextual space-time from its fundamental level. We are programmed to believe what the brain observes.

Everything is made of energy fields, protons, neutrons, electrons, and a few short-lived particles, all separated from zero information. Protons, neutrons, and electrons are energy and simply frequency ($\nu=1/\text{time}$) multiplied by a constant ($E=h\nu$). Observed complexity is primarily due to the vast number of particles and the way they interact.

Each component of the proton is associated with an information value labelled N, where N is information by Shannon's definition, $N = -\ln(\text{Probability})$. With $E=e0*\exp(N)$ the information level pattern describes an energy-based proton in space and time. The energy value 2.801 MeV, the energy 10.15 MeV and number $N=\exp(90)$ define gravity and the space that thermodynamic cells expand into. Collectively they represent the universe.

We are constructed of protons but there are information level codes that create the universe. Our viewpoint is from within a point that defines three dimensions. Our reality is based on neural networks that process current and stored observations. A key understanding for the mind-body problem is that our brain networks use electrons as functional components. Overall, everything is simple; but there are a lot of duplicated parts and possibilities.

Western science demands that new theories extend existing theories, match all available data and contribute to understanding nature. Information N values were uncovered in particle data group data that shows that the proton is information-based. It contains the information required to create the universe from our viewpoint. This document explains that X, Y and Z information hardwires or viewpoint of nature. Proton-electron information supports our brain's electrochemical network. Network information adds in a way that observed and stored information becomes real to our brain through the models it constructs.

Understanding the role of information is important because physics deals with fundamentals. Earlier theories must be discarded and replaced by theories that are more explanatory. For example, early civilizations considered earth, water, and fire as fundamental. It was replaced because it is easier to explain nature by the more fundamental atomistic theory, developed in the fifth century BCE. This simplified nature

and paved the way for molecules that explain earth, water, and fire. The discovery that particles consist of information paves the way for theories that explain why something dealing with information, like the brain, is a manifestation of creation.

Looking back, we found two levels of nature and studied the interplay that underlies body evolution and mind development.

7. Force unification.

In this section, the following topics are presented: The value 10.15 MeV and 20.3 MeV is used many times. It is derived from the N value for kinetic energy from Section 3.

$$E=2*e0*exp(12.4319) = 10.15 \text{ MeV}$$

1. Energy values from the proton mass model unify the four fundamental forces.
2. The weak energy (strong residual energy) is due to 20.3 MeV missing in the overall energy balance (960.6 MeV).

The Proton model is a source of constants for unification of forces.

Interaction	Mass (m) (mev)	Ke (mev)	R meters	Field (E) (mev)
Gravity	129.541	10.151	7.0445E-14	-2.801
Electromagnetic	0.511	1.36E-05	5.2911E-11	-2.72E-05
Strong	926.885	957.185	2.0615E-16	-957.18
Strong residual	939.565	10.151	1.4211E-15	-20.303

Figure 23 Values derived from the proton model.

Unification Table.

The table below contains values from the proton-space model for the strong, weak (also called the strong residual) and electromagnetic interactions. Gravitation $r = hC/E$. The other forces use the equation $(r = hC/(E*m)^{0.5})$, where m is mass. $H =$ Planck's constant = $4.14e-21$ MeV-second. $h = H/(2\pi)$ is Planck's reduced constant [Wiki].

Unification Table	cell ax74	Strong (comb) (MeV)	Weak (MeV)	Electromagne MeV	Gravity MeV
Mass M (kg)		926.88			938.272
Field Energy E (MeV)	E=2.801/EXP(90)	957.18	80400	2.72173E-05	2.295E-39
R (meters)	hC/E=1.97e-13/E	2.0615E-16	2.4543E-18	7.2501E-09	8.5972E+25
Particle Mass (MeV)		129.54	4.357	0.511	938.272
Mass M (kg)		2.31E-28	7.77E-30	9.11E-31	1.6726E-27
Kinetic Energy (MeV)		797.34	749.62	1.361E-05	10.318
Gamma (g)	m/(m+ke)	0.1398	0.0058	0.99997	0.9891
Velocity Ratio	v/C=(1-(g)^2)^.5	0.9902	1.0000	7.298E-03	0.1471
	V=(6.67e-11*1.67e-27/7.045e-14)^0.5			5.291117E-11	
F=6.6742e-11*(1.67e-27^2/7.045e-14^2)	KE loss	-30.30		5.291E-11	5.73E+40
F=2*10.318/7.045e-14*1.6022e-13/exp(90)			5.2E+09	8.242E-08	5.7279E+40
				8.623E-04	
Inertial F=M*V^2/R)		720353.192		8.241E-08	5.697E+40
time	2pi R/C (sec)	4.32E-24	5.14E-26	1.52E-16	1.80E+18
E*t (MeV-sec)	Field E*time	4.136E-21	4.136E-21	4.136E-21	4.136E-21
E*t/H	Et/H	1.00	1.00	1.00001	1.00000
Coupling constant derived from this work		0.00	0.00	137.03037	1/exp(90)
Derived c^2 (E*R) MeV m		1.97E-13	1.97E-13	1.440E-15	1.45E-12
Derived c^2 joule m		3.16E-26	3.16E-26	2.31E-28	2.33E-25
Derived exchange boson (MeV)	hC/R	926.885	80400.000	0.0037	0.000
*published c^2 mev m	F=E/R			1.442E-15	1.17E-51
*published c^2 joule m				2.31E-28	1.87E-64
*Range	R			5.29E-11	8.60E+25

Figure 24 Force table.

The inputs for each column are M (mass), E (energy of the field) and kinetic energy from the proton model. The total particle mass including its kinetic energy is at the probabilistic radius R. In quantum mechanics the force is caused by exchange bosons [3][4][72] but the proton model explains that mass is attracted to fields because they were separated in the beginning.

Strong Force

The strong field energy values, known as gluons or color forces, are from the proton mass table. Together with r=hC/E equation, define quark orbits inside the atoms. The resulting r is on the order of 2e-16 meters. There are three gluons, one for each quark. Quarks are confined in the nucleus. The author’s work extends the accepted theory by providing mass and field values. A force coupling constant calculated above is 1.00 and derived c^2 (E*R) values are presented in MeV-meter and joule-meter. The published values [3] for the coupling constant verify the value 1.0 in color chromodynamics theory. Dr. Wilzcek’s diagrams for this force in Appendix 8 “Reconciliation of the standard model....”

Electromagnetic Force.

The electromagnetic force is the result of N= 3* 0.0986= 0.296 being separated from the N= 10.432- 0.296= 10.136. This becomes the electron (N= 10.136 and energy =0.511 MeV). The electromagnetic energy of the field attracting the electron is E= e0*exp(0.296) = 27.217e-6 MeV. This is exactly the published value for the electromagnetic field.

The permittivity constant ϵ' (ϵ prime) governs electromagnetism (including charge and the electrical field). The following table shows calculation of the constant, but there are small quantum effects not included since the electron's orbitals are very complicated.

$$F = (1/(4 * \pi * \epsilon')) * q^2 / r^2$$

$$\epsilon' = (1/4 * \pi * F) * q^2 / r^2$$

$F = 8.2414e-8$ newtons and $r = 5.2911e-11$ meters

q in Coulombs $= 1.6022e-19 = F * r / 27.217e-5 / 1e6$

$$\epsilon' = (1/4 * \pi * F) * q^2 / r^2 = 8.853e-12 \text{ nt/m}^2$$

This compares favorably with PDG published value $8.854e-12 \text{ Nt/m}^2$.

Calculation of Permittivity Constant, ϵ' .

Once the permittivity constant ϵ' is known, the classical equation is used to calculate the electrostatic force i.e.

$$F = (1/(4 * \pi * \epsilon')) * q^2 / r^2$$

Refer to the Unification table above. The electron and proton have equal and opposite charge based on charge conservation that separates them. Since the proton has three quarks and the quarks must carry 1/3 the charge of the electron. Coulombs ($1.602e-19$) comes from the definition of the electron volt.

The residual strong force (aka the weak interaction).

The Higgs is accepted as the source of mass for the standard model [Appendix 8][72]. The W boson energy is 80400 MeV and according to the standard model, it makes the interaction distance very low. The force table above calculates a coupling constant as the inverse square of 137, in substantial agreement with the reference below.

[Coupling Constants for the Fundamental Forces \(gsu.edu\)](http://gsu.edu)

The Standard model coupling constants in the reference above can be compared with the proton model predictions in Section 4 above. The models appear complimentary, and the proton model provides specific energy values.

Force unification summary.

Patterns that we recognize as neutrons and protons exist throughout the universe. Mass and energy are created by separation. Field energy position particles in orbits and the force balance give values for the fundamental forces. Constants required are provided by the proton mass model.

The electron has $N = 10.136$ ($M = 0.511 \text{ MeV}$) and the electromagnetic field has $N = 3 * 0.0986 = 0.295$ ($E = 2.72e-5 \text{ MeV}$). They are related through $10.431 - 0.295 = 10.136$. During decay, separation of charges occurs. The electron becomes negative charge 1 and

the proton becomes positive charge 1 to satisfy zero net charge conservation. The electromagnetic field is the only field that can attract or repel.

The proton mass model indicates that each proton has a potential energy deficit of 20.3 MEV in the left-hand side components. The deficit is the strong residual energy (weak energy) that explains binding energy and elemental abundance. There are other aspects of the weak force described by Feynman diagram W boson. The W boson energy is one of the particles in the series discussed in section 3 [72].

The W and Z bosons role in neutron decay.

The proton model starts with splitting N=90 into four parts. It is converted to two Higgs particles, (N=22.53), a Z boson (N=22.235) and a W boson (N=22.106) in the second column. According to the Standard Model, the Higgs particle is the source of field energy. The standard model states that the W boson [66] changes the quarks in the neutron to quarks in the proton. The biproducts of the weak interaction decay are the electron and the anti-electron neutrino. Appendix 8 plates TT and UU [69] describe the W boson as the link between entities displayed vertically.

Higgs=22.53		Z components	
Z=22.235		W component: Action of W-	
Split 90/4	W=22.106		
22.500	22.530		
	-0.1972		0.197
	0.167		5.167
22.500	22.530		
	-0.1972		0.197
	0.167		3.167
22.500	22.235	-10.4316	
	0.0986	10.507	0.197
	0.167	10.333	3.167
22.500	22.106	-10.4316	
	0.3944	10.408	
		10.432	
			12.092
90.000	90.00	22.50	
		22.50	

Decay of the proton in a neutron, electron, and anti-electron neutrino.

As a proton, the electron quad of the proton mass model contains these energies:

Z components	E=e0*exp(N)	Z Field	E=e0*exp(N)	W components	E=e0*exp(N)	W field	E=e0*exp(N)
-10.432		-10.432		-10.432		-10.432	
10.507	0.740	10.507	0.740	10.408	0.671	10.507	0.740
10.333	0.622	10.333	0.6224	10.136	0.511	10.333	0.622
				0.296	2.72E-05		
90.000		90.000		90.0000		90.000	

It precisely predicts the electron energy and the value 0.111 MeV. This value is the energy where primordial nucleosynthesis begins during expansion and the “barrier energy” for fusion. This important value does not appear in the standard model.

The weak force is, according to the standard model, associated with binding energy. There is a value in the proton model that directly determines binding energy. The sum of

all the field energies is more strongly negative than the total energy of the proton with its kinetic energy. The value 10.15 MeV is derived from the N value for kinetic energy from the model. $E=2 \cdot e^0 \cdot \exp(12.4319) = 10.15$ MeV. Energy with value $2 \cdot 10.15 = 20.3$ MeV is missing in each proton and neutron (figure 4 right hand side= neg total 960.6 MeV is larger than the nucleon mass).

Refer to the weak force column in the Unification table above. We can describe the quarks in their 20.3 MeV field energy as a “bundle of quarks.” The bundle acts like a particle with kinetic energy 10.15 MeV orbiting in field energy 20.3 MeV. When nuclei bond together in nuclear reactions, the nucleons come close enough together to “see” the deficit. This embeds the mass 928.12 MeV in a 20.3 MeV field with 10.15 MeV of kinetic energy and determines a radius of $1.43e-15$ meters (the radius of the atomic nucleus). This is of course not new to physics, but the origin of the 20.30 MEV is new and comes from the proton mass model.

The atomic binding energy curve is a result of the weak interaction. The key value is the kinetic energy 10.15 MeV associated with the proton that is partially released in atomic fusion. Section 8 describes a simple model using the value, 10.15 MeV as the basis for binding energy. This is the kinetic energy that changes as atoms fuse (928.121 MeV + 10.15 MeV = 938.272 MeV). The following figure is brought forward from Section 10 where a detailed model is presented. The release is asymptotic to 10.15 MeV.

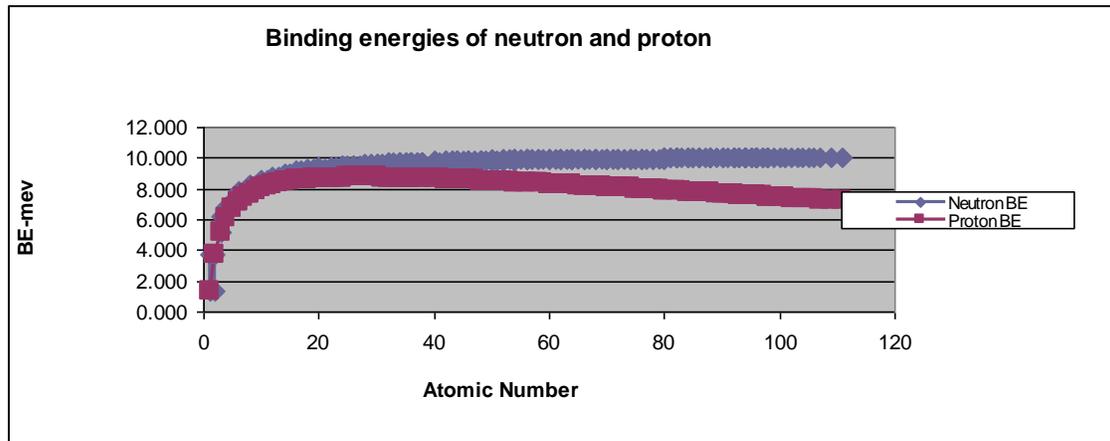


Figure 25 Binding energies of neutron and proton.

8. Relativity.

Section 3 indicated that everything is based on time ratios. Time dilation is the time shift (dt/t) associated with velocity known as special relativity. The table below is the energy balance for a zero net energy universe.

Unification Table		cell bj162		partially expanded	partially expanded
				Mass+Ke	Field Energy
exponent					90.372
Field Energy E (MeV)	E=2.801/EXP(exponent)				1.6E-39
R (meters)	R=hC/E=1.97e-13/E				1.25E+26
Particle Mass (MeV)	m=1.67e-27 KG			938.27	957.18
Mass M (kg)	1.6726E-27				
Kinetic Energy (MeV)	KE=7.045e-14*10.138/R			6.54E-13	
					-1.18E-01
				1.293	
conserved E=PE+KE				20.3	2.80
Sum of above				959.87	959.87
Required energy in column (MeV)				959.8680	959.8680
time		2pi R/C (sec)			2.61E+18
Time across radius=time/(2 pi) seconds					4.16E+17
E*t (MeV-sec)		Field E*time			4.14E-21
E*t/H		E*t/H			1.00E+00

The question to ask is “when time dilates in relativity does time 4.16e17 seconds slightly change?” If it did, the value $E_t/H=1$ would be violated. The counter argument is $dt/t=1/\gamma-1$ must change with ke because $\gamma=m/(m+ke)$. The values highlighted in red above resolve the issue. At this point in expansion every particle has a great deal of potential energy from its journey outward opposed by the force of gravity. In the table above $ke+pe=20.3$ is conserved. The value $6.53e-13$ MeV in the table above is the expanded condition. If the particle falls from this height into an orbit around a galaxy, its kinetic energy will increase to about $1e-4$ MeV. Its kinetic energy will increase, and $ke\ \delta=(1e-4-6.53e-13)$ MeV. But its potential energy will change the same amount in the opposite direction.

$\gamma_{ke}=m/(m+\delta ke)$ and

$\gamma_{pe}=m/(m-\delta ke)$.

These are local effects and $dt/t-dt/t=0$. In other words, there is no global effect on time. The values like 4.16e17 seconds above do not change but this does not change our concepts of relativity. If the particle retains its kinetic energy gained by falling, its time is dilated. Nature has a zero-energy mandate, but potential energy is not as easy to identify as kinetic energy. One can argue that a speeding car has kinetic energy because its speed can be detected by the doppler effect. But the car received its kinetic energy from a chemical reaction that is not as easy to measure. Entropy effects are unavailable energy effects. Energy can be extracted from organized energy systems (low entropy) but if the particles are disorganized and there are no temperature differences to exploit, energy becomes unavailable. But energy is conserved ($E=k*\text{temperature}$).

Special and general relativity.

The established relationships are below for two kinetic energy values in the two columns.

Special relativity relationships			
Kinetic energy		10.15 MeV	1.02
Mass in Kg		1.67E-27 kg	1.67E-27
Mass in MeV		938.27 MeV	938.27
C (light speed)		3E+08 m/sec	3E+08
gamma=m/(m+ke)= 938.27/(938.27+ke)			
V=gamma*C		4.38E+07 m/sec	1.39E+07
gamma=((1-(v/c)^2)^.5		0.9893	0.9989
v/c=(1-gamma^2)^.5		0.145909	0.046476
dt/t=1/gamma-1		0.0108	0.0011

General relativity relationships are also established but the two theories are about different things. General relativity is about curvature of space around massive objects. The relationships yield dt/t for a central mass M at radius R with the equations below. The example of a galaxy with mass 2e41 Kg has a proton orbiting it with kinetic energy is presented at the top of the table (two columns for two different kinetic energies). The orbital radius R is calculated using the relationship $r=7.045e-14*10.138/ke$.

Relationships from quantum gravitational theory			
Galaxy Mass M		2.00E+41 kg	2.00E+41
R=10.15*7.045e-14/ke*M/m*1/exp(90)		6.9E+15 meters	6.9E+16
General Relativity relationship			
dt/t=1/(1-G*M/(R*C^2))^0.5-1		0.0109	0.0011

The special relativity variables mass m and kinetic energy ke are linked with general relativity variables radius R and mass M by the gravitational theory above. With linked relationships, the general relativity equation produces the same dt/t value as the special relativity equation. This means when a particle orbits the central mass it has the same dt/t.

Combining quantum grav theory and general relativity			
dt/t=1/(1-G*M/(R*C^2))^0.5-1			
R=10.15*7.045e-14/ke*M/m*1/exp(90)			
dt/t=1/(1-G*M/(10.15*7.045e-14/ke*M/m*1/exp(90)*C^2))^0.5-1			
dt/t=1/(1-G*m/(10.15*7.045e-14/ke*1/exp(90)*C^2))^0.5-1			
dt/t calculated with equation above		0.0109	0.0011

There is an important lesson in the equation below that combines the effects. The only variable in the equation is kinetic energy (ke). Mass m is the mass of a proton. Based on this, once you know an orbit is established central mass does not enter the calculation, only ke. The other lesson is that since $pe+ke=20.3$ MeV, potential energy will cause the global time to remain constant ($dt/t-dt/t=0$).

$$dt/t=1/(1-G*m/(10.15*7.045e-14/ke*1/exp(90)*C^2))^0.5-1$$

General relativity can be better understood by combining equations related to curvature. The equation derived for constant G is:

$$10.15*7.045e-14= ke*r \text{ also written as}$$

$$r=10.15*7.045e-14/ke$$

This relationship maintains G and defines radius as expansion kinetic energy (ke) changes. Put these facts together and the scaling equation from the neutron orbit to a galactic scale orbit is:

Orbital R for galaxy= GM/V ² where M is the central mass	
substitute G=r0 v ² /m*(1/exp(90))	
R= r v ² /m*(1/exp(90))*M/V ²	
v ² /V ² =1 (cell v and large V equal)	
m/M=m/(m*number of cells in galaxy)	
R= r*(1/exp(90))*M/m	
multiply top and bottom by exp(180)	
R=r*exp(90)*M/(m*exp(180))	
m*exp(180)=Muniverse	
R=r*exp(90)*(Mgalaxy/Muniverse)	
r=r0*10.15/ke=7.04e-14*10.15/ke	
R=7.04e-14*10.15/ke*exp(90)*(Mgalaxy/Muniverse)	
R=r0*10.15/ke*(Mgalaxy/1.67e-27)*(1/exp(90))	
R=7.04e-14*10.15/2.74e-4*(2e41/1.67e-27)*(1/exp(90))	

R=r0*10.15/ke*(M/m)*1/exp(90) where M is the galaxy central mass and m is 1.67e-27 kg.

What causes space curvature?

The cell radius r=r0*10.15/ke is small scale space curvature. The other terms (Mgalaxy/1.67e-27)*(1/exp(90)) make the curvature larger. The scaling value (1/exp(90)) relates small level structure and macro level structure. This means that mass is a modifier of curvature but not the cause of curvature [60].

A proton orbiting each central body in the table below has a value for kinetic energy, cell radius and dt/T=1-gamma. By exploring their change, we can answer what curves space.

Orbit	Mass Central K	Vel m/sec	ke (mev)	cell r (m)	Orbital R (m)	1-gamma	(Mcentral/1.67e-27)*1/exp(90)
Sat/earth	5.98E+24	5.59E+03	1.635E-07	4.37E-06	1.28E+07	1.74E-10	2.93E+12
earth/sun	2.00E+30	2.98E+04	4.642E-06	1.54E-07	1.51E+11	4.94E-09	9.81E+17
star/galaxy	2.00E+41	2.27E+05	2.694E-04	2.65E-09	2.60E+20	2.87E-07	9.81E+28

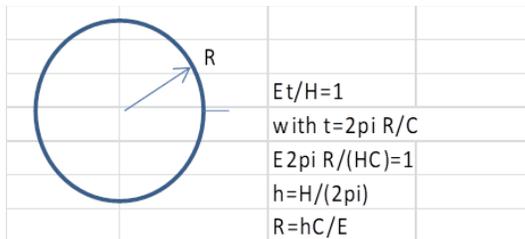
Figure 26 Curvature comparisons.

	Ratio	
ke (mev)	cell r (m)	1-gamma
1645	1649	1649

The time effect ($dt/t=1/\gamma-1$ approximated by $1-\gamma$ above) changes by a factor of $2.87e-7/1.7e-10=1649$ but ke and cell radius r also change by the same ratio. Small r changes because ke changes and $dt/t=1-(938/(938+ke))=ke/938$ for these low speeds. These ratios modify curvature but are not the cause of curvature.

Since $r=r_0*10.15/ke$ maintains G , the ratio $10.5/ke$ scales small r_0 to a larger value. The real cause of space curvature is $r=hC/E$ where $hC=1.97e-13$ MeV-m and $E=2.801$ MeV. The gravitational field energy E causes curvature; everything else scales it to larger curvature. The other forces in nature are also based on field energy curving space; i.e., E curves space for the different forces ($r=hC/E$). General relativity starts with $r=hC/E$ that is based on $Et/H=1$. This leads to the equation $r=hC/E$. The derivation is repeated below:

$Et/H=1$ with $t=2\pi r/C$ leads to $r=HC/(2\pi)/E=hC/E$. E in this equation is 2.801 MeV from the proton model. It is the source of time and space (Section 3.20).



The source of special relativity is discussed below. Velocity is a time related freedom necessary to create a dynamic universe.

The diagram above defines distance with $R= hC/2.801= 7.045e-14$ meters but a proton with potential energy 20.3 MeV fell to an orbit with this radius and gained 10.15 MeV of kinetic energy. Its state was 10.15 MeV pe +10.15 MeV ke in the figure above. Thereafter maintaining G required $r= 10.15*7.045e-14/ke$. This allowed kinetic energy (and velocity) to vary in an orbit. Of course, radius away from a central body is also part of gravity. $F=GMm/r^2$ converts to $F*r=PE=GMm/r$ and when ke increases, pe decreases by the same amount. The left-hand side of the proton model is constant mass plus kinetic energy plus potential energy. The right-hand side is also constant. At our advanced point in expansion, the universe is mainly mass plus potential energy. Kinetic energy has been reduced from 10.15 MeV to $3.5e-10$ MeV. Mass plus $ke= (938.27+20.3-3.5e-10)$ MeV. Most of the 20.3 MeV of potential energy is difficult to observe. For example, we need telescopes to observe earlier conditions when everything was more compact at lower potential energy. We are standing on earth but must think about the fact that the earth has potential energy relative to the sun and it has potential energy relative to the galactic center. Potential energy doesn't enter the equation for velocity, i.e., Velocity is $V= C*(1-(m/(m+ke))^2)^{0.5}$. But potential energy can take many forms that are not easy to trace and there are always offsetting effects allowing overall energy to be zero. Potential energy may be a hidden variable that allows the universe to maintain zero energy. It may also allow universal time with the same time everywhere. This would mean that time contraction with velocity may be a local effect balanced by potential energy.

If we give the proton a huge amount of kinetic energy, what happens?

We are studying whether proton-space maintains zero. An extreme example we can learn from is data from high energy experiments.

There are 103 baryons in the 2020 PDG [20] summary sheets. The author analyzed the baryons decay time and masses. It was found that the energies inside the proton model above can simulate all the baryons using the concept that the energies in the proton can be excited into resonances. The energy apparently surges back and forth in the circle locked in by probability collapse $P=1$. The kinetic energy resonances are often 2x, 3x, etc. of the quark energy. The N(1520) baryon contains the same energy quarks plus resonances of energy that exist inside the proton. There are higher energy quarks and higher energy resonances in other baryons. The resonances present a decay path to lower energy because they are differences between quark energy. The PDG quarks masses are multiples of 0.622 MeV and decay to electrons, photons, and kinetic energy. There are often other intermediate state baryons and mesons between total decay and baryon produced.

9. Binding energy and abundance of elements [40]

The proton model (Section 3) contains values that allow binding energy and abundance of the elements to be accurately predicted. The sections below show the calculations. These results support the possibility that the proton model unifies science.

Binding energy model.

The goals of this section are to verify the proton model value 10.15 MeV and present a simple model of atomic binding energy. Literature cites “water drop” models for binding energy that are admittedly empirical. Quantum physicists have suggested that there should be “electron like” shells inside atoms but to the author’s knowledge they remain unclear. If there are shells the nucleons should fall into lower energy states releasing the remainder as binding energy. The author explored this possibility. Empirically, the model was successful, but no explanation could be found for why a nucleon occupied a given shell. The first part of the binding energy curve rises quickly and then levels off as saturation occurs. When the author compared the shape of the curve to a probability-based model a simple relationship was discovered. The basic relationship is again $P=1/\exp(N)$ presented in Section 1.

Orbital kinetic energy inside the proton.

The quark mass plus kinetic energy from the model is $129.5+799.25-0.67=928.12$ MeV. There is, however, an additional kinetic energy of 10.15 MeV that makes up the total mass of the proton (938.27 MeV). This value changes during fusion.

The proton and neutron mass models have a total energy of 959.92 MeV, but the neutron mass is only 939.56 MeV. The total energy balance is zero if we consider the 20.3 deficit (959.92-939.56) as a field that surrounds the central mass like the way the electromagnetic field surrounds the electron and proton. As nucleons fall into the weak field, the released energy binds the neutrons and protons inside atoms.

Fundamental release of atomic energy.

Section 3 identifies $\exp(180)$ as the number that restores $P=1$ if the probability (P) of one proton $1/\exp(180)$. The author believes that nature uses Shannon [29] type information theory and makes $N = -\ln(P)$ a number related to energy. For example, the electron, energy, and N are related by the relationship $E = e_0 \cdot \exp(N)$ where the number $N=10.136$ represents the electron since $E = 2.025e-5 \cdot \exp(10.136) = 0.511$ MeV, the energy of the electron. In other words, e_0/P is the electron energy where $e_0 = 2.025e-5$ MeV and $P = 1/\exp(10.136)$.

The fundamentals of binding energy appear to be based on the same probability approach. For example, the probability of a neutron in lithium3 is given by $P = 1/\exp(2/3)$. The 2 means there are two types of particles (protons and neutrons) and 3 is the number of neutrons for lithium. This makes $N = -\ln(P) = 2/3$. In this case N is a number smaller than 1. Following a similar approach, energy would be modified by P to give the energy release. The value e_0 is 10.15 MeV for binding energy, the value given above for “kinetic energy in the neutron orbit”. Energy release for the neutron contribution to lithium is $10.15/\exp(2/3) = 5.21$. In the figure below the familiar probabilistic approach above is applied to the fundamentals of atomic binding energy.

P neutrons					
neutrons	P = 1/n	N = -lnP	E = e0 * exp(N)		
			e0 = 2.025e-5 meV		
1.48938E+78	6.71E-79	180			
	P electron				
	3.96E-05	10.136	0.511	Electron	
P energy release			e0 = 10.15		
neutrons	P = 1/exp(2/n)	N = -ln(P)	E = e0/exp(N)		
3	0.513	0.667	5.211	Lithium	
144	0.986	0.014	10.010	Plutonium	
			e0 = 10.15		
	P = 2/neutro	N = -P	E = e0 * exp(N)		
3	0.667	-0.667	5.211	Lithium	
144	0.014	-0.014	10.010	Plutonium	

Figure 27 Fundamentals of binding energy.

Heavy atoms can have over 144 neutrons which give a potential release of 10.01 MeV of atomic binding energy, indicating that the curve is approaching “saturation” at 10.15 MeV.

The values based on the fundamentals above (5.21 for Lithium and 10.01 for Plutonium) will be called the “fundamental atomic energy release” in the work below.

Free neutrons decay. This means neutrons involved in fusion are re-converted protons and release a part of 10.15 MeV as they fuse. The following calculations illustrate that the total fundamental release is the weighted contribution from the protons and neutrons. The weighted average is darkened in the table below. All energy is quoted in MeV (million electron volts).

protons (10.15*EXP(-2/protons))		neutrons (10.15*EXP(-2/neutrons))		
p		n		
1	1.374	1	1.374	1.374
2	3.734	2	3.734	3.734
3	5.211	4	6.156	5.751
4	6.156	5	6.804	6.516
5	6.804	6	7.273	7.060
6	7.273	7	7.627	7.464
7	7.627	8	7.905	7.775
8	7.905	9	8.127	8.023
9	8.127	10	8.310	8.224
10	8.310	11	8.463	8.390
110	9.967	272	10.076	10.044
				(weighted average)

Figure 28 Example calculations for binding energy.

Lithium7 has 4 neutrons and 3 protons, and the calculation above gives a total binding energy of 5.751 MeV.

$release = (p * 10.15 * EXP(-2/p) + (n * 10.15 * EXP(-2/n))) / (p + n)$
$Li7\ release = 5.751 = (3 * 5.211 + 4 * 6.156) / 7$

This is close to the NIST [26] value 5.644 MeV; the difference is significant but there are two additional effects: retained energy and addition energy for isotope number.

The re-conversion process.

Section 3 reviewed the neutron to proton decay (conversion) process $N > P + e^- + \bar{\nu}_e + K_e$ (e^- , $\bar{\nu}_e$ and K_e refer to the electron, the anti-neutrino and kinetic energy required to balance the process). The electron quad table (reproduced below) indicates that the electron initially has 0.111 MeV of kinetic energy.

As a proton, the electron quad of the proton mass model contains these energies:

Neutron		Proton	
Z components	E=e0*exp(N)	W components	E=e0*exp(N)
-10.432		-10.432	
10.507	0.740	10.408	0.671
10.333	0.622	10.136	0.511
		0.296	2.72E-05
90.000		90.0000	

Figure 29 Comparison of neutron and proton quads.

The decay energy balance from a neutron to a proton is:

$939.465 - 0.74 - 0.622 = 938.272$ MeV. The value $0.622 - 0.111 = 0.511$ MeV is the electron. During decay, the electromagnetic energy is separated into $0 = 2.72e-6 - 2.72e-6$. One half goes to the electron making it negative. The other half goes to the neutron making it positive. Creation of an electron requires creation of an anti-electron neutrino.

During fusion, there are protons that are re-converted to neutrons.

The re-conversion energy balance from proton to neutron is:

$$938.272 + 0.671 + 0.511 + 0.111 + (0.740 - 0.671) = 939.565 \text{ MeV}$$

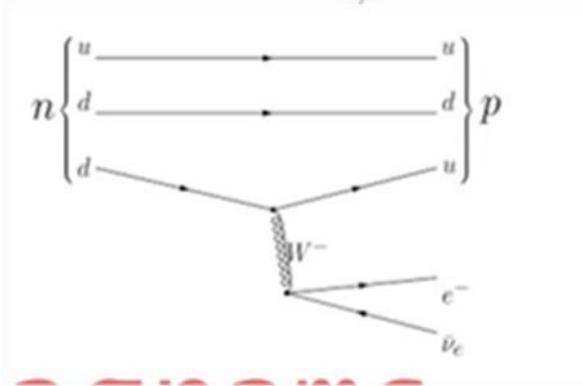
This only occurs if there is heat and pressure available to supply the difference in energy.

This is a probabilistic process based on the chance that 0.111 kinetic energy will be regained.

The values 0.740 and 0.671 are particles available in the fusion environment.

The electromagnetic difference disappears $0 = 27.2e-6 - 27.2e-6$.

The Feynman diagrams are below [72]:



	Neutron		Proton	
up	15.432	→	15.432	up
	-17.432	→	-17.432	
down	13.432	→	13.432	down
	-15.432	→	-15.432	
down	13.432	↘	13.432	up
	-15.432	↘	-15.432	
Z compo- nents	-10.4319	↘	-10.432	W componen
	10.50691	↘	10.408	
	10.33333	↘	10.136	electron
		↘	0.296	e/m energy
			-10.432	
			10.136	
			0.296	
			10.33333	e neutrino
			-10.33333	
Sum N	4.408313		4.408	

Since it is a subtraction of four values in the electron quad, some of the values contain properties (spin and charge) that balance the re-conversion. The proton gains the two energy values lost in the decay process from a neutron to a proton (energy $0.6709+0.6224=1.293$ MeV). The electron is converted to energy $0.622=0.511+0.111$ MeV. Re-conversion and a gain of energy on the order of 0.111 are pre-requisites for fusion. The process involves new neutrons and protons falling into weak field energy. More than half of the incoming protons become neutrons because neutrons can lose more energy. The other portion of the incoming protons is accepted without conversion.

Summarizing, the requirement for fusion is that the environment must provide energy. In this model, if the electrons and protons gain 0.111 MeV and are densely packed, they fuse. This amount of energy required is large compared to the kinetic energy available from even an extremely hot environment. For example, the sun's core temperature of 1.5×10^7 degrees K provides 0.002 MeV. (A probabilistic process appears to limit the reaction rate. A simplified way to think about this is a Boltzmann probability P . $P = \exp(-0.111/0.002) = 1e-11$, where -0.111 MeV is a barrier energy, and 0.002 MeV is kinetic energy from the environment. The low probability that the barrier energy will be achieved helps understand why fusion only occurs in hot places (a description of solar fusion is contained Section 9). The barrier energy is quite simple in this model. It is the retained kinetic energy described below.

Retained kinetic energy and barrier energy

The incoming protons gain energy from their environment (i.e., the core of the sun). When energy conditions allow, protons are accepted into the developing atom, and they retain part of the supplied energy. After considering the fundamental release, the binding energy falls with increasing atomic number (and is quite evident for large atomic number) as more energy is retained inside the atom. Retained energy follows the relationship: $E_{\text{retained}} (\text{MeV}) = -0.101/4 * \text{protons}$. This is related to the value 0.111 given in the proton model as the kinetic energy of the electron. This energy may be stored in compressed charges (literature refers to a coulomb barrier since protons resist bringing more positive charge into the nucleus). Retained kinetic energy becomes the barrier energy (BE) for fusion.

Addition for isotope number.

Without a second addition, the difference between the published and predicted value cycles slightly within one atomic number for the several isotopes of that atom. The section below entitled "Prediction of excess neutrons" below is the source of the correction for the isotopes. Neutrons release slightly more energy than protons and the isotopes either have an excess or deficit of neutrons. The following equation gives the addition:

Addition for isotope number = $1.293 * (\exp(\text{excess neutrons}/220) - 1)$ MeV. Excess neutrons equal the predicted number of neutrons minus actual number. Predicted neutrons = $(\text{protons} + \text{neutrons}) / (\exp(1.293 / (E_{\text{retained}})))$. Of course, 1.293 MeV is the difference in energy between the neutron and proton.

Binding energy results.

The following data is a combination of NIST [26] data for published binding energy compared to the author's binding energy model. Two additions (the additions are usually negative numbers) were made to the fundamental release. To summarize, binding energy = weighted fundamental energy release + retained energy + isotope number energy.

There was another correction sometimes required that the author believes can be easily identified. Some of the predicted values are multiples of 0.111 MeV higher or lower (this is the energy associated with the electron kinetic energy that initiates fusion). This correction only appears in the steeply rising portion of the curve. In addition, there were two atoms that were obviously different. The fundamental release from Helium (2,2) was exactly doubled. Secondly, it appears that Carbon (6,6) retains an extra 0.622 MeV.

			-0.00067	electrostatic retention		
			0.017409	isotope n correction		
			Pub BE-pr	Binding Energy		
	prot	neut	mev	Published	prediction	
H	1	0	0	0	0	
D	1	1	-0.03714	1.115051	1.152194	
T	1	2	0.000224	2.914766	2.914543	
He3	2	1	-0.02023	2.489848	2.510077	
He4	2	2	-0.04539	7.075042	7.120429	
Li	3	3	0.006003	5.334028	5.328025	
Li7	3	4	-0.02211	5.64441	5.666515	
Be	4	5	-0.0108	6.492464	6.503259	
B	5	5	-0.00188	6.476361	6.478242	
	0	5	6	0.028574	6.952107	6.923533
C	6	6	0.039666	7.681103	7.641437	
		6	7	-0.0071	7.490528	7.49763
		6	8	-0.00632	7.557838	7.564159
N	7	7	0.03027	7.47663	7.446361	
		7	8	0.0314	7.717454	7.686054
O	8	8	-0.01434	7.977084	7.991424	
		8	9	-0.0435	7.766718	7.81022
		8	10	-0.0175	7.796393	7.813894
F	8	11	-0.04432	7.861472	7.90579	
Ne	9	11	0.029683	8.09777	8.068087	
		10	11	-0.04443	7.984761	8.029189
		10	12	0.007449	8.104534	8.097086
Na	11	12	-0.02063	8.123431	8.144058	
Mg	12	12	-0.02294	8.261501	8.284439	
220	12	13	-0.00394	8.234534	8.23847	
		12	14	-0.02984	8.354309	8.384146
Al	13	14	0.025146	8.341799	8.316652	
Si	14	14	0.006674	8.448492	8.441818	
		14	15	-0.02128	8.458196	8.479474
		14	16	0.023813	8.53842	8.514607
P	15	16	-0.04372	8.490166	8.53389	

Figure 30 Partial list of binding energy comparisons.

			average	
			stand dev	
			Energy	
	prot	neutrons	retention	
H	1	0	0	
D	1	1	-0.02534	
T	1	2	-0.02534	
He3	2	1	-0.05069	
He4	2	2	-0.05069	
Li	3	3	-0.07603	
Li7	3	4	-0.07603	
Be	4	5	-0.10137	
B	5	5	-0.12672	
	0	5	6	-0.12672
C	6	6	-0.15206	
		6	7	-0.15206
		6	8	-0.15206
N	7	7	-0.1774	
		7	8	-0.1774
O	8	8	-0.20275	
		8	9	-0.20275
		8	10	-0.20275
F	8	11	-0.20275	
Ne	9	11	-0.22809	
		10	11	-0.25344
		10	12	-0.25344
Na	11	12	-0.27878	
Mg	12	12	-0.30412	
220	12	13	-0.30412	
		12	14	-0.30412
Al	13	14	-0.32947	
Si	14	14	-0.35481	
		14	15	-0.35481
		14	16	-0.35481
P	15	16	-0.38015	

Figure 31 Retained energy (barrier energy)

Figure 31 contains the difference between the latest NIST [26] binding energy data minus the binding energy predictions. The predicted binding energy contains an extra retention of 0.111 MeV for a few atoms. The remainder of the atoms were calculated but not presented here for brevity. For all 351 atoms (including most isotopes), the standard deviation was 0.017 and the average from zero was -0.0006 MeV. Since the predicted values are close to the published binding energy, the points overlaid each other and there was no need to present the predicted curve. Retained energy for binding energy becomes the barrier energy for fusion since the lost energy must be returned. This value will be used extensively in topic 5.2.

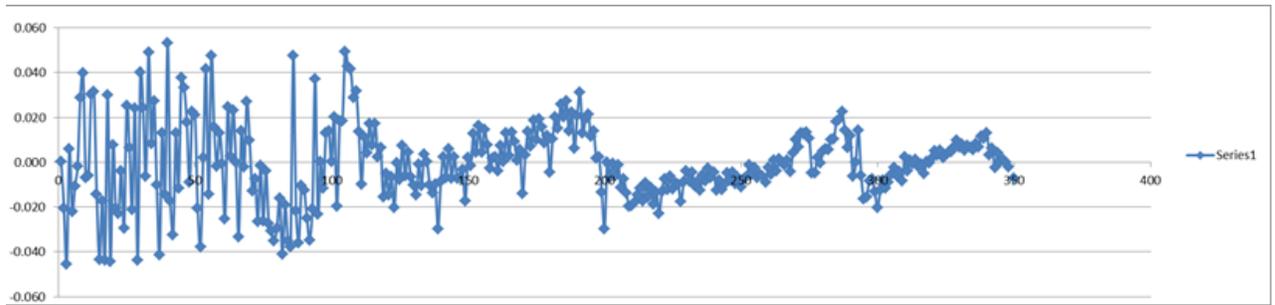


Figure 32 Binding energy accuracy (MeV)

The more meaningful graph is the above deviation for the 351 atoms. The vertical axis is based on published binding energy minus predicted binding energy in MeV.

It is instructive to show the binding energy for the proton and neutron separately since it shows that the neutrons give up almost all their kinetic energy. The proton release is less since energy is retained as described above.

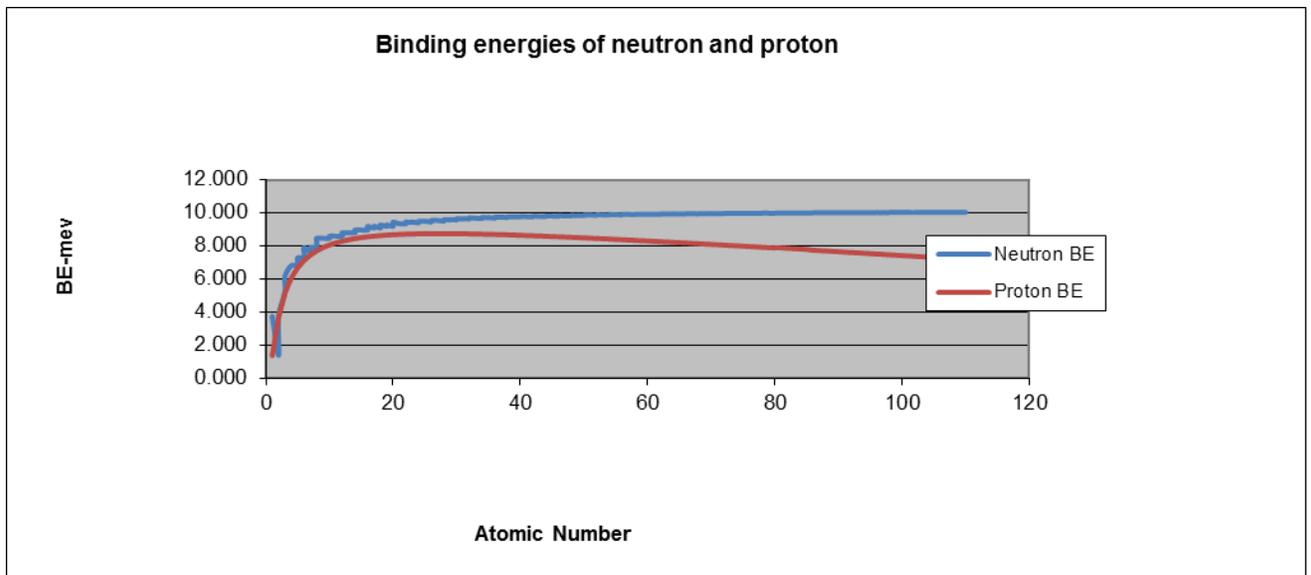


Figure 33 Binding energy curves for the proton and neutron.

Prediction of excess neutrons over protons with increasing atomic number

Excess neutrons are produced because they can give up more energy. Prediction of excess neutrons is simply a function of the energy that protons retain. Based solely on this parameter, the number of neutrons can be predicted from the number of protons.

$$\text{Predicted neutrons} = \text{protons} + \text{protons}/(\exp(1.293/(E_{\text{retained}})))$$

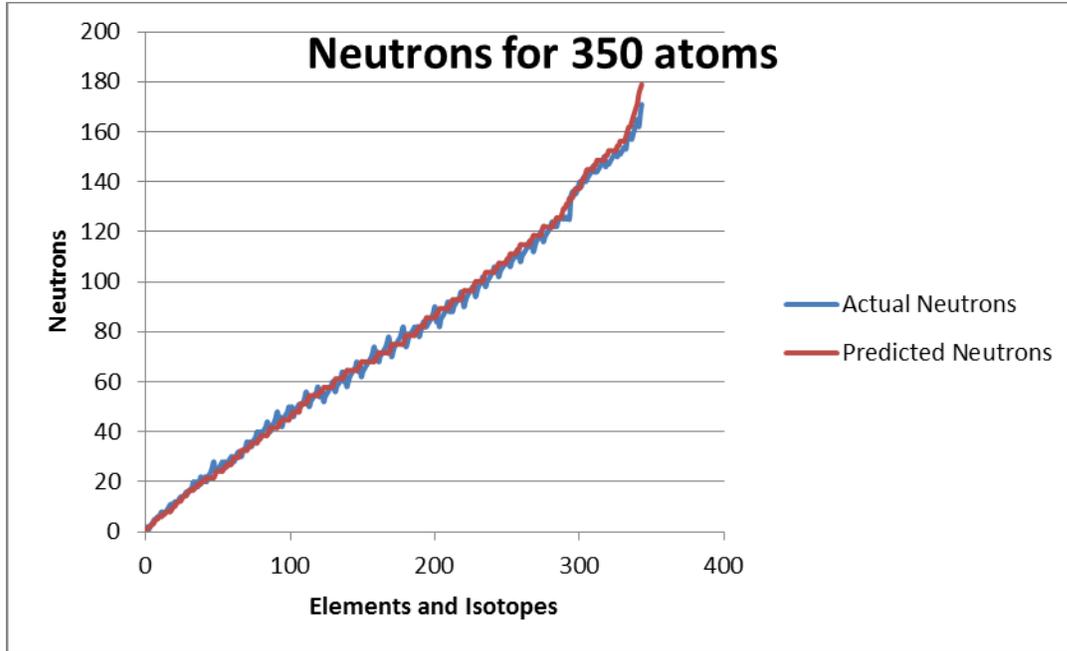


Figure 34 Prediction of excess neutrons.

Note the ripple in the actual number of neutrons. This was the basis for the isotope number correction described above under the heading “Addition for isotope number.”

Binding energy summary.

A proposal regarding how nature releases binding energy is offered as verification of the proton model kinetic energy value 10.15 MeV and the energy 0.111 MeV associated with the decay of the neutron to a proton, electron, and anti-electron neutrino. A simple probabilistic model agrees with NIST data to within 0.017 MeV when the two effects are applied.

Abundance of the elements [19][25][26].

Fusion is an important process in nature and determines the abundance of elements measured throughout the universe. Fusion powers the sun and is important in the aging of the stars and other high density, high temperature processes. A binding energy model for atoms is extended in this section to abundance of the elements produced in stellar burning phases. Of particular interest was a model that was independent of measured parameters and based on probabilities.

Section 5 presented a temperature history for expansion that was like other cosmologies. A brief time later (on the order of seconds) the author’s model produces temperatures in the range of $1e9K$ from the initial kinetic energy 10.15 MeV. Plasma exists until the temperature drops enough to allow electrons to form orbits around protons. Eventually acoustic and gravitational forces become dominant and accumulation of mass into clusters, galaxies and clusters begins. The concentration process later allows stars to “light up” with fusion when they become dense and hot. This is known in literature as re-

ionization. Stars burn up their hydrogen and follow a well-documented aging cycle that depends on the kinetics of progressive fusion reactions. Literature cites measurements regarding the abundance of the heavy elements [26] that are produced by these reactions.

Fusion fundamentals.

Fusion is based on a proton and electron with kinetic energy from its environment colliding with an existing proton or atom. Since the proton and the existing atom are positively charged, they repel one another creating a barrier for fusion. Reference 40 discusses fusion, binding energy fundamentals and accurately models data from reference 26. To match the barrier energy (BE), the proton and its associated electron must gain energy from the temperature of the environment and must be at high density. This prompts the properties exchange and nil release (0.511+0.111-0.622) that characterizes the re-conversion process to neutrons for about half of the protons. The barrier energy (BE) is simply the retained energy for the protons.

If the temperature is low only some atoms will achieve the barrier and fuse. Boltzmann's approach to equilibrium kinetics characterizes the process even though it may involve several reaction paths. This probability can be characterized by the expression $P_{\text{barrier}} = \exp(-BE/\text{Environment energy}) = \exp(-BE/(1/5B*T))$.

Barrier energy.

The author's binding energy model results in barrier energy (BE) values for all the elements.

$$BE \text{ (MeV)} = -0.101/4 * \text{number of protons}$$

Barrier energy results are reproduced below. Since the barrier energy becomes increasingly restrictive there are very few large atoms found in nature and gold is scarce.

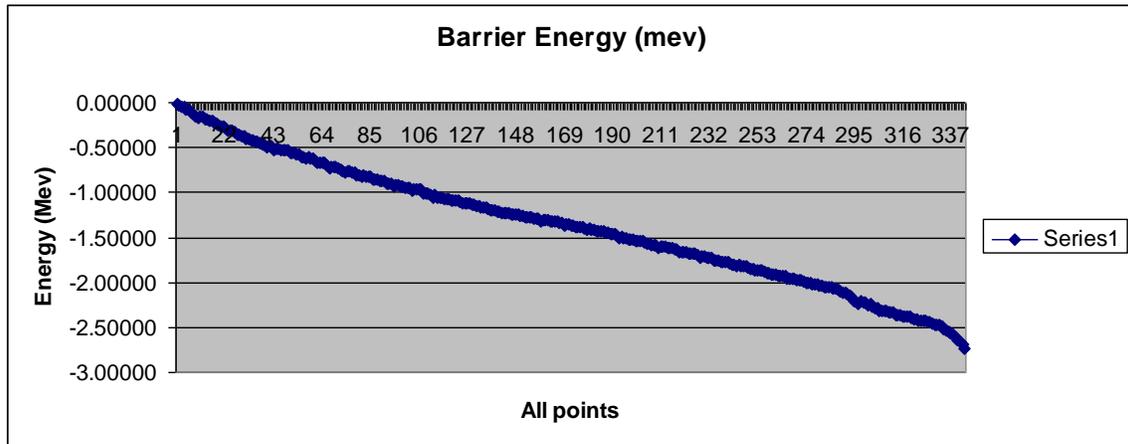


Figure 35 Barrier energy of atoms.

All points means all atomic numbers for elements and their isotopes.

Fusion probabilities

Specifically, the energy of the environment is the MeV of the electron that it gets from temperature. Reactions that have lower barrier energies are more frequent, and this is the basis for the cosmic abundance of the elements. The proposal is as follows:

Probability of fusing/sec = $P_{\text{barrier}} * P_{\text{density ratio}} * \text{reaction rate}$

Number of protons fused = probability of fusing/sec * number of protons * delta time

$P_{\text{barrier}} = \exp(-0.011 / (1.5 * B * T))$

Where -0.011 MeV is the barrier energy for the reaction that converts hydrogen to helium/deuterium, but each atom has a unique BE.

Boltzmann's constant = $8.62e-11$ MeV/K

Probability related to density:

At higher density (density ratio) more atoms are present to undergo the reaction.

The density ratio is formed from (density/max density). (Maximum density is the initial density associated with time zero radius $7.35e-14$ meters and the mass of a proton. For 50% hot matter:

Max Density = $(0.5 * 1.67e-27 / (4/3 * \pi * 7.35e-14)) = 5.02e-11$ kg/m³).

Probability of reaction/second:

The number of reactions is also dependent on how fast each reaction can occur (number of reactions per second). The reaction speeds up if an electron can cross a barrier radius and reach the nucleus more quickly. The radius is the degenerate radius $5.29e-11 / \text{degeneracy}$ where degeneracy is $(\text{density} / 2699)^{.33}$. The value 2699 is the density for protons just separated by the electron orbit $5.29e-11$ meters. The velocity is $v = C * (1 - (0.511 / (0.511 + ke))^2)^{.5}$.

This makes the probability of a reaction in rate/sec:

Reaction Rate = $\text{velocity} / (2 * \pi * \text{degenerate radius}) / \exp(60)$

The value $\exp(60)$ is the delay "entropy".

Mesons and baryons also have delay "entropies" based on N for their fundamental components [42][43].

Solar example.

In the following example, the proposed fusion model is applied to the sun. The core density in the sun is about $1.3e5$ kg/m³ [Wiki] and the temperature is about $1.6e7$ K.

Solar example		
Temp	deg K	1.59E+07
Density	kg/m ³	1.28E+05
Dmax	kg/m ³	5.02037E+11
KE temp	1.5*B*T	0.002055756
degeneracy		3.62
Degenerate radius		1.46171E-11
v/c		0.089429948
Barrier		-0.011
Example calculation for above conditions		
rate		P _{barrier}
Probability/sec		exp(-.0139/.005)=.0047
		P _d =(dens/max)
		(1.2e5/5e11) ² =2.55e-7
		Reaction rate R/sec
		v/(2pi*r)/exp(60)=2.56e-9
P _b *P _d *Rate/sec		2.67E-18
Burn time seconds	1/above	
burn time (Byrs)		11.90
sun N		1.1976E+57
fract burning		0.1
burn rate N/sec*me		3.70593E+38
power mev/sec		2.47371E+39

Figure 36 Example calculations for solar fusion.

Burn time= 1/(P_{barrier}*P_{density}*Reaction rate)

Abundance of the elements summary.

Studying the atom deepened our understanding of how probabilities shape nature. In addition, it proves that the kinetic energy 10.15 MeV from the Proton model (Figure 4) is accurate. Atomic energy is energy released when protons come back together and fall into each other's strong residual (weak) energy (20.3 MeV). The shape of the binding energy curve was successfully modeled.

The author studied mesons, baryons, baryon resonance, their decay times, and properties. Fitting the data with fundamental particle values gave a tentative understanding of what these transient particles are (Section 8). They are simply combinations of particles and kinetic energy that decay rapidly into simple particles found in the proton pattern of energy.

1. A probabilistic fusion model was developed that relies on barrier energies from Section 5 to characterize fusion rates of stars, temperatures, densities, and element abundances. The model determines which elements are formed from each of the solar burning phases and determines temperature from the slope of the abundance line. The model is dependent on observed burn times of supernovae and

abundance data. It uses many fundamentals but, in the end, is semi-fundamental since the fraction of mass exposed to high temperature is highly complex.

- Supernovae are the source of heavy elements. This means that the sum of the measured abundances for elements heavier than helium is the fraction that was at some point in the core of stars.

The standard model contains all the entities below. The lower energy quarks, their fields and the three neutrinos are in the neutron and proton model but there are higher energy quarks and bosons, known as the W and Z bosons. The N values for mass is shown to the left and the N values for fields is shown on the right. In some cases, there are two N values that are added. For example, the charm field= $2.02e-5 * \exp(17.432) + 2.02e-5 * \exp(17.432) = 1506.6$.

PDG							
Data (MeV)			Mass	Ke	Field	N1	N2
2.49	11.432	Up	2.49	99.46138	101.9514	15.432	
4.36	11.432	Down	4.36	97.59138	101.9514	15.432	
100	15.432	Strange	101.95	651	753.3245	17.432	
1275		Charm	1283	224	1506.649	17.432	17.432
4180	17.432	Bottom	4174.768	1392	5566	19.432	
173000.0	21.432,22.5	Top	160800	0	160800	22.5	21.430
125200.0	19.432,22.5	Higgs	125237	0	125237	22.5	19.432
80399	22.106	W+,W- Bosc	80399				
91188	22.228	Z boson	91188				
0.511	10.136	electron	0.511				
	2*0.0986	e neutrino	2.47E-05				
	10.333	mu neutrino	0.622				
	10.51	Tau neutrino	0.74				
		muon	105.6584				
		taon	1776.82				

Figure 37 Standard model entities.

The quark masses $2.49 + 4.36 + 1283 + 4174 = 5566$ MeV. This makes $E = 2.02e-5 * \exp(19.432) = 5566$ the source of the lower quark masses. The N=11.432 based quark masses were discussed in the section entitled Quarks. The N=15.432 quark mass (101.95) is “right on” the PDG data. The bottom quark mass is $4175 = \frac{3}{4} * 5566$ and the charm mass are the remainder. With these values all the Particle Data Group data is matched.

The W boson and H boson

The other feature of the Standard model is the role of the W boson. Plates TT and UU describe the W boson as the link between entities displayed vertically.

The Higgs mass is:

$$125237 = 2.025e-5 * \exp(19.432) + 2.02e-5 * \exp(22.5)$$

The Top quark mass is:

$$160800=2.025e-5*EXP(21.432)+2.02e-5*EXP(22.5)$$

The Higgs is viewed as the source of mass for the other entities. Its N value is related to $90/4=22.5$.

Measured properties of Neutron and Protons

N values related to charge.

The neutron decays into a proton, electron, and anti-electron neutrino. It also takes on charge +1. In the neutron model $N=10.432$ is charge neutral and if you take away 0.295, the N value becomes $N=10.136$. By the formula $E=2.02e-5*\exp(10.333)$, its original mass 0.622 MeV becomes 0.511 MeV plus 0.111 MeV of kinetic energy during neutron decay. After decay, the electron is charged with $E=2.02e-5*\exp(0.295)=27.2e-6$ MeV, the exact electromagnetic field. The electron of course presents an enormous number of possibilities. It orbits the proton, and the creativity of chemistry is opened to nature. Some entities in the Standard model have yellow and blue bars that, according to Reference 66, represent e and v.



The standard charge for the down quark is -0.33 and the standard charge for the two up quarks is 0.67. This makes the charge of the proton $-0.33+0.67+0.67=1$. But charge and parity are conjugated meaning that as parity changes from -0.5 to 0.5, charge changes from 0.67 to -0.33. This changes the proton charge from 1.0 to 0 for the neutron. The overall spin of the proton and neutron are 0.5. These two particles also have iso-spin [20] as listed below. Overall charge + parity + iso-spin + spin = 1.5 for both particles. But each quark also has a field energy of -0.5 (-1.5 overall). This makes the overall properties zero for each particle. Charge conjugation could accomplish this. Parity transformations conserve CPT (Charge, Parity and Time). I studied all the mesons and baryons and was able to match their mass, decay times, parity, and charge properties [20] as combinations of the entities above (there may be other ways of correlating the data). The neutron and proton have these properties:

Proton D-U-U			Original parity	Neutron D-U-U (parity changes charge)		
0.5	-0.5	-0.5		Parity P	0.5	-0.5
0.5	-0.5	-0.5	isospin I	0.5	-0.5	-0.5
-0.33	0.67	0.67	0.67 Charge	-0.33	0.67	-0.33
0.5	0.5	0.5	spin (T)	0.5	0.5	0.5
13.432	11.432	11.432	Quark N	13.432	11.432	11.432
DOWN	UP	UP	name	DOWN	UP	UP
4.357	2.489	2.489	Mass	4.357	2.489	2.489
			MeV			
0.67	0.67	0.67	CPT invariance	0.67	0.67	0.67
Isospin		-0.5		Isospin		-0.5
Proton charge		1		Neutron charge		0
Proton parity		-0.5		Neutron parity		0.5
Proton spin		1.5		Proton spin		1.5
CPTI		1.5		CPTI		1.5
Fields		-1.5		Fields		-1.5
CPTIF		0		CPTIF		0

Figure 38 Proton and Neutron parity changes.

The charge and parity values highlighted in yellow change the proton properties to neutron properties.

Baryon and meson masses and decay times.

NIST baryon and meson data correlations are in appendix 2 because they are extremely detailed. Conclusions are:

The proton and neutron model are the basis for resonances in all baryons. The correlation that leads to the proton model, the series N=13.43,15.43,17.43 and 19.43 is fundamental to not only the proton and neutron but all the baryons and mesons. One way to think about this is that the proton is a manifestation of the laws of nature. The baryons receive extra energy from the accelerator but mimic the basic form of the proton. Resonances of the basic proton energy values are like an organ pipe that produces specific sounds when energized. Nature is using the kinetic energy of the accelerator to produce resonances like the proton.

Decay times are simply H/width, but a model helps understand why. The model proposed is that an orbit is formed with velocity determined by half width of energy. The decay occurs as a quark bundle circles the radius at velocity V once. At that point, Schrodinger P should be 1. It is exactly unity for proton and neutrons. This underlies their stability. The remaining baryons have incomplete wave functions. Width is associated with resonance. Each resonance produces a certain width energy. Mass simulations and decay time correlations are consistent with the proton model components.

10. Unification concepts

Perspective is real physics.

Perspective is real physics but often not under our control. An example of this is the electron-anti-electron pair. They are the same particle if perspective changes from forward time to backward time. Parity (right-handedness and left-handedness) changes and this is simply whether perspective is looking down or up on a spinning particle. Nature uses time shifts to create velocity, but velocity is perspective dependent (relative to other things). There is further scientific evidence of perspective being real physics. The double-slit experience is a quantum mechanics experiment with light (or particles) originating from a single source. As the light passes through double slits in its path toward a screen behind, it interferes and causes wave like dark and light patterns. The Heisenberg principle states that we cannot measure energy and time at the same instant because they consist of one another. This can be explained with the Argand diagram. $P=1$ is the point "particle" labelled "one" that exists only after a full revolution of time t around the diagram ($1/\text{time around the circle below} = \text{energy}$). The wave pattern is the normal uncertain perspective.

The other perspective is from one of the slits. If we know (measure) which slit the particle went through it is no longer an interference pattern; it is a spot indicating the particle passed through the slit. Our mental processes create reality from our perspective. For things to be separate they must be different, leading to the Pauli exclusion principle. EPR experiments have determined that there are probabilistic connections across large distances. This would be expected with neutron-space that is duplicated multiple times and may be $P=1$ overall. When an EPR measurement is made, the system knows about the denominator in the probability ratio because the system is whole.

Physicists have been learning, teaching, using, and discussing quantum mechanics for a century. Even the founders of the theories could not agree on the meaning. Einstein never accepted some of it even though Bohr, Heisenberg and others convinced us it described probabilistic nature. Many said, "it would never make sense, but it didn't deter us from discussing it ad infinitum." There are still very smart people with different thoughts about it.

Evidence that we are part of a system.

It is not unreasonable to believe that information, perception, and perspective play central roles in physics. There appears to be a central information level (N) and a dependent energy level that exists inside complex conjugates (iEt/H) and ($-iEt/H$). We know about energy through the model our brain creates and the measurements we make based on our perspective. This work proposes that everything consists of a Schrodinger system. Our brains draw information about energy out of the system using quantum mechanical equations. This document proposes that an information pattern we perceive as the neutron and proton in time and space are part of the system. Probabilities are used to construct nature because they describe a component as part of the entire system. Energy is separated into parts (mass and fields) that depend on one another. This understanding has been encoded in what science calls wave particle duality and the Heisenberg uncertainty

principle. There is evidence that we are seeing from within a system. Our brain registers information about energy from our perspective but knows we are energy. Our language and experience trains us to locate things but perhaps the locations we perceive have information analogs.

We identified $N=0.0986$ as information and explored how it is used in color vision perception and storage of DNA information. But $N=0.0986$ is part of the N pattern for physical particles. For example, $N=10.333-2*0.0986=10.136$ is the electron energy 0.511 MeV. And $3*0.0986=0.296$ is N for the $27.2e-6$ MeV electromagnetic field energy that we use for vision. The fact that 0.0986 is used by our visual system and fundamental particles indicates that we are more fundamental than we think. We could be components in the overall $P=1$ system and be “inside” the Schrodinger information system composed of $\exp(180)$ particles.

Probabilities that multiply to $P=1$ within the Schrodinger system are networked structures—storage and retrieval systems within $P=1$. Nature is an information and energy pattern making up a whole of which we are an integral part. Nature appears to be goal oriented toward achievement of life, diversity and thought. The basis of both physical life and mental life appears to be nature’s uncanny ability to develop complexity from simplicity. On the mental side, complexity increases because of networking and learning. We can think about our brain as our center in a complex system that we perceive as energy, space, and time. Our senses observe the position of particles from our individual perspective and our brain assigns composite meanings to the energy received. The basis of the eye’s absorption of light is a key to understanding perception. Our eyes gather light energy, but our brain gathers information. Criteria matching is the condition for Feynman function- based perception indicating that nature has a supporting structure for storage, retrieval, and processing information.

Unification Summary.

Particle data was correlated leading to the discovery of a series that underlies fundamental particle energies. The energy series was combined into a mass model that matches NIST and Particle Data Group masses of the neutron, proton, and electron to within $1.6e-6$ MeV.

The mass models were shown to be based on MIT’s unitary solution to the Schrodinger equation. The structure of the model is based on information values called N that multiply to probability 1.0 for each of 5 sub-components. The equation, $E=e0*\exp(N)$ converts each sub-component into values that define quarks with kinetic energy that were apparently separated from equal and opposite field energy during a creation process. This makes each sub-component energy zero overall.

Energy values in the proton model are basic to a unified theory.

- 1) Fundamental forces. The strong forces, weak force, electromagnetic force, and gravitational force can be calculated from proton model components. The gravitational constant G was constant and was calculated from the quantum scale proton model. Key values were the gravitational field energy 2.801 MeV that gives

fundamental radius $7.045e-14$ meters and potential energy 20.3 MeV. Time and space are defined by these values.

- 2) Cosmology. In the process of understanding energy and forces, constants were discovered in the neutron model that are important to cosmology. . The model provides the initial kinetic energy 10.15 MeV for expansion and the number of protons in nature.
- 3) Relativity. The source of general and special relativity appears to be linked to the source of gravity.
- 4) Atomic binding energy and abundance of the elements. The total mass of the neutron and proton have a 10.15 MeV internal component that is released during fusion. A small kinetic energy value 0.111 MeV is released during neutron decay that serves as the trigger for fusion. Probabilistic fusion kinetics were presented that model the abundance of elements and power the sun based on the barrier energy 0.111 MeV.
- 5) Baryon and meson masses and decay. Proton model components are resonances for high-energy, short- lived particles. Multiples of 10.15 MeV are input values for the Breit-Wigner function that correlates baryon decay times.
- 6) Standard model constants. The entities identified by Dr. Wilczek were shown to be components of the proton model. The W and Higgs bosons are extensions of the N series used by the model.

A unifying theory was proposed that everything is part of a P=1 system. It places perception at P=1 that depends on complex conjugates $(iEt/H)^*(-iEt/H)$. Time and space are defined by the gravitational field and energy is defined by separations. There appear to be two levels in nature. An underlying information level that creates and a space and time level that we perceive around us.

- 1) Perception is fundamental, based on quantum mechanics. Color vision is shown to follow Feynman absorption equations spaced by increments of $N=0/0986$. But our ability to display it in our internal model of reality proves that our brain uses quantum mechanics to extract information and process it with the Schrodinger system.
- 2) Current knowledge about DNA leads to the critical question “How does it construct our physical and mental reality?” It is proposed that molecular protons and electrons in our body are part of a network system that stores, retrieves, and processes information. The best example of this are DNA molecules. It appears that coordinates provided by the standard model would be useful. Successful traits are stored and re-used.

Progress toward resolving current cosmology issues was reported.

- 1) A cosmology expansion model was presented based on thermodynamics. It agrees with the WMAP and PLANCK lambda CDM model but is based on proton energy components and zero net energy.
- 2) The thermodynamic model is an alternative to the critical density concept [65]. The critical density concept may be incorrect, leading many to search for missing matter.
- 3) Dark energy is identified as late-stage fusion energy from stars.
- 4) Dark matter measured by WMAP and PLANK may consist of black holes. Accretion into massive black holes at the center of galaxies may occur very early. Unexpected

flat galaxy rotation curves are a result of kinetic energy difference leading to local expansion effects.

Reading between the lines.

We do not know where information originated but it appears to be fundamental. We can speculate that a “Mind” may have created the pattern that preceded us by billions of years and established the physics we are studying.

An analogy helps us imagine this. A dreamer, lying sleeping and safe, produces information images. We often find ourselves in the dreamer’s dream and experience a different reality. The analogy represents the possibility that our mind is inside Mind (not a new thought). Sir James Jeans said, that “the universe begins to look more like a great thought than a great machine.” James Allen said, “Mind is the master power that molds and makes.” We can believe that mind in Mind is fundamental and act accordingly. This is central to many traditional religious beliefs. One way to view religion is the act of seeking fundamental truths and one way to view the purpose of creation is ongoing creation. We can be in awe of nature and not interfere with different beliefs.

Time is the freedom that enables our bodies and brains to evolve and develop. We are perspective dependent observers in an information system/energy we call the universe. We do not have perfect memories, instead we can focus and pick the important few out of the many. With the right choices, our collective efforts become dynamic and cooperative. We appear to be a part of a perceptive, creative universe [86][58][59] that evolves through all experiences. Nature may have been divided into $\exp(180)$ pieces but when re-assembled in the right way it is a beautiful picture.

1. APPENDIX 1 Fundamentals.

This appendix contains some fundamentals. The only quantum mechanics important to this book are contained in about three equations. The author draws on a very reputable source; “The Feynman Lectures on Physics” [2].

Units review

This document uses the MKS system (Meters, Kilograms, and Seconds). Here are a few important constants.

Measured Constants become definitions of MKS System (Meters, Kilograms, Sec, MEV, Newtons)							
	Natural Units			MKS		Planck's reduced	
Planck	$h=1 \text{ ne nt}$	H-mev sec		4.13567E-21 meV-sec	PDG	6.58212E-22 meV-sec	1.97327E-13
Light Speed	$C=1 \text{ nl/nt}$	c-meters/sec		299792458 meters/sec			
ne/meV		h-newtons m sec		6.63E-34 newton m sec/joule	PDG		
ne-sec	Charge	q-coloumbs	1.60E-19	1.60E-13 (newt-m)/meV		6.24E+12 meV/(newt-m)	
	Mass	Kilogram/meV	PDG	1.78266E-30 kg/meV		5.60959E+29 meV/gm	

A primer on logarithms.

The next few paragraphs are written at a high school level to make sure they are easy to understand. If this is too simple, you can skip to the next section.

Open a Microsoft Excel ® spreadsheet on a computer and type the following:
 $=\exp(180)$. The computer will return an exceptionally large number. Exp stands for the natural number e to the power N . N is the exponent. The number e is called that natural number $= 2.718$. The natural number occurs when something increases in proportion to itself. If mice have unlimited food, their number increases in proportion to the number of mice. The population would increase exponentially $\exp(N)$. The beautiful spiral of a conch shell is another example of the natural number e . The radius increases exponentially as the angle from the center increases. It is also known as the Archimedean spiral.

Now type the following into the spreadsheet:

$=1/\exp(90)$. You have written a probability we call P . A probability is a ratio of one outcome divided by all possible outcomes.

Type this into the spreadsheet:

$=\exp(90)*\exp(90)$

$=\exp(180)$

Note that $\exp(90)*\exp(90)=\exp(180)$

Look at the enormous number $=1.22e39$. In this case, the e stands for “move the decimal point 39 places to the right” or some people might say “it has 39 zeroes after 1.22”.

Type the following into the excel spreadsheet:

$=\ln(1.2204e39)$

The computer will return the number 90. The computer command \ln stands for a natural logarithm. It is the opposite command of $\exp(N)$. In other words, $\ln(\text{number})$ returns the exponent N for $\exp(N)$.

Now type:

$=1/1.2204e39$ and note that it returns $8.19401e-40$. Of course, the $e-40$ means the decimal place is moved 40 places to the left, making this a small number.

Now type equal minus $\ln(8.19401e-40)$:

$=-\ln(8.19401e-40)$ and note that the spreadsheet returns 90.

The minus sign before $\ln(\text{number})$ means that it will return $1/\ln(\text{number})$. Below, we will use the relationship $N=-\ln(P)$ extensively. N will be a number I call information and P is a probability.

Now type the relationship $E=e0*\exp(N)$ into the computer with $e0=2.02e-5$ and $N=0.296$.

This is typed:

$=2.02e-5*\exp(0.296)$ and the computer returns $2.72e-5$. This is the field energy of the electron in MeV.

N in the proton model uses base 10 numbers just like our fingers. I don't know why because there are other bases. For example, some computers use base 2 and this makes them digital computers and numbers are either 1 or 0.

We used the energy unit MeV above. It stands for million electron volts. One electron volt (eV) is the energy required to move an electron across one volt. Think about a 1-volt battery. It has a positive and negative end, but the electron is attracted to the positive end because it is negative. You can move the electron against the force resisting it to the negative end, but you must expend energy. Since one eV is a small energy, physicists often use MeV.

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

P	$p_1 * p_2 = \exp(-i Et/H) * \exp(i Et/H)$		
	with $Et/H=1$		
multiply by adding the logarithms			
ln P	$\ln(p_1 * p_2) = -i + i = 0$		
P	$\exp(0) = 1$		

Example of exponent sign change:

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

A primer on the Schrodinger equation.

The Schrodinger equation is the basis for orbital models with mass components orbiting fields. The form below is MIT's unitary solution.

<https://ocw.mit.edu/courses/chemistry/5-61-physical-chemistry-fall-2007/lecture-notes/lecture7.pdf>

Schrodinger equation:

$P = \exp(-i*1) * \exp(i*1) = 1$. The imaginary number separates 1 into two parts, i.e., $-i*i=1$

Note: $\exp(\text{power})$ means the natural number e to a power. Example $\exp(-0.693) = e^{(-0.693)} = 1/2$, where e is the natural number 2.712.

Energy E and time t enter nature through the exponent, $(i*1)$ where $1 = Et/H$. Energy is E, time is t and H is Planck's constant.

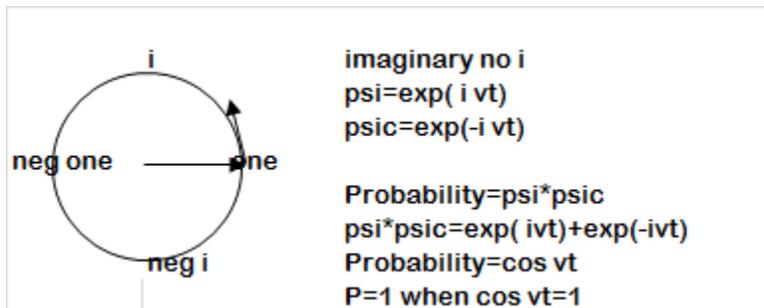
Schrodinger's equation exponents are known as complex conjugates or wave functions. The result of the multiplication Probability=1 is also referred to as "collapse of the wave function".

Probability=1 in the left-hand side (LHS) of Schrodinger's equation. The RHS complex conjugates represent waves moving through time cycles. Sinusoidal wave varies with $\exp(i \theta) = \cos \theta + i \sin \theta$ as θ increases. They are circles with a vertical imaginary axis and a real horizontal axis. Results are restricted to the unitary point where the wave function collapses on a quantum circle with $Et/H=1$. With the right amount of mass, kinetic energy and field energy circular orbits are formed with real axis. Velocity is a vector (x,y&z) and circles represent spheres, not linear motion. The proton model derives orbits that obey energy zero. This means there will be positive and negative energy terms created through separation.

The Argand diagram and Schrodinger's equation.

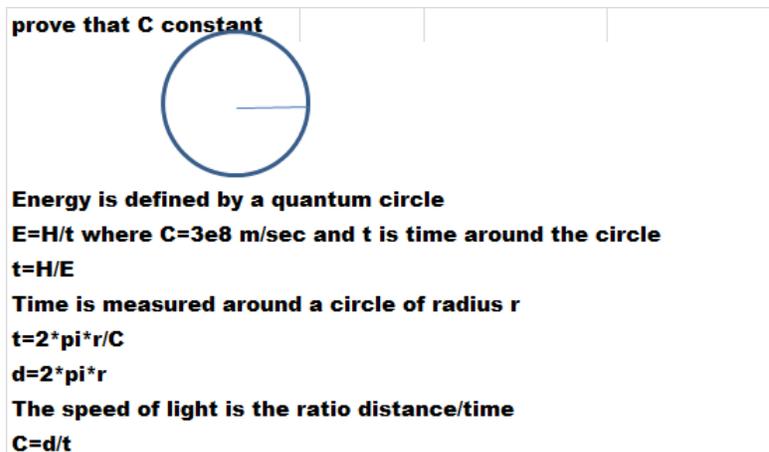
The following review is nomenclature and fundamentals that come from the field of quantum mechanics. Psi is the Greek symbol for wave amplitude. Psi is a complex number meaning it is the addition of a real number and an imaginary number. The imaginary number represented by the letter I is the square root of negative one. Even

though the symbol ψ will be used several times below, we will deal with concepts and not the actual complex numbers. The basic energy equation is $E=h\nu$ (usually stated as $E=h\nu$ where $\nu=1/t$ is a frequency that counts revolutions in a time interval). The full equation for ψ can be very complex and a simple form is $\psi=\exp(i\nu t)$. A complex conjugate simply reverses the sign on νt , so $\psi^*=\exp(-i\nu t)$. The multiple $\psi\psi^*=\cos(\nu t)$. $\cos(\nu t)=1$, when $\nu t=0, 2\pi$, etc. This occurs at the collapse point marked 1 below as time moves forward. The Argand diagram is a plot of real numbers on a horizontal (x) axis and imaginary numbers on a vertical (y) axis. Higher energy represents moving around the diagram faster. The Argand diagram moves through the sequence, 1, imaginary number, -1, negative imaginary number and back to 1. The wave function ψ can be added linearly to other wave functions. Probability is fundamental in quantum mechanics and the standard interpretation is that it gives the probability that something exists over a certain interval.



Wave function collapse shown on the Argand diagram.

Light speed

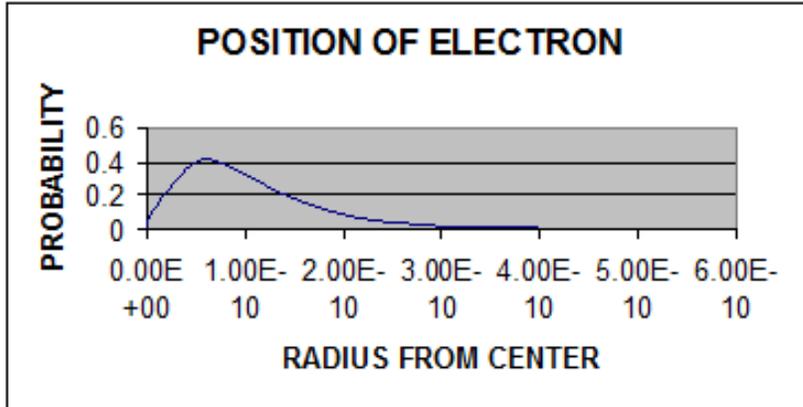


Electron orbits.

One of the features of quantum mechanics is that the “orbit” of an electron is probabilistic¹ in nature. We cannot say exactly where an electron is, although we know

¹ Condon, E.U., Morse, P.M., *Quantum Mechanics*, McGraw Book Company, Inc., New York, 1929.

the most probable radius (value called a) is 5.29e-11 meters. Quantum mechanics can write the probability distribution in terms of x, y, and z coordinates but there is only one electron in this representation, and it can't be everywhere at once. Here is one example of how an electron is located:



The net angular momentum of the universe is zero. Quantum physics quantizes angular momentum and calls angular momentum/h “spin.” They assign quanta in units of 1/2 to this property. The conservation rule is that quantized spin must be conserved and balance to zero overall. Two neutron quarks have positive spin balanced to zero by one negative spin quark and loss of one neutrino half spin. Two proton quarks have positive spin balanced to zero by one negative spin quark and one lost neutrino. The electron is also balanced to zero by loss of one neutrino.

Prove that the Schrodinger equation with P=1 and E=0 constraints is relativistic.

Force unification moved to the Dirac equation because it is known to be a relativistic equation. Many thought that the Schrodinger equation did not satisfy this criterion. It will be shown that the Schrodinger equation becomes relativistic like the Dirac equation with P=1 and energy=0. If an equation satisfies the famous relationship $E^2 = (mC^2)^2 + P^2C^2$ it is relativistic. P=momentum=mV and gamma are a shift into the time dimension with velocity. The above equation can be used to define gamma. $\text{Gamma} = (1 - (V/C)^2)^{0.5} = m / (m + ke)$ (mass 13.8 MeV is already mC^2).

Example calculations for quark.

Quark	Energy zero	E1+	(E3+E4-E1-E2)+	E2	-E3-E4=0	
		13.797	83.76		5.08	-102.63
						0.000

Quark in example above							Energy=102.63 MeV
$g = m / (m + ke)$	V/C	P	PC (mev)	P^2C^2	M^2	$P^2C^2 + M^2$	E^2
0.134	0.991	3.392E-07	101.70	10343.33	190.36	10533.69	10533.69

$$\text{gamma} = 13.8 / (13.8 + 83.8 + 5.07) = .135$$

$$P = mV = m / \text{gamma} * V / C * C / C^2$$

m is in mev

It is proven above that $P^2C^2+(MC^2)^2=E^2$. The square root of E^2 is 102.63 MeV, the total energy in the quad E3+E4. The energy 0, probability 1 constraint makes the Schrodinger equation relativistic. Reversely, it defines the relativistic equation $E^2=(MC^2)^2+P^2C^2$.

Black holes.

What about particles accelerated to near light speed? Experiments show that decay times for mesons and leptons are dilated. For these particles time does travel more slowly. These particles are not part of the proton-space model, but they are traveling through space defined by the proton. They are short lived. Their temporary local time dilation does not violate the P=1 information core being evaluated because they are unstable. Brief departures from average are part of quantum mechanics. Again, the [Wiki] equation:

$$t_0 = t_f \sqrt{1 - \frac{2GM}{rc^2}} = t_f \sqrt{1 - \frac{r_s}{r}}$$

Escape velocity for a massive body is $V=(2Gm/r)^{0.5}$. If we use the Newtonian equation for orbital velocity, we can find the velocity orbiting a black hole.

$V=(GM/R)^{.5}$	
$r=r_s=2Gm/C^2$	
$r=GM/C^2$ if light is not escaping	
$V=(GM/(GM/C^2))^{.5}$	
$V=C$	

The observed and correct explanation is that the light follows the curvature of the event horizon.

2. APPENDIX 2 Baryon decay times and mass simulations.

Baryon and meson decay

High energy labs produce baryons and mesons and measure their masses. They study their decays and classify them according to their properties. The Particle Data Group consolidates data and reviews models. The author downloaded 2020 information [26] from the website and analyzed it. The latest PDG review indicates that mass models lack accuracy due to resonances within the particles. The author developed a model of the proton and neutron and used it to study whether it could help predict mass and decay times for the 103 baryons listed by PDG. This paper proposes that baryon quark bundles orbit a negative energy like neutrons and protons. For baryons and mesons, the negative energy is the Breit-Wigner width. The quark bundles orbit for only one revolution before decaying because it is not the same negative energy as the stable neutrons and protons.

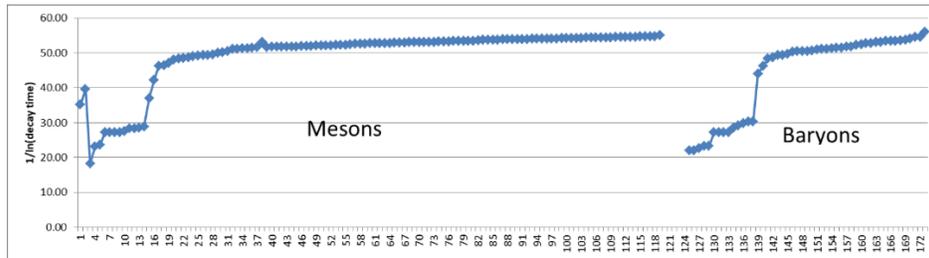
This work started as an attempt to understand why decay times for mesons and baryons varies over about 19 orders of magnitude. Decay rates are measured by gathering information and analyzing it with the Breit-Wigner probability equation [Wiki]. The width is the energy across decay distributions at probability 0.5 and published in Particle

Data Group data sheets. The decay time is \hbar/width with energy in MeV and decay time in seconds. It is proposed that the baryon Breit-Wigner width energy is related to energy resonances but becomes negative as the particle takes a form like the proton. Insight into decay was gained by comparing models of the decaying particles with a model of the proton that does not decay.

Another goal of this document was to correlate the masses of the baryons. Correlating the massive amount of data available is a huge task and does not yield easily to correlation. The Particle Data Group publishes reviews but indicates that “resonances” are encountered that hinder the accuracy of meson and baryon mass models (current accuracy about 30%). Improving this accuracy is important to particle physics. It was found that the mass model of the proton and neutron produces a series of resonances useful for simulating the mass of these particles.

Meson and baryon decay times.

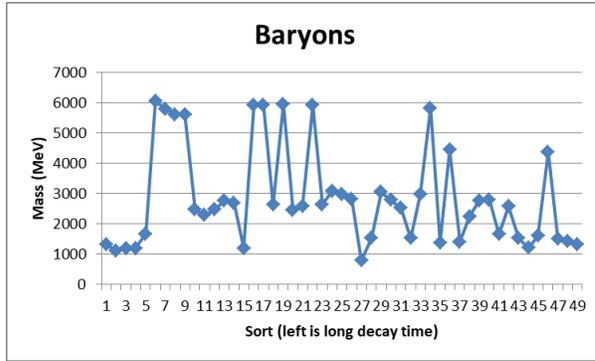
The PDG decay time data was entered into an Excel ® spread sheet. The decay times vary from $2e-6$ seconds to $1e-25$ seconds (19 orders of magnitude). This is a vast range for particles that range from 105 MeV to 10400 MeV. The following graph is produced by sorting the mesons and baryons from long life to short life (on the right below). The y axis = $\ln(1/\text{decay time in seconds})$, where ln stands for natural logarithm.



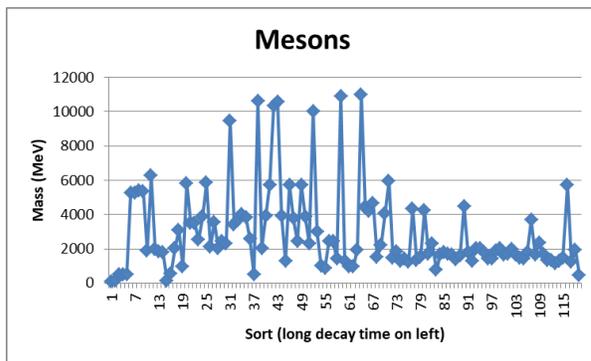
Example: natural log of particle with 1277 MeV mass has decay time $2.9e-10$ seconds. Natural log($1/2.9e-10$)= 21.96 if the numerator is 1 second.

Baryon and meson mass variability.

The following graph is the mass associated with the sorted decay times. Measured baryon mass is shown on the y axis. Message: long lives on the left are not necessarily low mass particles and there is a lot of variability.



The mesons mass variability is shown below; the same message, long life particles on the left are not necessarily low mass particles.



Breit-Wigner width fundamentals.

Two baryons, the proton and neutron, have radii that follow the simple formula below. The value 20.3 MeV is the called weak energy (also called residual strong energy). This value originates in the mass model of the proton model (figure 4).

$$R = \frac{hc}{(\text{mass} \cdot 20.3)} = 1.97e-13 \text{ MeV-m} / (938.27 \cdot 20.3)^{0.5} = 1.43e-15 \text{ meters (proton)}$$

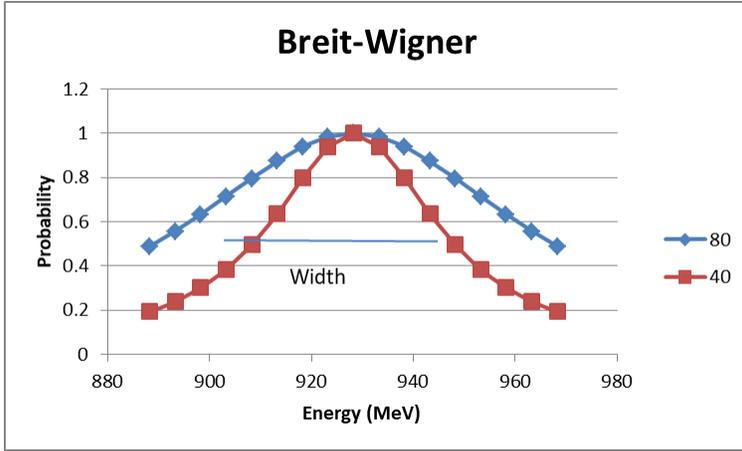
The 3 quarks form a “bundle” (called a bag in the MIT bag model of meson and baryons).

The quark bundle inside mesons contains two quarks and quark kinetic energy. For baryons, the same is true for three quarks. The bundle in the equation above is 928.12 MeV, and orbits with 10.15 MeV of weak kinetic energy. The velocity of the bundle around the radius is given by the relativistic formula $v = C \cdot (1 - (928.12 / (928.12 + 10.15))^{0.5}) = 0.147$. Since 10.15 is one half 20.3 MeV, a stable orbit is established with forces balances.

The decay time is the time to circle the radius once:

$$\text{Circle time} = 2 \cdot \pi \cdot 1.43e-15 / (0.147 \cdot 3e8) = 3.25e-21 \text{ seconds.}$$

The Breit-Wigner equation correlates decay energy data for a single meson or baryon. It yields a full width measurement at probability 0.5 in the plots below. The narrower peak is associated with a lower width (40 MeV in the example below).



Energy	Mass	Width	P=(1/(((Energy^2-Mass^2)^2+Width^2*Mass^2))		
			Ln(P)	Ln(P)/Ln(P')	
5		40			
928.27	928.27	40	-21.0444042	1	1
933.27	928.27	40	-21.105346	0.940877957	0.984534
938.27	928.27	40	-21.2697058	0.798275447	0.940579
943.27	928.27	40	-21.4965151	0.636283612	0.874962
948.27	928.27	40	-21.7483239	0.494642647	0.796549
953.27	928.27	40	-22.0017848	0.383897158	0.713666
958.27	928.27	40	-22.2453635	0.300905416	0.632581
963.27	928.27	40	-22.4744902	0.23928834	0.557176
968.27	928.27	40	-22.6880929	0.193265827	0.489343

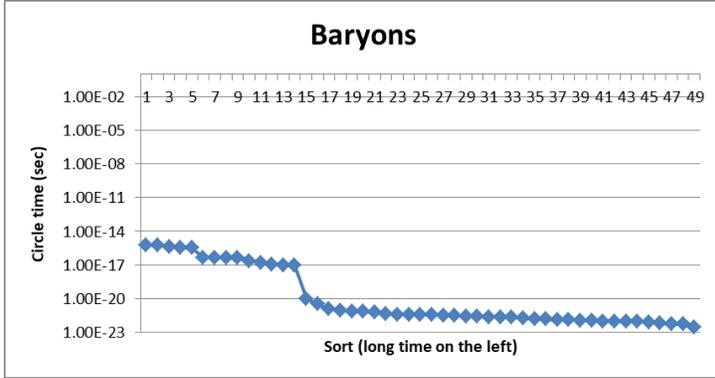
This can be simplified to only produce the probability ratio 0.5 if the width/2 is added to the proton mass.

			40	Ln(P)	Ln(P)/Ln(P')	
	928.27	928.27	40	-21.0444042	1	1
20	948.27	928.27	40	-21.7483239	0.494642647	1

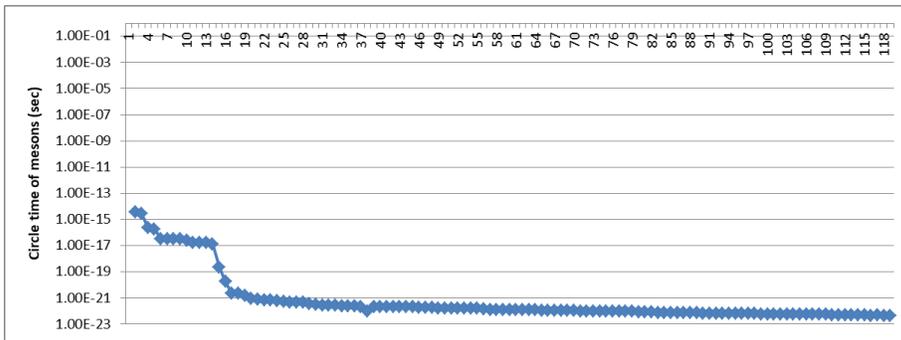
According to the Breit-Wigner equation, the 40 MeV width destabilizes the wave function and decay rate is proportional to the width energy. If the width above was the weak field energy 20.3 MeV, the proton of mass 938.27 MeV would be stable. Other baryons have different width energy and are not stable.

Decay time of baryons.

There are many energy values (mass of the quarks and resonances of kinetic energy) that make up the quark bundle. What makes the width the special energy that causes decay? The same sort (decay time long to short) is used in the plot below but this time the half width determines V for the circle time around R for the baryon. The Y axis below is circle time.



The mesons produce a similar plot shown below:



Decay time and circle time relationship.

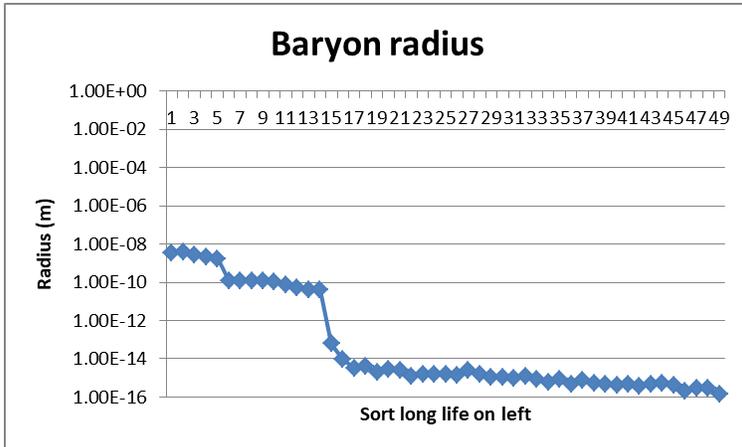
Calculations were carried out like the proton above. A radius was determined and the time to circle the radius was determined. Width was used as the field and V/C was determined from half width. The circle time was always decay time multiplied by 2pi.

$$R=1.973e-13/(M*width)^{.5}$$

$$\text{And } V/C= (1-((M-half width)/M)^2)^{.5}$$

$$\text{Circle time}=2 \pi R/(VC). \text{ Circle time}= 2 \pi * \text{measured decay time.}$$

The high energy experiments produce small radius baryons as follows (again the same sort, long decay time to short decay time on the right).



The time to circle radius R was always the decay time multiplied by 2 pi. This requires some understanding. The accelerator produces a great deal of kinetic energy. It is energizing resonances in nature that form a bundle (bag) of quarks that circle the negative energy. An accelerator produces kinetic energy but where does the negative value in the equation $R=1.97e-13/(M*\text{negative value})^{.5}$ originate? The negative value is probably not resonance since they would be various constants. Nor would the negative value be a field since the particle accelerator produces only kinetic energy. Example calculations are below for a few baryons downloaded from the PDG website. The decay time convention is h/width but if it were H/width instead circle time would be decay time.

Decay KE (MeV)	Particle Name	PDG Mass (MeV)	$R=1.973e-13/(M*width)^{.5}$ (meters)	$V/C=(1-((M)/(M+ke))^2)^{.5}$	Circle Time	(seconds) H/width
	1 p					
	2 n				time=2*pi()*R	decay time
175.0	3 N (1440) 1	1440.00	2.8E-16	4.8E-01	1.2E-23	1.2E-23
55.0	4 N (1520) 3	1515.00	4.8E-16	2.7E-01	3.8E-23	3.8E-23
75.0	5 N (1535) 1	1530.00	4.1E-16	3.1E-01	2.8E-23	2.8E-23
62.5	6 N (1650) 1	1652.50	4.3E-16	2.7E-01	3.3E-23	3.3E-23
72.5	7 N (1675) 5	1672.50	4.0E-16	2.9E-01	2.9E-23	2.9E-23
61.3	8 N (1680) 5	1685.00	4.3E-16	2.7E-01	3.4E-23	3.4E-23
100.0	9 N (1700) 3	1725.00	3.4E-16	3.4E-01	2.1E-23	2.1E-23
70.0	10 N (1710) 1	1710.00	4.0E-16	2.8E-01	3.0E-23	3.0E-23
137.5	11 N (1720) 3	1715.00	2.9E-16	3.9E-01	1.5E-23	1.5E-23
92.5	12 N (1875) 3	1885.00	3.3E-16	3.1E-01	2.3E-23	2.2E-23
150.0	13 N (1880) 1	1880.00	2.6E-16	3.9E-01	1.4E-23	1.4E-23
70.0	14 N (1895) 1	1895.00	3.8E-16	2.7E-01	3.0E-23	3.0E-23
105.0	15 N (1900) 3	1920.00	3.1E-16	3.3E-01	2.0E-23	2.0E-23
187.5	16 N (2060) 5	2115.00	2.2E-16	4.1E-01	1.1E-23	1.1E-23
130.0	17 N (2100) 1	2100.00	2.7E-16	3.5E-01	1.6E-23	1.6E-23
155.0	18 N (2120) 3	2105	2.44242E-16	0.377	1.4E-23	1.3E-23
200.0	19 N (2190) 7	2170	2.11771E-16	0.419	1.1E-23	1.0E-23
212.5	20 N (2220) 9	2250	2.01763E-16	0.424	1.0E-23	9.7E-24
225.0	21 N (2250) 9	2285	1.94571E-16	0.433	9.4E-24	9.2E-24
325.0	22 N (2600) 1	2650	1.50331E-16	0.480	6.6E-24	6.4E-24
58.5	23 Δ(1232) 3/	1232	5.19671E-16	0.304	3.6E-23	3.5E-23
58.5	23 Δ(1232) 3/	1232	5.19671E-16	0.304	3.6E-23	3.5E-23
58.5	23 Δ(1232) 3/	1232	5.19671E-16	0.304	3.6E-23	3.5E-23
58.5	23 Δ(1232) 3/	1232	5.19671E-16	0.304	3.6E-23	3.5E-23
125.0	24 Δ(1600) 3/	1510	3.21121E-16	0.398	1.7E-23	1.7E-23
65.0	25 Δ(1620) 1/	1610	4.31263E-16	0.281	3.2E-23	3.2E-23
150.0	26 Δ(1700) 3/	1710	2.75466E-16	0.410	1.4E-23	1.4E-23
125.0	27 Δ(1900) 1/	1880	2.87792E-16	0.359	1.7E-23	1.7E-23
167.5	28 Δ(1905) 5/	1882.5	2.48449E-16	0.412	1.3E-23	1.2E-23
150.0	29 Δ(1910) 1/	1900	2.6133E-16	0.389	1.4E-23	1.4E-23
150.0	30 Δ(1920) 3/	1920	2.59966E-16	0.387	1.4E-23	1.4E-23
150.0	31 Δ(1930) 5/	1950	2.57958E-16	0.385	1.4E-23	1.4E-23
142.5	32 Δ(1950) 7/	1932.5	2.65855E-16	0.377	1.5E-23	1.5E-23
175.0	33 Δ(2200) 7/	2200	2.24844E-16	0.391	1.2E-23	1.2E-23
250.0	34 Δ(2420) 11	2450	1.78262E-16	0.440	8.5E-24	8.3E-24
0.0	35 Λ	1115.683	3.73522E-09	0.000	1.7E-09	1.7E-09
25.3	36 Λ(1405) 1/	1405.1	7.40675E-16	0.189	8.2E-23	8.2E-23
8.0	37 Λ(1520) 3/	1519	1.26558E-15	0.102	2.6E-22	2.6E-22
100.0	38 Λ(1600) 1/	1600	3.4878E-16	0.348	2.1E-23	2.1E-23
15.0	39 Λ(1670) 1/	1674	8.80418E-16	0.134	1.4E-22	1.4E-22
35.0	40 Λ(1690) 3/	1690	5.73634E-16	0.202	5.9E-23	5.9E-23

The 5.08 MeV values (20.3/4) are kinetic energy and required to balance the top three blocks on the neutron model to zero energy and probability 1. But the mass and kinetic energy values that total 938.27 MeV contain negative energy -20.3 MeV. The three top blocks of the model add to this energy, but 20.3 MeV is borrowed, making it negative energy. It is called a weak field but also called residual strong energy in literature. As the orbit forms, the bundle of quarks falls into the field. When its kinetic energy equals 10.15 MeV, a stable orbit is formed. This block of the model would now be represented by:

Weak Void	-20.30			
Weak KE	10.15			
Balance	-10.15			
Neutrino ke	-0.67		10.50694	0.74
ae neutrino	-2E-05			
E/M field	-2.7E-05			
938.27				

With Weak KE= 10.15 MeV. Now the masses and kinetic energy values add to the proton mass 938.27 MeV if a balancing entry -10.15 MeV exists in the table. The value -20.3 MeV acts more like a whirlpool might act. Perhaps the mass and kinetic energy circle a void. If the whirlpool stops, the original values are recovered. This is a rough analogy but real gluon related fields in the model are equal and opposite mass plus kinetic energy. The value 20.3 MeV is different. The model represents the proton including space and time and that nature is a manifestation of the proton. Values outside the proton must be included. The 20.3 MeV value is in the bottom (space part of the model). The entire right hand side energy must equal the entire left-hand side and the right-hand side adds up to 959.99 MeV. The energy outside the proton must be 959.99-proton mass (shown below).

938.27				
	2.72E-05	0.296		
	-0.6224	-10.33		
0.5110	0.11	10.14		
electron neu	2.02E-05			
Neutrino ke	0.67	10.41		
	0.74			
expansion pe	10.15			
expansion ke	10.15			
959.99				959.99
Total N values		90.10	90.10	

The -20.3 MeV inside the proton is part of its relationship to everything else. The proton has expansion plus potential energy equal to 20.3 MeV. During expansion, kinetic energy is converted to potential energy, but the total is maintained.

Why the proton is stable.

Nature is very good at producing stable protons. The Breit-Wigner equation indicates that width energy destabilizes the wave function. Width becomes the decay rate for baryons but not protons. To understand proton stability, we need to understand its wave function. Probability values in the proton model underlie its wave function.

For each set of values, $P=1$ satisfies the Schrodinger equation:

			$P=1=\exp(itE/H)*\exp(-itE/H)$			
	E				E	
	Mass plus				Strong Field Energy	
	Kinetic Energy (MeV)				Gravitational Field Energy	
	$E=2.02e-5*Diff\ KE$		N	P	N	$E=2.02e-5*\exp(N)$
Down Qua	4.36	744.55	15.43	1	17.43	753.29
Kinetic E		5.08	12.43		10.43	0.687
Up Quark	2.49	95.07	13.43	1	15.43	101.95
Kinetic E		5.08	12.43		10.43	0.69
Up Quark	2.49	95.07	13.43	1	15.43	101.95
Kinetic E		5.08	12.43		10.43	0.69

The probabilities are $p=1/\exp(N)$, where N is $N=\ln(E/2.02e-5)$. For example; $P=1/\exp(15.43)*1/\exp(12.43)/(1/\exp(17.43)*1/\exp(10.43))=1$. This means when we write:

$15.43+12.43=17.43+10.43$, we are specifying N values that represent $P=1$.

Overall, the 4 sets multiply $1*1*1*1=P=1$. This is the wave function for the top part of the proton model.

The bottom part of the diagram has a set of probabilities highlighted below:

Weak Void	-20.30		
Weak KE	0.00		
Balance	0.00		
Neutrino ke	-0.67	10.51	0.74
ae neutrino	-2E-05		
E/M field	-2.7E-05		
	938.27		
	2.72E-05	0.296	
	-0.6224	-10.33	
0.5110	0.11	10.14	
electron neu	2.02E-05		
Neutrino ke	0.67	10.41	
	0.74		
expansion pe	10.15		
expansion ke	10.15		

$0.296-10.33-10.14+10.41=10.5069$. Again, these probabilities multiply to 1.0.

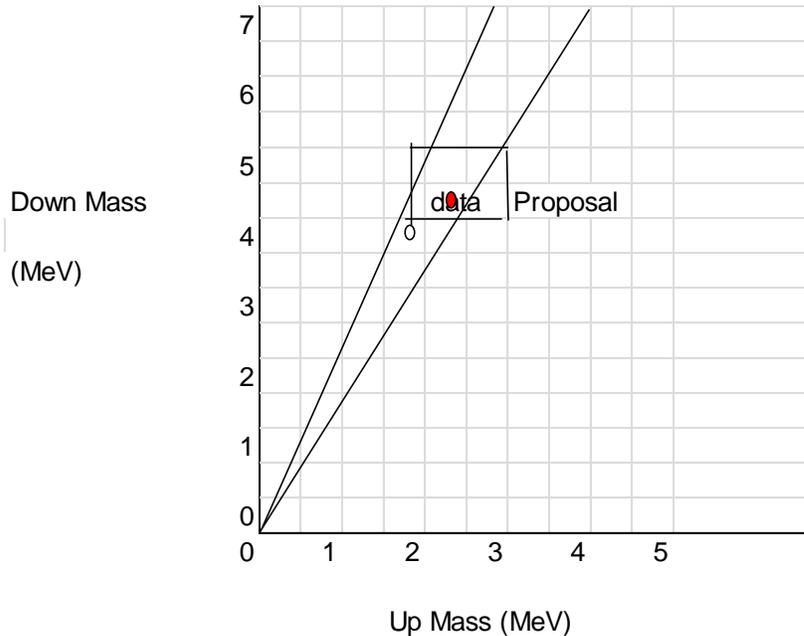
I believe the proton is stable because the five sets of probabilities=1. Why does circle time= decay time * 2π = one time around the circle? Because the wave functions for other baryons do not multiply to probability 1.0. Collapse of Schrodinger type wave functions occur every probability 1. The particle “discovers” at this point that the wave function is incomplete. Decay then ensues at the decay rate (width).

Proton mass model with PDG value quarks.

Figure 4 lists the quark mass related to the N series ending in xxx.431. Figure 5 lists the Particle Data Group Masses. It was explained in Section12 that quarks transition to lower values while conserving mass plus kinetic energy. Details are below but the result is proton and neutron model consistent with all PDG data. The goal of this effort is to use the best data from PDG to understand the meson and baryon measured masses. The

following table lists masses for the quarks of interest and some properties discussed later.

Note: There is an N series (11.43+2=13.43+2=15.43) that suggests there should be a quark at N=13.43 (13.8 MeV). It is not observed, probably because it transitions to a $4 \times 0.622 = 2.49$ MeV Up quark + 11.31 MeV of kinetic energy. The PDG data for the Up and Down masses is shown below. The proposed up and down quark masses (the red dot below) are consistent with PDG values. Two quarks have a mass of 2.49 MeV, and one has a mass of 4.36 (multiples of 0.622 MeV from Quad 5).



rpp2014-rev-quarkmasses.pdf
Figure 2

Particle Data Group at Berkeley (2008		(I J)			2012	2014	2016	
Particle Data Group designation	pdg mass (mev)	propti	charge	PDG	PDG			
pdg quarks	up	1.5-3.3	.5 .5+	0.667	2.4	2.3	2.2	0.289629
pdg quarks	down	3.5-6	.5 .5+	-0.333	4.9	4.8	4.7	-0.34315
pdg quarks	strange -1	104 +26/-34	0 .5+	-0.333	100	95		
pdg quarks	charm +1	1250+/-90	0 .5+	0.667	1290	1275		
pdg quarks	bottom=-1	4200 +170/-7	0 .5+	-0.333	4190	4180		
new bottom						4660		

Particle data group designations.

Data from various sources was correlated (Section 2) using the equation $E=2.02e-5 \cdot \exp(N)$. A pattern of N values appeared that defined the energy of quarks and bosons.

(The value $2.02e-5$ MeV is evaluated with the known mass of the electron and the value N for the electron. Its value is $10+1/3-2*\ln(3)-1=10.136$. The calculation then is $0.511/\exp(10.136)=2.02e-5$).

Baryon mass simulation fundamentals.

The series $N=13.43, 15.43, 17.43$ and 19.43 .

The energy values of the neutron model will be used below to model baryon masses. The above information was used to understand the PDG quark masses. The fact that meson decay products are combinations of lower energy quarks and kinetic energy supports the theory that quarks and resonance combinations might simulate the measured masses of all the mesons and baryons. Our goal below is to understand the combination rules and resonances.

The following rules will be applied:

1. Simulated mass= total quark mass+ resonances total- width energy. This rule was derived by observing that negative 20.3 is required to simulate proton mass. The negative width in the baryon mass sum is the same value in $R=hC/(m*width)^.5$. This means the accelerator must provide extra energy because it is taken out of the total mass.
2. The quark assignments are consistent with the PDG data. This means that the quark assignments yield the PDG data for iso-spin, spin, charge, and angular momentum.
3. Two quarks for mesons and three for baryons.
4. Neutron and proton simulations must use the same resonances. Baryon resonances may be multiples of the base resonance.
5. The resonances must provide an energy path downward to lower energy particles and ultimately to decay products that include the electron, kinetic energy, and photons.

The decay path to lower quarks and kinetic energy combinations from the N series 13.43, 15.43, 17.43 and 19.43 reveal the resonances below:

Bottom quark+ resonances decay to Charm quark+ resonances.

Charm quark+ resonances decay to strange quark+ resonances.

Charm quark+ resonances decay to Down & Up quarks + resonances.

Down and Up quarks decay to multiples of 0.6224

MeV

0.622 MeV decay to 0.511 MeV electron +

0.111 MeV or photons

Aside:

$N=10.333$ is associated with 0.622 MeV. $N=10.333-2*0.098=10.136$ and N is the electron mass 0.511 MeV and $3*0.0986*3=0.271$. $E=2.02e-5*\exp(0.271)=27.2e-6$ MeV (the charge of the electron and proton). The difference value 0.111 MeV is the "spark" for fusion and the temperature of the universe that allows primordial fusion.

Obviously to satisfy the above criteria, the resonances must be differences between quark masses. Resonances are derived from the correlation of data from the table above that reduces PDG data and shows the series 13.43, 15.43, 17.43 and 19.43. The table below

explores differences between the dominant N series ($E=2.02e-5*\exp(N)$) and the measured PDG quark mass data on the right-hand side of the diagram. The resonances (quanta) are differences that meet the criteria listed above. The PDG data for the strange quark is exactly 101.95 MeV as predicted.

Dominant N Series	$E=e0*\exp(N)$ (MeV)		Difference E (quanta marked in red)		Within range of PDG Data MeV
13.432	13.79701	minus →	11.307	→	UP 2.4896
13.432	13.79701	minus →	9.440	→	DOWN 4.3568
			88.150		
15.432	101.9469		651.3442		STRANGE 101.95
17.432	753.291	plus →	6*88.15	→	CHARM 1282.19
19.432	5566.11	→	minus 88.15	→	
			minus 2*651.34	→	BOTTOM 4175.2715

The proton model is “built into” the universe. It was found that the energies inside the proton model above can simulate all the baryons using the concept that the kinetic energies in the proton are resonances. Energy E can be represented as a circle with a probability of collapse point 1. The energy can surge back and forth in the circle locked between P=1 points at the origin. Resonances are multiples of the base energy found in the proton. Here is a model of one of the baryons. The kinetic energy value resonances are designated as 2x, 3x, etc.

The circles are also Schrodinger type wave functions with energies E_t/H moving in the circles (like sound from organ pipes).

The next task was to “test” whether the resonances and quark masses match the baryon mass data. Each line of the table represents the simulated mass of one of the mesons. Using PDG data for quark assignments markers labeled with 1’s were placed in the table for the quarks. Calculations take the 1’s and multiply them by the quark masses listed above the table. The resonance kinetic energy values (shaded in blue) from the discussion above are also listed at the top of the table. To the right of the table, the value negative width energy (MeV) is listed. The only unknown is the resonance multipliers. Once these are adjusted, the meson energy is calculated by adding all the energies in the line. The measured accuracy is then compared with the difference between the PDG mass and the simulated mass. These two columns are listed as “accuracy” and “difference.”

Long lived baryons.

The literature proton quarks DOWN, UP, UP and the neutron quarks DOWN, DOWN, UP were placed in the table below. Next, the resonances developed above were added. Referring to the proton model, we see that there are $3*0.69$ MEV values and one neutrino of value -0.671 MeV (negative means this energy has exited the proton). These values were added to the proton line. When all the values are added across the table, the

simulated mass exactly matches the PDG proton mass, 938.272 MeV. This was repeated for the neutron that decays to a proton. Before decay, it contains the -0.671 MeV neutrino and one additional 0.622 MeV particle. This sum is the difference 1.293 MeV between the neutron and proton and the simulated Neutron is exactly 939.565 MeV.

0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	Parity								
0	0	0	0	0	0	0	0	0	0	0	0	0	0	iso spin								
0.33	-0.33	-0.67	0.67	0.33	-0.33	0.33	-0.33	0.33	-0.33	0.67	0.67	0.67	0.67	Charge								
0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	spin Sz								
19.43	19.43	17.43	17.43	quanta	15.43	15.43	quanta	13.44	13.44	quanta	13.43	13.43	quanta	N series			1					
b	bottom field	c	charm	kinetic Es	strange	kinetic Ed	down	kinetic Eu	u	kinetic E Baryon				accuracy								
4175.3	4175.3	1282.2	1282.2	651.34	101.95	101.95	88.15	4.36	4.36	9.44	2.49	2.49	11.31	data								
				1			3	1	1				2	2				938.272	-20.3	0.0	-20.3	proton
				1			3	2	2				1	1				939.565	-20.3	0.0	-20.3	neutron

The width of the proton is called its weak field energy and has the value -20.3 MeV. The baryon simulations require a predictive variable that determines the weak energy. For the proton and neutron, the variable is the number of resonances*5.08 MeV/resonance. We see that there is one resonance located in the 651.3 column, one in the 9.44 column and two in the 11.3 column. Four resonances*5.08/resonance= 20.3 MeV. This algorithm was used for the remainder of the width simulations, except sometime the width=resonances in the columns time 20.3 MeV/resonance.

Baryon simulations.

New data was published in 2020 by the Particle Data Group. It was downloaded from the web site from a table entitled “rpp2020-sum-baryons [26]”. The masses and widths are listed below. The PDG tables also contain property information including the quarks. After placing the quarks in the table below, the resonances were multiplied to simulate energy values that add across the table to the simulated baryon mass. Referring to the proton model, we know that the width energy is negative and must be included in the simulated mass. The mass plus resonances and width simulations must both fall within the accuracy listed by PDG. Using the 9.44 and 11.3 MeV resonances brings the accuracy of both mass and width within measurement accuracy. In many cases the masses are almost exact. There is excellent agreement between simulated mass, measured mass and simulated width.

3. APPENDIX 3 Elemental abundance.

The role of the electron in fusion.

The electron comes from energy interactions of the “electron quad” in the proton model (Figure 4). As with the other energy interactions there is a difference in kinetic energy resulting from the requirement that the energy entering the interaction must equal the exiting energy. In this case difference energy specifies the initial kinetic energy of the electron. $(0.622+27.2e-6-2.47e-5-0.511=0.1114 \text{ MeV})$.

As the neutron decays and releases the electron, the proton mass model indicates that the electron has the maximum initial kinetic energy above. The 0.1114 MeV energy is released, and the electron is in its base state of about $13.6e-6 \text{ MeV}$. As density changes the electron is either in its base state or degenerate if compression reduces the electron to less than $5.29e-11 \text{ meters}$. A requirement for fusion is that the electron must gain energy before it can be accepted into the atom. This kinetic energy barrier is quite high. For example, the sun’s temperature produces only 0.002 MeV . This alone makes fusion low probability.

Late-stage fusion in stars.

Mass accumulation results in first generation stars that light the skies at about 500 million years. As stars over a threshold mass age, processes are put into motion that burn hydrogen to helium, helium to carbon, carbon to neon, neon to neon, oxygen to silicon and silicon to iron. There are several sets of data regarding the temperature and density during the life cycle of stars (burns) [25][26][30]. Based on the proposed fusion kinetics model, heavy elements found in nature are produced. The main empirical factor is the amount of material subjected to the high temperature conditions.

Burn time, temperature and density information [26] is shown below including the author’s barrier energies and fusion calculations for burn time. Each column contains information for a specific burn. The fusion model gives the probability of reactions/second and burn times are calculated from $1/(\text{probability of reactions/sec})$. This produces time for the burn that is converted to years. Densities are listed for comparison.

Comparison of lbl.gov burn times with calculated burn times				
	protons→He	He→Carbon	C→Ne	Ne→O2
Chap10 density				
(kg/M ³)	5.00E+06	7.00E+08	2E+11	4E+12
Density**	1.52E+06	1.85E+09	1.2E+11	7.8E+11
Chap10 k	5	20	80	150
(mev)	0.00187	0.00892	0.03345	0.09915
Chap10 t	3.87E+07	1.55E+08	6.2E+08	1.2E+09
	1.45e7*	1.55E+08	6.2E+08	1.2E+09
V/C elect	0.09	0.18	0.35	0.55
degenera	8.26	88.17	352.68	661.28
Barrier	-0.01360	-0.08	-0.27	-0.49
Energy (mev)				
degen R	6.4E-12	6.0E-13	1.5E-13	8.0E-14
react rate	5.6E-09	1.3E-07	9.6E-07	2.9E-06
years	7.00E+09	5.00E+05	600	1
	1.20E-17	burn rate (n/sec)		
	2.65E+09	predicted burn (yrs)		
	7.00E+09	Chap10 burn (yrs)		
		He→Carbon		
	(n/sec)	6.0401E-14	burn rate (n/sec)	
		5.25E+05	predicted burn (yrs)	
		5.00E+05	Chap10 burn (yrs)	
			C→Ne	
			7.1E-11	
			447	
			600	
				Ne→Oxyg
				3.2E-08
				1.0
				1
* alternate source for solar temperature				
** density formula $5e-16 \cdot T^3$ kg/m ³				
http://www.lbl.gov/abc/wallchart/chapters/10/0.html				

Elemental abundance burn times.

Comparison of lbl.gov burn times with calculated burn times			
	O→Si	Si→	fe→
Chap10 density			
(kg/M ³)	1E+13	3E+13	5.00E+15
Density*	1.9E+12	9.9E+12	6.25E+15
Chap10 k	200	350	3000.0
(mev)	0.10249	0.3115	3.00E+00
Chap10 t	1.5E+09	2.7E+09	2.32E+10
	1.5E+09	2.7E+09	2.32E+10
V/C elect	0.55	0.78	0.99
degenera	881.707	1542.99	1.32E+04
Barrier	-0.55	-0.9	-1.00
Energy (mev)			
degen R	6E-14	3.4E-14	4.00E-15
react rate	3.9E-06	9.6E-06	1.03E-04
years	0.5		
	6.6E-08	burn rate (n/sec)	
	0.48	predicted burn (yrs)	
	0.5	Chap10 burn (yrs)	
		Si→	
burn rate (n/sec)		1E-05	
predicted burn (yrs)		0.0030	
Chap10 burn (yrs)		0.00274	
		burn rate (n/sec)	9.22E-01
		predicted burn (yrs)	3.44E-08
		Chap10 burn (yrs)	3.17E-08

Abundance comparisons with burn times.

Fusion kinetics during star evolution.

The example for solar fusion presented in topic 5 was used for the remainder of the elements with temperatures for each of the supernova “burns”.

Using barrier energy from the binding energy (BE) model, the fusion model and temperature from 5-9, an abundance can be calculated for each element. Using abundance data from reference 27 it is easy to determine the burn that formed each element. Once the source is determined the elements can be plotted and the slope determined. The slope is unique for each burn because the denominator in the following equation (MeV) is determined by temperature alone.

$$P_{\text{barrier}} = \exp(\text{BE}/(1.5 \cdot B \cdot T)).$$

Density was calculated as follows and compare favorably (Figure 13:1).

$$\text{Density (kg/m}^3\text{)} = (T^3)/3.14e16 \text{ where } T \text{ is degrees K.}$$

Abundance calculations.

Equation for abundance calculations:

$$\text{Abundance fraction} = P_{\text{barrier}} * P_{\text{density}} * \text{Reaction rate} * \text{fraction} * \text{burn time}$$

Where:

$P_{\text{barrier}} = \exp(-BE/ke)$ barrier energy from binding energy model

Reaction rate = $v / (2 * \pi * r \text{degenerate}) / \exp(60)$

$P_{\text{density}} = \text{density} / 5.03e11$

Fraction = fraction available in the core to burn

Time = burn time in seconds

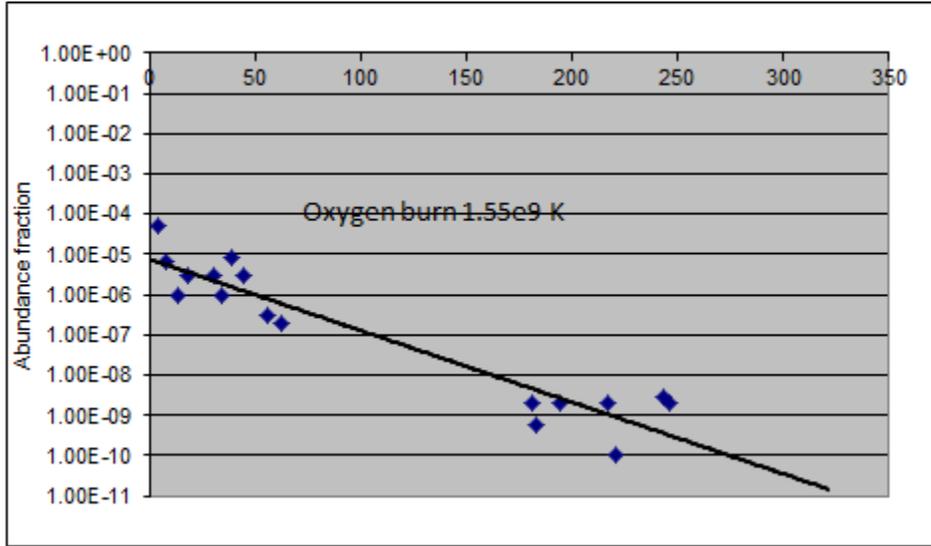
$$\text{Burn time} = 1 / (P_{\text{barrier}} * P_{\text{density}} * \text{Reaction rate})$$

The table below contains the constants for each burn in the vertical column. The only unique thing about each element is its barrier energy.

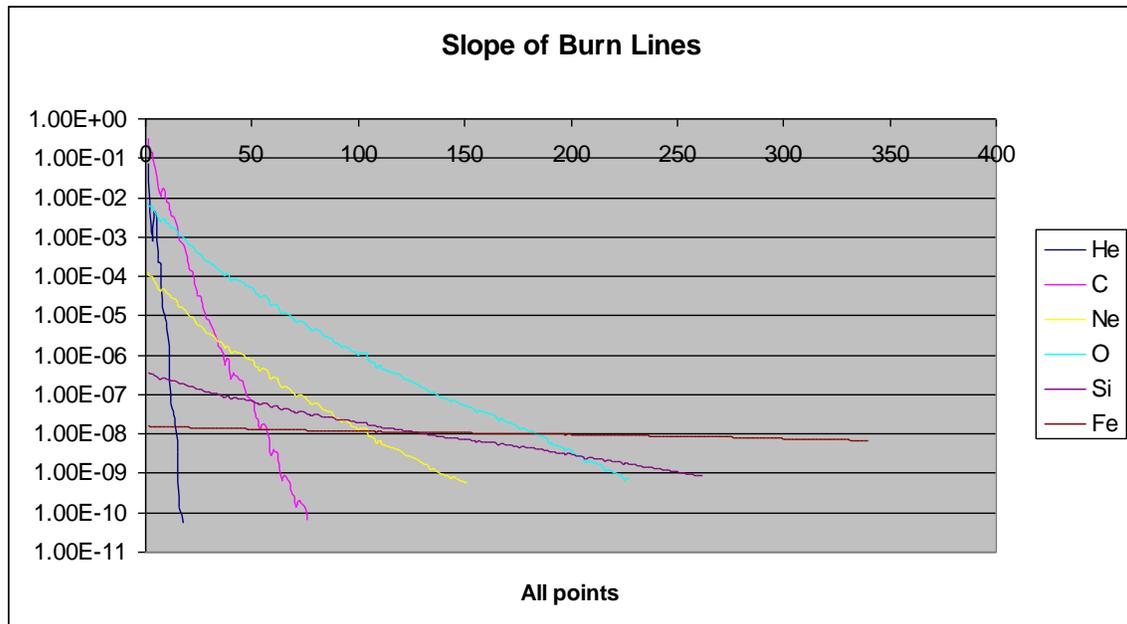
Carbon Abundance Example		
Temp	deg K	1.55E+08
Density	kg/m ³	1.20E+08
Dmax	kg/m ³	5.02E+11
KE temp	1.5*B*T	0.020
degeneracy		35.43
Degenerate radius (DR)		1.49E-12
v/c		0.27
Barrier		-0.15
Example calculation for above conditions		
	Pbarrier	
	$\exp(-.152/.02) = 5e-4$	
	P density	
	$(\text{dens}/\text{crit}) = 2.3e-4$	
	P rate/sec	
	$v / (2\pi * r) / \exp(60) = 7.6e-8$	
fract at temp		8.00E-03
Pb*Pd*Rate/sec		7.25E-17
time (seconds)		1.58E+13
calculated carbon abundai		0.0011
	data	0.005

Carbon abundance example.

The calculation above was carried out for each element. The resulting abundance data was grouped by burn (this required selecting which atoms were produced in the burn, but a pattern was clear because each burn has a unique slope) and plotted on a semi-log plot for all points (atomic numbers including isotopes). A statistical fit was determined (the line below) from the abundance groupings. The burn lines were produced from the barrier energies, densities, and fusion kinetics. One example is shown below.



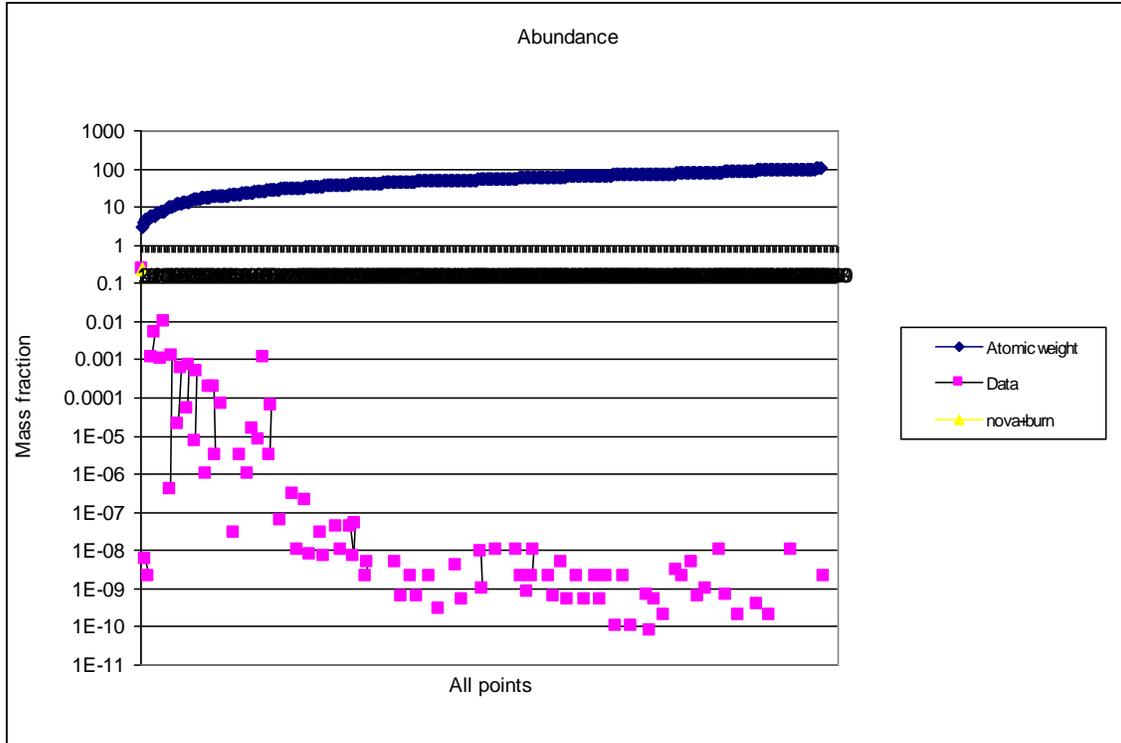
Oxygen burn slope.



Comparison of burn slopes.

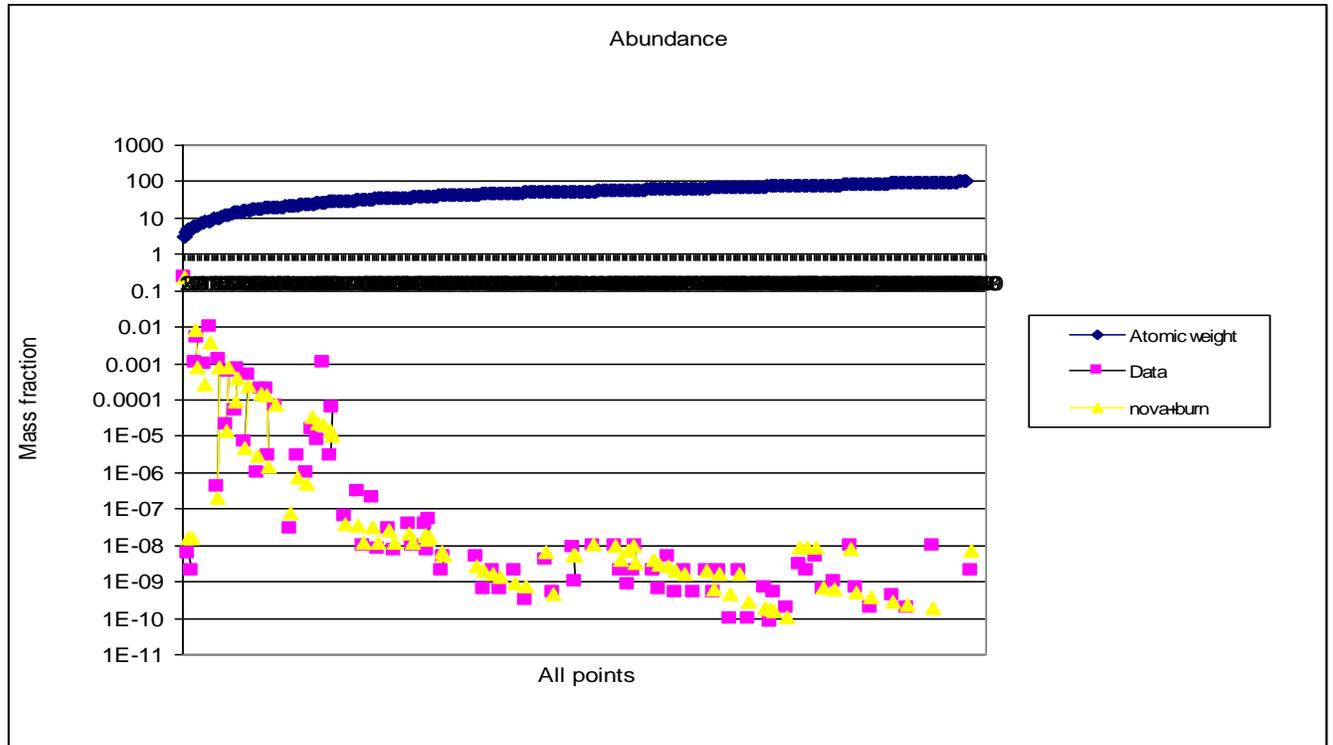
Abundance of the elements.

Abundance data [26] is presented below on the vertical axis of a semi-log plot. The horizontal axis is all the atomic numbers and their isotopes.



Abundance data.

The calculated burn lines (the points marked in yellow that determine the burn line) above are superimposed on the raw data below to produce a comparison of data and calculated abundances. The ratios for each data set below compared with its temperature line are on the order of 1 or 2 standard deviations.



Comparison of abundance data and abundance calculations.

As indicated above, the model is semi-empirical since the vertical position of the line is also dependent on the fraction of the burning element that is subjected to high temperature. This will remain empirical because the history of all supernovae cannot be known.

This completes the author's goal of demonstrating the power of a probabilistic model for fusion based on 10.15 MeV for a probabilistic binding energy curve.

4. APPENDIX 4 The information pattern originates with the Higgs, W and Z bosons. The table below proposes how the N values for the Higgs, W and Z bosons may have transitioned to become the neutron and proton N value tables above. The genealogy starts on the left with the value $N=90$ being split into four components. The value $N=22.5$ is conserved in the boxes to the right. The Higgs is the highest energy boson found to date and the Standard Model [66] is based on lower energy particles and fields that emanate from the Higgs. It occupies the top two boxes below and the two remaining boxes are the Z and W bosons. Refer to the data table above for comparison of energy values related to the N values 22.53, 22.235 and 22.106. (The residual values $0.1972=2*0.0986$ and $0.167=0.5/3$. The box on the left is the only place that $0.5/3$ appears).

	0.098612289			21.432	Top		
	Higgs			19.432	Bottom		
	Higgs			17.432	Charm		
	Z =22.235	Z components		Neutron	Neutron	Proton	
Split 90/4	W=22.106	W componer	Action of W-	N values for mass	N values for fields	N values for mass	N values for fields
	22.500	22.530		12.432	10.432	12.432	10.432
	-0.1972		0.197	15.432	17.432	15.432	17.432
	0.167		5.167	down -.33		down -.33	
	22.500	22.530		12.432	10.432	12.432	10.432
	-0.1972		0.197	13.432	15.432	13.432	15.432
	0.167		3.167	up -.33 plus 1 op		up -.33 plus 1	
	22.500	22.235	-10.4316	12.432	10.432	12.432	10.432
	0.0986	10.507	0.197	13.432	15.432	13.432	15.432
	0.167	10.333	3.167	up -.33		up -.33 plus 1	
	22.500	22.106	-10.4316	Z components	Z Field	W components	W field
	0.3944	10.408		-10.432	-10.432	-10.432	-10.333
		10.432		10.507	10.507	10.408	10.408
				10.333	10.333	10.136	10.333
			12.092			0.296	
	90.000	89.999	22.50	12.092		90.0000	90.000

It appears that components of the W and Z transition to lower values by giving up N= 12.092. The proton diagram shows that the three quarks quad gain their N values from N= 12.092. The quark N values are N= 2 below their corresponding strong field N values. The values 12.432 are N values for kinetic energy and N= 10.432 are values for gravitational field components. N values come from $10 + 1/3$ and the which is exactly $N = \ln(3) - 1 = 0.0986$.

Action of W-	N values for mass	E=e0*exp(N)	N values for fields	E=e0*exp(N)
	12.432	5.076	10.432	0.687
0.197	15.432	101.947	17.432	753.291
5.167	down -.33			
	12.432	5.076	10.432	0.687
0.197	13.432	13.797	15.432	101.947
3.167	up -.33 plus 1 op			
	12.432	5.076	10.432	0.687
0.197	13.432	13.797	15.432	101.947
3.167	up -.33			
12.092	Z components	E=e0*exp(N)	Z Field	E=e0*exp(N)

The original W and Z with N= 22.5 conserved were apparently separated into three pieces that form particle columns in the bottom of the proton and neutron diagrams.

Z components	E=e0*exp(N)	Z Field	E=e0*exp(N)	W components	E=e0*exp(N)	W field	E=e0*exp(N)
-10.432		-10.432		-10.432		-10.333	
10.507	0.740	10.507	-0.740	10.408	0.671	10.408	-0.671
10.333	0.622	10.333	-0.622	10.136	0.511	10.333	-0.622
	1.363		0.000	0.296	2.72E-05		
10.408313		10.40831		10.40830		10.40830	

The W component N= 10.432 has transitioned to N= 10.136+ 0.296 (correlated with energy of the electron and its electromagnetic field). The value 10.408 = 90 minus the N values above it in the table. The value 10.507= 10.408+.0986.

Z and W components in the table above total 10.408. This means that all probabilities= 1/exp(N) multiply/divide to p_{mass}/p_{fields} =1.

Z components	P=1/exp(N)	Z Field	P=1/exp(N)	W components	P=1/exp(N)	W field	P=1/exp(N)
	3.018E-05		3.01806E-05		3.01809E-05		3.0181E-05
	p/p	1			p/p	1	

Again, the entire proton and neutron models are based on energy overall= 0 and probability= 1.

The transition above involving N= 12.09 may be the basis of the Feynman diagram W and Z vertices that increase or decrease N values. (see topic below entitled Feynman diagram analysis). It also appears to be the basis of the high energy quark series shown below.

W additions						
3	3	5	7	9	11	
13.432	13.432	15.432	17.432	19.432	21.432	
0.667	-0.333	-0.333	0.667	-0.333	0.667	
Up	Down	Strange	Charm	Bottom	top	42 and

Operators

Dr. Frank Wilczek summarizes quantum chromodynamics in reference 66. Sixteen variations of six entities are central to what he calls the Core Theory. One objective of this paper is to compare these 16 entities with what the author calls the neutron model (figure 4) and its decay into a proton, electron, and anti-neutrino). Dr. Wilczek’s book title “A Beautiful Question” refers to the underlying beauty of symmetry. He indicates that discovery of the Higgs particle in 2012 reinforced and perhaps confirmed that the “Higgs fluid is a space-filling active entity that appears in the equations of the Core Theory”. The Red, Green, and Blue entities below from Plates VV and WW are called gluons and considered to be quantum entities of the strong field. They have properties related to the electron and neutrino (yellow and blue). The reference orders the 16 entities by the value Y (Hypercharge) with the formula given. Each gluon has a hypercharge of - 1/3 and the electron and neutrino have hypercharge (1/2).

						$Y = -1/3 * (\text{Red} + \text{Green} + \text{Blue}) + 1/2 * (Y + P)$		
						Y	mass	
						e	v	
1	1				1	0.166667	u	R
2		1			1	0.166667	u	R
3			1		1	0.166667	u	R
4	1					1.00	d	R
5		1				1.00	d	R
6			1			1.00	d	R
7		1	1			-0.66667	u	L
8	1		1			-0.66667	u	L
9	1	1				-0.66667	u	L
10	1		1	1	1	0.333333	d	L
11	1	1		1	1	0.333333	d	L
12		1	1	1	1	0.333333	d	L
13	1		1	1	1	-0.5	v	L
14	1		1	1		-0.5	e	L
15				1	1	1	v	L
16				0	0	0	e	R

It appears that the proton model can identify N values for the charge and parity operators in the above table labelled e and v. The e operator turns charge off and on and the parity operator changes parity from right-hand to left-hand. N (information) for the proposed operators in the table below is based on the bottom lines of the proton model.

W additions										
3 3 5 7 9 11										
	13.432	13.432	15.432	17.432	19.432	21.432				
$E = e^0 * \exp(N)$	13.80	13.80	101.95	753.28	5566.04	41130.54	e		v	
	0.667	-0.333	-0.333	0.667	-0.333	0.667	W- charge on	W charge off	parity Right	parity Left
	Up	Down	Strange	Charm	Bottom	top	operator	operator	operator	operator
	1 operator			1 operator		1 operator	neg 1 operator		mu v	a mu v
	10.432	-10.432	-10.432	10.432	-10.432	10.432	-10.432	-10.4316	-10.333	10.333
	-10.136			-10.136		-10.136	10.136			
	-0.296	10.432	10.432	-0.296	10.432	-0.296	0.296	10.432	10.333	-10.333
Mass (MeV)	2.4896	2.4896	4.3568	1282.2	4175.3	17261.5				
Mass Transition	UP	UP	Down							
Model mass MeV	2.488	2.488	4.354	1273.4	4175.3	17261				
PDG error	2.65	2.65	5.15	1275	4175					
PDG data center	2.160	2.160	4.670	1250	4150	17276				
PDG error	1.9	1.9	4.5	1290	4200					

The proposed information operators (in grey and yellow above) are components of the W and Z. Each operator totals N=0 but has the information effect of changing charge or parity. Each of the quarks is xx.432. It appears that the natural charge of a quark is -0.333 and that the plus 1 operator changes alternate quarks to charge 0.666. We will use

operators in the Feynman diagram analysis. But the e and v operators of interest for the Wilczek diagram are:

e		v	
W- charge on	W charge off	parity Right	partity Left
	operator	operator	operator
neg 1 operator		mu v	a mu v
-10.432	-10.4316	-10.333	10.333
10.136			
0.296	10.432	10.333	-10.333

1. Muon fundamentals

Reference 42 and 43 reports the author’s correlation of all meson properties. It was possible to calculate the mass, charge, parity and iso-spin of all the particles and successfully compare them with Particle Data Group data. The muon is a Down quark plus an anti up quark plus kinetic energy. N values for the muons can be diagrammed as follow:

	13.432	Muon-	13.432	Muon+
	-15.432	-0.33	-15.432	-0.33
	-10.431		10.431	
	10.13613333		-10.13613	
	0.2958	-1	-0.2958	1
	-13.432		-13.432	
	15.432	0.33	15.432	0.33

The muon mass is 105.6584 MeV in the PDG data base of 2020. Multiply the numbers in color by the values in the header to get the mass and add the values accross the table.

The muon calculated mass is within 0.0009 MeV. For example:

$$2*88.1+4.36+9.4+11.3+2.49+2*0.0695-4*0.114=105.6593 \text{ MeV.}$$

				-0.5	-0.5			0.5	0.5			10.33333	weak	3 out .03
				0.33	-0.33			-0.67	0.67			0.62	ke	average
				0.5	0.5			0.5	0.5			10.43		-0.64
Data	Meson			13.43	13.43			11.43	11.43			10.43		
PDG	Energy	KE	down	DOWN	KE	KE	up	UP			ke	ke		
MEV	MEV	88.1	4.36	4.36	9.4	11.3	2.49	2.49			0.0695	0.1114		Eaccurac
105.6584	p	105.6593	2 0	1	1	1	1	1			2	-4	m	0.0009

The mass correlation helps identify the muon neutrino energy with the value 0.0695 MeV because the PDG muon mass is very accurate. It appears as the difference in energy between Z and W components shown below.

Z compone	E=e0*exp(N	W component	E=e0*exp(N)
-10.432		-10.432	
0.099	0.000	10.408	0.671
10.333	0.622	10.136	0.511
	0.622	0.296	2.72E-05
	1.3628		1.1819
0.181	1.363-1.1819		
-0.11141	Kinetic E		
0.0695	mu neutrino		

2. Pi+ fundamentals

The mass is calculated across. To match PDG properties, the Pi+ must be an Up quark and an anti-down plus kinetic energy.

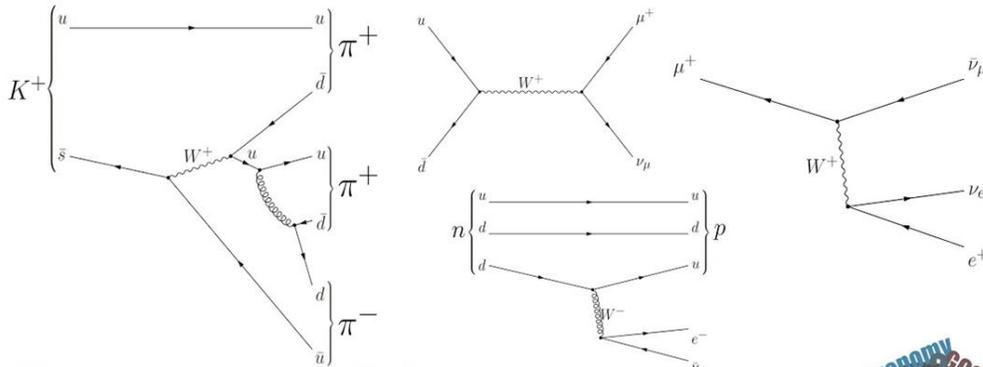
			Field E	101.9	101.9			101.9	101.9
			Field N	15.43	15.43			15.43	15.43
			CPT	0.33	0.67			0.33	0.67
			parity	-0.5	0.5			0.5	-0.5
			Iso-spin I	-0.5	-0.5			0.5	0.5
			Charge	0.33	-0.33			-0.67	0.67
			spin	0.5	0.5			0.5	0.5
Data	Meson	Calculated	Quark N	13.43	13.43			11.43	11.43
PDG	Energy	accuracy	Quark KE	down	DOWN	KE	up	UP	
MEV	MEV	(MeV)	MeV	88.1	4.36	4.36	9.4	11.3	2.49
139.5702 p	139.6	-0.01	0.00	2	0	1	1	1	1

Pi+ diagrams as follows:

13.431	-0.33	
-15.431	UP	
10.432		pi+
-0.2958	1	
-10.1361		
-13.431	A Down	
15.431	0.33	

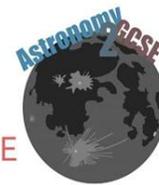
5. APPENDIX 5 Feynman diagram analysis [2][64][72].

An introduction to:



Feynman Diagrams

astronomy2GCSE

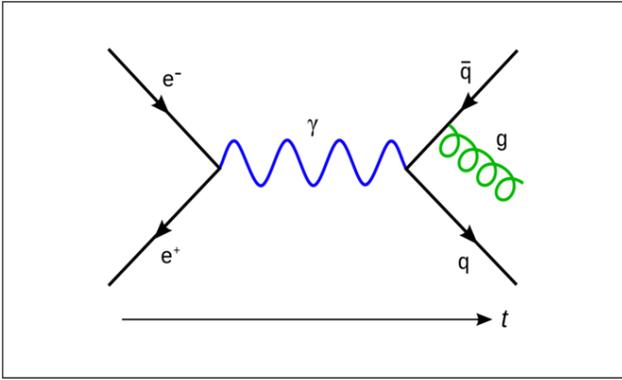


The transitions above are modelled below with N values. The block at the bottom of each diagram are totals for N, charge, and time direction (the convention for backward time = -1).

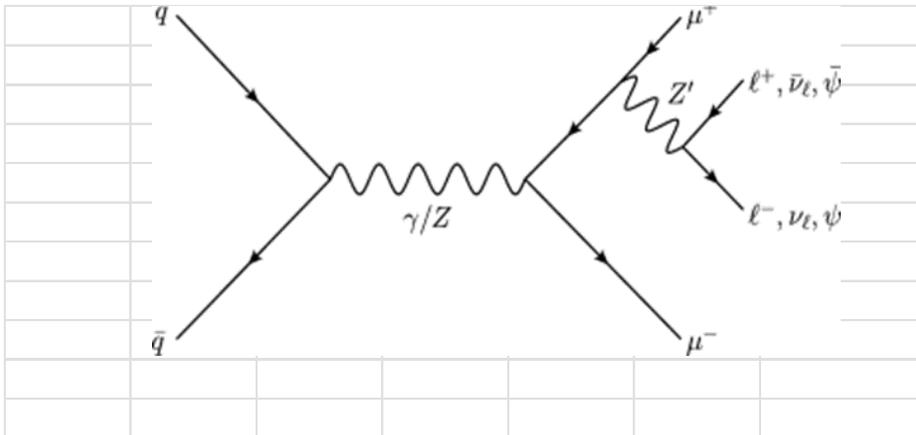
2.02E-05		up-anti down decay to muon+ and muon neutrino			
				W+	
	-0.33	13.432		13.432	-0.33
Up		-15.432		-15.432	UP
t=1		10.432		10.432	t=1
	1	-0.2958		-0.296	1
		-10.1361		-10.136	
				-13.432	0.33
A Down		-13.432		15.432	a down
	0.33	15.432		10.333	t=-1
t=-1				-10.3333	
Nsum		0.00		0	
charge sur	1				1
time sum	0				0

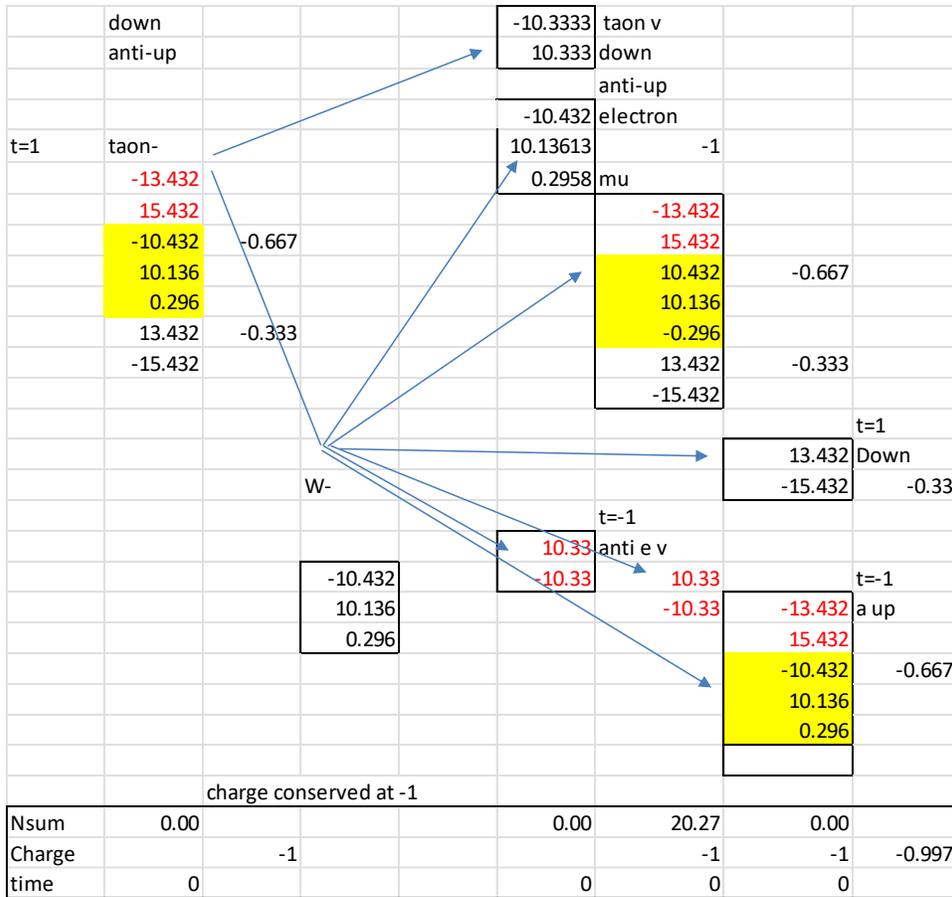
Kaon+ decay to pions				
			13.431	-0.33
t=1			-15.431	UP
-0.33	13.431		10.432	pi+
Up	-15.431		-0.2958	1
	10.432		-10.1361	
1	-0.2958		-13.431	A Down
	-10.1361	2	15.431	0.33
		W+	13.431	-0.33 pi+
			-15.431	UP
			10.432	
			-2	-0.2958
			-10.1361	
			-13.431	A DOWN pi-
			15.431	0.33 N's opposite
			13.431	Down
t=-1			-15.431	-0.33
anti Strang	-15.431		-13.431	0.33
0.33	17.431		15.431	A UP
			-10.432	
			0.2958	-1
			10.13613	
N sum		0.00	0.00	
Charge su	1			1
time sum	0			0

Muon+ decay to anti mu neutrino + e v and positron				
	-0.33	13.432	10.333	anti mu v
Muon+		-15.432	-10.333	t=-1
t=1		10.432	-10.333	
1		-10.1361	10.333	electron v
		-0.2958	10.432	t=1
t=-1		-13.432	-10.136	1
0.33		15.432	-0.2958	neg 1
N sum		0.00	0.000	
charge sur	1			1
time	0			0



electron scattering			
t=1	-10.432	-13.432	anti UP quark
e-	10.136	15.432	0.33
-1	0.2958	-10.432	t=-1
		10.136	
		0.2958	-1
		(photons)	
e+	10.432	13.432	UP quark
t=-1	-10.136	-15.432	-0.33
1	-0.2958	10.432	t=-1
		-10.136	
		-0.2958	1
SUM N	0	0	
charge sur	0		0
time sum	0		0





Rules for Feynman interactions including N, charge and time					
anti particles are neg N of the particle and their field N values reverse					
field is different from the particle N by N=2					
down, strange and bottom are naturally -0.33 charge					
charge operators attach to up, charm and top to change their charge (yellow)					
parity operator are associate with neutrinos (yellow)					
overall--N is conserved, charge is conserved and time is conserved					
N=0 overall for the interactions studied.					
W vertices can change N values, but reverse to conserve zero					
Z vertices are often parity operators					

Anti-electron neutrino.

The anti-electron neutrino is a necessary component that allows the proton model mass to agree with PDG within 6 significant digits. It's negative 0.5 spin balances the electron spin in the neutron to proton decay interaction.

144.77	Mass + KE
646.955	Kinetic E
83.761	Kinetic E
83.761	Kinetic E
10.15127081	Kinetic E
-30.4538124	Weak E (-20.45)
-0.622	minus quark mass
-0.048	ae neutrino
-5.44E-05	Em Field +2
938.27209	

Taon neutrino

The taon model is similar to the muon model except it has more kinetic energy. The proton model does not identify its energy.

The six entities are as follows in Plates TT, UU of Reference 66.

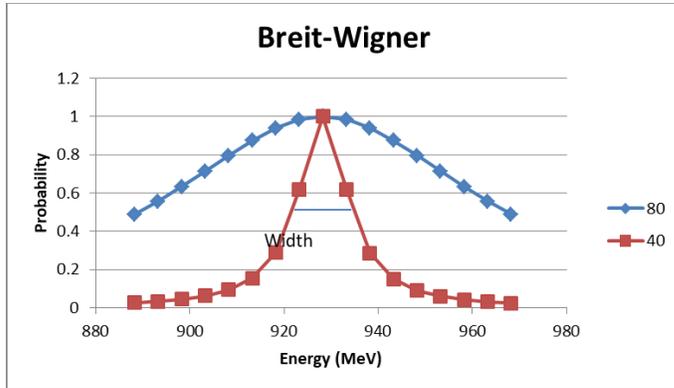
The W boson is often diagrammed as the link between particles as they change into related particles. The following plates from the reference categorize the particles vertically as changes related to the weak force and the W boson. The particles are categorized horizontally in plate TT by the strong force. The small case u and d associate the first four entities with up and down quarks. The last two entities are labelled as e and v (e for electron and v for neutrino). The Higgs is considered the entity that gives substance to the other 5. The Core Theory also gives the Left (L), right (R) data.



	Quark mas (MeV)	Kinetic E (Mev)	Field E (MeV)			
strange	101.95			0.00		
DOWN	4.36			4.36		
-0.333		651.34	753.29	-0.333	1302.69	2x 753.29
		88.15			264.45	3x
		9.44			18.88	2x
		0.69	0.69		0.69	0.69
UP	2.49			UP	2.49	
0.667		88.15	101.95	0.667		0.67
gluon!=99		11.31			11.31	
		0.69	0.69		0.69	0.69
UP	2.49			UP	2.49	
0.667		88.15	101.95	0.667		101.95
		11.31				
		0.69	0.69		0.69	0.69
Weak Field	-20.30			-101.50		
Weak KE	0.00					
	0.00					
Neutrino k	-0.67		0.74	-0.67		0.74
ae neutrino	-2E-05					
E/M field	-2.72E-05					
charge 1	938.2721			1506.55		N (1520) 3/2- baryon
electron	0.51	2.72E-05				
electron k	0.11					
	-0.6224					
electron n	2.02E-05					
Neutrino k	0.67					
	0.74					
expansion	10.15			-1506.55		Decay products
expansion	10.15					
	959.99		959.99	0.00		

The 1506 MeV baryon diagram on the right above shows the temporary particle-space energy values for a collision between a proton and anti-proton. The proton diagram on the left contains energy values that become resonances in the baryon. In the example above they are 2x651, 3x88.5 and 2x9.44 MeV. The other values are the same. A major difference is the way the weak field forms. There are 5 resonances that each represents negative 20.3 MeV. Just like the proton, the total baryon energy equals the quarks plus resonances minus the weak energy. The simulated baryon mass is 1506.55 MeV, well within accuracy reported by the Particle Data Group. The weak energy is a measurement known as the width energy. Five resonances simulate the width energy equal to 5*(-20.3

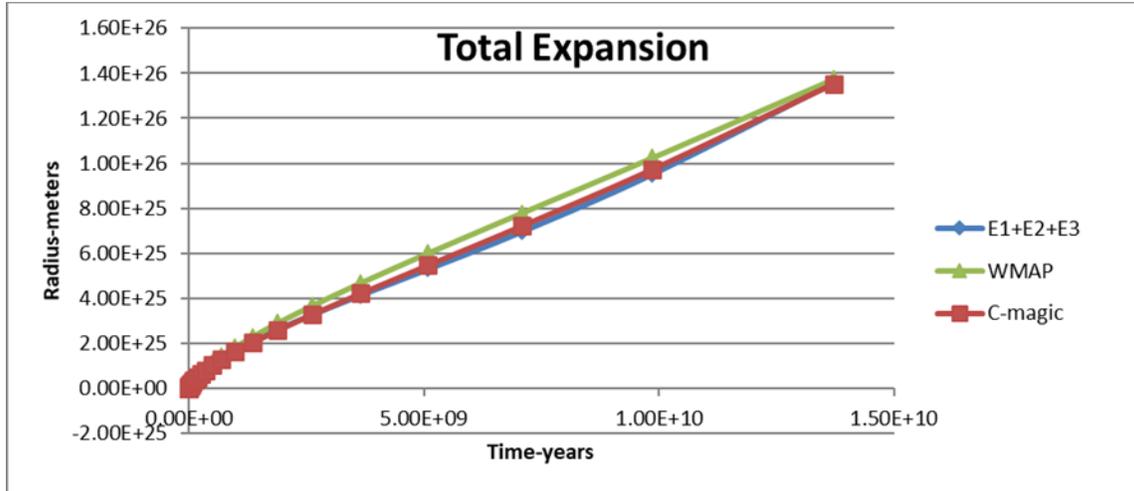
MeV/resonance) = -101.5 MeV. The Breit-Wigner probability is 0.5 at width 101.5 MeV. Decay time is related to width with the simple relationship decay time = \hbar/width . Breit-Wigner theory indicates that the wave function is unstable, and the width becomes the decay rate.



The decay time for the baryon is 6.48×10^{-24} seconds. Nature allows deviations from the proton norm but when the wave function collapses, the particle-space diagram returns to the base wave function that collapses at $P=1$. Protons must maintain zero or they are unstable. We can be clear about the exact feature of the wave function that makes it unstable: From above, five resonances simulate the width energy equal to $5 \times (-20.3 \text{ MeV/resonance}) = -101.5 \text{ MeV}$ and decay time = $\hbar/\text{width} = 6.58 \times 10^{-22}/101.5 = 6.48 \times 10^{-24}$ seconds. This simulation is also within reported measurement accuracy. The -20.3 MeV value is the energy borrowed that gives the proton itself kinetic energy and potential energy equal to 20.3 MeV . The problem is that it is 5 times too much. The proton energies in the diagram are violated, specifically it can't balance its energy values and the underlying wave-function is briefly disturbed. It briefly violates creation laws (zero energy, probability 1) then decays into particles that obey the laws.

6. APPENDIX 6 Review of WMAP.

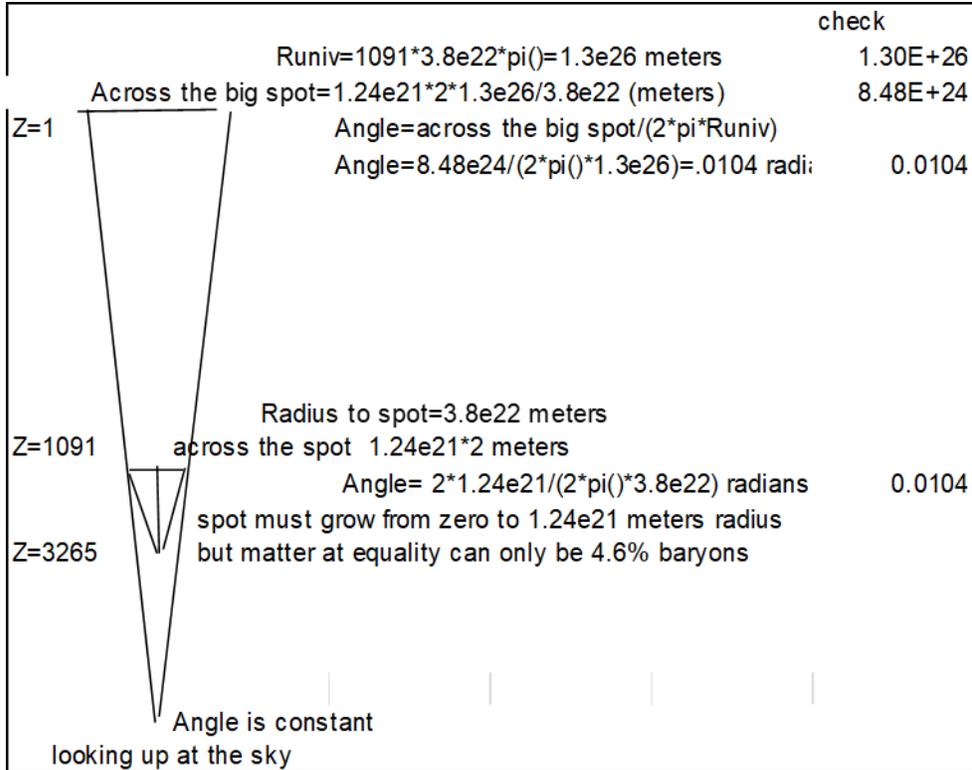
WMAP documentation [11][34] contains information for timewise simulation of expansion using the lambda CDM model. Integration continues until expansion matches the measured Hubble constant. The model uses two components. Through most of expansion radius outward is a function of $(\text{time}'/\text{time})^{2/3}$. Late in expansion the lambda component (also called the cosmological constant or dark energy) adds velocity and radius. The Cmagic [12] model concludes that the universe is accelerating even more rapidly than the WMAP model. Many have concluded that the source of the acceleration appears to be a cosmological constant that becomes increasingly important as expansion reaches the later stages. Since supernova data is based on luminosity of its "standard candle," the interpretation is mainly based on the final slope of the expansion. The "cosmological constant Lambda" was the subject of historical discussions between Einstein, Friedman, Mach, and others [10]. Lambda is the major part of WMAP critical density, with dark matter and normal matter making up the other two parts. The expansion model labelled E1+E2+E3 is plotted below.



Comparison of radius and age determined by WMAP.

WMAP [7][18] measured the dominant CMB spot temperature and size. Its angle against the sky was 0.0104 radians (imagine looking up and seeing a spot against the sky). If they could determine the size of the universe when it was created, they could use ratios to determine the radius of the universe using the fact that the angle in radians would remain 0.0104. They thought the spot size was an acoustic wave initiated at the point mass density and photon density were equivalent. Using its velocity ($3e8/3^{0.5}$ meters/sec) and travel time it would be visible at decoupling (where electrons can settle into orbits around the proton).

The figure below shows the ratios they used to determine the size of the universe = $1.3e26$ meters.



But this led to odd values for components of the universe. If the wave started at expansion ratio $Z=3265$ it would travel $1.24e21$ meters from equality to decoupling. The starting point requires that photon mass density = baryon mass density. But baryon mass fraction had to be reduced to 0.046 at equality for the wave to reach radius $1.24e21$ meters at de-coupling.

WMAP published these results [18] over several years (summarized below) and the Planck mission [20] expanded the results. Many authors have anticipated and discussed this cause for CMB variations [4][6][13].

WMAP			
published			
1.20E+26	Inferred Radius (m)		
2.26E-18	H0		
8809	Temperature at equality (K)		
	Photon mass density		
	Proton mass density		
2973	Temperature (K) decoupling		
0.0106	Spot angle (radians)		
0.254	baryon number density		
5.77E+08	Photon number density		
4.400E-10	baryons/photon		
0.235	Dark matter fraction		
6.57E-27	dark matter density in kg/m ³		
4.24E-28	baryon matter density in kg/m ³		
0.719	Dark energy fraction		
9.14E-27	critical density		
0.0464	Baryon fraction		

The WMAP (red) expansion curve above includes the cosmological constant added to normal expansion. The term dark energy is the other name for the cosmological constant (0.72 fraction of the total mass). It is added to accommodate the finding that the universe radius is unexpectedly accelerating its expansion [8][26]. This flattens the curve toward the right end. The total is 1.0 (based on the concept of critical density), and this left the remaining mass called dark matter at 0.23 mass fraction.

Astrophysicists have been searching for dark matter and speculating about dark energy with meager results. There is an alternative. None of these requirements apply to the zero net energy expansion curve. It is already flat because it exchanges kinetic energy for potential energy at a different rate. Also, the analysis below demonstrates that the cause of CMB micro-temperature variations are not acoustic. If there is no requirement for an acoustic wave to start at a certain point, baryon density can be unity. "Zero net energy cosmology" [30] reviewed the concept of critical density and concluded that there is no dark energy or dark matter.

Table 17 page 130 9 yr WMAP		Co-moving data			
		Mparsec	RS	RS/2140	
0.5953	rs/da +/- .0013 in degrees				
0.0104	rs/da in radians	152	4.68E+24	1.09E+21	2.19E+21 rs
1090.97	Z+/- .85 at decoupling		da/pi	6.42E+22	2.02E+23 da
3265	Z+/-100 at equality				0.0108 rs/da
4.3209E+26	DA=14029*3.08e22 meters	3.961E+23	da decoupling=DA/1090.97	1.261E+23	da/pi
4.4938E+24	RS=DA*0.0104 meters	4.119E+21	rs decoupling=RS/1090.97	2.060E+21	R at decoupling
1.3754E+26	R Hubble (meters)=DA/pi()				
0.0104	RS/DA=rs/da				
2.2683E-18	h=70+/- 2.2 1/sec	145.8	5.80E+24	2.71E+21	1.36E+21 rs/2
4.333E+17	time=(13.74+/- .11)*1e9*365*24*60*60 seconds				
2.725	Temperature CBR				
6.19E-10	baryon/photon ratio +/- .09				
302.37	Angular scale l=pi()/0.0104				
	ref: cell dy538 H045				

The observer knows that the angle has not changed and he knows d_a , the angular distance when decoupling occurred. He can determine the size of the universe because DA will be $d_a * 1090 = 3.96e23 * 1090 = 4.32e26$. Hubble radius = $DA/\pi = 4.3e26/\pi = 1.37e26$ meters.

Comparison of current energy expansion kinetic energy.

Appendix 7 shows that the energy/proton currently expanding the universe is the energy associated with the CMB temperature 2.73 K. This energy is $3.52e-10$ MeV. This energy will be compared with the “shoot a rocket straight up” strategy. Kinetic energy is exchanged for potential energy but particles do not achieve an orbit. We will use $\exp(180)$ cells [Section 4 topic 5 but it could be somewhat different and produce the same result]. In three dimensions there are $\exp(60)$ cell radii across the radius ($1.37e26/\exp(60) = 1.203$ meter). The volume of a cell = $4/3 * \pi * 1.203^3 = 7.29$ meters³. With this volume the mass per particle is $9.02e-27 * 7.29 = 6.58e-26$ Kg.

Hubble’s constant times radius ($2.25e-18 * 1.37e26 = 3.08e8$ meters/second) is the outward velocity at the Hubble radius from the Lambda CDM model.

Current kinetic energy for velocity $3.08e8$ meters/second and $6.58e-26$ Kg = $1.94e4$ MeV.

2.25E-18	H (1/t)	
1.37E+26	R	
3.08E+08	V=R*t (m/sec)	
6.6741E-11	G	
9.0221E-27	rho	
7.28883719	vol=4/3*pi*1.203^3	
6.5761E-26	mass=rho*volume	
1.94E+04	kinetic energy=0.5*6.57E-26*3.08e8^2/1.603e-13	
1.82E-09	kinetic energy per cell= ke/exp(60)	
94.13	velocity=(2*ke/6.57E-26*1.603e-13)^0.5	

The kinetic energy of the mass in the/cell is $1.94e4/\exp(60) = 1.82e-9$ MeV. Particles must have velocity to keep moving and the velocity at the Hubble radius is the escape velocity.

Escape velocity = $V_e = (2GM/R)^{0.5}$.

$V_e = (2 * 6.67e-11 * 6.6e26 * \exp(180) / 1.37e26)^{0.5}$

Escape velocity = 3.09E+08 meters/sec

Current expansion kinetic energy: zero net energy strategy = $3.5e-10$ MeV/proton.

LCDM current expansion energy required to expand the universe: Lambda CMB = $1.82e-9$ MeV/proton. The reason this comparison is important is that density does not expand the universe, energy does. A value they call critical density is proportional to energy in the LCDM model ($\rho_c = (V/C)^2 / \text{constant}$) and this proves that their critical density is inaccurate. (See section 5 for derivation of critical density).

The Jeans length’s relationship to the number of stars in a galaxy.

Total number of stars=2.4e20 [Figure 5]. Number of stars/number of galaxies= 2.4e20/4.9e10=4.9e10. Using this value to divide the galaxy volume of radius R=8.2e18 meters, one gets the radius of R= 8.28e18/4.9e10^(1/3)= 2.2e15 meters. This is close to the Jeans length for the radius of the unstable gas (J=2.2e15meters) in Table 8 and verifies that the Jeans length is the basis of star formation in galaxies. This gas collapses to stars like our sun.

3.00E+22	Radius of galaxies		8.20E+18 meters
1.13E+68	Volume =4/3*pi()*spacing^3		2.32E+57 m^3
3.03E+64	Volume /4.9e10		4.74E+46 m^3
1.92E+21	Radius of stars=(3/(4*PI()))*volume)^(1/3)		2.24E+15 meters
	Number of stars/galaxy	4.92E+10	

7. APPENDIX 7 Thermodynamics of expansion

The Cosmic Background Radiation (CBR) temperature has thermodynamic properties (for charged particles). Thermodynamics uses the equation PV =mRT, where P is pressure, V is volume, R is the gas constant and T is the temperature. Pressure expands the universe and we can use traditional thermodynamics to obtain the energy remaining at any point in expansion (this is justified below where it is shown that the orbit of a particle around a circle produces a force equivalent to pressure). Expansion kinetics and thermodynamics are both based on the volume of one proton. The table below is based on one orbiting proton mass exerting *inertial* outward force on the surface of a sphere. Physically the proton is bouncing around inside the sphere but the outward pressure is equivalent to an orbiting proton’s inertial force/area where area is the area of the sphere. Pressure P =Force/Area = ((m*velocity^2/r)/area). The derivation for PV (Pressure times Volume) is below. The example is for the kinetic energy associated with 2.73 K (CBR temperature at the current radius).

PV	F/Area*Volume	$mV^2/r/(4\pi r^2)*4/3*\pi*r^3$	
PV		$mV^2/r/(4\pi r^2)*4/3*\pi*r^3$	
PV		$mV^2/r/(4)^*4/3*r$	
PV		$mV^2/3$	
PV		2/3 ke	
		2.3522E-10	MeV
T		2.73	K
PV/T (Boltzmann's constant B)		8.616E-11	MeV/K
PV/T=mR			
R=(PV/T)/m	B/1.67e-27*1.6e-13	8257	Nt-meters/kg

Boltzmann’s constant is the slope of PV/T and the gas constant R is derived with proton mass=1.6726e-27 Kg.

Pressure is derived two ways in the model below. Each pressure =5.17e-24 Nt/m^2. The first way (P1 below in red) is the outward inertial F/A pressure of mass moving around the radius. The second way (P2 below in red) is the conventional relationship P=

$(m/\text{Vol}) \cdot RT$. The velocity $V_2 = (2 \cdot 3.528e-10 / 1.67e-27 \cdot 1.603e-13) \cdot 0.5 = 260.1$ meters/seconds. The outward inertial F/A pressure of mass moving around the radius 1.203 meters is outward $F = mV^2/R$.

Force = $1.67e-27 \cdot 260^2 / 1.203 = 9.4e-23$ Nt

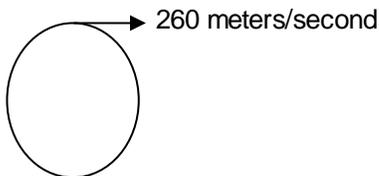
Area = $4 \cdot \pi \cdot (1.203^2) = 18.2$ meter²

Pressure₂ = Pressure₁ = Force/Area = $5.17e-24$ Nt/meter².

$V_2 = (2 \cdot K_e / 1.67e-27 \cdot 1.6e-13)$ m/sec	260.1
Force (Nt) $1.67E-27 \cdot V_2^2 / R$	9.40E-23
Area (m ²) $4 \cdot \pi \cdot R^2$	1.82E+01
P1 pressure $P = F/A$ Nt/meter ²	5.17E-24
$R \cdot \exp(60)$ meters	1.374E+26
Radius R for $P_1 = P_2$ (m)	1.2030E+00
Volume $V = 4/3 \cdot \pi \cdot R^3$ (m ³)	7.293E+00
dens- $1.6726e-27 / m^3$	2.294E-28
P2 pressure = dens $\cdot 8257 \cdot T$ Nt/m ²	5.17E-24
$P \cdot V$ MeV	2.352E-10
Boltzman's constant $B = PV/T$	8.620E-11
$K_e = 1.5BT$ (MeV)	3.528E-10
Temperature T (K)	2.729E+00

The Radius 1.203 meters is the only radius that satisfies the thermodynamic model above for one proton. This means that when WMAP measured the CBR temperature, they may have inadvertently discovered the radius of the universe without using a thermodynamic model. With $PV = mRT$ and $\exp(180)$ cells, the radius of the universe = $1.203 \cdot \exp(60) = 1.374e26$ meters. WMAP measured the CBR temperature temperature 2.73K ($3.52e-10$ MeV/particle). This is the accepted value from WMAP and Wiki.

To be clear, the equivalence between a proton orbiting a cell with velocity 260 meters/second and pressure $5.17e-24$ Nt/meter² allows us to consider a thermodynamic model as an alternative to critical density. The critical density of the thermodynamic model is based on the mass of one proton. The orbit has 260 meters per second of tangential velocity associated with CBR temperature 2.73K allows us to equate this with orbital kinetics.



8. Appendix 8 Reconciliation of Standard model and Neutron/Proton model

The relationship between dimensions, directions and N value suffixes.

Six of the entities in the Standard model have a quark linked to a single field. Other entities have a quark influenced by two fields. With two fields the quark responds in two dimensions, creating planes rather than one dimensional confined axis.

The neutron/proton model and the standard model establish basic properties like those listed below.

PROPERTIES

- X, Y, Z
- REVERSE X,Y,Z
- PLANES XY, YZ AND XZ
- AROUND CIRCLE LEFT AND RIGHT ---TIME
- HANDEDNESS (PARITY)
- CHARGE UP or DOWN
- SPIN

Standard model [60].

The Standard model is often shown in families. For example, the Charm, Bottom and Top quark plus the muon and taon are in their own higher energy family. The charm quark and top quark fall into the reference 66 category of two fields and one quark. They have no e or v property since they are not in the neutron or proton.

7		1	1		-0.66667	L
8	1		1		-0.66667	L
9	1	1			-0.66667	L

		$1 = \exp(itE/H) * \exp(-itE/H)$	
	E	←	→ E
	Mass plus		Strong Field Energy
	Kinetic Energy		Strong Field Energy
Charm	1283		753.3
			753.3
Charm Ke	224		
		$1 = \exp(itE/H) * \exp(-itE/H)$	
	E	←	→ E
	Mass plus		Strong Field Energy
	Kinetic Energy		Strong Field Energy
Top Quark	160800		41130
			119670

Figure 39 The corresponding energy 0 construct.

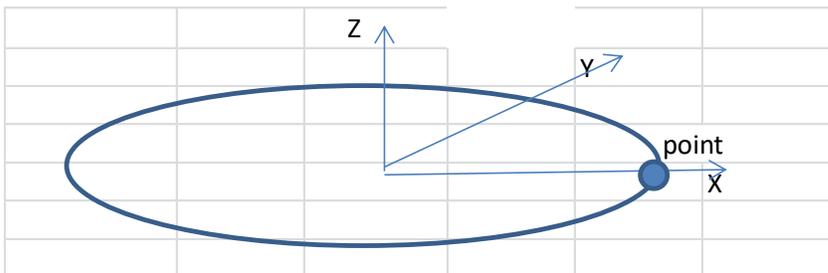
	$1 = \exp(itE/H) * \exp(-itE/H)$	
	E	E
	Mass plus	Strong Field Energy
	Kinetic Energy	Strong Field Energy
Higgs	125237	5566
		119670

	Y	X	Z	e	v	Y			
1	1				1	0.166667	u	R	2.490
2		1			1	0.166667	u	R	2.490
3			1		1	0.166667	u	R	2.490
4	1					1	0.166667	d	4.979
5		1				1	0.166667	d	4.979
6			1			1	0.166667	d	4.979

The corresponding proton model entities with the same numbers are rearranged for comparison with the Standard model. As indicated in Reference 66, entities 1,2 and 3 are Up quarks and 4,5 and 6 are Down quarks. The energies are provided by the proton model. Each entity is an energy 0, probability 1 construct. (The mass+ kinetic energy minus the two fields= zero. Each energy has an N value and $p=1/\exp(N)$. Overall $P= p*p/(p*p) =1$) This means they are entities independent of the proton as a whole. This becomes important when analyzing mesons and baryons since they are combinations of entities from the models.

Entities without e or v properties and two fields

These entities define one point on a circle in the x-y, y-z, or x-z planes.



Standard model [66]

	Y	X	Z	e	v	Y			
						$Y = -1/3*(Red+Green+Blue) + 1/2*(Y+P)$			
7		1	1			-0.66667	u	L	2.490
8	1		1			-0.66667	u	L	2.490
9	1	1				-0.66667	u	L	2.490

		$1 = \exp(itE/H) * \exp(-itE/H)$			
		E		E	
		Mass plus		Strong Field Energy	
		Kinetic Energy		Gravitational Field Energy	
		MeV		MeV	
7	Up Quark	2.49	X	-101.95	Down Strong Field
	Up Quark		Z	-753.29	Up Strong Field
	Kinetic E	853.435		-0.687	Grav Field component
8	Up Quark	2.49	Y	-101.95	Up Strong Field
	Down Quark		Z	-101.95	Up Strong Field
	Kinetic E	202.088		-0.687	Grav Field component
9	Up Quark	2.49	Y	-101.95	Up Strong Field
	Up Quark		X	-753.29	Down Strong Field
	Kinetic E	853.435		-0.687	Grav Field component

Figure 40 Neutron model comparison with Up quarks and fields.

Entities with e or v properties and two fields

Standard model

	Y	X	Z	e	v	Y			
						$Y = -1/3*(Red+Green+Blue) + 1/2*(Y+P)$			mass
10	1		1	1	1	0.333333	d	L	4.979
11	1	1		1	1	0.333333	d	L	4.979
12		1	1	1	1	0.333333	d	L	4.979

		$1 = \exp(itE/H) * \exp(-itE/H)$			
		E		E	
		Mass plus		Strong Field Energy	
		Kinetic Energy		Gravitational Field Energy	
10	Up Quark	4.36	Y	-101.95	Up Strong Field
	Down Quark		Z	-101.95	Down Strong Field
	Kinetic E	200.22		-0.687	Grav Field component
11	Down Qua	4.36	Y	-101.95	Down Strong Field
	Up Quark		X	-753.29	Up Strong Field
	Kinetic E	851.57		-0.687	Grav Field component
12	Down Qua	4.36	X	-753.29	Down Strong Field
	Up Quark		Z	-101.95	Up Strong Field
	Kinetic E	851.57		-0.687	Grav Field component

9. APPENDIX *The language of nature*

Since language is information, an analogy can be drawn between information structures found in nature and language. Language is based on symbols that we learn to form into concepts and eventually complex meanings. One important aspect of information is it can be taken as parts or. Small defined units can be added together (integrated) into larger and larger structures. The analogy below proposes a relationship between language, information and observed physical reality. The concepts DNA words and DNA sentences represent molecules held in place by electrons. Their meaning is coded but are read and expressed as specific functions that support life. The author calls these structures linked probabilities.

Our vantage point is from within an existing information structure. One definition of intelligence is seeing differences, and we appear to have mental freedom to use information and expand reality. This is enhanced by language that increases our ability to see differences and think about complex issues. Our evolving mental reality suggests that our mind participates in an overall information-based reality. When we create new thoughts from old ones, we are advancing our reality.

Is it possible that information operates on a different level than our brains and bodies? It appears that information-based laws pre-dated our physical reality. The diagram below shows a relationship between two sides of reality but suggests that they are separate. The physical side of reality (right side of diagram) began as information (left side of diagram) and now appears to fix the laws of nature. Quantum mechanics and information form the senses that evolve to the brain, and these are part of physical reality. The left side of the diagram underlies physical reality, and our mental reality is an extension of this information side. The left side can be called Information-based reality.

Science appears to be on the verge of finding that the universe is teeming with life. This is great news but dialog across huge distances is currently inaccessible, and we are still alone. We must depend on our own resources and the scientific method. Science poses questions gathers data and correlates results. What it means is sometimes open to interpretation and dialog. Scientists accept that the path forward requires exposing ideas to proof. If there is resonance, the ideas survive and contribute. Meanwhile, society is left waiting. We still have childlike questions like “what are things made out of?” Where do the laws of nature come from? Why is life possible? What connects mind and matter? Is there anything after death?

The universe appears to be goal oriented. Ultimately, its goal appears to be development and support of life and thought. Below we explore whether nature is information based. Section 3 outlined the role of the Schrodinger equation and proposed that probability 1 represents perception of energy-based particles in time and space. Sections 4 and 5 showed that the Feynman equation supports color vision and information storage leading to life.

A computer program works because instructions written in a standard language can be processed by a machine into an output. Lego ® blocks make things because they fit together. Integration of the body information structures makes a complete human not just

the components. This is like language telling a story; i.e., we focus on the story not the components. We see alphabetic symbols but automatically read them as words. There are repetitive patterns throughout nature that suggest many levels of information structure and integration. Higher level DNA structures integrate sense components into the body. Our senses evolve with our body and extend basic information to mental structure. As the brain evolves, freedom for everyone to be different emerges because the information is not “hardwired.” The brain can process information and does not have to exactly follow a set of instructions. Complex living beings are made possible by integration. DNA sentences form the body and survival promulgates DNA. In similar fashion, as our brain develops useful concepts that survive, our reality evolves. More specifically, we participate in creating nature. The basic thesis is that organized information, like DNA, underlies everything.

Addressing the child-like questions above; things appear to be made of energy and the laws of nature appear to be encoded in the neutron and proton. Matter and mind are connected by quantum mechanical equations like the Schrodinger and Feynman equations. But deeper questions require us to rethink our basic assumptions regarding reality. Reality could be both information and energy. We should be mindful of those that say the only way we know is through a brain that builds models of reality. It is possible to occasionally experience feelings of wholeness because we are part of the picture puzzle.

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