Reconciling General Relativity with Quantum Mechanics

John Peel*

Charles Sturt University

jpeel01@hotmail.com

December 13, 2017

Abstract

There has been a crisis in theory regarding Quantum Mechanics and General Relativity. Here I propose a solution by saying that there is a flexible framework to the structure of the universe and that this is essentially the structure of the Cartesian Axes. The employment of sets both as metrics and wave functions is analysed. The notion of information fields is proposed - these are the fundamental quanta of spacetime and mass/energy. For now this is strictly a mathematical model but may be explored experimentally. Certain aspects of sets and infromation is presented in, hopefully a new manner.

I. Introduction

At the current time there is a vast arsenal of literature regarding the authors aims here. It is extremely difficult with limited time and resources to survey the entire body of literature. hence the author,here tries to propose some, what are hopefully novel ideas and to those whom these are the areas of specialty I apologise for my naivety.

I would like this article to be simple and accessible to a wider audience without much of the jargon and pretence that can ruin a beginners enthusiasm. This article is dedicated to geometry and how it relates to the ultimate nature of reality.

It is the authors belief that many of the problems in reconciling Quantum Mechanics and General Relativity can be solved by giving the vacuum and hence any energy incident upon it a structure. This structure is the Cartesian Axes.

I examine the possibility that energy lies upon the "branches" of these axes. This is an argument from probability.

Please note that a search will produce results similar to this - "Information may be defined as any type of pattern that influences the formation or manifestation of other patterns". This is a much more apt definition than counting binary values. The name GUT fields is given to the axes described. The form information takes may be separate to the Cartesian Fields but they are a useful starting point.

I introduce the notion of a particular set that can be used in particle dynamics. These are analogous to Vector valeud Functions. Much of this article is devoted to these sets. I examine some ideas from String Theory and Loop Quantum gravity, albeit briefly. I show how frequency and geometry can be used as a computational device reminiscent of popular radio. The argument is put forth that reconciliation is due to this structure of quanta. I look at logic and it's place in reality.

It may be arrogant to say that the wave function has a geometry but the perceived nature of these fields and a space called the Information Superspace are good enough reasons to suggest a geometry.

The essence of this article is the role of geometry in particle physics, that is that the GUT fields are a manifestation of information in our

*A thank you or further information

physical universe. They are not meant to be physical in the usual sense as they are manifestations of a larger super-space. Any shape witha bound can be expressed as a curve on these fields.

In the current climate of String Theory and Loop Quantum Gravity there is a need to be consistent between the two. Information as a sub-set of study is still in its infancy and restricting it to Binary values is to throw much away. It is the authors belief that information is closely related to the structure of the universe (Multi-verses). This involves Geometry and its complement frequency.

In microscopic space and Minkowski space the radii that follow can be simply the straight line distance. In curved space they are the sum of the curved elements of the Cartesian Fields. Further In any case the path $[r, \theta]$ can be qualified by knowing the configuration of the elements.

As well as making the paper simple I follow an abstract version of the Quantization Problem. This is when small scale information systems appear different to large scale systems such as ourselves.

$$X^\mu(\varphi, \sigma) = x_0^\mu + \frac{\sigma}{\pi}\left(x_\pi^\mu - x_0^\mu\right)$$

II. Results

Allowing the equations in General relativity to approach Planck length presents problems. Essentially the problem is defined by the metric $G_{\mu\nu} = R_{\mu\nu} - 1/2Rg_{\mu\nu} = (8\pi G)/c^4 T_{\mu\nu}$ and for the vacuum we have $T_{\mu\nu} = 0$ The issue is basically reconciling Quantum Mechanics with

The notion of quantum gravity and that is that space needs to be continuous.

The main concept here is the postulate that information (that which describes) can be equivalent to it's structure (that which exists). This is best done by the cartesian Axes. This is the six arms of the axes with an all permeating volume of time. To begin consider octahedrons. They are 8 sided figures that can completely fill space. A example is given here When placed with other octahedrons we have. (Show patchwork) Each octahedron can be constituted by the cartesian axes. (Show axes) Now if we assume the Vacuum has a structure, then perhaps, energy, at such small scales, has a structure. Of course it is only possible to find a probability regarding the appearance of this energy but, say, we work with this probability. To demonstrate that energy is grouped along these axes, we consider a probability function of finding a wave function in a certain volume. Let $P(\phi) = 1$ when a particle is to be found within the volume. Let the area = A. We can break this area into two vectors dx and dy such that $dxdy/A$Thus this can be interpreted as two vectors describing the wave as dw and dz the probability is maximum when $dw = dx$ and $dz = dy$. Thus it appears that the information lies along the axes.

(Insert further work here) The axes (called branches) are distorted by the presence of mass/energy incident upon them. That is they contract and towards the centres and change geometry. This is quantified by $E = 1/x$ with appropriate constants. The difficult notion here is that the Axes are purely information - a mathematical construct. When energy is incident upon them they contract, curving spacetime. Fields, such as charge, are effects that affect the geometry of the axes in distinct ways to particulate mass. Obviously the GUT fields transmit information through transferring geometries and frequencies between neighbouring fields.

Forces can be described by the geometry and frequency of particles. Certain geometries attract, other s repel. Gravity is the tendency for mass/energy to travel toward contracted fields. The macroscopic time is given by $t = dV/m$ (Perhaps another relationship with appropriate constants

Thus as mass increases, time axes contract and thus time slows down. Here the branches may not be simply parameters of space and time but rather the 'enablers of the laws of the universe'. That is they are entities such as logic, energy, time, information etc but this is speculation.

To use some mathematics to represent

the unification of General Relativity with Quantum mechanics we consider the symbols $X = \{R_i, \theta_i, \phi_i, x_(\mu), A_(ij)\}$
These can be represented as, for example the set: R_i = Radii to a point on the shape.
θ_i = An angle corrsponding to the point.
ϕ_i = Second angle (ie three dimensions).
$x_(\mu)$ = the number of dimensions involved.
$A_(ijk)$ = The position in the corresponding grid. (ijk can be extended)
Here (David to fix)
$R \in \mathbb{R}$
$\theta \in \mathbb{R}$
$x_m u \in \mathbb{Z}$
$ijk \in \mathbb{Z}$

Here $x_(\mu$ Represents the dimensions of the above octahedrons. Thus to find the large scale metrics of space we have $\Sigma x^\mu = \Sigma x, \Sigma y, \Sigma z$ WHich gives the metric of space. Reconciling QM's with GR is as simple as using the same sets to describe a wave function. When given a wave we have $X|\psi >$ That is a wave $|\psi >$ has dimensions of (x, y, z) In the information super-spaceand the wavelength is given by the value of $x_1 - x_2$ where the values of $y_1 = y_2$. That is where the wave repeats itself.

The amplitude is given by $(\max y - \min y)/2$. Further the sets above can be used to find arbitrary geometries ,such that, θ_i and R_i are the radii and angles of a certain parameters of a geometry as below. The main idea here is to quantise or 'break the space ' into GUT fields. These are essentially the expression of inforamtion becoming physical in the pattern of a grid(s). Thus a^μ is the sum of all the elements of the grid and A^μ is the area of each grid element. The boundaries of the fields have "rays" which are essentially the strings in string theory and form (possibly massless) "guides" to reality. These can also form sheets etc.
At the origin of the fields are mathematical entities called Centres. These are responsible for communicating with the Information- super-space.

Thus for a shape in two dimensions we have $X = \{R_1, \theta_1, \phi_1, x_(\mu), A_i jk\}$Thse first order sets can be summed to find larger shapes,and can be used in studying things such as fractals. This is a recurring theme throughout this article so again it is stated; For every shape there is a set given by $X = \{R_i), \theta_i, x^\mu, A_i jk\}$ where; R = radius to the boundaries of a certain geometry.
θ = the corresponding angle for each radii.
x = the counter for each dimension
a = the number of elements of a grid making up the geometry.
$A_i jk$ = Position in the grid. These sets can be constructed to contain as many elements as necessary to describe a shape. The purpose of this paper is to show how these sets and the notion of the axes,call GUT fields can influence particle physics. Different shapes can metamorphise by changing the underlying values of the sets

$$X_i \to X_f$$

It appears to the author that the laws of the universe are simply the interactions of geometries.

For instance $\{\exists(x) : f(X_i) = G(s)\}$ where $G(s)$ is a certain shape. That is wherever you have a displacement the sets can be used.

Also $\beta(t)G(s) = X_f$ Where $\beta(t)$ is a 'choice' function which selects certain values of the $G(s)$ and X_f sets. $\beta(t)$ may be a type of time evolution operator.

The sets (if you like they could be called Peel sets) can be used in standard quantum mechanics as a position operator. $< X|\psi >= \psi(x)$ Or can perhaps be used in their own right. For the time evolution of the sets we have

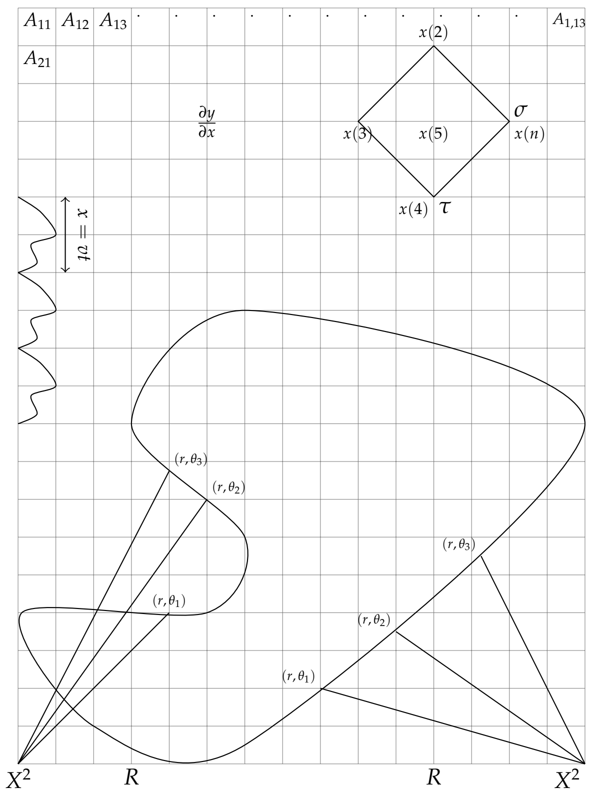
$X(t + (\epsilon)) - X(t) = iH|X >$ (Assuming X can be manipulated to create a wave function. Also

$$dX/dt = iHX$$

For symmetry operators we have $VU = UV$. Where U = time progression, V = symmetry operator. When employing the sets. $element X_1 = element X_2$ Or $x1 = -x2$ Where one element of a set if reflected about the axes to its negative value. To return a state $\beta(t)X_i = X_i$ where $\beta(t)$ is a choice function which selects elements from the sets.

A path can be represented by X. That is

for each radius there is a corresponding angle which denotes where the path will go in 2 dimensions. Here $X = r^\mu, \theta^m u$



For the GUT fields we have $X = \{x_1, x_2, \ldots, x_6\}$. The sets (and hence shapes) can self iterate.

$$X(t+1) = X(t)$$

. The final term in X is quite useful as the Fields naturally form a grid. We can also use the radii and angles to differentiate and integrate.

$$dy/dx \propto \theta$$

$$\tan(\theta) = dy/dx$$

$$\theta = \tan^{-1}(dy/dx)$$

To integrate Area $= 1/2 R_i r \sin(\theta)$ Where R is the horizontal coordinate.$R = r\cos(\theta)$ N.B the swapping of R and r

Where x(i) are points on a grid.
Also if we let frequency = f then $Xf = X/t = v$ That is $[x1, x2, x3....][f1, f2, f3...] =$ velocity set.

Thus revisiting we have: $\{\exists f(x) : f_i(X) = G(s)\}$ where X is the desired set and $G(s)$ is the required shape. Such that any function that employs a displacement can be used to produce a 'picture' of the phenomena.

Here $\sigma = sqrt(< X^2 > - < X >^2$ and $\bar{X} = (x_1 + x_2)/2$.

According to classical physics all waves need:

1. A disturbance
2. A medium containing elements that can be disturbed.
3. A mechanism by which the elements of a medium can influence each other.

The fields fit this criteria well. N.B In the branches of the fields energy causes them to contract as $E = 1/x^n$ but energy is also dependent on the amplitude $E = KA^2$.

$$A = \int \left(e^{\int \frac{\partial x^\mu}{\partial \tau} + \frac{\partial x^\mu}{\partial \sigma}} \right) d\tau \, d\sigma$$

The solution to the field equations for a branch (or ray) with Dirichlet boundary conditions is:

$$X^\mu(\tau,\sigma) = \left(X_0^\mu + \frac{\sigma}{\pi}(X^m u_\pi^\mu - X_0^\mu) \right)$$

Consider the general equation:

$$\frac{\partial^2 x}{\partial^2 t} = f(x,t)$$

Where x and t can be interchanged. The solution is a sinusoidal or complex exponential term. The sinusoidal elements mean that any phenomena such as force produces physical waves (strings) having a wav nature. The exponential solutions is the abstract solution set as in the centres. This is where the notion that energy is a form of information becomes important. The wave equation can be the unification of the logical with the physical.

Perhaps the large scale surfaces seen in reality can be expressed in terms of the mathematics for fields that is:

$$\alpha = [x^(mu)(\tau), \phi(\tau)]$$

Which defines a boundary 3 surface in Minkowski space and have boundary values:

$$\phi(x(\tau)) = y(\tau).$$

What is needed is an expression to turn quantised space (ie the fields) into a homogenous large scale reality. For example in String Theory there is a worldsheet given by:

$$s_{NG} = -T \int d\tau\, d\sigma \sqrt{(x^{\mu} \cdot x') \cdot (x^{\mu 2} \cdot) \cdot (x'^{2})}$$

Which is the Nambu - Goto action where T is tension.

In Quantum field theory this is essentially that there is a difference between local and Global particles. In Anti-information there should be no distinction from $X's$ of small scale to $X's$ of large scale. The patterns that emerge should be mathematically quantifiable these are patterns of both small and large scale reality.

The Relational Problem of observers in Quantum Mechanics is easily solved by postulating an information-superspace where possibilities occur and are cemented into reality whenever a string interacts with another string, that is when information reduces to reality and reality interacts with reality.

The spin of particles may lie in their momentum with relation to the fields, for example a "point" particle such as an electron may only revolve around a single Field.

At the boundaries of the Axes are entities called 'rays' these are essentially the strings in string theory. To equate angles with rays we have $\sum \hat{f}(n)e^{i}(\theta)$ It is believed by the author that there is a type of singularity at the centre of the GUT fields. The function can determine the angle corresponding to the desired path of the string. To find the information to be transferred from the centre to the string we have $s = r\theta$ or $g(r) = r(t)f_n(e^{i}(\theta)$ For angles within the centres. The difference between the strings and sheets in s tring theory may possibly be that strings have variable mass whereas the Rays are simply parameters which "guide" reality. Here also the sum of momentums in the fields equates to the total momentum. $\Sigma P_F = P_t otal$ This is where unfortunate things happen as the Fields may actually result in smaller quantities than is allowed by the quanta of Quantum Mechanics. There may also be an inherent momentum (torque) within the branches of the Fields.

And when a position on the circle a_i we have $(a_1 - a_i) < 0$ Now in general for attraction we can examine $x_1 - x_2 = 0$ That is when attracted $x_1 = x_2$. So for a sphere at the centre of the fields $a_f - a_i = 0$ For periodic functions displayed as a sinusoidal graph we can use the Peel sets when looking at radii r_i. That is for a period $r_i - cr_(i+1) = 0$ Where r_i is the radius from a reference point to the desired range.

Here $f(x+p) = f(x)$

And $f(x) = a_0 + \sum_{n=1}^{\infty}(a_n \cos(n\pi/Lx) + b_n \sin(n\pi/Lx))$

Where the coefficients can easily be found in any text including Fourier analysis.

For finding the "peaks" of a certain recurring shape (even approximately) we have: $y_(i-1) < y_i$ and $y_i > y_(i+1)$ That is for any amplitude y there is a point before it which is less and a point after it which is less. This heuristic may be useful in finding regularities when there may not seem to be any.

N.B $y_i = r_i \sin(\theta)_i$

The probability of finding a certain element dR along a ray (radius) R is $P(r) = dR/R$

When moving in an informational subspace toward a more likely value of a particles wave function we have an increased frequency of something occurring ie the number of events. Thus we can very loosely equate distance with frequency $d = f$. This can be inverted, depending on the situation as $d = 1/f$.

The probability density of a wave is proportional to its wave function squared with a differential of displacement. Thus we can again say $d = f$.

The informational subspace can be many dimensional. It is essentially a logical basis behind reality. It is where the wave function exists before it collapses. To see that it is multi dimensional up to a useful dimension n we have the following diagram. (figure 10). Here a set is a collection of information. This can be a collection of radii or angles etc. These can point toward shapes which then have their own set of information such that $f(i)$ is a function which describes many sets X. These however are just radii pointing to a position and again this position has its own set X.

To illustrate that higher dimension of information can exist, at least logically we take the matrix:

$$A = [a]$$

The single element, say a point, can then be equated with a new matrix:

$$A = [a]$$
$$a = \begin{bmatrix} b & b \\ b & b \end{bmatrix}$$
$$b = \begin{bmatrix} c & c & c \\ c & c & c \\ c & c & c \end{bmatrix}$$

A fundamental heuristic here is the velocity equation $v = \lambda f$ Here the wavelength λ can be represented by X thus for constant velocity $X_1 f_1 = X_2 f_2$ and for momentum $p = mXf$. Here m may be a separate value to the mass and a certain parameter.

While considering these sets we can see how geometry can be used to calculate unknown quantities (figure12). Here we have two separate shapes, say isomorphic and equal apart from size. Then it is a simple matter to say $X_1 = cX_2$ Where c is the value to be calculated. This can be extended to determine any numerical values from different shapes and may mirror the processes in the brain. It is also believed that the fields are aware up to some certain radius determined by the uncertainty principle. This may explain both consciousness and the inherent difficulty in examining small radii and momentums.

To see the role that frequency and geometry have in the awareness of these fields, it is proposed, that they are aware up to $\Delta x \Delta p < \hbar/2$. But how do they achieve this awareness? The same architecture can be used in the brain. This is simply geometries and frequencies being aware at certain scales.

To illustrate that frequencies play a central role in the general informational-configuration of the Fields we have. Here placing a series of the same shape on the axes, assuming the velocity of information carried to the intersections of these shapes, and using the equation $x = vt$, you only need the time (t) of input and output and you can determine the frequency $f = 1/t$. That is $v = xf$,

And you have a position dependent only on this frequency. This relationship between frequency and geometry is crucial in the kinematics of these fields. Of course teh velocity can be varied and this will produce a different set of positions. $v = x/t$

Using the sets X we have $X_i = v_i t_i$ and geometry is a matter of period. around a circle of radius r we have:

$$\theta = vt$$

Where v is the angular velocity. Also varying the displacement of shapes gives different frequencies.

$$v = Xf.$$

Frequency here can be used in a binary manner. Notice the feedback between shape and frequency. thus being aware of higher dimaensions may be crucia; to the human brain (see section on higher dimensions of paths).

For resonance when the driving frequency matches the natural frequency the formula are:

$$y'' + (\omega_o^2)y = F_0/m\cos(\omega_0 t)$$

where:

$$a_0 = F_0/k\rho \quad \text{and} \quad \rho = 1/(1 - (\omega/\omega_0)^2)$$

A solution is:

$$y_p(t) = F_0/(2m\omega_0)t\sin(\omega_o t)$$

Where ω is the frequency.

Also frequency $= \omega = sqrt(k/m)$ Where k is the restoring force and m = resistance to motion.

The total energy $E_(tot)$ in a region V is the sum of the energies of the various fields.

$$\sum E_(Fields) = E_(tot)$$

Again back to paths and higher dimensions. For a n sided polygon we have $\theta = (n-2)180$. Now for every dimension there are d-1 angles. Here a path taken by Xf is denoted by $X^{\mu}, R^{\mu}, \theta^{\mu}$ and the path taken has n angles so that an open sided polygon is created by any path. Thus perhaps any path is crossing through the higher dimensions of information.

A useful parameter in studying the connection between information and matter which is the aim of this article is that of 'Anti-information'. It is essentially that which is not part of the solution set. $Antiinfo = \Sigma Info - logic$

$\Sigma info = X_i nfinity$ ie $Xnotequaltof(x)$. Exploring this a little further we have a heuristic for existence. $Info = Logic + physicalreality$ Rearranging this we have $Physicalreality = Info - logic$ but this is the equation for anti-information. Therefore physical reality is illogical and not part of the solution set. This gives licence to invert many of the equations describing logic such as $distance = f = 1/f$. that is $X = t = 1/t$. Furthering this if $X = d$ then X can be written as $h\omega$.

Another interesting aside is the use of the sets in circular motion. Here $a = v^2/r$

$$a = (X^2(\omega)^2)/X$$

Therefore $d^2x/dt^2 = X(\omega)^2$ Also $v = -(\omega)Asin(\omega t + \phi)$ $X(\omega) = -(\omega)Asin(\omega t + \phi)$ $X = -Asin(\omega t + \phi)$ Also

$$a = X(\omega)^2 = -A\cos(\omega t + \phi)$$

This illustrates that the shapes (underlying sets) can be periodic in nature.

A useful equation regarding the position of information in the Fields is that of the Center of Mass.:

$$COM = \sum_{i=1}^{n} m_i(x_i - R) = 0$$

Thus when a wave function collapses the information is brought from these configurations to the centre. When a wave function collapses the information in the fields is transferred to the rays (strings) this is the process by which the logical becomes physical.To illustrate that the fields influence the rays: The numerical patterns that emerge from X such as geometries and frequencies may have, at least, analogies between small and large scales. Ie in the grid $A_i jk$ certain patterns regarding $\beta(t)$ will produce numerical sequences. Written language itself can be analysed (especially math) with the sets. For example the letter a. (Figure 13) Here it is the relationships between the symbols that is important. The symbols themselves are arbitrary.

Again on our trajectory to the relationship between logic and reality we have:

Modus Ponens

$$p \to q$$

$$p$$

$$\therefore q$$

This can be modified

$$X_i - X_f \to \epsilon$$

$$X_i - X_f$$

Therefore ϵ

Syllogism

$$t \to X$$

$$X \to X_f - X_i$$

Therefore $t- > X_f - X_i$

Where $t/c = d$

Also let the set of objects be denoted by A then

ΠA = All possible combinations. Here we have a choice function $\beta(t)$
$\beta(t)\Pi A = Law$ The actual parameters for the interactions of geometries needs to be found.
The ordering of the shapes and their sequences is shown as:
$XRX \to X'$.
$XPX \to X''$.
Where R and P are ordering functions. N.B that for any non-intersecting shape the order of X does not matter as each radii etc points distinctly to a point.
N.B that for attraction between two elements $x_1 - x_2 = 0$ such that $x_1 = x_2$ then we have:

$\Delta X = 0$.
Which can imply attraction. Or: $\Delta X = f(\epsilon)$.
However, identical shapes are given by:
$\Delta X = 0$
and for slightly different shapes:
$\Delta X = g(\epsilon)$ This equivalence of form may be a manifestation of an underlying principle.

for the expectation value of the square of the separation distance between two particles we have (fomula 3 david), To test the influence of the GUT fields experimentally we could examine two concentric circles of charge, as small as is experimentally possible. The interactions of these circles may give clues as to the structure of the building blocks of reality. I.e for a sphere of mass m the information acts as though it is concentrated at the centre. Experimenters would need a method of determining which areas of such a setup are stimulated.

A matrix can be set up of X to denote many different geometries. This is tied to the higher dimensions of information described above. The set X can contain as many elements as necessary (and feasible) to describe a shape. They must be properly defined such as to whether you are talking about radii, angle or other such information. If they are used to describe higher dimensions this must be stipulated. Often the cardinality will need to be equivalent between the sets. If we have $\Delta X = 0$ then the two shapes are equivalent.

To describe topology we need to specify a 'nihilum' set which describes the presence of holes in the shape. That is for a torus we have the radius of the entire figure with radius r minus a Δr term that describes the hole.

Furthering the work on logic we have 'Valid' and "Forbidden" regions which can best be described by binary operators.
E.g $X_t f = 1, 0, 0, 1 \ldots$ $X_t fandX = Validregion$
Where 1 = true. $X_t fandX = forbiddenregion$
Where 0 = false. Attraction and repulsion are matters of geometry and frequency. IF something is attracted to something else the radius between them will decrease thus $X_(i+1) < X_i$ and if repulsion occurs $X_(i+1) > X_i$. Again a numerical pattern should be discernible.

Also antiinformation occurs when the set X does not correspond to the required function $f(x)$ That is $Xunionf(a) = validregion$

For example $a = 1, 2, 3, 4, \ldots$ and $f(a) = a^2$
Then X must take the values $1, 4, 9, 16, \ldots$

The centres depend on mass/energy. The more energy incident upon then the larger they grow (possibly). That is in empty space, orthogonal, unmotivated radius $r = 0$. The centres follow mathematical limits:
Here $limf(x) = L$ exists if and only if for $\epsilon > 0$ there is $\sigma > 0$ such that:

$|x - x_0] < \sigma$ implies:

$$|f(x) - L| < \epsilon$$

The exclusion principle can be explained by whether or not the particle's information completely fills the required region. For example a photon may occupy only partially whereas an electron will fill the region completely as well as the constraints on geometry etc.

It is proposed that an information sub-space exists within the fields. This information is expressed physically by rays which lie on the boundaries of the fields. All interactions involve geometry. The information sub-space may be common to the Multi-verse thus exposing the centres by manipulating the orthogonality of the GUT fields may allow communication with other universes and because the fields constitute spacetime, separating them may allow wormholes in spacetime.

To speculate on the maximum size of the fields (They are most likely planck scale) we need to define mass as function of information contained bya radius $m = f(I)/r$ and also that frequency can be related to distance.

$$f = X$$

$$\Delta x \delta p >= h/2$$

$$p = f(I)/Xdx/dt$$

$$1/dt = f = X$$

Therefore $f(I)X\Delta X >= h/2$

Let $f(I) = 1$

$x = 7.25e - 18m$ But this is basically a pure guess with some dodgy assumptions. GUT

fields of this size are unlikely. Also equating momentum with position squares one value and gives this figure. The fields may or may not grow in size and may very well be geometries other than the Cartesian structure - the paramount concept is that there is an "antennae" to the Information - superspace. Concerning the grid like structure of space we can use X to determine curvature in a separate sense to the use of Tensors.
Consider artificial curvature lines denoting a finite length. From any point near these lines we can use the sine rule $C/\sin(\phi) = B/\sin(\theta) = A/\sin(\alpha)$
Knowing a posterio the straight line distances or using $d = vt$ for a light beam we can determine a metric. Further how do you tell if the fields are curved or not? A solution may be to find a grid within the universe and let it be two dimensional where i equals one side and j equals the other. If the space is well behaved then $\frac{\delta(i)}{\delta(j)} = c$
And also $\tan(\theta) = i/j = c$ for flat spaces and each element concerning i and j.
In the above $i = idx$ and $j = jdy$
$\tan(\theta)$ implies that $j = ci$ or $\theta = cr$
This could possibly be used to tell if a space is flat without calculating the curvature tensor and is useful in the GUT fields where a grid structure is formed.
Perhaps the GUT fields are arranged ina fractal manner with structures "nested" inside other fields of similar or varying geometries. For example remember mathematically there are and infinite number of divisions between the interval $0 and 1$
Perhaps coordinates are so fundamental that even our brains use them. Consider the space of reality where the coordinates are objects given by $X_i -> X_f$.
A peculiar point is that for the six degrees of freedom in the GUT fields there is, colloquialy, a front, back, left, right and up,down. Here we can write
$y_1/i = iy_2$ such that $y1 = -y2$
The Greeks used the term Eidos to describe the content of this article. It essentially means ??. The other classical concept is that of Plato's forms. The information superspace $\vec{I}$ represents 'forms'. The fact that the universe is expanding suggests there is a divergence of information. That is information is supplied to the physical universe $\vec{P}$ but not to $\vec{I}$
$\frac{\partial I(\mu)}{\partial x(\mu)}$
Where $\vec{I} + \vec{P} = k = \infty$
$\frac{\partial I(\mu)}{\partial x(\mu)} + \frac{\partial P(\mu)}{\partial x(\mu)} = M = \infty$
$\frac{\partial I(\mu)}{\partial x(\mu)} - \frac{\partial P(\mu)}{\partial x(\mu)} = L = \infty$
Therefore
$\frac{\partial P(\mu)}{\partial x(\mu)} = (M_L)/2 = constant$
This implies contrary to the above statement that information is constant i $\vec{P}$ however.

The information Super - Space is the background topological space to essentially everything that can exist - heaven and earth so to speak - the multiverse in particular. We denote the Information - Superspace as $\vec{I}$
The physical universe as $\vec{P}$ and awareness (to be defined) as $\vec{C}$ Then we have $\vec{I} -> \vec{P}$ and $\vec{P} -> \vec{I}$ Further:
P:

$$I : \sum_{i=1}^{\infty} f_i(x) -> P : \sum_{i=1}^{n} g_i(x)$$

Here $\vec{I} \supseteq \vec{P}$
$\vec{C} \in \vec{P}$
$\vec{C} < h/2$
Denoting time we have:
$(t_i(\vec{I}))_{i=1}^{\infty} \in \vec{I}$ Here and further it is assumed that there is a countable infinity such as a set and a "true" infinity which is an ultimate infinity.
$(t_i(\vec{P}))_{i=1}^{\infty} \in \vec{P}$ This is essentially quantising time as well as space.
$\vec{I} \supset \vec{P}$ and $P(\vec{t}) \in t(\gamma)$ Where γ is a time dilation factor
There is no preferred reference frame in $\vec{P}$ because any element of:
$(t_i(\vec{P})_{i=1}^{N}$ Are equally valid. Further there is time dilation because of the same assumption. The distribution of velocities for a local area of space is of interest here. $\vec{I}$ acts on both sets of velocities/ momentums such that there is no preferred reference frame. There is evidence

for $|vecI$ in the idea of a quantum machine. It is an abstract quantum description of a teo dimensional complex vector space. As is stated repeatedly $\vec{I}$ is not solely the phase space.

Motion, that is, velocity and acceleration are the vitae to communication with the information - superspace $\vec{I}$. Here the author makes two definitions.

Time is the rate of change of an information variable wrt geometry , and energy is the time rate of change of info. (We will see later that you can define time in terms of energy and information without referring back to time itself). $t^-1 = \frac{\partial g(I)}{\partial X}$ for geometry.

$E = \frac{\partial f(I)}{\partial t}$ for energy.

To define time we denote it as the change in information wrt a base. The base is geometry.

$t^-1 = \frac{\partial g(I)}{\partial X}$

Many people currently believe that time is a sequence of frames as in an old movie, which move one after the other. If we quantise in terms of the fields we have

$t^-1 = (\frac{\partial g(I)}{\partial X})_{i=1}^{N}$ But how do these frames run? The answer is to define energy as an operator, distinct from quantum mechanical operators: $E = ng$ Where energy "picks out" which frames are to be placed in order. Here $g = \beta(t)$ the selection matrix. To see this, if we let n simply be the number of occurences of events we have $f(I) = n^-1$ then:

$t = ((n^-1)/x)_{i=1}^{N}$

Thus events occuring more rapidly will take less time as $n- > \infty : 1/n- > 0$

Also if n increases (as happens when much info is incident on a field) then t is less ie time dilation. Thus this is how the frames run: If we have energy:

$E = \frac{\partial f(I)}{\partial t}$ = rate of change of info wrt time then this is $1/t = frequency\ E- = (\partial f(I))f$ This is where we eliminate time as its own definition by saying that f = number of occurences:

$E = h(I)n$ or better $E = ng$ where g picks out the desired element and n is the number of times this occurs.

For example $\psi = \vec{E}|1/2mv^2 >$

For n= 1, $g = \beta(t)$ such that $v = 1$ $m = 1$

$\psi = 1/2(1)(1)^2 = 1/2$

We now have a way of progressing the frames without referring to time itself. The energy is the ordering of the frames where they progress from 1 to n. That is time can be defined as the rate of change of information wrt geometry and that the progression is defined by energy. This implies that knowing the nature of the frames and their ordering sequence we can know the future - remember that :

$\beta(t)\Pi A = LAW$ since both time and laws depend on $\beta(t)$ this is a fundamental basis for the laws governing $\vec{P}$

Please note here symmetric functions such as even functions can be used, then:

$f(-X) = f(x)$ for even functions.

$f(-X) = -f(X)$ for odd functions. Then $\beta(t)f(-X) = \beta(t)f(X)$ Then

$t = (((n^-1)/f(-X))_{i=1}^{N}$ This may imply a "sister universe" where time runs in the opposite direction, anti-matter dominates and is generally symmetric to our own. $\vec{P}$ may be a bubble in the cause and effect chain of $\vec{I}$

Regarding the energy operator $E = ng$ we can define:

$\vec{E}\vec{I}- > \vec{E}\vec{P}- > \vec{C}$ Where $\vec{C}$ is the awareness of the fields of their input and output and their state , determined by the uncertainty principle inverted. That is: $\delta x \delta p < h/2$

Further $\vec{E}$ can operate on X.

A curve (shape) on the GUT fields could possibly be seen as one geometry hence a small number of bits. That is it may be restricted to the elements of X

An example of how to use the set X is the "locks and keys" in the neurons in the brain. here we have: $p = m\lambda f = mXf = mv$ Which is a conserved quantity (the momentum)

$m_1 X_1 f_1 = m_2 X_2 f_2$ $r \in X- > r1- > m_1 r_1 f_1 = m_2 r_2 f_2$ similarly for θ

$((\theta)_1) : m_1 \theta_1 f_1 = m_2 \theta_2 f_2$

Then the solution set "follows" the progress of the rotations etc involving X. The selection matrix $\beta(t)$ can be applied to see the "picture" of how the locks and keys fit with the monentum conserved. We can also order the sets $XRX = X'$ using $x = v/f$ a different set X can be used to study teh behaviour of the underlying GUT fields. We turn now

to some ramifications of the Uncertainty Principle. That is in the form of $\Delta x \delta p > h/2$ Now if we write this as $p(x_2 - x_1) > h/2$ then $(x_2 - x_1)/h/2 > 1/p$ let $x_1 = h/2$ then $x_2/h/2 - 1 > 1/p$ thus:
$p < |h/2/x - 1|$ Which can be construed as a probability involving the distance x from a point where information is to be studied. That is the closer you get to studying a field the less the probability of discovering information about that field. This may or may not reflect reality.
Also if we let $x = f$ a function f and $p = g$ then:
$fg > h/2$ or $f > h/2/g$ if we let $f = g$ then $f > f^(-1)$ That is the condition which you are trying to study prevents this from happening.
Further the wave fucntions in the double slit experiment involve:
$(\psi_1(x), \psi_2(x))$ which in terms of geometry can be written as:
$X_[\psi_1](r), X_[\psi_2](r)$ Then the probability P is:
$P_[1,2](r) = |X_[\psi_1 2](r)|^2 = |X_[\psi_1](r) + X_[\psi_2](r)|^2$ Here we have a value for $P_[12](r)$ however if we place a "counter" next to the slits the outcome of the experiment is changed $P_[12](r)$ does not equal $P'_[12](r)$ We have a value for $X_[\psi](r)$ its probability is $|X_[\psi](r)|^2$
Also the probability of finding a particle dR on a line R is $P = dR/R$ that is $dR/R = |X_[\psi]|^2$ Further $P_[12](r) = |X_[\psi_1 2(r)|^2 = |X_[\psi_1](r) + X_[\psi_2](r)|^2 = dR/R$
We have an expression for wave functions in general:
$X_[\psi] = A\sin(kr)$ This indicates the presence of r and θ terms. If we now square this expression we get the probability. Thus integrating we have:
$\int dR/R = \int \sin^2(kr)$ Because $P'_[12](r)$ does not equal $P_[12](r)$ the probabilities are different. Using $\Delta r \Delta p < h/2$ we can say thta the fields 'know' there is a centre.
Regarding information we have:
$t^-1 = \frac{\partial g(I)}{\partial x}$
Then quite importantly there are two expressions which are central to this hypothesis:
$f(I) = mx^2 f$ Where m is some parameter say mass (units mass), x is displacement(units length) and$f$ is frequency (units Time).
secondly we have:
$g(I) = mxf$.
This is where these two expressions become useful.
$\frac{\partial f(I)}{\partial t} = \frac{\partial}{\partial t}(mx^2)/t$
$= -mx^2 t^- 2$ = $-mv^2$ = Kinetic energy.
Then:
$\frac{\partial}{\partial t} g(I) = \frac{\partial}{\partial} mv$ = force.
Also:
$f(I) = xg(I)$
This is the action xp. There may be many other functions involving information, contrary to the strict binary values usually ascribed. The expressions relate also to the momentum of the branches.
$f(I) = mx^2 f = xp$ = angular momentum.
$g(I) = mxf = mv$ = linear momentum.
These can be interchanged between fields and strings:
$field- > string$ and $string- > field$
further we have for disturbing the equilibrium of the fields :
The derivative wrt to position of potential energy = force. If we equate the above kinetic energy as a potential:
$\frac{\partial}{\partial x} mv^2$ = force. Again we have a force and we may be able to manipulate teh fields, perhaps creating a wormhole.
It is the authors belief that at the sub - quantum level of the fields the notions of time, length and mass break down and all that is left is waves etc ie geometry.
Finally a small venture into string theory: the edges of the fields forms lines and surfaces which could be strings and worldsheets etc. These may be massless however as opposed to the notion of massive said entities.
The quadrants of the fields appear to be D_3 Branes to which strings and sheets are attached. The branches of the axes may be D_1 Branes. the centres may be D_0 Branes (again possibly massless) and follow teh attraction/repulsion of the fields.
Given six D_1 branes which are the branches of the axes and four dimensions of larger

space-time we have ten dimensions as in Super String Theory.
If we add the eight three dimensional D_3 quadrants they make twenty four dimensions plus a $D_)$ centre and time which makes 26 dimensions.
Regarding black holes the GUT fields constitute the interior of the black hole with a roughly Planck length mass of strings forming the horizon. the singularity is a centre with much mass etc.
If the black hole is rotating the interior fields rotate along with it , causing frame dragging around the black hole.

III. Discussion

Regarding the Higgs field perhaps the most profound influence on the fields is that of the Higgs boson which alters the usual dynamics of the GUT fields, altering the very information constituting the fields. In fact the writer envisages that the Higgs field may supply evidence for the physical existence of the GUT fields but cannot see a mechanism.

Regarding wave functions and their corresponding probabilities we can use the sets to determine a position in the information subspace. For each radii in the sets the probability of finding an element dR along the radii is $P(r) = dR/R$ thus for all of these radii the information must exist along it so $P(r) = 1$ this is essentially equivalent to $|\psi|^2$. When the wave function collapses $R_i- > R$ That is the particle lies on one radii (for sufficiently small particles). The author believes the concept of infinity has been misused. Rather the integrals should involve 'Deviation' functions. This is where we choose limits of integration where the probability is close to zero but not infinitley so. This means choosing limits that correspond to an arbitrary number of standard deviations.

Finally it appears that to coincide with current theories on information the centres must be binary processors of information. The reader may want to examine D particles in enquiring about these fields. It would be useful to look at the possibility of a "sister" universe to our own where anti-matter dominates and time perhaps runs in the opposite direction. This is essentially an argument about symmetry and is not new.

In regards to the sets : In curved and flat spaces, regarding the constancy of the speed of light, when determining distances the time taken by the signal is simply $x = vt$ Thus is this formula is used to determine r_i then the light follows a geodesic and hence the value is accurate. In conclusion I will summarise some ideas on the GUT fields and how they relate to the current state of quantum mechnaics and General relativity. Here the notion that information should be lost in black holes according to General Relativity but that it will be conserved in Quantum Mechanics These can be reconciled by the statement that:

The vacuum and energy has a structure. This is such that it is of the Cartesian axes and this produces Octahedrons that can completely fill space. These essentially are the building blocks of the universe. They are essentially a manifestation of information and perhaps do not exist in reality. They are a subset of a larger Information - superspace.

This is useful in the study of black holes as when mass/energy is incident upon the fields they contract as $E = 1/x$.

Thus for black holes the branches (the arms of the axes) contract to the singularity at the centre. Gravity is explained by the notion that the fields contract with mass thus contracting neighbouring fields out to infinity (albeit very weak far away).

This is essentially the same as the curvature $R_{\mu\nu}$ of spacetime as the fields are curved. The fields curve spacetime and spacetime curves the fields.

This may also explain the 10 dimensions in Super string theory as there are 6 dimensions in the fields (one for each branch) and 4 for spacetime.

The fact that the fields are interacting with energy/information means that black holes conserve information in that the fields preserve their states.

One problem is determining the behaviour of the fields to satisfy the uncertainty principle $\Delta x \Delta p \geq h/2$ further because of the mathematical analogy of Cartesian Axes supplying the structure of the fields , this means that the fields , perhaps, can calculate variables in their very geometry. This is essentially a code. This may explain entanglement as what is necessary is the 'key' to the code contained within the fields.That is certain geometries and frequencies This information is contained both within spacetime and the particles themselves and also interactions with the information - superspace.

The singularities at the centre of the fields may be a type of antennae which code/decode information upon them.

That is they are a sort of 'router' as in computing terminology. They decide which information goes back and forth to an informational sub-structure. The informational substructure could perhaps be called the logical space. I plan to publish further work on this. It essentially contains a soup of information where there must be some sort of separation.

If you are not familiar with 'string metrics' they are the logical distance between two sets of data. Here I propose that if the string metrics of two particles conform to certain conditions the particles either attract or repulse. Another way of viewing this is the particles geometry. That is the shape of the axes of the vacuum where the required matter has coincided. This implies that matter/energy causes the axes (the structure of the vacuum) to distort from its unmotivated position. If the set X is used as a measure of smaller scale phenomena certain patterns may emerge. When compared to large scale phenomena these patterns may be especially useful in analysing the Information - super space which in turn may give information about the Multi-verse.
There appears to be little about why the Cartesian axes are so important mathematically. These axes are a form of antennae and are important in the expression of the logical to the physical. The nature of a grid/lattice can be used to determine derivatives etc. It may be useful to study the arrangement of symbols in mathematical proofs etc and perhaps use X to uncover relationships between the symbols and their meaning. As a point of interest the author has produced the following formula regarding Anti - Information and entropy:
$\vec{A}$ = Info - logic
= $X - \beta(t)X$ = S = entropy. The author will publish more on this but it may be a way of tying entropy to geometry.
The vertices of the fields bear an uncanny resemblance to the notion of spin networks used in Quantum Loop Gravity. The Information - superspace is disntinct from the phase space but should include the phase space.

Finding the large scale curvature in General Relativity will produce quite nicely the curvature of individual fields - this may be altered if the evidence says the two match up and you want to hold onto these fields. Unfortunately the curvature of individual fields cant be found experimentally. In regard to the sets above, modern computers handle sets quite well. The intermediate fields can be represented by functions ie field (0) to field $1e35$ for one meter.

To summarise in explaining how giving the vacuum and energy structure we can say that the curvature of spacetime and the nature of quantum interactions can be explained by the fact that there is a pervasive network of structures that relate to energy and information yet are also flexible in the nature of spacetime.

These fields are perfect transmitters and should not provide a reference frame due to their transitional/ uniform nature. The continuity of spacetime can be preserved by noting that within the axes are a length of continuous interval. These fields, of any geometry may simply be a mathematical model. They may be a step in understanding that logic is a geometry and that structures of information are the building blocks of our reality and the multiverse.

References

[1] ovelli. C (2003) Quantum Gravity.
Serway et al. (2013) Physics vol2. Cengage

learning. ISBN 978017019408
Wray. K. (2009) An introduction to string theory.