Information and Reality

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Abstract for Part 1 Information and Reality

This document explores the possibility that reality is embedded in a medium that allows information to create physical nature. The laws of nature are rules discovered from data but better understood as information. One basic information operation was identified that separates zero into particles with kinetic energy from field energy. A second operation creates space. Another information relationship is related to the probability of particles and defines the number of neutrons. It is thought that a medium must support these operations and we will explore the character of the medium. One clue regarding the nature of the medium is that perception of energy is fundamental. The result is an evolved brain that operates within the medium and participates in enhancing reality. Part 2 of this document presents the relationship between information and energy in enough detail to support the part 1 concepts.

Background

Over centuries nature has been well characterized but the author developed a new approach that helps answer deeper questions often addressed by philosophers. Of course "new" is "wrong" in physics but I do not believe that anyone has bothered to understand the approach. I believe in data. Data is used to construct models focusing on the behavior of physical observables of particles, energy, time, distance, etc. Scientists use but do not fully understand quantum mechanics. Quantum mechanical particles do not act like large scale objects. This disconnect has been termed "quantum weirdness" [appendix 1]. For example, the position of an electron in an atom is a probabilistic cloud. Quantum mechanics has not been able to unify physics with a uniform set of rules because large scale gravity appears to have a different character than the other three fundamental interactions. Cosmologists believe that there can be no preferred position (no edge) for any object in the universe but we see objects arranged around us in 3 dimensions and all have edges except the universe. Many would like to look to science and philosophy for clues regarding our existence but science appears to be fragmented into a series of well-developed disciplines that rarely connect. There are many questions that demand answers and philosophers, religions thinkers, scientists, etc. owe everyone answers to questions like "where do the things we observe come from?" or deeper yet, "why are we here"?

Information

Understanding involves correlating data in a different way. We start with the fact that we are using a limited tool, our perception. It is clear that the brain is gathering, processing and storing

information. There is no denial that reality exists but it is treated as information until we can understand it more fully. If we can find the origin of the information, we will make progress in understanding it. The advantage associated with focusing on information is that it avoids the endless argument that things are made of other things, ad infinitum.

The formal definition of information is attributed to Claude Shannon [12]. Information (N) = negative natural logarithm of probability (P) or N= -ln P. He used natural logarithmic relationships because probabilities multiply but information is additive. In other words when we add two pieces of information together, we are adding N values together and at the same time preserving the definition of probability which is the chance of one event divided by all possibilities. The negative sign tells us that information (N) is high when probabilities are low.

Energy and Information

Can energy (E) be described by information? Using the concepts developed by Shannon, the answer is yes. The relationships are simply information (N) = - ln P and probability P=e0/E where e0 is a constant that forms an energy ratio. Combining the relationships, probability P=e0/E=1/exp(N) or inversely E=e0*exp(N). The symbol exp(N) means that N is the exponent of e, i.e. E=e0*e^N, where e is the natural number 2.718.

The key to understanding there was an N value for fundamental energy data gathered by high energy labs was the electron. Comparing N values for other particles (see the title below "N for Fundamental Particles of Nature") and knowing that the electron has a field equal to 2.72e-5 Million Electron Volts (MeV), allowed the author to know that the electron N was 10.136 and the electromagnetic field energy N was 0.296=3*0.0986=3*ln(3/e) where e is the natural number 2.718. The constant e0=2.02e-5 MeV is calculated below from Particle Data Group [5] data for the electron mass. The same constant is used for all N.

Electron N	**10.136**	**(10.3333-0.0986*2)**					
Electron mass (mev)		**mass of electron (MeV)**		**0.51100024**	**MeV**		
Find the value e0 by solving the above equation with E=.511						**e0=E/exp(N)**	
						e0= 0.511/exp(10.136)	
						2.025E-05	**mev**
Note that 3*.0986=.296				**E=eo*exp(.296)=2.72e-5 mev**		**2.722E-05**	**mev**
The electric field energy of the electron is known to be: (MeV)						**2.72E-05**	**mev**

N for fundamental particles of nature

Logarithmic numbers labelled N are shown to anchor fundamental energy values and underlie the mass of the neutron, proton and electron. The author used the relationships above to correlate fundamental energies. Data showing a fundamental N value for each observed fundamental particle is listed in Part 2 Topic 1. The fundamental particle data is from either from NIST, (National Institute of Standards and Technology), the Particle Data Group [5] maintained by UC Berkeley) or other reported values [4][7]. There are three quarks confined in a proton or neutron

but they are not observed individually. This makes their energy values somewhat uncertain. The electron field is well known and agrees perfectly. The higher energy bosons are variations of N=22.5 and the Higgs particle measured in July 2010 agrees well with the author's N value of 22.575.

Information Code

The author developed an "information code" based on N values for quarks and the way quarks make up a neutron. It is detailed in Part 2 Topic 2 and reference 1. It attempts to identify the information path leading to fundamental information values that make up the neutron.

N for the Neutron

There are 3 quarks in a neutron each with kinetic energy. N for each component is part of the information code detailed in Part 2 Topic 2. The particle mass and kinetic energy components for a neutron are listed in Table 1 below. The total N value for the neutron is the natural logarithm 90.

Neutron particle and kinetic energy N		
15.43		quark 1
12.43		kinetic energy
13.43		quark 2
12.43		kinetic energy
13.43		quark 3
12.43		kinetic energy
10.41	0.07	neutrino
-10.33		
10.33		pre-electron
0.00		
90.00		Total

Table 1

Neutron field energy N		
17.43		strong field 1
10.43		gravitational field component
15.43		strong field 2
10.43		gravitational field component
15.43		strong field 3
10.43		gravitational field component
-10.33	0.07	gravitational field component
10.41		
10.33		gravitational field component
0.00		
90.00		Total

Table 2

Table 2 is similar to Table 1 except the fields for a neutron are listed. Since the neutron does not carry charge, the electromagnetic field is absent but will appear once the neutron decays to a proton. Likewise, the strong residual field appears when neutrons combine into atoms. The total is once again the natural logarithm 90.

The universe begins when the medium supports an "information operation" that separates zero energy into two types of energy. Particle plus kinetic energy is positive and field energy is negative. The total energy is:

Energy= 2.02e-5*(exp(90)-exp(90))=0.

The number of neutrons in the Universe

Part 2 Topic 4 also details an information model of the neutron that results in a mass of 939.59 MeV. The neutron decays to a proton, electron and neutrinos. Their measured mass and simulated mass is within measurement error.

There have been several projects (COBE, WMAP[6], HSST, and PLANCK) and earlier work [4][15] that yield a great deal of information about the universe. Measurements and models allow astronomers, astrophysicists and cosmologists to estimate the number of neutrons in the universe. The author believes the best number is exp(180)[Appendix 2]. There is a remarkable relationship between the natural logarithms 90 and the natural logarithm 180. Information (N) is a measure of how improbable an event is. It is very improbable that a single proton will form with exactly the N values listed in table 1. The probability that it will contain the particle and kinetic energy N values is: P=1/exp(N)=1/exp(90). Likewise, it is highly improbable that the proton will contain fields with the N values of table 2. Again the probability P=1/exp(90). Probabilities multiply and the probability of a neutron with these particles *and* field energies is P=1/exp(90)*1/exp(90)=1/exp(180).

But we know that neutrons exist. When we know something for certain, its probability is 1.0. An improbable event will eventually occur if you "roll the dice" many times. Nature apparently creates exp(180) neutrons to maintain probability=1 as an initial condition.

P=1=1/exp(180)*exp(180), where the probability of one neutron is very low but there are many neutrons.

The "big bang" duplicates the zero based neutron many times. Neutrons decay to protons, electrons and neutrinos in space. Yes, the dice are heavily loaded since they roll "neutron" every time (quantum weirdness).

Space

Having an information value associated with particle energy is important but we must understand what positions particles in space. An information operation involving four N values (called a quad) from the information code is associated with a fundamental interaction radius. The operation adds N=2 to one fundamental value and subtracts N=2 from the other value in the set. After the interaction four energy values have a specific meaning.

Quad for quark 1 before exchanging N=2				
N=13.4 for quark 1		N=13.4		
N= 12.4 for kinetic en		N =12.4		
Quad for quark 1 after exchanging N=2				
N=13.4 for Q1 mass		N=15.4 for strong field		
N= 12.4 of kinetic ene		N =10.4 for gravitational field		
N total unchanged		N total unchanged		

Table 3

The information N=2 exchange preserves two things simultaneously, zero energy and N. Before the exchange, the N values are associated with energy but there is no space. After the exchange, quark 1 orbits in a strong field with kinetic energy at a probabilistic radius R and a component of the gravitational field. For the neutron there are four quads undergoing the same exchange process. After the exchange a neutron is imbedding in a gravitational field *in space and time*. Part 2 Topic 3 details exactly how the exchange process creates space and Part 2 Topic 4 describes the neutron.

This exchange process is similar to some aspects of quantum mechanics. After the exchange, a circle of radius R defines the range (space) of a quantum particle. Quantum mechanics utilizes complex numbers and a "particle" is the point where the math allows the complex numbers to be a real number. This is the source of quantum mechanics, particle/wave duality and the Heisenberg uncertainty principle. The Copenhagen interpretation makes quantum mechanics an information science "…the only information we can have about a particle position is probabilistic".

There are 4 fundamental field energies in physics. Quarks are held into tight positions inside neutrons by strong fields, a residual strong field holds protons and neutrons inside atoms, an electro-magnetic field holds electrons in position around atoms and gravitation curves space and cause planets to orbit stars. How do we know these "circles" agree with physics measurements? Part 2 Topic 5 shows agreement with the forces within these circles and the four fundamental forces in nature (unification).

Time is discussed in Part 2 Topic 6. This gives more information about the information medium. The medium is not space but supports the creation of space through an information operation. We have identified the information code and the operation that nature used to create space.

Review

We identified information values associated with energy. Further, we understand that neutrons are information structures containing particles with kinetic energy imbedded in fields. Overall they were created by a separation process, starting from zero. The large number of initial neutrons (exp(180)) is evidence of another information separation process. Highly improbable structures were duplicated in a way that probability 1 is preserved (1=1/exp(180)*exp(180)). We also now know what space is because we understand the process that simulates it. It exists after N is preserved within a quad while N=2 is separated from one N value and given to another. What we have learned agrees with the probabilistic (information) nature of quantum mechanics. Based on the above, we have some clues regarding capabilities of the medium that supports separations. It is still somewhat illusive but supports information operations that seem to create the physical universe from zero energy and probability 1. The author developed the "information code" but does not claim to know why it contains specific values.

Fundamentals of Perception

Why can we perceive the results of these separations? There is an excellent example of how quantum mechanics underlies a fundamental process leading to perception. It involves responding to light and, through evolution, color vision in humans. Although we will discuss vision, our other senses operate in a similar manner.

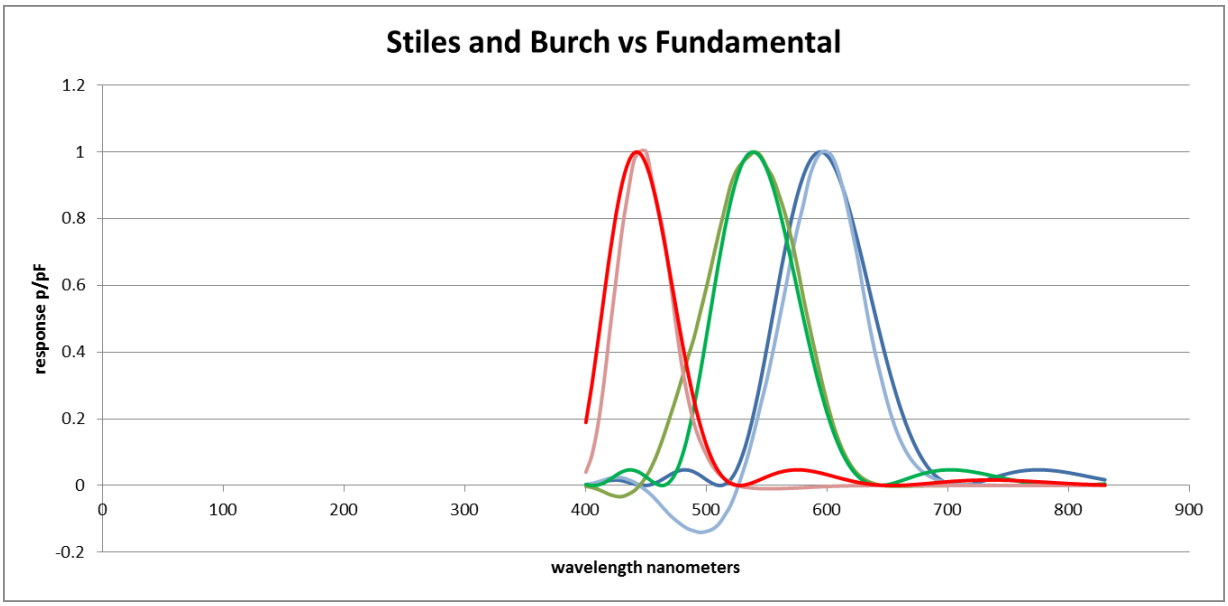
Our eye/brain is tuned to respond to information related to variations in the electromagnetic field. Our brain reads the N value series 0, 0.0986, 0.197, *0.296*, 0.394 (1, 2, 3, and 4 times 0.0986). N=3*0.0986 is exactly N for the electromagnetic field. N=0.0986=ln (3/e) where e is the natural number 2.71.

Series N	Energy MeV	P=e0/E e0=2.02e-5	Meanin	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

Using the quantum mechanical Feynman equation [3][Part 2 Topic 7] for absorption of light, our mind sees in color although the information entering our eyes are simply N values related to the frequencies associated with red, green, scotopic and blue light. The processing in our brain is probabilistic (fuzzy logic) in nature and neurons sometimes carry logarithmic information [11][2].

Stiles and Burch (UCSB)[10] 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 Feynman equation pf/pF for the three color peaks 594, 538 and 442 nanometers. The associated width series was 61, 55 and 41 respectively for red,

green and blue responses based on differences between the primary frequencies. These are tentatively called fundamental since they appear to follow the information series. Of course evolution has invented sight many times and there are many variations.



The fundamental calculations are the lighter colors and the dark colors are Stiles and Burch.

The explanation for color vision being sensitivities to different wavelengths based on N=0.0986 is surprising and new. The author followed up on this finding. Rather than four full distinct pf/pF responses, we see white light and this indicates that our human color vision system is operational and stringing together meanings. The other hues are comprised of combinations of these colors without full spectrums and it clear that the brain is adept at creating meanings from these curves. Other senses have different multi-wavelength responses (the ear for example).

We know that thermodynamic entropy is increasing overall but life absorbs energy and uses information to exploit thermodynamic entropy locally. It appears to the author that perception accompanies energy gain and it is proposed that this leads to associated molecules with a primitive identity. Exploitation of the identity's energy and information gain across deep time apparently leads to the thriving and replicating chemical system that we call life. This is fundamental in the author's view because probability P and normalized wavelength are equivalent, normalized wavelength is inverse energy and information N= -ln P.

One doesn't have to accept or understand the information code to understand that nature is adept at building information systems from, well, information. However, it allows one to understand that studying nature is an information based science.

What information preexists and what do we create?

The information we get about the world around us is where light, sound, taste, touch, etc. comes from relative to our position. With protons constructed of information, light represented by probabilities and position described by probabilities, it is fair to say we receive limited information about physical nature. There are parts of nature like dark matter that we do not detect. We know the output of our brain. It is the reality that we see around us and it is reasonable to suspect that our brain participates in enhancing and personalizing reality. Consciousness consists of many new and remembered experiences but its structure is information based and can be integrated at a high level.

Although we may enhance reality (see reality differently than other chemical life), the underlying information that we interact with has a source and a history. We also have a memory that appears to be a map in the brain that can be activated. The nerve cells become wired to interpret reality and have stored pathways that give us the impression of memory. The stored temporal and space like pathways may evolve in a way that what we experience is quite different than what is presented to brain.

Most of us agree that we should not confuse mathematical models with reality but what should we believe about information? Sir James Jeans said, that "the universe begins to look more like a great thought than a great machine". It seems to me that nature is the result of information operating within a medium that we need to identify.

It is not unreasonable to believe that the "big bang" utilized an information code to create a giant information source in a medium. A medium is required because information operations involve changing the state of something. (For example, computer instructions change binary memory states inside a machine). We need to separate pre-existing information from operations we may be performing with thought. It is reasonable to believe that we are late comers able to interact with an information source that we see as light coming from particles. We only receive information about the position of "particles" from our two eyed perspective and other senses. It is also reasonable to believe that the information source has a history and our time like perspective is also very limited.

Information in the source:

It appears that the information code existed at the big bang. Initial conditions also existed at the big bang, i.e. zero energy and probability 1. There were also eminent information processes: information separation, duplication by the huge number exp(180) to preserved unity and the exchange process that creates space. The information source produced has a history and dimensions but probably maintains zero or 1 in unsuspected ways causing some aspects of quantum weirdness.

Information we create:

Life as we know it did not exist for billions of years after the big bang. The information source and our brain interact to create conscious impressions synonymous with our physical reality. When we interact with position information, the center of our reality is unique. Consciousness created by integrating many sensory inputs with memory makes reality unique to one individual.

What we called an information source and consciousness are supported by a medium. We can learn more about the medium by examining the way the brain integrates information.

Language and Linked Probabilities

One definition of intelligence is "seeing differences" (a separation process) 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, share experiences and think about complex issues. 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 as a whole. Small defined units can be added together (integrated) into larger and larger structures. There is a similarity between language, information and observed physical reality. DNA "words" and "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.

Integration

When information is integrated it represents the product of its components. 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 similar to 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 improve the input our brain receives. As the brain evolves, freedom for each individual 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.

What we know about the Medium

1. Initial conditions within the medium were energy=0 and probability 1.
2. The medium allows information to create many identical particles with kinetic energy opposite energy fields.
3. The medium is not space because space is created by an information process involving the exchange of the information value N=2.
4. The medium supports perception through a quantum mechanical process of capturing light.

5. Starting with primitive perception, the medium supports integration of components into complex evolved chemistry we call life. A brain and organism (or plant) evolves within a medium that supports information storage and usage.

Similarities with the Medium

6. The medium is similar to the definition "intelligence is seeing differences". Differences separate thoughts into complex consciousness that is partially remembered and available for integration.
7. When we dream our minds are known to be the medium that support the dream. It seems very real until we awake.

Circumstantial Evidence regarding the Medium

The universe appears to have occurred in a medium through the use of information. Intelligence is a tool that differentiates but also builds and unifies. Jean's "great thought" requires a great mind and this could be the medium we are searching for. Is it possible that our minds are part of a larger mind? We are allowed to use the medium but will we be a memory?

Part 1 Summary

The universe appears to be imbedded in a dynamic medium that supports information. Information based laws predated and created what we eventually perceive as physical reality. Our eyes gather light energy but our brain gathers information. The basis of both physical life and mental life appears to be nature's uncanny ability to evolve complexity from simplicity. On the mental side, complexity increases through integration and learning. Connections may exist that we do not fully perceive and the medium may integrate information in a way that we can only dream of.

Many have reached similar conclusions including religious people, eastern philosophies and some philosophers. There are examples of religious scientific people but in general science does not embrace work of this nature. I wanted and found answers but will never be satisfied.

Part 2 Information and Energy

Topic 1 Correlation of Fundamental Energy with N

The best data for fundamental particles is in column 3 below labelled Particle Data Group but column 5 contains data from other reputable sources. The value on N listed in column 2 clearly shows a natural logarithmic correlation with the data. The quarks form a series with N=4 separating members of a family, i.e. Up, Strange, Bottom and Down, Charmed, Top. The bosons are variations of N=22.5. The electron allows us to find e0 and E=e0*exp(N) values in column 4 can be compared to the data.

unifying concepts.xls cell aw48			Proposed	IS Hughes
		Particle Data	Energy	Bergstrom
		Group energy	E=eo*exp(I	Randall
Identifier	N	(Mev)	(Mev)	energy
			e0=2.02e-5	(Mev)
0.0986	0.0986			
e neutrino	0.197	2.00E-06	2.47E-05	3.00E-06
E/M Field	0.296	0.0000272	2.72E-05	
	(3*.0986=.296)			
ELECTRON	10.136	0.51099891	0.511	
mu neutrin	10.408	0.19	0.671	less than 0.25
Graviton*		1.75E-26	2.732	
Up Quark	11.432	1.5 to 3	1.867	1.5 to 4.5
E Op	12.432		5.076	
Down Qua	13.432	3 to 7	13.797	5 to 8.5
Strange qu	15.432	95+/-25	101.947	80 to 155
Charmed	17.432	1200+/-90	753.29	1000 to1400
Bottom Qu	19.432	4200+/-70	5566.11	4220
Top Quark	21.432		41128.30	40000
W+,w- bos	22.106	80399	80668.71	81000
Z	22.228	91188	91154.0	91182
HIGGS	22.575	125300	128992.0	105000

Topic 2 Information Code

A logarithmic information code was developed from the above data and a subsequent model of the neutron, proton and electron. It involves four arithmetic operations, the first of which is simply, divide the N= 90 by 4 to give four values of 22.5 each. Arrows mean a separation has occurred. The “fundamental N” values on the right side of the table are additions across each line in the table.

						Fundamental		
		Operation 1				N values		
			Operations 2----------->4					
Bosons		22.5	10.167	5.167	0.099	15.432	set1	
			12.333		0.099	12.432		
Bosons		22.5	10.167	3.167	0.099	13.432	set2	
			12.333		0.099	12.432		
Bosons		22.5	10.167	3.167	0.099	13.432	set3	
			12.333		0.099	12.432		
			0.667		0.075	0.075	set4	
Bosons		22.5	11.500					
			10.333			10.333		
Total		90	90			90		

Information Code

Topic 3 Space

The fundamental N values are labelled as sets above. After an interaction particles with kinetic energy are imbedded in fields. Set 2 will be used as an example. The information interaction adds the logarithm 2 to 13.43 to give 15.43 while at the same time the logarithm 2 is subtracted from 12.43 to give 10.43. Each number in the interaction has a specific place and a specific meaning described below. We will call these 4 numbers and associated energy a quad.

E1 will be identified as a mass (a quark for the strong interaction)
E2 is identified as a kinetic energy (ke) addition to energy E1.
E3 is identified as field energy (strong potential energy for this N).
E4 is identified as a gravitational energy component.

		mev			mev		
		E=e0*exp(N)			E=e0*exp(N)		
N1	13.432	13.797	E1 mass	N3	15.432	101.947	E3 field
N2	12.432	5.076	E2 ke	N4	10.432	0.687	E4 field

These above energy values are placed in a table below with mass plus kinetic energy (102.634 MeV) separated from field energy (102.634). The total energy across the interaction is conserved at zero with mass (E1) + ke (E2) +ke difference (E4+E3-E2-E1) balancing field energies (E3+E4 shown as negative).

				Results of logarithmic value 2 exchange				
					(difference ke)			
N1	E1 mass	N3	E3 field1		E3+E4-E1-E2		E3 field1	
N2	E2 ke	N4	E4 field2	E1 mass		E2 ke		E4 field2
	mev		mev	mev	mev	mev	mev	mev
13.432	13.797	15.432	101.947	13.8	83.8	5.1	-101.9	
12.432	5.076	10.432	0.687					-0.7
				Sum of energy from above table				
N1,N2,N3,N4 is defined as quad				E1+difference KE		102.6	E3+E4	-102.6
				Energy is conserved since 102.6=102.6				

This interaction has powerful implications. The interaction involving E1 can be read E1 is given exp(2) of energy to become E3 . Since the numbers (N) are exponents (E=e0*exp(N)), the number 2 can be associated with a divisor 1/exp(2)=0.135 that increases the kinetic energy of E1. In other words, energy 13.78 MeV becomes 101.947 MeV after the interaction since 13.79/0.135=101.947 MeV. The value 0.135 is identical to the concept of gamma in relativity. Gamma is the divisor that increases the kinetic energy of a moving mass involved in the Lorentz transformation. The definition is: ke=m/gamma-m. These may be special case Lagrangians and the energy interaction is similar to a physics qauge transition.

The table above can be read “a quark of mass 13.797 MeV with 83.761 MeV of kinetic energy orbits in strong field energy of 101.947 MeV”. “The quark mass also orbits in a second field energy 0.687 MeV (a gravitational field energy component) with 5.076 MeV of kinetic energy”.

Quantum mechanics (QM) deals with small circles identical to the results above. The circle is a model and the radius is probabilistic. The circle (two dimensions) actually represents the surface of a sphere. The statement is “the position of the particle is probabilistic with the maximum probability at radius R”. The basic concept is that energy is related to a circle by the equation E=H*v. Frequency v is the number of times per second energy travels around a quantum circle at the speed of light and H is Heisenberg’s constant 4.136e-21 MeV-sec. The speed of light is 3e8 meters/second. Frequency can be a large number but cycle time t will be 1/frequency=1/v. How much time does it take to move around a circle (R) at velocity C? The time t= 2*pi*R/C equals time t= H/E. The important constant H (Heisenberg’s constant) relates time and energy. Knowing the constant relationship, radius is defined. If we are to understand quantum circles, we need to know their radii. Below, we will find a radius from accepted facts about an electron circling a proton (the element hydrogen) and then generalize the equation for other quantum circles.

t=H/E and t=2*pi*R/V are equal for a little quantum circle.

2*pi*R/C=1/frequency

2*pi*R/C=H/E

where H=Heisenberg's Constant 4.136e-21 mev-sec.

Electromagnetic field		**2.72E-05**	**MeV**
t=H/E	**t=4.14e-21/27.2e-6**	**1.52E-16**	**seconds**
2*pi*R/V	**equal but V?**	**1.52E-16**	**seconds**

If we know V above, we can calculate R

Known	**1.36E-05**	**MeV**	**kinetic energy**
Known	**0.511**	**Mev**	**electron mass**
g	**0.999973**	**g=0.511/(0.511+13.6e-6)**	
V/C	**0.007296**	**V/C=(1-g^2)^0.5**	

R calculated from H/E=2piR/V

R=H/E*V/(2pi)

R=4.136E-21/27.2e-6*0.00729*3e8/(2*PI())=5.29e-11 meters

Where: H=Heisenberg's constant

M=mass of the particle. If the particle is moving fast relativistic mass is m/gamma

E=field energy that helps define the radius of the circle.

R=maximum probabilistic position of the particle.

R=HC/(2*pi)/(E*m/g)^0.5

R=1.973e-13/(E*m/g)^0.5 and sometimes=1.973e-13/E

where HC/(2*pi) =1.973e-13 MeV-m

The equation for radius R is central to four fundamental forces [13] with different inputs from the proton model below but concepts of Topic 6 are required for gravity [14]. Gravity defines the space that exists around us.

Topic 4 How N=90 Represents the Neutron

Fundamental N values from the information code were used to a model the neutron's known mass, 939.56 MeV. Three sets of information are associated with three quarks and the fourth set transitions to the electron. The values toward the left side of the box, labeled mass and kinetic energy are balanced by fields on the right hand side of the box. Fundamental N values (13.431, 12.431, 15.431 and 10.431) are shown to the left of the box. These values are the source of the energies (E=e0*exp(N)) inside the box. Each "quad" exchanges N=2 and creates a quark orbit with kinetic energy and associated field energies. The kinetic energy column has several components. Kinetic energy for each quad =E3+E4-E1-E2-E2. The extra E2's are added back to form the column weak kinetic energy (10.15 MeV) and gravitational expansion energy (20.3

MeV). The bottom quad is for the electron after it has decayed from the neutron. These energies play crucial roles in cosmology.

Unified.xls cell g191										
					Mass, Kinetic Energy and Fields for Neutron					
										Gravitational
N for Neutron Energy Interactions							Residual ke	Expansion		Field
mass	Energy-mev	S field	Energy	Mass	Difference KE			KE	Strong field	
ke		G field	mev	mev	mev		mev	mev	MeV	MeV
15.43	101.95	17.43	753.29	101.95	641.88				-753.29	
12.43	5.08	10.43	0.69							-0.69
13.43	13.80	15.43	101.95	13.80	78.69				-101.95	
12.43	5.08	10.43	0.69							-0.69
13.43	13.80	15.43	101.95	13.80	78.69				-101.95	
12.43	5.08	10.43	0.69							-0.69
							10.15	10.15		
-10.33	-0.62	-10.33	-0.62	0.00	0.00			10.15		-0.67
10.41	0.67	10.41	0.67				0.048			
10.33	0.62	10.33	0.62	0.62	0.00					
0.00	0.00	0.00	0.00							
				130.16	799.25	939.57	**0.048**	20.30	-957.18	-2.73
90.00	sum	90.00				NEUTRON MASS		Total m+k	Total fields	
								Total posi	Total negative	
								959.916	-959.92	
								MeV	MeV	

Add the quarks together:

	Mass and Kinetic Energy			**Field energy**	
	Mass	**ke**		**Strong**	**Gravitational**
				field ener	**Energy**
	MeV	**MeV**		**MeV**	**MeV**
Quark S	**101.947**	**641.880**		**-753.291**	**-0.687**
Quark U	**13.797**	**78.685**		**-101.947**	**-0.687**
Quark D	**13.797**	**78.685**		**-101.947**	**-0.687**
	129.541	**799.251**		**-957.185**	**-2.061**

Simplify the Neutron Table:

Simple neutron model

r20 uc2

	Mass and Kinetic Energy			Field energy	
	Mass	**KE**	**Strong**	**Strong**	**Gravitational**
	Quarks		**Residual**	**field ener**	**Energy**
	MeV	**MeV**	**Field**	**MeV**	**MeV**
Strong	**130.16**	**799.25**		**-957.18**	-2.73
Strong Residual KE		**10.15**			
Neutron		**939.57**	**-20.35**		-959.92
neutrinos		0.05			
Gravitational ke		**10.15**			
Gravitational pe		**10.15**			
Total		959.92			

The neutron decays to a proton by emitting neutrino energy 0.671 MeV and separating the electron quad of value 0.622 MeV. The proton has 957.59 MeV minus 1.293 (0.671+0.622) MeV and has energy 938.272 MeV. The three quark masses total 129.5 MeV and together have 799.2 MeV plus 10.15 MeV of kinetic energy minus one neutrino of energy 0.671 MeV. These components give the proton mass (938.27 MeV). The mass of the proton, neutron and electron match published NIST masses within experimental error.

	129.541	**799.251**	**-0.671**	
		10.151		
Proton		**938.272**	**Mev**	

Proton mass model

	Mass and Kinetic Energy			Field energy	
	Mass	KE	Strong Residual	Strong field energy	Gravitational Energy
	MeV	MeV		MeV	MeV
Strong	130.16	799.25		-957.18	-2.73
Strong Residual		10.15			
Neutron		939.57	(-20.3)		-959.92
neutrino		0.05			
below, the Neutron decays to a proton, electron and neutrino					
Proton		938.27		2.72E-05	
ejected neutrino		0.67		E/M charge splits	
Electron	0.51	0.11		-2.72E-05	
Gravitational ke		10.15	10.11		
Gravitational pe		10.15	10.19		
Total		959.92			

Note: Some may be familiar with quarks that have lower energies. It appears that the quarks were formed at higher energy but have transitioned to lower values while preserving mass plus kinetic energy.

Topic 5 Unification of 4 fundamental interactions

The proton is thought to be a primary manifestation of underlying laws and as such contains information (energy associated with N values) that determines many aspects of nature. The proton model above is the source of constants for unification of forces, the subject of reference 1.

	Mass (m) (mev)	Ke (mev)	gamma (g	R meters	Field (E (mev)
Gravity	938.272	10.110	0.9893	7.2238E-14	-2.732
Electromagn	0.511	1.36E-05	0.99997	5.2911E-11	-2.72E-05
Strong	129.541	798.580	0.1396	2.0936E-16	-957.18
Strong residu	928.121	10.151	0.9892	1.4297E-15	-20.303

This table above gives the mass, kinetic energy and fields for fundamental constants. Gamma is g=m/(m+Ke) and R=hC/(field energy*mass/g)^.5 (small h is Heisenberg's constant sometimes called hbar = H/(2*pi)). The important values for gravity are the mass of the proton with 10.15 MeV of kinetic energy imbedded in a field energy of 2.732 MeV. The residual strong force (related to the weak interaction) is determined by a mass of 928.792 MeV, a kinetic energy of 10.15 and field energy of 20.3 MeV. This field energy is the missing energy required to balance 959.92 MeV with balancing field energies totaling 959.92 MeV. (Overall the energy is zero by

being balanced since there are no negative energies). An orbit is formed by a "bundle of quarks" with kinetic energy 10.15 MeV orbiting in field energy 20.3 MeV.

Before considering gravitation more thoroughly, it is instructive to review other interactions supported by information extracted from the proton mass model. An updated table from [1] is reproduced below. The inputs above, intermediate results, forces predicted and literature data are listed by column for four forces.

Unification Table	cell ax74	Strong		Electromagn	Gravity
Higgs energy (mev)		Combined	Strong Residual		proton
***Field coupling to Higgs field Energy					
Potential energy of proton falling into gravitational field (mev)					20.115
Field Energy E (mev)		957.18	20.303	2.72173E-05	2.732
Mass Coupling to Higgs field energy					
Particle Mass (mev)		130.16	928.121	0.511	938.272
Mass M (kg)		2.32E-28	1.65E-27	9.11E-31	1.6726E-27
Kinetic Energy (mev)		798.58	10.151	1.361E-05	10.111
Rydberg energy from PDG				1.361E-05	
Gamma (g)=m/(m+ke)		0.1401	0.9892	0.99997	0.9893
Velocity Ratio	v/C=(1-(g)^2)^.5	0.9901	0.1467	7.298E-03	0.1456
R (meters) =((HC/(2pi)/(E*M/g)^0.5)		2.0929E-16	1.4297E-15	5.291E-11	7.2238E-14
Electromagnetic R minus proton R=5.291627e-11-1.4297e-15				5.291E-11	
Force Newtons	F=E/R*1.6022e-13	732765.9	2275.2	8.242E-08	3.6556E-38
				7.250E-09	7.2238E-14
Inertial F Newtons	F=M/g*V^2/R	710992.321	2262.86246	8.241E-08	3.6556E-38
Force=HC/(2pi)/R^2=3.16e-26/Range^2 (n		721797.0	15466.9	1.129E-05	
HC/(2pi) 3.16E-26	(4.13e-21*3e8*6.24e12/(2*pi())				
F=(5.907e-39)*hC/R^2 (nt)					3.5786E-38
F=6.67428*m^2/R^2					3.5782E-38
Coupling constant derived from this work		1.0152	0.147099	137.03047	1/exp(90)
Derived c^2 (E*R) mev m		2.00E-13	2.90E-14	1.44E-15	1.19E-51
Derived c^2 joule m		3.21E-26	4.65E-27	2.31E-28	1.91E-64
Derived exchange boson (mev)		942.856	138.02	0.0037	2.732E+00
*published c^2 mev m			1.56E-14	1.44E-15	1.17E-51
*published c^2 joule m			2.5E-27	2.31E-28	1.87E-64
*Range				5.29E-11	8.82E+25
*http://www.lbl.gov/abc/wallchart/chapters/04/1.html				5.29177E-11	
Published coupling constant (PDG)		Rydberg data from PDG		137.03599	

The field energies for three strong (color) interactions and their associated particles are from the proton mass table. They are referenced to the Higgs energy since it is considered by many to be the source of field energies and particle masses. A force coupling constant is calculated to be 1.00 and derived c^2 (E*R) values are presented in MeV-m and joule-m. The lower hierarchy electromagnetic coupling constant is well known and the author's calculations substantially agree.

Strong Force

The strong energy comes from the proton mass table. Together with the R equation, they define quark orbits inside the atoms. The resulting R is on the order of 2e-16 meters. There are actually three variations of the strong force because there are two types of quarks involved and three different kinetic energies. It appears to the author that they combine but there is a concept called confinement that hides the true nature of the "color" forces.

Weak Force

The sum of all the field energies is more strongly negative than the total energy of the proton with its kinetic energy. Energy is missing in each proton but not missing from the total 959.86 MeV. The lack of balance in energy causes an inward force we know as the weak force. The same is true for the neutron. When nuclei bond together in nuclear reactions, the nucleons come close enough together to "see" the deficit. The "weak energy" is 20.31 MEV. With this energy and the neutron mass as the attracted mass used as "R Equation Inputs", a radius of 1.43e-15 meters is calculated. The accepted value for the radius of the atomic nucleus is (1.5e-15). It is evident from the weak deficit holds the nucleus of atoms together. This is of course not new to physics, but the origin of the 20.31 MEV is new and comes from the pattern. The atomic binding energy curve is considered to be a result of the strong residual interaction. Again, the proton mass model provides information. The key value is the kinetic energy 10.151 MeV associated with the proton. The strong residual force F=hC/R^2= 15467 NT requires the coupling constant 0.147 and the derived c^2= 2.9e-14 MeV m is similar to the published value 1.56e-14 MeV m. Also the radius of the proton appears to be credible. Section 5 topic 5.1.5 describes a simple model using the value 10.15 MeV as the basis for binding energy. In this model 10.15 MeV is the kinetic energy that changes as atoms fuse. (928.121 MeV+10.151 MeV =938.272 MeV).

Electromagnetic Force

The electromagnetic force is the result of N=3* 0.0986=0.296 being lost from the 10.43195 particle to become the electron (10.1361). (10.4319-.296=10.136). This gives the electron its negative charge. The electromagnetic energy of the field attracting the electron is E=e0*exp (0.296) =27.2 eV. This is the published value for the electromagnetic field.

Quantum Gravity

Gravity appears to be different that the other 3 interactions but a concept called cellular cosmology allows substitutions that lead to a calculation of the gravitational constant (G) from proton mass model information.

Cellular cosmology

Consider large mass M (for our purposes the mass of the universe although the term universe seems a little presumptive) broken into exp(180) small cells, each with the mass of a proton labelled lower case m below. The mass (m) of a proton is 1.67e-27 kg. Fill a large spherical volume with exp(180) small spheres we will call cells. Consider the surface area of many small

cells as a model of the surface of one large sphere with the same surface area. For laws of nature to be uniform throughout the universe there can be no preferred position. A surface offers this property but the equivalent surfaces of many small spheres also offer this property as long as we do not distinguish an edge. As such a surface model equivalent to the surface of many small cells is useful if the fundamentals of each cell are known.

In general relativity [15] the metric tensor (scholarly matrix equations from general relativity) is based on (ds^2=three distances^2 and (C*time)^2). Note that ds^2 is a surface area and it is this surface that we will break into exp(180) small spheres. Let small r represent the radius of each small cell and big R represent the radius of one large sphere containing exp(180) cells with the same surface area. Position a proton like mass on the surface of each cell. The total energy will be that of one protons/cell plus a small amount of kinetic energy. We will evaluate the gravitational constant G of a large sphere and compare it with G of small cells.

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

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

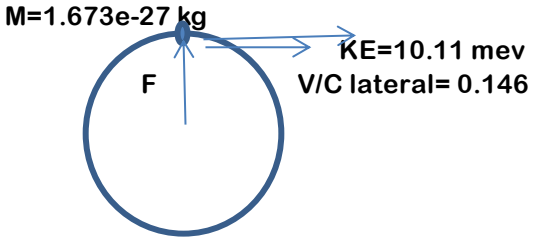
At any time during expansion		
Large space		**Cellular Space**
		With substitutions:
		R=r*exp(90) and M=m*exp(180)
R*V^2/M=	**G=G**	**r*exp(90)*V^2/(m*exp(180))**
R*V^2/M=	**G=G**	**(r*v^2/m)/exp(90)**

The extremely small value 1/exp(90) is the coupling constant for gravity. When measurements are made at the large scale as must done to measure G, the above derivation indicates that we should multiply cell scale values (r*v^2/m) by 1/exp(90) if we expect the same G. Geometric and mass relationships give the cell “cosmological properties”. I call this cellular cosmology.

It must be recognized that for equal gravitational constant the radius of curvature and mass are vastly different between the large and small scale. It was unfortunate that the great physicists of the 1900’s did not have the advantage of WMAP [6] expansion model, nor did they have the advantage of knowing the approximate number of protons in the universe. Perhaps they couldn’t compare cellular scale space to large space because they lacked information.

Gravitational constant fundamentals for cell size space

Fundamental gravitational radius r= 7.22e-14 meters. This equation and maintaining geodesics that give the gravitational constant G=6.674e-11 Newton m^2/kg^2 define the geometry of space time. Mass follows and defines the geodesic by establishing an inertial force F=mV^2/R. For gravity the inputs are from the neutron and proton model (mass of the neutron =939.565 MeV and kinetic energy =10.15 MeV). An "orbit" is established for the proton when the above kinetic energy of 10.11 MeV imparts a velocity of 0.146 C to the mass 938.27 MeV. The gravitational constant is calculated with the inertial force and the radius 7.22e-14 meters. The diagram below shows the fundamentals:



GRAVITY		
	proton	neutron
Neutron Mass (mev)	938.2720	939.565
Neutron Mass M (kg)	1.673E-27	1.675E-27
Field Energy E (mev)	2.732	2.732
Kinetic Energy ke (mev)	10.111	10.140
Gamma (g)=M/(M+ke)	0.9893	0.9893
Velocity Ratio v/C=(1-g^2)^0.5	0.1456	0.1457
R (meters) =(HC/(2pi)/(E*E)^0.5	7.224E-14	7.224E-14
Inertial Force (F)=(M/g*V^2/R)*1/EXP(90) NT	3.656E-38	3.666E-38
HC/(2pi)=1.97e-13 mev-m		
Calculation of gravitational constant G		
G=F*R^2/(M/g^2)=NT m^2/kg^2	6.6739E-11	6.6743E-11
Published by Partical Data Group (PDG)	6.67E-11	6.6743E-11

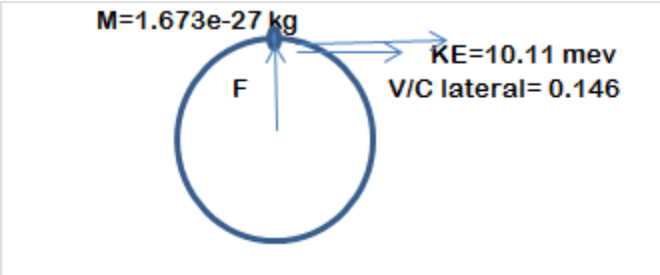
Published value of G (PDG)= 6.6743e-11 Nt m^2/kg^2.

Topic 6 Time

The cell radius is 7.22e-14 meters with a proton "orbiting" with 10.11 MeV in gravitational field energy 2.73 MeV. This quantum circle is special because it defines the gravitational space and time we exist in. The time for light to travel around this cell is the fundamental unit of time in nature.

Gamma (g)=938.27/(938.27+10.11)=0.9897

V/C=(1-0.9897^2)^.0.5=0.146.



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

The author believes that the cycle time 1.51e-21 seconds has repeated many times since the beginning. In other words, a quantum mechanical fundamental time is defined that cycles *and* counts forward (fundamental time*exp(N)).

Consider why the universe expands. Kinetic energy (ke) must be turned into gravitational potential energy (pe=Fr) over *time*. Time enters physics through cosmology! The derivation below indicates that the increasing radius of the universe and increasing time are related through expansion.

ke	pe
ke	F r
1/2M(v)^2	GMM/r
1/2M(r/t)^2	GMM/r
1/2Mr^3/t^2	GMM
1/(2GM)*r^3	t^2

(r/r0)^3 increases as (t/t0)^2

The above derivation contains only radius and time. If we believe that expansion occurred we must believe that time advances (perhaps in snapshots of fundamental time 1.5e-21 sec).

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

With the understanding that the large scale we observe is made of cells defined by gravity and the further understanding that fundamental time cycles, counts and moves everything forward we can simplify our understanding of nature. This cycle is established by the quantum mechanics of the gravitational field inside each proton (the proton model in Part 2 Topic 2) and each proton is identical and none occupy a preferred position. All protons advance in elapsed time simultaneously ready for the next count (a second kind of time can be slightly longer given by

the Schwarzschild equation). Elapsed time is the primary variable for the expansion equations and they determine the expanded radius.

Topic 7 Equation for Capture of Light

Light

Light is the energy absorbed/released when an electron "jumps" from a lower energy to a higher energy orbit. Quantum mechanics describes the allowable orbits. Absorbed light is characterized by a discrete wavelength. We will focus on the shift in energy associated with the electron jumping from the second orbital to the third orbital (quantum number 2 to quantum number 3). This particular delta energy (1.89e-6 MEV) is special because nature uses it as the "standard" energy for perception. It is converted to a wavelength in nanometers by WL=hC/delta E*1e9=4.14e-21*3e8/1.89e-6*1e9=656 nanometers.

N	Binding Ene	Quantum no	Quantum no	Delta Energy
		2	3	
0.29583687	1.3609E-05	3.40E-06	1.5121E-06	1.8901E-06

Quantum Shifts that Produce 656 Nanometer Light

Information theory probabilities

C. Shannon [30] used S= -ln P to represent information and thermodynamics incorporates similar concepts except it is the statistics of many particles. The author's N identifies particles such as an electron and components of the electric field and E= e0*exp(N). In this system, dimensionless energy ratio e0/E=P probability. Since wavelength is proportional to 1/E=1/hv (h is Heisenberg's constant and v is frequency), the probability and a dimensionless wavelength are equivalent.

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

The equation of interest for light absorption is a wave function for a system that has an internal freedom that varies back and forth between two frequency (f) values.

Psi=mu e0/h (1-exp i (f-F) t/ (f-F))

The solution to this quantum mechanical equation is found in The Feynman Lectures on Physics, Volume III page 9-13 [2]. The basic equation for a probability pf is divided by pF to form a ratio normalized to make the peak response equal to one at the peak frequency, F. This equation will be called the absorption equation.

pf/pF=(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*C/C *(2D) = 2DM. (C, the speed of light, cancels).

pf/pF= (SIN (2MD)) ^2/ ((2MD) ^2

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

As wavelength increases to the peak, the quantity (1/wl-1/WL) becomes zero for an instant and probability builds to one. On both sides of WL, the absorption equation gives the response of the eye to that color. The ratio pf/pF peaks at one through the sin^2 function.

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Appendix 1 Examples of Quantum Mechanical "Weirdness"

There is a lot of evidence that nature does not conform to our conventional concept of what is "real" at the quantum level. We must recognize that we are evolved beings with billions years of history that may be "enhancing" the information we receive to "gloss over" quantum mechanical relationships.

The Heisenberg Uncertainty Principal violates common sense

The principal states we cannot locate a particle and its momentum simultaneously. Large scale objects have a position and energy. Our mind tells us that large objects act "differently" than small scale objects.

Schrodinger's Cat violates common sense

Common sense large scale behavior doesn't apply to quantum possibilities. In quantum mechanics, a cat subjected to a quantum process is alive *and* dead until an observation is made.

EPR, dual slit and "back from the future" observations question distance and time

Observations regarding unexpected connections in quantum mechanically entangled systems are revealing a new understanding of our position in the universe. Experiments known by the initials EPR (Einstein, Podolsky and Rosen) show a statistical correlation between separated particle properties. If two particles are produced with opposite spins and move in different directions, it is observed that changes induced in one particle cause immediate changes in its partner. The classic "dual slit experiment" demonstrates that quantum photons can either produce a spot pattern or an interference pattern depending on whether an observer can "measure" which of two slits the photon travels through. More recently, a Discovery Magazine article by Zeeva Merali (Aug 26, 2010) indicates that an entangled particle responds to future changes in its partner (called "back from the future" observations by Jack Sarfatti of Cornell University). Some call this quantum weirdness.

All cosmology models are two dimensional

All cosmology expansion models are based on a model of a surface expanding because it has kinetic energy overcoming a resisting gravitational force. The two dimensional surface "represents" a three dimensional universe. The author's concept of quantum gravity depends on the understanding that there is a two dimensional surface of interest but in cellular cosmology there are exp(180) cells with the equivalent surface area , each containing a proton. At least we can conceive of these cells making up our three dimensional universe but it is still a model of the

surface area of many small spheres expanding. This is one of the few ways the universe can be arranged that has no preferred position. The exp(180) cells combine seamlessly to fill the space around us and each cell contains a proton. During mass accumulation the proton can combine into the objects we see. To understand this model it is important to review the basis of quantum mechanics.

Chemical bonding models violate concepts of velocity

We have all seen molecules diagrammed as wire-frames. For example, an atom like carbon is attracted to an oxygen atom. We are told that the electrons are shared between the atoms and we also told that these electrons each have velocity and orbit their respective atoms. How can they be in between the atoms and moving at the same time? The concepts are correct but they don't conform to the way large objects behave.

Appendix 2 Number of proton like masses in the universe

The left side of the table below summarizes WMAP cosmological parameters and the right side shows for comparison, the R1+R3 proposal [16].

WMAP [7]		WMAP	R1+R3	R1+R3
NOW		decoupling	decoupling	NOW
published				
4.02E+25	Inferred Radius		1.69E+21	4.02E+25
			R1	3.22E+25
2.26E-18	H0			
8809	Temperature at equality (K)			
2.73	Temperature now (K)			4.15
2973	Temperature at decoupling (K)	3115.8	3123	
0.0106	Spot angle (radians)	0.0106	0.0105	
0.254	baryon number density			0.902
5.77E+08	Photon number density			2.04E+09
4.400E-10	baryons/photon			4.43E-10
0.235	Dark matter fraction			0.835
6.57E-27	dark matter density in kg/m^3			7.63E-27
4.2377E-28	baryon matter density in kg/m^3			1.51E-27
0.719	Dark energy fraction			0
9.1351E-27	critical density	2.81E-01		9.14E-27
0.0464	Baryon fraction			0.165
2.72E+77	Overall volume (m^3)		2.04E+64	2.72E+77

We can now calculate the number of proton like masses in the universe. The critical density 9.14e-27 kg/m^3 is baryons plus dark matter. The current radius R1+R3 is 4.02e25 meters and this gives volume 2.72e77 meters^3. Multiplying critical density by volume gives the number of proton like masses in the universe compared to exp(180) below. We do not know if dark matter has a proton like mass but this is an interesting number to the author because exp(180) was the starting point for the unifying theory.

rhoC	Volume	rhoC*Volume	exp(180)	rhoC*V/exp(180)
9.135E-27	2.72E+77	1.49E+78	1.49E+78	1.000

The baryon/photon ratio above separates exp(180) into baryons and dark matter. Baryons are 0.165 and dark matter is 1-0.165=0.835. Baryon densities is 0.165*exp(180)*1.67e-27kg/2.72e77m^3=1.51e-27 kg/m^3.

Appendix 3 Review of Author's Work

A Top-Down Approach to Fundamental Interactions **[**viXra:1307.0082**]** details a model of the proton that provides information pertinent to many aspects of nature. Starting with data from WMAP that allows an estimate of the number of protons in the universe (exp(180)), where exp stands for natural number 2.712^(180) the author explored how this number is used by nature to anchor the energy of fundamental particles. This reference described models for the neutron and proton mass based on Shannon type information theory. In addition, it shows that information from the model unifies the electromagnetic, weak, strong and gravitational forces. ***The Language of Nature*** [viXra:1410.002829] explains the important role of probability.

On the Source of the Gravitational Constant at the Low Energy Scale **[**vixra:1307.0085, revised Feb 2014. Prespacetime Journal Vol. 5 No. 3 March 2014**]**

The proton model provides the energy value of a field that allows the gravitational constant to be calculated from fundamentals. This document summarizes arguments for a low energy gravitational scale and offered an understanding of the weak and long range character of gravitation. Physics has struggled with the reconciliation of general relativity with the other fundamental interactions (strong force, weak force and electromagnetic force). The reason for the difficulty is that in general relativity gravitation is the large scale geometry of space and time and the other forces originate at a quantum level. The author offered scaling relationships called cellular cosmology that appears to resolve this conflict. With this understanding the four interactions are very similar. ***Discovery of Quantum Gravity*** [viXra: 1508.0128] contains details.

On Expansion Energy, Dark Energy and Missing Mass **[**Prespacetime Journal Vol. 5 No. 5, May 2014, viXra:1307.0089**]**

The proton model extends quantum gravitational theory to the field of cosmology and provides the initial expansion kinetic energy. The fundamentals of space and time are described including the relationships that accurately model expansion, temperature, gravitational history and helium abundance. Information from the proton mass model is applied to observables from the field of astronomy. Results from an expansion model are compared to values reported in WMAP analysis and CMAGIC studies. Two models of expansion are compared and a proposal regarding dark matter is discussed.

Dark Energy **(**viXra: 1511.0185**)** proposes that dark energy is the energy produced by stars. Information is presented that revises the WMAP conclusion that only 0.046 of the universe is normal protons. It now appears that the baryon (proton) fraction is 0.165 and the cold dark matter fraction is 0.835. Justification for the higher baryon fraction considers measured values of primordial deuterium.

The Effect of He4 Fusion on Primordial Deuterium **[**viXra:1404.0465**]** reviews literature regarding primordial nucleosynthesis. Measured primordial deuterium is a sensitive test that

limits the baryon mass fraction. Surprisingly literature does not account for He4 fusion which releases approximately 1.6 MeV/proton. When this energy is added to temperature curves for early expansion the temperature increases and deuterium photo-disintegrates. However, as the temperature finally falls due to expansion deuterium recovers to the measured values. Calculations show that the photon/baryon number ratio does not restrict the baryon fraction from reaching 0.165.

A Simple Model of Atomic Binding Energy **[**viXra:1307.0102**]**

This document supports the value 10.15 MeV from the proton mass model. This kinetic energy changes and causes the atomic binding energy curve. The model presented is a probabilistic model that follows the same fundamentals of reference 1.

Semi-Fundamental Abundance of the Elements **[**viXra:1308.0009**]**

This document again supports the proton mass model and the model of atomic binding energy. It provides a probabilistic model of fusion using barrier energy from the binding energy curve model. It models the abundance of the elements produced during the life cycle of stars.

Baryon and Meson Masses Based on Natural Frequency Components **[**viXra:1307.0133**]**

The purpose of this document is to extend the approach used to develop the proton mass model to data gathered for the hundreds of mesons and baryons observed at high energy labs. Although the work is somewhat tentative most of the particles have "mirror" particles that allow nature to balance properties to zero (particles with properties can be created from zero if there is a "mirror" particle).

Color vision **[**viXra:1311.0124v1**]**

Since quantum mechanics it has been known that probabilities (information) are fundamental to the universe. Life is of course made out physical components but they fit together in an uncanny way. The author studied how the eye senses four light frequencies and interprets them as color vision. It is not unreasonable to think that the other senses are similar and that the brain is a great integrator and manipulator of information because it uses probabilities related to the proton model.