1) A Concept of Mass as a Statistical Intensive Parameter

Geoffrey Holstrom

(Victor Valley College, SBVC, CHC)

gholstrom@msn.com

Summary

This talk is about the construction of matter and geometry. It is a verbal discussion supported by background slides. The discussion provides the main ideas, and the slides indicate some of the associated analysis.

At the start there exists no geometry, no coordinates, no matter. We begin by examining single particle formation.

-Consider formation intervals and formation volumes for one particle.

-Group them together on a sheet. There is no concept of geometry or location

-Construct a direct product of two sheets

-Trigger formation by separation of half of the direct product

-Distributions develop for these intervals on the remaining sheet.

-The intensive parameters in these distributions are mass and density.

-The separated half becomes a neutrino, the remaining sheet forms an electron or positron

-The electron and positron have positive mass and positive energy

-Maxwell, Einstein, and scale fields all come from the same connection.

-Mass and geometry form together

-The same procedure is applied to SU(3) to construct heavier particles

2) Basic Method

Formation intervals for a single particle are imagined as existing on a sheet. This isolates it from other particles. There is no geometry. Two of the sheets are linked in a direct product. Connections exist, in formation interval space, across this direct product. One sheet separates, leaving the connections behind on the other sheet and triggering the formation of formation interval distributions. The intensive parameters of these distributions are the particle properties. Mass, specific density, and associated fields result, as does the coordinate description.

X and V are formation intervals on a flat sheet. No concept of geometry. No idea of NOW in X, no idea of HERE in V. Define internal vectors on each sheet: γ e, β E
e is a basis vector in one sheet, E a basis vector in the other. γ and β sort each basis.
Define a direct product of two formation interval sheets: $\gamma \times \beta$. Then:

Bridge vector: $\nabla\gamma e \, \beta E$ Bridge connection : $L = \Gamma + \frac{1}{2} T$ Bridge metric : $\beta \check{S} \beta$

All indices in this talk are suppressed. They are all flat. Because one index is on the base sheet, and two on the attached sheet, bridge connections between the sheets exist. The bridge vector is the derivative of β E along γ e. $\check{S}$ is the inverse of $\Box^2$ expressed in formation intervals. From the norm we obtain the particle-field equation:

$$\gamma \{\partial/\partial X - \tfrac{1}{8}\Gamma(\beta\beta - \beta\beta) + \tfrac{1}{8} T\} u \times \bar{u} = \beta \, \partial/\partial X \, u \times \bar{u} \quad \text{(Particle-field equation)}$$

This procedure creates a Determined Union on the direct product sheet of formation intervals. Allow $\bar{u}$ to separate. This splits the particle-field equation into two parts. One part yields the massless creation neutrino. The other part becomes the Particle equation. In the separation, the β indices on T are summed, leaving a single index operator φ. The sign is plus or minus depending on bridge vector or one form insertion. This leads directly to leptons. The departure of the creation neutrino turns Γ into a single index operator ϵ. Its sign depends on neutrino propagation up or down. Three possible directions lead to a one third factor, and ultimately to quarks. From the commutator of the gradient operator in the particle-field equation, we obtain an equation for field operators.

$$\gamma \, \partial/\partial X \, \Psi(X,V) = k.(\partial/\partial X - \varphi)\Psi(X,V) = k.\mathrm{Op}\, \Psi(X,V) \quad \text{(Particle equation for leptons)}$$

$$\mathrm{Div}\, K = 0 \quad \text{resulting in:} \quad \mathrm{Max}\, \varphi = J(\varphi) \quad \text{(Field Operator equation)}$$

In the first, k is the creation neutrino wave number. In the second, nothing external is introduced. J is a bridge operator expression for specific density. A typical term is:
$\eta\eta$🗁 $SS(\varphi\check{S}\check{S}\varphi - \varphi\check{S}\check{S}\varphi)\, \partial/\partial X$. $\check{S}$ is the inverse of S. It will be used to generate Maxwell's equation without introducing any external current density.

In the event a creation neutrino does not separate, we are left with the connections Γ and T. There is no potential to form properties. This is a sheet of Undetermined Unions of formation intervals.

3) Property Construction

Formation interval and formation volume are described by statistical distributions for extensive variables. The intensive variables for these distributions are particle properties of mass and specific density.

On a determined union sheet, we find that $\Psi^\dagger \Psi$ is the distribution of X and V.

In a random process Ψ influences φ , and φ influences Ψ .

The intensive parameters are:

$$\partial S / \partial \Xi = m \qquad \partial S / \partial \varsigma = 1 / \Delta \qquad (\Xi, \varsigma \text{ are average values})$$

By performing a four integration over formation intervals, we find:

$$< \Psi | \gamma\, \partial/\partial X | \Psi >^4 = \int dX < \Psi | Op | \Psi > / < \Psi | \Psi > = \int dX\, m < \Psi | \Psi > \quad , \quad < > \text{ over } V$$

for the intensive parameter m associated with the extensive variable X . Similarly

$$< \Psi | Max\, \phi | \Psi >^4 = \int dV < \Psi | J | \Psi > / < \Psi | \Psi > = \int dV\, 1/\Delta < \Psi | \Psi > \quad , < > \text{ over } X$$

for the intensive parameter $1/\Delta$ associated with the extensive variable V .

There is an equation of state among the intensive variables. It is

$$m \geq = e'' / \hbar c \ \sqrt{(1/\Delta\ 1/\Delta)} \qquad \text{(Equation of State)}$$

Note that units are one over length.

Because the entropy is a concave increasing function of the extensive variable, we find that m , and particle energy, is always positive. This requires the following associations:

Electron mass with a left handed creation neutrino

Positron mass with a right handed creation anti-neutrino

Formally the entropy and the distribution are related by

$$\ln \rho(X) = S(X) - S(\Xi) + (X - \Xi)\, \partial S / \partial \Xi + C$$

4) The Appearance of Space and Time---The Dirac Equation

The Dirac equation unfolds from the development of the intensive parameter of mass, expressed in units of one over length. It establishes a flat geometry, puts in coordinates, and connects the intensive properties to them.

No matter what the size of X , m is always the same. Thus m can be treated as independent of it. We can pick any X size, and still have the same m . After m exists, this allows selection of a special X : namely X = ct , and m exists for any t . If we choose time such that we a looking at X much less than average X , m still applies and can be used. The effect of the temporary limit on X means that parts of the system are not yet involved. This means that everything, at some time t , is not described by m . The use of m at that time is perfectly valid, but is unable to describe everything. But what is does describe is correct, and description will evolve with certainly to apply to everything on the sheet. For a full description, we need X greater than its average. That is a time of about 10 to the -22 seconds.

Similar ideas apply to the specific density $1/\Delta$.

Thus: X goes to ct, $V^{1/3}$ goes to x , and we have coordinates as well as mass.

The coordinate space is flat. The reason as that the particle can have no interaction until it appears, and formation intervals are flat.

With mass available, unfolding out of the four integration equation, we have

$$\langle \psi | \gamma \partial / \partial x | \psi \rangle = m$$ the Dirac equation in an average form.

Note that this is completely mechanical in nature. It is time reversible, because m is the same for any X . However, m , and energy (M) must be positive because they are associated with the entropy of the extensive variable X , and this increases such that

$$\partial S / \partial \Xi = m$$ is greater than zero.

The Dirac equation is one for a wave function in coordinate space. It is an envelope carrying mass, a parameter determined elsewhere on formation intervals. The initial wave function of the particle carried by the Dirac equation is one with equal probability of being anywhere: a plane wave.

Subsequent interactions will concentrate it such that it will possess an average location

$$\Xi = \langle \psi | x | \psi \rangle$$

The parameter m has no location of its own. The concept is meaningless. Location is supplied by the Dirac envelope.

5) Operator Equations on Determined Sheets: Maxwell's Equations

The field operator equation has been developed on Determined Sheets. It is an equation among operators. It has a source term involving the already developed specific density parameter. There are two other terms. The first, under a mass shell average with a concentrated wave function, yields Maxwell's equations in terms of the average position coordinate. The second term is zero under a mass shell average. Under a non-mass shell average, the test (or averaging) particle adds or subtracts from the field. For examples, this is radiation from acceleration, or from orbital change.

The operator equation for Maxwell's equations are:

$$\text{Max}\ \varphi = 1/\Delta$$

$1/\Delta$ is a formed property. Its value has nothing to do with ψ, but its location depends upon it.

$$\text{Max}\ \varphi = \Box^2\varphi - \partial\partial.\varphi + S(\Box^2\varphi - \partial\partial.\varphi)\check{S} - (\varphi - SS\varphi\check{S}\check{S})\partial + (\varphi - SS\varphi\check{S}\check{S})\,\partial$$

(S is a mass shell operator on the wave function of a created particle, Š its inverse.)

Notice that the field operator equation must be averaged. This is either by a test particle from a sheet other than that where $1/\Delta$ was formed, or by the particle from the sheet associated with $1/\Delta$.

In a typical physical case, $\psi^\dagger\psi = \rho(x-\Xi)$, and is reasonably well concentrated.

When we average with a mass shell by moving the test particle around and taking averages, we obtain a push map:

$$\Box^2 A(\xi,t) = 1/\Delta$$

We have used the definition $e\,\varphi = e\,''/\hbar c\ A$. If we use the equation of state, the right hand side can be written, in a rest frame, as $e/\ \lambda \geq$

Note that this equation depends on the average particle position, and not on the details. Also, the charge density is one of the intensive parameters, and does not depend on the wave function for the source.

If we do not use a mass shell test, the other terms in $\text{Max}\ \varphi$ contribute. The result is, for example, radiation due to particle acceleration or deceleration, or orbital change.

6) Operator Equations on Undetermined Sheets: Einstein's Equations

A field operator equation is developed on Undetermined Sheets. There are no constructed properties, and no sources. The divergence of the full Riemann curvature, in operator form, appears. Under a mass shell average of the contraction, Einstein's equations result, with divergence free energy-momentum tensor and the cosmological term forced in mathematically. This is standard, except that these equations apply to the average value of x for the particle position. This is a gravitational push map. If we attempt to match the divergence of the full Riemann curvature to a property created by some other means, and contract to obtain Einstein equations, the property drops out and does not contribute. On the other hand, it is possible to match the divergence of the full Riemann curvature to a three index object, and compute a two index energy momentum tensor. The three index object is related to quark formation. At one average particle position we can work in local flat. We can do so at another point, in another local flat. These are different and Euclidian space is denied. Otherwise the match fails. Space curves to join an entity it had no part in creating. Electromagnetism and gravity are two parts of a whole. Electromagnetism is a result of created properties but says nothing about space in between. Gravity says everything about space in between, but nothing about created properties.

Use undetermined sheets where no neutrino has separated. Calculate the connection from bridge vectors:

Curvature: $K = [\blacktriangledown, \blacktriangledown]$ involves Rbr. $\blacktriangledown$ is the covariant derivative with Γ. Rbr is the bridge operator for full Riemann curvature. We have: Div Rbr = 0

In contrast to Maxwell, there is no source and no created property. A mass shell test yields: Div R = 0. R is the mass shell average of the bridge curvature. It depends on the average particle position. We attempt to match to some property (a three index object A*) already created by other means.

Perform a four integration on the contraction, apply the Bianchi identity, A* falls out, and we obtain the Einstein equations, with the divergence free objects put in by hand:
$R - \frac{1}{2} g R = T$

This is standard except that the average particle position is the spatial variable. It is possible to reintroduce A* into the problem, since we have a three index quantity related to quark formation. This constructs a specific divergence free object, and we can match to the divergence of the full Riemann curvature:

$$\text{Div } R \rightarrow A^*$$

. It is possible to find an energy momentum tensor related to quarks using the full Riemann curvature, and then use this in the Einstein equations.

7) Adjusting Undetermined Sheets: the Scale Field

The geometric scale resulting from Determined Sheets is fixed by the properties formed there. The scale resulting from Undetermined Sheets is not so fixed. As a result the field operator equations for Undetermined Sheets carries a scale field operator. This field changes the geodesic equations, but under certain restrictions, leaves Einstein's equations alone. The strength of the scale field depends non-locally on the generators for the gravitational field, and locally on the propensity for matter compared to anti-matter formation (bias). The scale field is locally positive, negative, or zero. It will influence particle motion, under a test average, accordingly. This, via the geodesic equation, gravity could seem to increase or decrease. In cases where the Einstein gravity field was very weak, the scale field could act to repel. This field depend on adjustable parameters, and thus can be made to empirically fit situations if that is sensible. It is not known if the scale field exists.

The scale field bridge operator exists accompanying $L = \Gamma + 1/2\ T$.

It is: $Sbr = 1/\Omega\ \partial\Omega/\partial X$, where Ω is the scale factor for the basis E.

Covariant derivatives are taken using it and the connection:

$$\blacktriangledown(\Gamma,S)$$

The geodesic equation is

$$d\,u(\xi)/d\lambda + \Gamma(\xi)\,u(\xi)\,u(\xi) + (S\,u)\,u(\xi) = 0$$

(Note that the geodesic refers to the average position ξ of the test particle.)

The equation for the scale field in the gravitational field of a single large mass is

$$S = 1/\Omega\ \partial\Omega/\partial r = \{(bC/\ r4)\ \ \exp(-2m/r))/D$$

$$\text{where}\quad D = C/2m\,(1/r'' + 1/mr + 1/2m'')\exp(-2m/r) + B$$

C,B, and b are constants. The bias is b, which depends on matter compared to antimatter formation. By incorporating standard gravity, and adjusting the parameters b, B, and C, various galactic rotation curves, and behavior, can be reproduced.

8) Construction of Heavy Particles by the Same Procedure

Arrange a stack of a certain number of direct product formation interval functions. The bridge connection is diagonal: the same for each function. Employ a transformation that mixes the functions among themselves. This is invariant and gauge fields appear in the standard way. (This is in contrast in trying to stack quarks, where the masses are different and invariance is less palatable.) Now let a creation neutrino separate out of the direct product. Bridge connections are then marked, and the invariance is broken. There are only three connection possibilities: a positron connection, an electron connection, and a quark connection of one sign only. A single neutrino can handle only that. A different neutrino is required if the quark connection is to change sign. Signs of the electron connections are unaffected. All that means we are talking about the group SU (3) in the most general case. This can contain various numbers of positron connections, quark connections, and electron connections. Two positron connections, and three quark connections is a proton. This has two components, and carries three short range gauge fields. The u quark is one positron connection and one quark connection, marked with a left handed creation neutrino. The d quark is a single quark connection, marked in the same way. Both quarks cannot successfully form because they violate the equation of state. The proton is a meld of uud. It does not violate the equation of state, and is obviously successful. The neutron is three quark connections, two positron connections (which is udd) plus what is called a bootstrap. That is one positron connection, and one electron connection, taken together and marked with a left handed neutrino. The bootstrap has a zero charge, and is in fact a right handed anti-neutrino. This arrangement gets the right neuron mass, and is set up to decay properly.

The equation for the stack of three $u \times \bar{u}$ contains T and Γ, plus eight gauge fields on both the left and right hand sides. This is invariant to a mix. When $\bar{u}$ leaves that invariance is destroyed, and we are left with marked bridge fields:

$$\varphi(+) \quad \epsilon \quad \varphi(-)$$

These are transferred to the left hand side, and are part of forming the mass parameter, as are the gauge fields. The result is an Op working on three Ψ functions. m is found statistically, and depends on the numbers of positron connections, quark connections, electron connections, as well as the gauge fields.

9) Bridge Operators for Some Particular Particles

Leptons

e-: $$\begin{vmatrix} 0 & & \\ & 0 & \\ & & \varphi \end{vmatrix}_L$$

e+: $$\begin{vmatrix} \varphi & & \\ & 0 & \\ & & 0 \end{vmatrix}_L$$

quarks

u: $$\begin{vmatrix} \varphi & & \\ & \epsilon & \\ & & 0 \end{vmatrix}_L$$

d: $$\begin{vmatrix} 0 & & \\ & \epsilon & \\ & & 0 \end{vmatrix}_L$$

created neutrinos

Lhν: $$\begin{vmatrix} \varphi & & \\ & 0 & \\ & & \varphi \end{vmatrix}_R$$

Rh anti ν : $$\begin{vmatrix} \varphi & & \\ & 0 & \\ & & \varphi \end{vmatrix}_L$$

Hadrons

p: $$\begin{vmatrix} 2\varphi & & \\ & 3\epsilon & \\ & & 0 \end{vmatrix}_L$$

n: $$\begin{vmatrix} 3\varphi & & \\ & 3\epsilon & \\ & & 2\varphi \end{vmatrix}_L$$

Particle bridge objects are marked by left handed creation neutrinos (L).

The left handed neutrino (above) is marked by a right handed creation anti-neutrino (R), and the right handed anti-neutrino is marked by a left handed creation neutrino (L).

The proton is uud , but the neutron is not udd. Two anti-neutrinos, with a left mark, have to be added. These are called bootstraps. This gets the right mass, and the right neutron decay scheme.

-All bootstrapped particles are unstable.

-Fractional charges violate the equation of state.

10) Conclusion

Particle masses are statistical intensive parameters. Coordinates exist because mass does. Mass is the intensive parameter associated with the extensive formation interval X.

Leptons, hadrons, and a secondary neutrino can be created, and all are associated with creation neutrinos. The secondary neutrinos join with formed particles in a bootstrap interaction, which changes mass but leaves charge alone.

Electromagnetic fields exist because of the intensive parameter $1 / \Delta$, which is associated with the extensive variable V. Electromagnetic fields have sources and leave space alone. Gravity has no source, and controls space.

Those sets of formation variables where formation has occurred are the realm of electromagnetic fields. A scale field can exist in formation spaces where creation does not occur and there is nothing to set the scale. This is the realm of gravity.

Both gravity and electromagnetic fields have their origin in the same bridge connection relating two formation variable spaces in a direct product.

Geometry comes after creation. The Dirac equation and gravity form it, and it is physical. It is a result of concentration of Dirac particles so they have a meaningful location, and the equations of motion for those locations.