Nature and Information

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Part 1 Information

Abstract

Most of nature is not hard to understand using the right approach. Understanding involves correlating data in a different way. Information (N) is defined by the negative natural logarithm of probability (N= - ln P) but the key equation is a new relationship between energy and information. The equation is E=e0*exp(N) where e0 is an energy constant and exp(N) stands for the natural number 2.718 to the power N. N values are found from data gathered by high energy labs. This paper describes how nature originates from these values. Nature repeatedly uses an operation involving separation of some information from other information. But there are important properties that are maintained and thought to be initial conditions. One property is probability one and another is zero energy. Separation occurs between N for the mass and N for field energy in a neutron. This causes an individual neutron to very improbable. But probability one is maintained by the creation of a huge number of neutrons. A mass model of the neutron was developed using information values that represent its components. The model is based on information separation between components of the neutron.   Zero net energy is maintained. Mass with kinetic energy is positive balanced by negative field energy. It will be shown that the model contains energy values that unify nature's four fundamental interactions.

An information value associated with the electromagnetic field is of interest to biology. Combined with a quantum mechanical equation for light absorption multiples of this value can be used to model our human color vision system. This links internal observations with information and is a clue regarding signaling and response in our brain's neural networks. Specifically the author proposes that there may be molecular level storage and interaction involved in perception. There are observations in physics that require explanation beyond physical networks. The dual slit experiment, instantaneous action at a distance (EPR) and collapse of a wave-function can be explained if perception is information gain occurring at the quantum level in a zero based system (zero energy and probability one).

Four types of time are involved. Frequency is associated with fundamental particles and field energy. Time that repeats around a quantum orbit is defined by mass with kinetic energy attracted to field energy. A third kind of time repeats and moves forward. It is related to an information operation that underlies gravitation and cosmological space and time. Nature positions particles in space by giving them kinetic energy to expand. The freedom to move is due to time dilation associated with kinetic energy. Expansion is another separation process. As particles expand, groups of particles form clusters, galaxies, stars and planets under the influence of gravity, then form chemicals under the influence of electromagnetic fields. Overall, separation leads to components that fit together, similar to a picture puzzle and its individual pieces.

There is a fourth kind of time that is extremely interesting. From the perspective of light and field energy that moves at the speed of light, time stands still. In a timeless state light is information. We extract information when light is absorbed. Information underlies the laws of nature but nature is a dynamic information based system.

Part 2 of this document presents the relationship between information and energy in enough detail to support the part 1 concepts. Detailed studies are presented in the references.

Background

The author developed an approach that helps address questions at the interface of physics and neuro-science. I believe in data. Data is used to construct models that accurately detail physical observables. There is work to be done. Quantum mechanical properties do no scale well to large scale objects. 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 three dimensions and all have edges. Physicists have not been able to unify the four fundamental forces with a uniform set of rules because large scale gravity appears to have a different character than the other three fundamental interactions. Furthermore, there are physics experiments (EPR) that show instantaneous connections and observer dependent reality. Some say that time doesn't exist. What we need is a clear set of rules that apply everywhere and allow us to see the source of relationships. The probabilistic aspects of nature require an information theory based perspective.

Science provides some clues regarding our existence but well-developed disciplines rarely connect. There are many questions like, is there a uniform theme to nature that includes life? Or deeper yet, what causes information separation? One advantage associated with focusing on information is that it avoids the endless argument that things are made of other things, ad infinitum. As we find the information origin of observations we make progress in understanding them.

Energy and Information

The formal definition of information is attributed to Claude Shannon [12]. Information (N) = -ln P (Inversely, P=1/exp(N) where exp(N) means the natural number 2.718 to the power N). Probabilities are the chance of one event divided by all possibilities. He used natural logarithmic relationships because probabilities (P) multiply but information is additive. The negative sign tells us that information is high when probabilities are low.

Can energy (E) be related to information? Using the right probability, the answer is yes. Probability P=e0/E where e0 is an energy constant that forms an energy ratio. Quantum mechanics deals with the square root of P (a complex number called psi). This is tied to wave/particle duality but the relationships of interest are described by probability P=e0/E=1/exp(N) and E=e0*exp(N).

N for fundamental energy values

The relationship E=e0*exp(N) will be used extensively. N is a logarithmic number. The key to N values for energy was correlation of data gathered by high energy labs. Comparing N values for particles and knowing that the 0.511 Million Electron Volts (MeV) electron has a field equal to 2.72e-5 MeV, allowed the author to deduce that the electron N was 10.136 and its

electromagnetic field energy N was 0.296=3*0.0986=3*ln(3/e) where e is the natural number 2.718. The energy constant e0=2.02e-5 MeV is calculated below from Particle Data Group [5] data for the electron mass. The universal equation for energy is E=2.02e-5*exp(N) MeV.

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**

Data showing an N value for fundamental energy observations is listed in Part 2 Topic 1. The 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 neutron (and proton) but they are not observed individually. 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. Time for fundamental particles is simply reciprocal time (1/time=frequency).

Neutron components

The author found N values for neutron components based on the way three quark masses and their kinetic energies add to the neutron mass. It is detailed in Part 2 Topic 2 and reference 1. The related information components total N=90 for the neutron. They are listed in Table 1 below.

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

Table 2 is similar to Table 1 except it contains N values for field energies of the neutron. Since the neutron does not carry charge, the electromagnetic field is absent but appears as a separation once the neutron decays to a proton (quads 4 and 4'). The strong residual field energy is part of

a total energy balance. Sets of four N values labelled quads are involved in an information operation described in the section below entitled "Repeating time quantum orbits". Part 2 Topic 2 details the information and mass model of the neutron. The information operation uniformly applies to each quad and leads to mass simulations within seven significant digits of published masses. The model also shows how the neutron decays to a proton, electron and neutrinos.

Tables 1 and 2 above each sum to the value N=90 but are separated opposites. This separates zero energy into two types of energy. Mass plus kinetic energy is positive and field energy is negative. The total energy for each neutron (939.56 MeV) plus the external kinetic energy that drives expansion is 960.54 MeV but the fields are negative 960.54 MeV. This conserves the other initial condition; zero energy.

Energy (MeV) = 960.54-960.54=0.

The number of neutrons in nature

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 cosmologists to estimate the number of neutrons in the universe. The author believes the best number is exp(180)[Part 2 Topic 2][17]. There is a remarkable relationship between the natural logarithms 90 and the number of neutrons. 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 mass and kinetic energy N values is: P=1/exp(N)=1/exp(90). Likewise, it is highly improbable that the proton will contain field energies 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 unity. An improbable event will occur if you "roll the dice" many times. The separation processes characterized by N=180 is rebalanced to an initial condition represented by probability=1. The "big bang" duplicates the zero based neutron exp(180) times. The component energies are constant so the dice roll "neutron" every time.

Repeating time quantum orbits

Quantum mechanics uses orbits (circles) to describe mass moving in a field energy it is attracted to. The author found an information operation that produces quantum circles. The operation involves four N values (called a quad) from the neutron components above. For example 13.43+12.43 is conserved but *separated* into the values 15.43+10.43 in the right hand side of the quad. Total energy is also conserved but four energy values have specific meanings. After the exchange, quark E1 orbits strong field energy E3 with kinetic energy (E3+E4-E1-E2) in an orbit of radius R. The quark is also attracted to a component of the gravitational field energy E4. The field energies are traveling around quantum circles at the speed of light.

		mev			mev			Results of the above energy interaction				
								(difference ke)				
								E3+E4-E1-E2			E3 field1	
		E=e0*exp(N)			E=e0*exp(N)			E1 mass	ke	E2 ke		E4 field2
								mev	mev	mev	mev	mev
N1	13.43	13.80	E1 mass	N3	15.43	101.95	E3 field	13.80	83.76	5.08	-101.95	
N2	12.43	5.08	E2 ke	N4	10.43	0.69	E4 field					-0.69
								Sum of energy from above table				
N1,N3,N2,N4 are defined as a Quad								E1+difference ke	102.63	E3+E4	-102.63	
								Energy is conserved since 102.634=102.634				

This information process creates a quantum circle (orbit or range) of probabilistic radius R. Repeating time is defined by the time for field energy to travel around the circle at the speed of light.

The time for one cycle of the wave is 2*pi*R/C since the wave moves at C (R is the radius of a circle).				
2*pi*R/C=1/frequency				
2*pi*R/C=H/E		where H=Heisenberg's Constant 4.136e-21 mev-sec.		
Using the example above:				
Field energy E		101.947	mev	
2*pi*R/C	time	4.057E-23	seconds	
H/E	time	4.057E-23	seconds	mev-meters
R=H*C/(2*pi)/E		1.936E-15	meters	E in the equation to the left can also be:

Waves are energy quanta described by mathematics involving i the imaginary number. One complete quantum circle eliminates the imaginary number through multiplication. This models some aspects of quantum mechanics. The Copenhagen interpretation makes quantum mechanics an information science "…the only information we can have about a particle position is probabilistic".

All 5 sets (quads) of N values from the neutron component table undergo the operation described in the example above. The result is the neutron model. It changes to a proton, electron and neutrino in a subsequent information operation that models decay and conserves N=90. This results in the neutron/proton models described in Part 2 Topic 2.

The proton model contains information that unifies the four fundamental forces of nature. There are 4 fundamental field energies in physics. Strong fields hold quarks in small orbits inside neutrons, a residual strong field holds components inside atoms, an electro-magnetic field holds electrons in orbits around atoms and gravitation curves space and causes planets to orbit stars. How do we know the forces produced by the neutron model agree with physics measurements? Part 2 Topic 3 shows the calculations and comparisons.

Review
The first type of time identified was frequency (1/time) for fundamental energy values. We proposed that separation of N=90 from N=90 followed by duplication of neutrons preserved probability 1. We showed a neutron component table and the information operations that model and are thought to create the neutron/proton. Separation of N=15.43+10.43 from N=17.43+10.43 followed by energy conservation forms quantum circles. Zero energy was conserved with mass plus kinetic energy positive and field energy negative. This is a probability

one, zero energy based system. Time repeats for the mass with the field energy traveling at velocity C.   So far, the picture puzzle has stable structural pieces and time only repeats.

Cosmological time and space

Next we deal with what positions particles in space and allow time to elapse rather than simply repeat. This is the realm of gravitational space and cosmological time. We turn our attention to the information process that creates both. The separate/conserve processes that created quantum circles imbedded the neutron in gravitational field energy. It totals -2.73 MeV in the model below. The radius involved is space and time is around the circle's radius. The kinetic energy of value 10.15 MeV gives the neutron velocity that simulates the temperature of the big bang. A new degree of freedom now exists based on the conservation of kinetic energy (KE) and potential energy (PE). It is circled in the neutron model shown below with KE plus PE conserved at 20.3 MeV. (This total can increase if some of the strong residual kinetic energy is released by nuclear fusion but the entire model is the constant 960.54 MeV.)

| Mass and Kinetic Energy | | | | | | Field Energy |
| Mass | Difference KE | strong residual ke | Neutrino | Expansion | Strong field | Gravitational |
mev	mev	mev	mev	KE or PE	energy mev	Energy mev
101.95	641.88	10.15			-753.29	
						-0.69
13.80	78.69			10.15	-101.95	
						-0.69
13.80	78.69			10.15	-101.95	
						-0.69
0.00	0.00		0.67	t neut ke	0.0E+00	-0.67
			0.0	neut m		
0.00	0.62				-0.62	
						0.00
129.5409	799.873	939.5653446	0.67	20.30	-957.807	-2.73
		NEUTRON MASS		Total m+ke	Total fields	
				Total positive	Total negative	
				960.539	-960.539	0.00E+00

The gravitational constant is calculated below using energy values from the neutron mass model [8][13][14]. It agrees with the published constant, G=6.674e-11 newton meters^2/kg^2. The gravitational coupling constant 1/exp(90) appears in the fundamental calculation for the inertial force in a cell that has cosmological properties (Part 2 Topic 3 "Cellular Cosmology").

| 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) N			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

The coupling constant 1/exp(90) and Heisenberg's uncertainty principle has the effect of dramatically reducing the force between protons and makes gravity very long range compared to the other forces. Defining gravity, time and distance with cellular cosmology means that nature uses the general theory of relativity at the quantum level. The constant 1/exp(90) scales the quantum level to the large scale we observe around us. The cell radius is 7.22e-14 meters with a proton "orbiting" with 10.11 MeV in gravitational field energy 2.73 MeV.

R (meters) =(HC/(2pi)/(E*E)^0.5	E=2.732		7.224E-14

This quantum circle is special because it defines the gravitational space and cosmological time we exist in. The time for light to travel around this cell is a unit of time that repeats and counts forward.

Gamma (g)=938.27/(938.27+10.11)=0.9897 for the proton.

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

M=1.673e-27 kg

KE=10.11 mev

V/C lateral= 0.146

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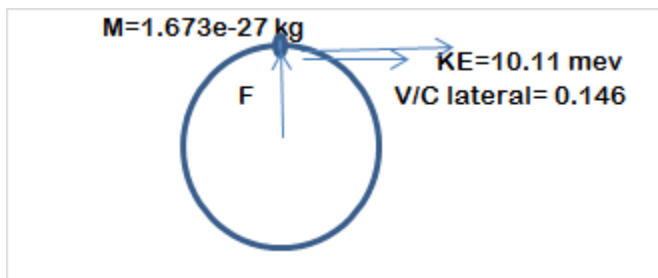
Identify the radius and time for the gravitational orbit described above		
Fundamental radius=1.93e-13/(2.732*2.732)^.5=7.224e-14 meters		
Fundamental time=7.224e-14*2*PI()/(3e8)=h/E=4.13e-21/2.732		
Fundamental time	1.514E-21 seconds	

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

Consider why the universe expands. Kinetic energy (ke) is converted to gravitational potential energy (pe=Force*radius) over *time*. The derivation below indicates that the increasing radius of the universe and increasing time are related through expansion. Expansion is simply each cell becoming larger as time progresses.

```
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
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The above derivation contains only radius and time. If we believe that expansion occurred we must believe that time advances.

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

Our large scale universe is made of cells (each containing a proton) that expand following the curve defined by r=r0*(t/t0)^(2/3). Each of exp(180) cells have already expanded from 7.2e-14 meters to about 0.5 meters. There is a second expansion component that becomes important about the time stars form. It may be related to fusion energy [16][17][20].

Relativity

It is known that a clock that is in relative motion runs slower than a reference clock. A twin that travels will be younger than his brother. This is called the twin paradox and has been proven with atomic clocks in satellites. Kinetic energy causes this difference. According to special relativity time runs slow for particles with kinetic energy (gamma=m/(m+ke) and v/C=(1-gamma^2)^.5). Kinetic energy slows time but gamma can only approach 0. In the last equation, only light can be timeless at gamma=0. The term relativity is appropriate because a particle in motion has no way of detecting its own kinetic energy.

But the twins are standing together at the end of the journey. Time is now passing at the same rate. There is no paradox here; what we are observing is nature dilating time to create a degree of freedom. Gamma=m/(m+ke)=t/t' is a ratio of reference time divided by dilated time. Often the reference time is also dilated but only the relative kinetic energy applies. Cosmological time has parts: one that is fixed and counts forward and other parts that move forward in time steps that are slightly longer than their relative reference. The main function of cosmological time is expansion of the universe and according to the proton model there is 10.15 MeV of kinetic energy and 10.15 of potential energy at the big bang. As time moves forward, kinetic energy decreases and potential energy approaches 20.3 MeV. A particle with velocity (V) moves (dR) because dR=V*dt. If particle collide, they can exchange kinetic energy and we tend to lose track

of its origin.   Some of the kinetic energy often exists as gas particle velocity. Thermodynamics is the statistics of these particles. But nature's zero based energy is conserved. Somewhere there is a loss of potential energy offsetting any kinetic energy increase.

Fundamentals of perception

Atoms are mostly structural but there are functional parts of nature that actually create and process information.   We start with perception and its information creating role for the brain, an electrochemical information machine. There is an excellent example of how quantum mechanics underlies a process leading to perception. 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 frequency (f) values.

 Psi=mu e/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 unity at the peak frequency, F.   This equation will be called the absorption equation. Perception is the information created when molecules in the eye absorb light *and collapse this wave function*.

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

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. This 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.
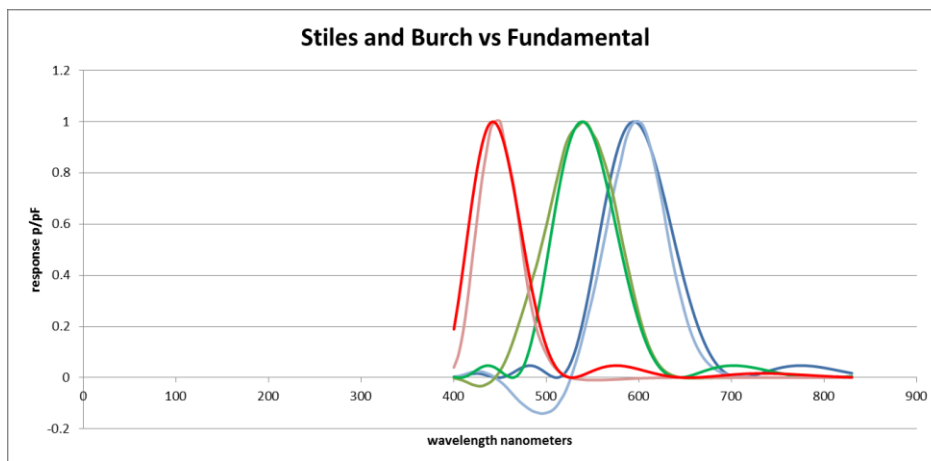

The fundamental calculations are the lighter colors and the dark colors are Stiles and Burch.

Perception and the brain

Molecules absorbing light in the retina (Feynman equation for absorption) initiate a neuronal action potential. The explanation for color vision being sensitivities to different wavelengths based on N=0.0986 is surprising and new. Rather than four full distinct pf/pF responses, we see white light (Part 2 Topic 4) and this indicates that our human color vision system is adding responses together. The other hues are comprised of combinations of these colors without full spectrums. Our brain is adept at creating internal images from these curves. It is well known that neurons send signals through various levels of processing. Once the signals reach the long ganglion neurons that connect to the visual cortex, the signals are electromagnetic spikes. Scientists are attempting to understand the spikes and the neural networks that produce color vision.

Chemicals and Perception

The author believes as many others do that the brain is primarily a neural network based processing machine. However, the model of color vision tells us that there is something occurring at the molecular level because it uses a quantum mechanics equation and information values belonging to electromagnetic field energy. The challenge is to understand what is taking place at the synaptic junction. The most common neuro-receptor AMPA is known to be involved in long term memory and LTP (long term potentiation). Glutamic acid is a neurotransmitter that opens ion channels and allows the action potential to progress to neuron postsynaptic connections. According to literature, neuroscientists believe that the amount of neuro-receptor at the junction strengthens the pathway. The molecular structure of AMPA (C atoms are at the junctions) is shown below.
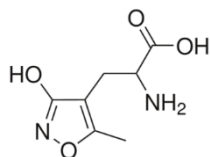
The structure of retinal is below. From what I have read about retinal, rhodopsin and its relationship with transducin a photon initiates an action potential. There does not appear to be much similarity between these molecules but both can form helical structures across neuron cell membranes with thousands of atoms.
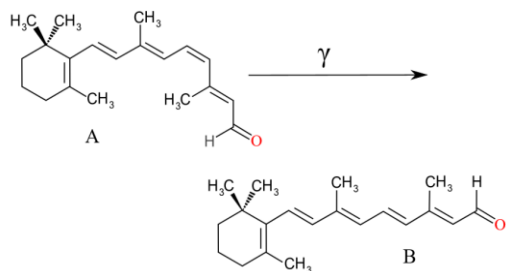
Neurons are inside the body and can't absorb light but an electromagnetic spike could be absorbed by AMPA similar to the way rhodopsin absorbs light. When a synaptic junction receives and responds to a signal it is involved in perception. According to this model, perception is a pf/pF response over a range of frequencies close to pF. A synaptic junction is analogous to a piano and the neuronal spikes are analogous to keys. In this analogy a pf/pF function similar to the graph above is stored in the neuro-receptor and an electromagnetic spike is absorbed. When a key is struck the pf/pF function plays the note. When many keys are struck simultaneously, we hear music. The overall response of millions of neural interactions in many areas of the brain leads to consciousness. A network as large as the brain can amplify the information to the large scale. Implications are discussed in the topics related to EPR and collapse of the wave-function.

Functional information systems

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. There are repetitive patterns throughout nature that suggest many levels of structure. For example, protons form atoms and atoms fit together into chemical structures.

But nature has functional structure, not just building blocks. Absorption of light or electromagnetic spikes increases information, something that cannot be over-emphasized. Thermodynamic entropy is a process that destroys information but information gain is unique in nature. A network has nodes and branches. There is a probability for each branch and it is known that neural networks have feedback loops that adjust the probabilities based on expectations (similar to fuzzy logic). If each node "plays a note" internal information is produced by adding the pf/pF responses (that are also fuzzy because they can respond with values less than 1 based on the match to pF). For vision the information creates an internal image based on position, color, etc. Integration of memory, senses and expectations create our reality. But there is also information gain associated with the path the action potential takes. In the example below the probability of each path is 0.71 but four nodes are reached with pF that code for red, green, scotopic and blue light. If the path taken is improbable, the information (N) value can be quite large. Many possible pathways are stored and improved but their function is to provide temporary information.

node	prob of signal	network information gain — normalized signal pf/Pf	information in raw signal n=-ln(p)	meaning	normalization factor 1/(prob of signal)
1	0.71	1	0.35	591	
2	0.71	1	0.35	535	
3	0.71	1	0.35	485	
4	0.71	1	0.35	439	
	0.25	1	1.39		4

Above, a signal pathway has occurred with 4 sequential nodes. A response occurs at each node and is additive. All are normalized to 1 or less since our perception is constant and responds to the meaning of the combined signal, not the probability. (For light, of course, many photons increase the intensity but our visual system adjusts to keep our internal response relativity constant.) The information we receive is a composite colored dot. In this example, we see white light. Much of the information entering the visual cortex is from the cerebral cortex. Many signals of this type could present an image to our visual cortex.

Thermodynamic entropy still applies, but an electrochemical structure with information about the things around it can exploit its environment. An organism that can recognize patterns has a higher probability of survival. It would survive and evolve if it could replicate itself. DNA is stored evolutionary information that codes for the body, brain and sense components of the nervous system. As the body, brain and its senses evolve there are many opportunities. Memory provides a vast array of potential perceptions that enhance survivability.

The uncanny way this works is due to the nature of information. It is the underlying language that allows pieces to fit together like a picture puzzle. There is a similarity between information, language and complex perception that we shape into our impression of reality. Language is based on symbols that we learn to form into concepts and eventually complex meanings. We see alphabetic symbols but automatically read the meaning they represent. Our neural networks use a language we understand and we automatically believe that the image we are viewing is reality

outside of us. There is a relationship but the image we are viewing is internal information. Perception always involves light or electromagnetic energy, both of which travel at C and are timeless. What about the timeless domain? Are there any observations that can help us understand it? Actually there are some clues from reliable physics observations that we cannot ignore. We will focus on three; the dual slit experiment, instantaneous action at a distance and collapse of the wave-function.

The dual slit experiment

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" whether a photon travels through one of two slits. If the perceived result is that light went through one slit, then a spot will appear. Perception is collapse of the wave function by light absorption at the molecular scale. Information is produced and amplified to large scale by the brain. However, there is a general quantum mechanical interference possibility of light going through both slits. If you perceive without measuring which slit it went through you will see the interference. Perception occurs when light and your molecular (quantum) level system create information. There is no new information until you perceive it.

Instantaneous action at a distance (EPR)

Observations regarding unexpected connections in quantum mechanically entangled systems are also revealing. 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 distant partner. 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).

I believe that nature starts with separation from zero. Spin would be another property conserved at zero. If components of a wave are separated they must preserve zero. Anything that is immediate involves the timeless nature of light. From the standpoint of light there is no separation because the separation would have to occur in time. Our perception of the event also occurs at the quantum scale, perhaps in the timeless domain. The concept is that a zero based universe (zero energy and probability 1) overrides our concept of distance. We perceive entangled properties balanced to zero because balancing has already occurred regardless of separation or time. "Back from the future" suggests that some relationships exist that can't be separated and we are fooled into believing they are.

Collapse of the wave-function

Thought experiments like Schrodinger's cat were intended to make fun of quantum states. The question is how does a quantum state collapse and get magnified to large scale? Quantum states are complex probabilities and continue to evolve until something collapses them to produce an outcome. You are the perceiver of the cat's fate that might or might not be killed by a quantum event. Wave function collapse occurs in your quantum level perceiving system as an interaction of light or electromagnetic spikes in your nervous system. Your brain magnifies the information produced to the large scale.

Conclusion

Information and information separations help understand nature. The natural logarithm 90 represents opposite forms of zero energy. Probability one is another initial condition. A neutron is very improbable and probability one requires many neutrons. A similar information operation involves separation of information values associated with components of the neutron. This defines quantum mechanical orbits that simply repeat in time. There are four types of time but time that moves forward allows evolutionary change. Molecules in our eyes interact with incoming light in quantum mechanical fashion. Molecules of this type become functional structures leading to life because they create information. There may be similar interactions at synapses leading to complex perception. Physics observations called EPR and the dual slit experiment can be explained if perception is a quantum level information operation and nature is zero based. Networks present us with an internal representation of reality and allow us to feel conscious. The answer to one of our deep questions is that we are products of information like everything else but we are unique in nature because we are creators of information. Our minds function somewhat like the process that separates information. But there is no clear answer to what separated information in the beginning.

There are remaining unknowns of course. Some believe that dark energy is causing expansion to increase. The neutron and proton models include expansion energy but the only other energy that can be released is nuclear energy. Stars start lighting up 200-500 million years after the big bang. There are potentially 2e20 stars producing energy that can add to expansion kinetic energy (pressure). Calculations show that the expansion force produced is slightly larger than the opposing gravitational attraction and can flatten the late stage expansion curve [20]. Another unknown is dark matter. It undoubtedly exists and the author believes that it may have a neutron like mass based on the modeling of other baryons [19]. It could be part of the exp(180) neutrons discussed in Part 2 Topic 5.

Part 1 Summary

Information based laws created what we eventually perceive as nature's physical laws. We are now able to deduce neutron component information and many of the operations involved. It appears that time is an important tool and we can resolve four types of time. Overall the neutron mass model that decays to a proton shows how information and information operations create them. Energy values from the neutron model unify nature's four fundamental interactions. The basis of cosmological time and the space we live in are quantum level gravitational relationships in the neutron mass model. Cosmological time repeats but also moves forward. Nature positions particles in the universe by giving them kinetic energy to expand and the freedom to move due to time dilation. Expansion is another separation process involving kinetic and potential energy.

Light is a shift in the electromagnetic field, moves at the velocity C and conducts information around the universe. Functional information systems depend on perception. Chemicals that use information to replicate and survive evolve into a body and brain. Intelligence can be defined as a process of seeing differences; another separation process.

We can 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. Life as we know it did not exist for billions of years after the big bang. The basis of both physical life and mental life appears to be nature's uncanny ability to evolve complexity from simplicity. We know that thermodynamic entropy is increasing overall but life uses information to exploit thermodynamic entropy locally. Some life molecules absorb light. On the surface this doesn't seem important but light actually collapses a wave function and produces information. Production of information is opposite the natural direction of thermodynamic entropy. Molecules that possess information about their environment have an advantage. The information gain can lead to cooperation with other molecules because they use the same information system. Information gain and exploitation across deep time apparently leads to the thriving and replicating chemical system that we call life. Eventually a brain develops and we have conscious impressions regarding physical reality. The information we get about the world around us is where light, sound, taste, touch, etc. comes from relative to our position. Our eyes gather light energy but our brain gathers information. This produces consciousness and it is reasonable to suspect that our evolved brain integrates information and enhances reality. We produce an internal reality that replicates what we believe is external reality. But we must be cautious about assuming it is a perfect replica. For example, there are parts of nature like dark matter that we do not detect.

Information operations create the universe and we are appear to be temporary creative participants. What about the timeless state of energy that moves at the speed of light? This might represent information storage but how would it be retrieved? EPR suggests that connections exist that are independent of space and time but always rebalanced in a zero energy probability one information system. Connections may exist that we do not fully perceive. A speculative interpretation of an information system based on zero energy and probability one might mean that we are not really separate. We could be part of a large network, a topic further discussed in Part 2 Topic 4.

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		Particle Data Group energy (Mev)	Proposed Energy E=eo*exp(l (Mev) e0=2.02e-!	IS Hughes Bergstrom Randall energy (Mev)
Identifier	N			
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 How N=90 Represents the Neutron

Neutron components

The neutron is comprised energy components, each of which is associated with an N value. The author developed tentative information operations that separate N=90 into N values that produce the neutron component tables 1 and 2. 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. (Bosons like the Higgs are thought to be the source of things). Arrows mean a separation has occurred. The component N values on the right side of the table are additions across each line in the table.

	Operation 1				Fundamental 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	

Component N values for the neutron

N values from above are the starting point for the two tables below:

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

Table 1 represents mass plus kinetic energy and Table 2 represents field energy. Set 2 will be used as an example for a quad that contains four values. The N values 13.43+12.43 are separated into 15.43+10.43. This operation conserves N but energy is also conserved. After these operations mass is imbedded in field energy quantum orbits. Each N has a specific place and a specific energy described below. N1 always gives a mass, N2 always represents a kinetic energy value, N3 always specifies strong field energy and N4 always specifies a second field energy (associated with gravity).

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 strong field energy.

E4 is identified as a gravitational field 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). This information separation followed by energy conservation has powerful implications. The operation involving E1 and E2 can be read E1 is given exp(2) of kinetic energy. 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. 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.

Information (N) values from the neutron component table were used to a model the neutron's known mass, 939.56 MeV. Three quads of N values 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. The kinetic energy operator N=12.431 gives mass kinetic energy. It's associated energy=2.025e-5*exp(12.431)=5.01 MeV. This 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). These energies play crucial roles in cosmology. The bottom quad is for the electron after it has decayed from the neutron.

Unified.xls cell cq5

Calculation of Neutron Mass

mass ke	Energy MeV	S field / G field	Energy MeV	Mass MeV	Difference MeV	strong residual MeV	Neutrino MeV	Expansion KE or PE	Strong field MeV	Gravitation Energy Me
15.432	101.95	17.432	753.29	101.95	641.88	10.15			-753.29	
12.432	5.08	10.432	0.69							-0.69
13.432	13.80	15.432	101.95	13.80	78.69			10.15	-101.95	
12.432	5.08	10.432	0.69							-0.69
13.432	13.80	15.432	101.95	13.80	78.69			10.15	-101.95	
12.432	5.08	10.432	0.69							-0.69
-10.333	0	-10.333	0	0	0			0.67 t neut ke	0	-0.67
10.408	0.67	10.408	0.67					0 neut m		
10.33	0.62	10.333	0.62	0	0.62				-0.62	
0	0	0	0							0.00
90.000 sum		90.000 sum		129.5409	799.873	**939.5653446**	0.67	20.30	-957.807	-2.73
						NEUTRON MASS		Total m+k	Total fields	
								Total posit	Total negative	
								960.539	-960.539	0

The quads at the bottom transition as the neutron decays. The model above becomes a proton below:

CALCULATION OF PROTON MASS

mass ke	Energy MeV	strong field / grav field	Energy MeV	Mass MeV	Difference MeV	Strong residual MeV	Neutrinos MeV	Expansion MeV	Strong & E field energ	Gravitation Energy
15.432	101.947	17.432	753.291	101.95	641.88				-753.29	
12.432	5.076	10.432	0.687							-0.69
13.432	13.797	15.432	101.947	13.80	78.69				-101.95	
12.432	5.076	10.432	0.687							-0.69
13.432	13.797	15.432	101.947	13.80	78.69				-101.95	
12.432	5.076	10.432	0.687					10.151 expansion		-0.69
		-0.296	-2.72E-05			10.15		10.151 expansion ke		
		equal and opposite charge						0 v neutrino m		
-10.333	0	-10.333	0	0	-0.67			0.67 v neutrino	0.00E+00	
10.408	0.67	10.408	0.67					0.67 t neutrino	-0.62	-0.67
the electron separates here				129.54	798.58	**938.272014**	PROTON MASS			
10.136	0.511	10.333	0.622	**0.511**	0.111			0.622 Electron + ke	0.000	
0.197	2.47E-05	0.296	2.72E-05	**ELECTRON**				7.40E-05 e neutrino ke		
90 sum		90 sum						1.342	20.303	-957.807	-2.732
									Total m+k	Total fields
									Total posit	Total negative
									960.539	-960.539	0

The neutron decays to a proton by emitting neutrino kinetic energy 0.671 MeV and separating the electron quad of value 0.622 MeV (0.671+0.622=1.293). The proton equals 939.57 MeV - 1.293 MeV= 938.272 MeV. The proton is comprised of a quark mass "bundle" of 129.54 MeV with 798.58 MeV of kinetic energy plus 10.15 MeV of strong residual kinetic energy minus one neutrino of energy 0.671 MeV. The mass of the proton, neutron and electron match published NIST and PDG data [5]. The "quark bundle" orbits with 10.15 MeV of residual strong kinetic energy in an "energy well" of 20.3 MeV. Changes in the value 10.15 are associated with the nuclear binding energy curve [18]. The "energy well" exists because the sum of all the field energies (960.54 MeV) is more strongly negative than the energy of the proton with its expansion kinetic energy. The entire proton has expansion kinetic energy in a 2.73 MeV gravitational field. This "orbit" is the basis of cosmological time and space. When established the gravitational orbit has 10.15 MeV of kinetic energy and 10.15 MeV of potential energy.

> 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 (19).

Topic 3 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 unification. The important values for gravity are the mass of the proton with 10.11 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 129.54+798.58=928.12 MeV, a kinetic energy of 10.15 MeV and field energy of 20.3 MeV. This field energy is the "strong residual energy well" produced by the total 960.54 MeV. (See the proton mass model). 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.

The unification table below is arranged in columns that calculate a radius associated with each force. Inputs to the radius calculation are above the radius and force calculation is the field energy E divided by R. Quantum mechanics (QM) deals with small circles. 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. 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. 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))=6.58e-22 MeV-sec.

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

$\qquad$ **where H=Heisenberg's Constant 4.136e-21 mev-sec.**

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

If we know V above, we can calculate R

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

R calculated from H/E=2piR/V

$\qquad$ **R=H/E*V/(2pi)**

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

Where: H=Heisenberg's constant
$\qquad$ M=mass of the particle. If the particle is moving fast relativistic mass is
$\qquad$ m/gamma
$\qquad$ E=field energy that helps define the radius of the circle.
$\qquad$ R=maximum probabilistic position of the particle.
$\qquad$ R=HC/(2*pi)/(E*m/g)^0.5
$\qquad$ R=1.973e-13/(E*m/g)^0.5 and sometimes=1.973e-13/E
$\qquad$ Where HC/(2*pi) =1.973e-13 MeV-m

The equation for radius R is central to four fundamental forces [13] with energy values from the proton model.

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.

Strong Residual Force (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 960.54 MeV. The lack of balance in energy causes the strong residual force (weak force). The same is true for the neutron. Radius 1.43e-15 meter is calculated from 928.121 MeV mass orbiting with 10.15 MeV in a 20.3 MeV energy field. The accepted value for the radius of the atomic nucleus is 1.5e-15 meter.   When nuclei bond together in nuclear reactions the nucleons lose part of their 10.15 MeV of kinetic energy. The atomic binding energy curve is considered to be a result of the strong residual interaction. Again, the proton mass model provides key values 20.2 MeV and kinetic energy 10.15 MeV. 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. Reference 18 describes a simple model using the value 10.15 MeV as the basis for binding energy. The model is a probability based model.

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 once the coupling constant (1/exp(90) is applied. In retrospect, all four interactions curve space similar to gravity. This is important because gravity was thought to be large scale curvature due to mass.

Cellular cosmology

Consider large mass M broken into exp(180) protons 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.

$$Area=4*pi*R^2$$
$$Area=4*pi*r^2*exp(180)$$
$$A/A=1=R^2/(r^2*exp(180))$$
$$R^2=r^2*exp(180)$$
$$r=R/exp(90) \quad \text{surface area substitution}$$
$$M=m*exp(180) \quad \text{mass substitution}$$

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.

Topic 4 Proposed Neural Language

There may be sequences of bonds that represent combined pf/pF functions. Another possibility is that combined pf/pF functions could be combinations of neural firing.

Using Feynman's equation we can associate a wavelength with multiples of 0.0986 that will drive pf/pF to unity. Only the colored columns below currently have known meanings but something like these could be stored by neuro-receptors. It is conceivable that a pf/pF function is "stored" in the AMPA bonds similar to the way rhodopsin absorbs light in the retina.

Pf/Pf0 (e (SIN(2D0*(1/wl-1/wl0)))^2/(2D0*(1/wl-1/wl0))^2			1	1	1	1	1	1	1	1	1	1	1
2D0*(1/wl-1/wl0)	intermediate result		0.0879	0.0796	0.0721	0.0653	0.0592	0.0536	0.0485	0.0440	0.0398	0.0361	0.0327
(1/wl-1/wlo)	intermediate result		20643	16941	13904	11412	9366	7688	6310	5180	4252	3490	2865
D0 (meters)			2.129E-06	2.34939E-06	2.59284E-06	2.86153E-06	3.15805E-06	3.485E-06	3.846E-06	4.245E-06	4.68E-06	5.2E-06	6E-06
Calculated peak wavelength (nanometers)			220.60	243.45	268.68	296.53	327.25	361.16	398.59	439.89	485.48	535.78	591.30
Probability (P=1/exp(m*0.0986))			0.338	0.373	0.412	0.454	0.501	0.553	0.611	0.674	0.744	0.821	0.906
	multiplier*0.0986		1.0846	0.986	0.8874	0.7888	0.6902	0.5916	0.493	0.3944	0.2958	0.1972	0.0986
	multiplier		11	10	9	8	7	6	5	4	3	2	1
	width in nanometer		20.71	22.86	25.23	27.84	30.73	33.91	37.43	41.30	45.58	50.31	55.52

In the above table, the probability (P=1/exp(multiplier*0.0986)) and peak wavelength is a function of a multiplier m. Each of the columns above represent a function similar the graph above showing the pf/pF response. As wavelength increases to the peak, the quantity (1/wl-1/WL) becomes zero for an instant and pf/pF builds to one. The responses can be added to other responses similar to the way white light is the addition of pf/pF responses in three colors and one photonic pf/pF.

Each neuron could represent a particular multiple of 0.0986 from the table above. For example m= 2, 4, 1, 3 firing together might be:

		network information gain				
		normalized	information	meaning		
		signal	in raw signal		normalization factor	
node	prob of signal	pf/Pf	n=-ln(p)		1/(prob of signal)	
1	0.707106781	1	0.34657359	591		
2	0.707106781	1	0.34657359	535		
3	0.707106781	1	0.34657359	485		
4	0.707106781	1	0.34657359	439		
	0.25	1	1.386294361		4	

The normalized sum of the pf/pF functions divided by four for three colors and the photopic response is white light with the following spectrum.

Integrated Vision
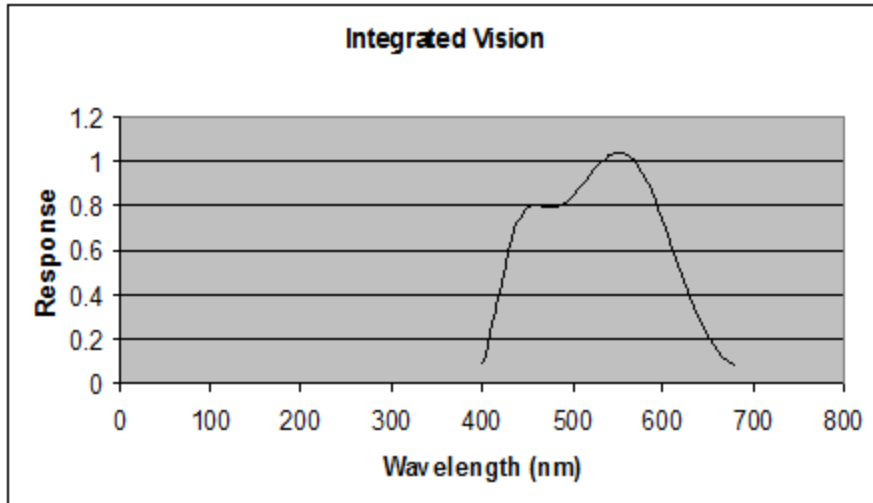
Proposed network for nature

This is highly speculative but there must be a process in nature that separates information. The diagram below suggests that it could be a network like the one suggested on page 12.

		normalized signal	information in raw signal		normalization factor
	prob of signal	pf/Pf	n=-ln(p)		1/(prob of signal)
	1.98605E-07	1	17.432		
	3.98909E-06	1	10.432		
	1.46751E-06	1	15.432		
	3.98909E-06	1	10.432		
	1.46751E-06	1	15.432		
	3.98909E-06	1	10.432		
	3.01803E-05	1	10.408		
	8.19401E-40		90.000		1.2204E+39
	8.19401E-40		90.000		
	6.71418E-79	1	180		1.48938E+78

Each node represents the components of a neutron. The overall signal is normalized to 1 with multiplication by 1/p. The separations are the major ones we see in nature.

Topic 5 Number of proton like masses in the universe

Reference 16 shows results of a cosmological model that uses cellular cosmology to study the expansion. The model is called the R1+R3 model. Here is a table excerpted from reference 16 that compares WMAP cosmological parameters.

WMAP [7] NOW published					WMAP decoupling	R1+R3 decoupling	R1+R3 NOW
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 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.

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18. Barbee, Gene H., *A Simple Model of Atomic Binding Energy*, vixra:1307.0102, revised Feb 2014. Reference spreadsheet atom.xls.
19. Barbee, Gene H., *Baryon and Meson Masses Based on Natural Frequency Components*, vixra:1307.0133.
20. Barbee, Gene H., *Dark Energy*, viXra: 1511.0185, December 2015.

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 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.