# The Genetic Code Predicts the Standard Model

(Foundations Paper 4)

Rough Draft Rough Draft Rough Draft ) Rough Draft

This paper is undergoing important updating and revision

It will eventually be entitled **Logic Driven Physics**

**Abstract**

The basic hypothesis advanced by this paper is that the genetic code not only codes the building blocks of biological organisms but also codes the elementary particles of Physics. The genetic code is interpreted as a generic means of coding entities that satisfy the principle of First Classness where no entity within the system is in a privileged position relative to all others. In previous work, it was argued that such a draconian condition enforces a generic geometry on any organism organised accordingly. In the case of Particle Physics, the universe as an organism respecting First Classness must be based on this geometry and its algebra. The generic algebra has four letters. The geometric semantics of the four-letter code is expressible in terms of generic timelike, spacelike, lightlike, and singular vectors within a Geometric Algebra methodology.

These four generic geometric forms are called "quarklets" as any quark, lepton, or boson can be constructed from a triad of quarklets. The paper develops simple techniques for calculating generic spin, different kinds of generic charge and other parameters. The predicted elementary particles are compared with the Standard Model using programmed database calculations resulting in exact matches. The only difference is that there is no need for fractional charges in the Generic Model and there are more particles than known in the Standard Model. The new particles, if they exist, are possibly empirically undetectable. The geometric methodology was inspired by the famous vision of Leibniz for a geometry without number that would simply explain the form of natural tings.

**Keywords**: genetic code, Particle Physics, spacetime geometry, geometric algebra, Leibniz, quarklets, Standard Model, Generic Model\

## Table of Contents

# 1 Introduction

Leibniz provided the vision for this work where, in a famous quote, he outlined his dream of a universal non-Cartesian geometry based on an algebra consisting of only a few letters. The approach was to be non-abstract and much simpler than conventional geometric and algebraic techniques. The perceived role of his geometry without numbers was to explain the form of “plants and animals” and all other natural creations of Nature. Embraced in its fullest extent, Leibniz was proposing a universal generic geometry that would not only explain the elementary forms of biological organisms but also be applicable to understanding the elementary constituents of our universe, itself considered as a self-organising organism.

Thus, from what we now know today, the proposed universal geometric algebra would be applicable to two entirely different kinds of organism. Firstly, there are the organisms where the material support for the code is different to that of the functional material. In this case, there will be at least one level of transcription between the code and the coded. We call these kinds of organism biorgs where the “bi” prefix stands for at least two layers of organisational substance. In the other kind of organism, there is no transcription process and so code substance and the coded substance is the same thing. We call these organisms’ monorgs. Our universe is an example of a monorg. Our hypothesis is that both biorgs and monor4gs are based on the same code but employ different implementation strategies.

Biorgs and monorgs are special cases of *orgs*. The common unifying element is any org, be it biorg or monorg, is that they all share a common generic purpose. The purpose can be stated as the systemic organisational principle generic for self-organising, self-maintaining systems. To avoid lapsing into metaphysics, we borrow a term from Computer Science, the term *First Classness* (FC). The generic purpose of any org is to aspire to, maintain, and not violate the principles of FC. A system that satisfies FC is one where no systemic entity is in a privileged position with respect to any other. The principle of FC is formidably difficult to formalise. For example, any attempt at axiomatisation will violate FC, as that would place the axioms in a privileged situation. For the purposes here, a way to avoid violating FC from a geometrical perspective is to avoid constructs that place any point in a privileged position relative to any other. The origin in Euclidean space is such a violation. Temporal ordering also violates FC. No time or point can be before or after any other within the system. Rigid dichotomies and dualisms violate FC. Non-duality is a fundamental requirement of FC. Intuitively, a system satisfying FC is a system possessing and maintaining an individual “nowness” and living within that self-imposed nowness. In this perspective, living organisms can be thought of as *now machines*. We claim that our universe, as a monorg, is such a machine. From a formal perspective, the FC principle plays a normative role as arbiter of truth just like axioms in analytic mathematics. Analytic mathematic is based on axioms; synthetic mathematics is based on FC.

These ideas are developed more fully in three previous papers. Only the very rudiments of the theory will be presented here.

## 2 The Four Generic Dyad Types

The central theme developed here is the match between the four letters of the genetic code and the four elementary vector types of synthetic geometry. The RNA encoding of the code will be employed here, thus we will have the four letter alphabet $\mathcal{A}$ = {*a,g,u,c*}. According to our theory, the semantics of each of the four letters of the genetic code can be expressed geometrically in terms of timelike, spacelike, lightlike, and singular vectors respectively. The idea is that sequences of letters from $\mathcal{A}$ code geometric structures consisting of the corresponding generic vector types. This geometric interpretation applies equally to both biorgs as well as monorgs. Because of the presence or absence of transcription technology, the possible kinds of coded structure will be different in both cases. In this paper, we restrict our attention to monorgs.

In our third paper (Author, 2013c) we used Leibniz's original notational scheme to show how these four generic vector types could be explained without the need for coordinates or any complicated algebra.

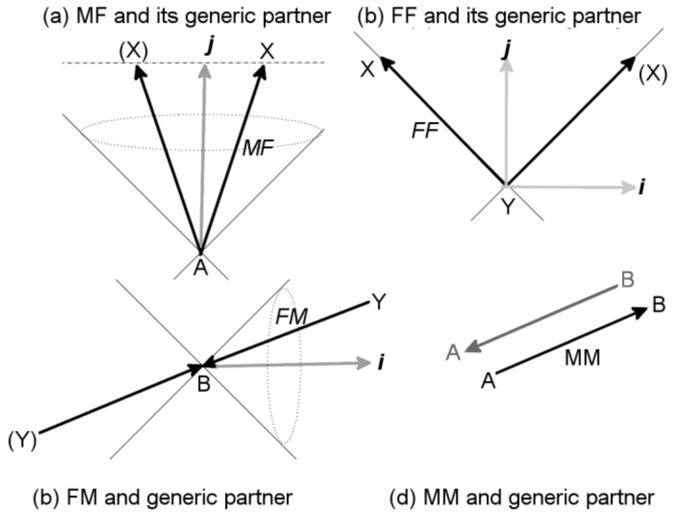


**Figure 1 Illustrating the four generic vector types and their generic partners in Leibniz notation**

Leibniz's geometry did not really get off the ground during his lifetime but the style of his notation does indicate his intentions. Points that had fixed situs he denoted by letters A, B, C. at the beginning of the alphabet, Points with undetermined situs were labelled by letters X, Y, Z at the end of the alphabet. Like Leibniz, we will use the Latin term situs rather than words like location" or "position." The word situs can be thought of as meaning the same thing as these words, but in a less determined, more generic way. For example, with situs, there is no reference to an origin. The situs does not explicitly indicate the *where* of an entity.

Using this simple notation, it is readily apparent that there are four basic vector types, notably XA, AX, XY, and AB. Leibniz never broke free of the Euclidean straight jacket, and so ended up with non-oriented lines and so only had two elementary types. In our case, the point pairs determine oriented line segments, not lines. Of particular interest is the vector AX with a determined situs at the source end and the line YB with its determined situs at the target end as illustrated in Figure 1(a) and (b). In order to be elementary types, the AX and YB dyads must be objectively unambiguous. The same applies with respect to the YX typed lightlike vector illustrated in Figure 1(c).

In previous work, we developed the generic notion of ontological gender as the fundamental typing mechanism for Generic Scie3nce. The

The solution to this dialectical puzzle involves each vector type possessing a "generic partner" or adjoint. For example, the adjoint to AX will be A(X) as illustrated. It is the property of the adjoint that contributes to the overall geometric characteristic of each vector type. There is a cone of possible AX vectors and a cone of possible A(X) adjoints. In this case, the two cones are superimposed. For the spacelike cone of YB vectors and its adjoint cone of Y(B), the two cones are disjoint. This characteristic expresses the fundamental difference between timelike and spacelike vectors. Assuming an inner product the inner product of a suitably normalised vector with its adjoint will be unity. Thus, including the lightlike vector YX and its adjoint Y(X) in the mix to fill in the gaps.

$$AX.A(X) = YB.(Y)B = YX.Y(X) = 1 \qquad (1)$$

this can be intuitively interpreted as a condition of non-dualism. The condition imposes an asymmetry on the AX and YB squares such that

$$AX^2 = 1 \quad \text{and} \quad YB^2 = -1 \qquad (2)$$

that is the metric characterisation of timelike and spacelike vectors.

For lightlike vectors

$$YX^2 = 0 \qquad (3)$$

Using coordinate analytic geometry leads to an analytic version of this construction.

The singular AB vector and its generic partner BA brings in the dimension of Figure and Ground. The convention is that Ground is the source of the arrow and Figure the target. Replacing AB with its generic partner BA brings about a Figure Ground reversal. This makes no sense in analytic geometry, as everything is Figure. Ground is implicitly assumed and so ignored. An alternative terminology to Figure and Ground is to talk about *value* and *placeholder*. The singular vector has a zero product with all vectors including itself and its generic partner. In the Particle Physics interpretation of these vectors, Figure and Ground correspond to what is referred to in the Standard Model as positive and negative "colour charge."

In previous work, we developed a fundamental typing system based on ontological gender. There are thus two fundamental types, the masculine and the feminine. Without going into details here, it suffices to say that the determined points labelled as A and B above, are typed masculine whilst the undetermined pints X and Y are typed feminine. Thus the four-letter coding {***a,g,u,c***} corresponds to the binary gender coding of vectors where a timelike vector is typed ***mf***, a spacelike ***fm***, a lightlike ***ff***, and a singular vector ***mm***.

## 2.1 Vector Triads

Composite structures can be constructed from elementary gender typed vectors. The structure preferred by Nature is the triad or a sequence of triads. It is the triadic structure that resolves the FC condition on vector endpoints where no point in the structure can be before or after all the others. To achieve this FC requirement, no two adjacent vectors can be end to end, The resulting triad can be unambiguously labelled. To be compatible with the terminology of the Standard Model, the dyads are RGB "colour-coded" as illustrated in Figure 2. The triad can be interpreted like a string in String Theory with the endpoints on a Brane. The endpoints will be gendered and so there will be four elementary types of brane. In String Theory, the masculine endpoints would correspond to being "pinned" satisfying the Dirichlet boundary conditions. The feminine gendered endpoint would correspond the Neumann boundary condition the endpoint is free and moving through spacetime at the speed of light. The vectors of the triad are shown as untyped and so would default to being MM typed singular vectors. The triad would correspond to a gluon in this case.

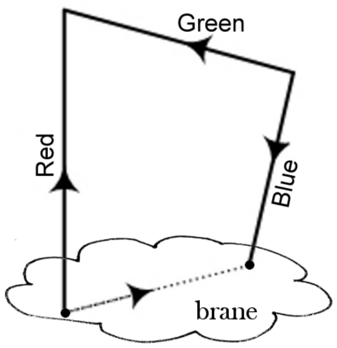


**Figure 2 An untyped RGB triad with endpoints on a brane.**

.

# 3 Calculating Generic Properties of Dyads and Triads

The gender typing off a dyad can be conveniently represented by iconic "Heraclitus" diagrams as shown in Figure 3. The circles at each end can be considered to have extent if feminine and of zero extent if masculine. A generic notion of angular momentum, potential or actual, suggests itself. This is exploited in the diagram to allocate numbers to each dyad according to gender and orientation. The respective numbers are then opportunistically called Spin. These are generic calculations based purely on the possible generic forms and do not assume any specific underlying physics.

## 3.1 Generic Spin

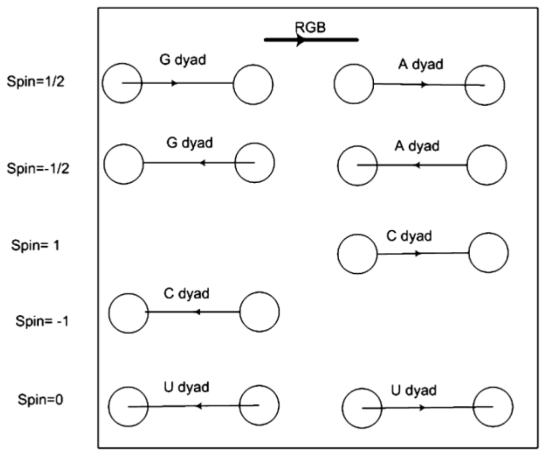


**Figure 3 Spin for the four binary gender types of dyad.**

In the case of a U dyad where both ends are feminine, the magnitude of the spon will be assumed unity. In the case of mixed gender for the A and G dyads, the magnitude will be ½. The MM typed C dyad will be zero spin. We conjecture that spin, calculated in this way, will behave like the trace of a matrix. Thus, the spin for a triad will be the sum of the signed spins of the three constituent dyads. In addition to orientation, spin will have handiness. Handiness is undetermined for a single dyad and only becomes determined in the context of a triad of dyads.

## 3.2 Generic Charge

Each dyad can be considered as a unit of signed charge. Since there are four types of dyad, there will be four types of charge. In the context of Particle Physics, we interpret the G dyad as expressing one unit of electrical charge. the A dyad expressing the "hyper-charge" related to the Weak Force, and the C dyad expressing "colour charge" related to the Strong Force. The U dyad, which has both ends if undetermined *situs*, expresses the most diffuse kind of charge and is related to the Gravitational Force. Unlike in the Standard Model, the idea of factional charges is not necessary.

For the moment, we lack a sound generic justification for calculating the charge of a triad and so we have made a pragmatic choice of algorithm. The simplest algorithm that works, as well as being intuitively satisfying, is to define the electric charge of a codon to be determined by the electric charge of the middle dyad, in other words, the charge of the Green dyad. It is this middle dyad that participates in the phenomenal world. The Red and Blue dyads each have an end *situs* on the brane.

#### 3.2.1 Triads of Triads made from Quarklets

Since the middle dyad is always pointing backwards, relative to the red dyad, the charge of a codon will always be negative relative to the local RGB convention of the codon. The only way that a codon can contribute a positive charge is that the codon itself is reversed relative to an RGB convention of wider scope. In this way, the fundamentally negative charge of a codon can become positive and so explain the positive charge of a proton, for example. In the Standard Model, a proton is made up of a triad of quarks where quarks are considered point-like. According to our Leibniz Model, quarks are themselves made up of triadic codons at an even deeper level. The three dyads making up a quark could be called *quarklets*. If a quark has a baron number of 1/3, the quarklet must have a baryon number of 1/9. Figure 5 illustrates how nine quarklets make up a proton. Note that the middle codon is reversed and so carries a positive charge relative to the overall RGB convention. However, relative to the middle codon itself, the charge remains forever negative.

### 3.3 Calculating the Leibniz Model

Our science is Generic Science. The object of the science is any entity whatsoever capable of organising its own existential integrity. The unifying principle is FC. The generic solution to the puzzle involves a coherent system of gender typing. The elemental structure of such systems is the self-labelling RGB codon. The three dyads that make up the codon can be typed by the binary genders labelled by the same four-letter alphabet as the genetic code. In this paper, we apply the Generic Science to the physics of biorg of which our universe is an example.

There are sixty-four possible types of codon, each one corresponding to a triplet of letters from the generic four-letter alphabet {a,u,g,c}. Generic properties analogous to charge and spin can be calculated for each codon. The codon triad explains the *phenomenal* aspect of the generic entity. The triad part is referred to as the *imaginary part* of the representation. Other than "charge" and "spin," a number of other useful properties can be calculated.

#### 3.3.1 Calculating Diffusion Index

The *Diffusion Index* of a codon is a relative measure of how determined is the codon endpoints. The more determined are the endpoints, the less the diffusion Index. The measure is based on the real part of a codon according to the table:

| Real Dyad | Diffusion Index | Comment |
|---|---|---|
| U | 4 | both ends of dyad of undetermined *situs* |

| | | |
|---|---|---|
| G | 3 | one dyad end of determined *situs* but non-individualised |
| A | 2 | one dyad end a determined individual *situs* |
| C open | 1 | both ends of determined *situs* but not closed |
| C closed | 0 | both ends of determined *situs* but zero metric between |

Our proposed algorithm for determining whether a C dyad was open or closed summed the signed charges and "weak charges" for the three-codon dyads to provide a measure of "flux divergence." The algorithm is an informal measure of how "stressed" the real C codon would be. If zero stressed, the codon would be closed and have the minimum Diffusion Index of zero. The ***aug*** codon has a C dyad real part. The charge of A and the "weak charge" of G cancels out and so the ***aug*** codon is closed.

The Diffusion Index can be used as a rough qualitative indication of relative mass. Zero mass corresponds to zero Diffusion Index. The real part of a codon determines what kind of brane is associated with the codon as a whole. There are four types of brane, A-branes, G-branes, U-branes, and C-branes. According to the table above, the lightest codons have endpoints on a C-brane.

### 3.3.2 Calculating Solidness

The C dyad represents form without extension whilst the U codon represents extension without determined form. Both dyads are considered to have a solidness of zero. The A and G dyads are defined to have a solidity of one. The maximum solidness for a codon will be three, corresponding to the case of no U or C dyads. As will be illustrated, the codons corresponding to quarks will have the maximum solidness of three.

### 3.3.3 Excluded Codons

Some codons in the Leibniz Model are excluded from consideration in the table below because they do not correspond to determined entities. A determined entity must have a real part whose specificity is determined by the three dyads making up the imaginary part. The overall disposition of an entity is articulated via the geometric form and degrees of freedom implicit in the imaginary part of the codon. To be included in the Leibniz Model as a particle candidate, the codon must express non-degenerate disposition.

The GGG codon is amongst the first casualties. Its imaginary part is composed of three G dyads that are supposed to determine the specificity of the real part. The real part is also implicitly a G dyad. There is no objective dichotomy between the imaginary part and the real part. Of the four dyads, any three G dyads could be taken as imaginary dyads determining the specificity of the other dyad taken as real, without perturbing the setup. Considering the fact that each G dyad is spacelike, we see that GGG is related in some way to three-dimensional Euclidean spatiality. The GGG codon is a kind of "space particle" and not something, one would expect to find whizzing around in space. The codon is spatial and must play a placeholder role in some way. The GGG codon as a particle candidate is excluded from the Leibniz Model.

The rule for excluding codons of this kind is that all dyads are of the same type. This rule excludes the AAA codon that, because all the dyads are timelike, is a kind of temporal placeholder. The UUU codon is also excluded as it articulates the notion of diffuse extension stuff UUU determining itself as U without any determined determination involved.

The CCC codon is another candidate but is an exception to the rule. All dyads involved are doubly masculine. Each C dyad in isolation is nothing but a featureless dyad. Masculine typing adds nothing to an entity except to bring it into focus as having determined *situs*. Each C dyad in isolation carries no tractable specificity, However, when participating in an RGB triad, each dyad formalises its *situs* by colour location. By default, each C dyad in the triad will carry one unit of the colour charge pertinent to its colour *situs*. The triad of colours determine the colour of the real C dyad, which will be coloured “white” by default. In a perturbed situation, the triad’s C dyads may take on negative colour charge resulting in the real dyad having one of eight possible complex colour states. From our automated calculations shown below, the CCC codon turns out to have a spin of one, an electric charge of zero, and have zero mass (zero Diffusion Index). Thus, the CCC codon matches up with the properties in the Standard Model for the gluon.

### 3.4 Leibniz Model Database

There are 64 triads of the four letters {a,u,g,c}. For biorg systems, each triad or codon transcribes one of twenty amino acids as well as three stop codons. The central claim of our work is that the organisational principle of a monorg, such as our universe, is the same as for biorg, and indeed the same for any autonomous self-organising system. The universal principle is the FC principle and can be summed up as the systemic maintenance of a non-dualist reality relative to the organism concerned. The principle of FC expresses the primary concern of any life form, not that of self- preservation, but the preservation of Self.

The big difference between a biorg and a monorg is that in the case of the latter there is no transcription between the letters of the algebraic code and the elementary constituents of matter. They are the same thing. The monorg will necessarily possess a more primitive range of dispositions and powers compared to the high-tech biorg and so will be easier to analyse. In biorgs, a linear sequence of codons can consist of hundreds of millions of codons. For a monorg like our universe, codon sequencing is very limited. Only three codons are necessary to code a neutron or a proton and the linear sequencing stops there and the combinatorial role of chemistry takes over.

In facilitate analysing the generic form of the 64 possible codons the author constructed a simple relational database containing the calculated properties of each codon. The calculated properties are generic spin, generic charge, generic weak charge, solidness, and Diffusion Index. The purely spatial codon GGG was excluded, including the purely temporal AAA codon.

#### 3.4.1 Quarks

A big difference between the Standard Model classification of elementary particles and our Leibniz Model is that the latter introduces another deeper layer to the supposedly point-like quarks and leptons of the Standard Model. At this deeper layer, there are only four elementary binary gender typed substances. All of the elementary particles in the Standard Model can be generated from these four generic substances plus quite a few more. One can even say that there is yet another deeper layer in the form of only two primordial substances, one type feminine, and the other masculine. However, the reasoning only starts to find traction at the level of the four binary gendered elements labelled by the letters taken from the generic alphabet {a,u,g,c}. Each quark is formed from a triplet of the four elementary substances, as are leptons and all of the additional particles left out of the Standard Model. In the Particle Physics context, we suggest the term *quarklets*, for these four basis elements of the system. Each quark is made up of three quarklets, as are leptons.

Leibniz Model Codon table where Solidness = 3

| Particle Name | Codon | Solidness | Spin | Charge | Diffusion Index | Excluded | Real Dyad |
|---|---|---|---|---|---|---|---|
| quark up | AAG | 3 | 0.5 | 0 | 1 | NULL | C |
| quark charm | GAG | 3 | 0.5 | 0 | 3 | NULL | G |
| quark top | GAA | 3 | 0.5 | 0 | 4 | NULL | U |
| quark down | AGG | 3 | 0.5 | -1 | 1 | NULL | C |
| quark strange | AGA | 3 | 0.5 | -1 | 2 | NULL | A |
| quark bottom | GGA | 3 | 0.5 | -1 | 4 | NULL | U |
| | AAA | 3 | 0.5 | 0 | 2 | 1 | A |
| | GGG | 3 | 0.5 | -1 | 3 | 1 | G |

**Figure 4 Table showing all codons with a calculated Solidness equal to the maximum value of 3.. The column on the left shows how the six non-excluded codons have been matched to the six kinds of quark of the Standard Modle. However, the charges are non-fractional and od not match.**

Another important difference is that there is no need for fractional electric charge in the Leibniz Model. The origin of fractional electric charge is totally unexplained in the Standard Model. If there is indeed another deeper layer, as we claim, this aesthetically challenging, theoretical Band-Aid quickly becomes untenable.

Figure 4 shows a result of a query of the relational database purely based on the requirement that the Solidness of the codons selected must have the maximum value of three. This requirement is the generic equivalent of only selecting "baryonic" particles. The baryonic requirement translates into demanding that all of the three quarklets determining the elementary particle must be either of ***a*** or ***g*** type.

The six results shown in the unshaded part of the table suggest a correspondence with the six types of quark shown in the shaded column. The up and down quarks have been matched to the results with the least indeterminateness. These up and down codons also have their endpoints on a C-brane indicating determined *situs* for both ends. This is the generic equivalent of a D-brane in String Theory. The C-brane is the most determined of the four-brane types in the Leibniz Model. The Standard Model postulates a fractional charge of +3/2 for the up, charm, and top, quarks with a charge of -1/3 for down, strange, and bottom quarks. In the Leibniz Model, the charges become zero and -1 respectively. Since no one can directly measure the actual charge of a quark, this is not a problem as long as everything fits together. Figure 5 shows the Heraclitus diagrams for each of the six quarks.

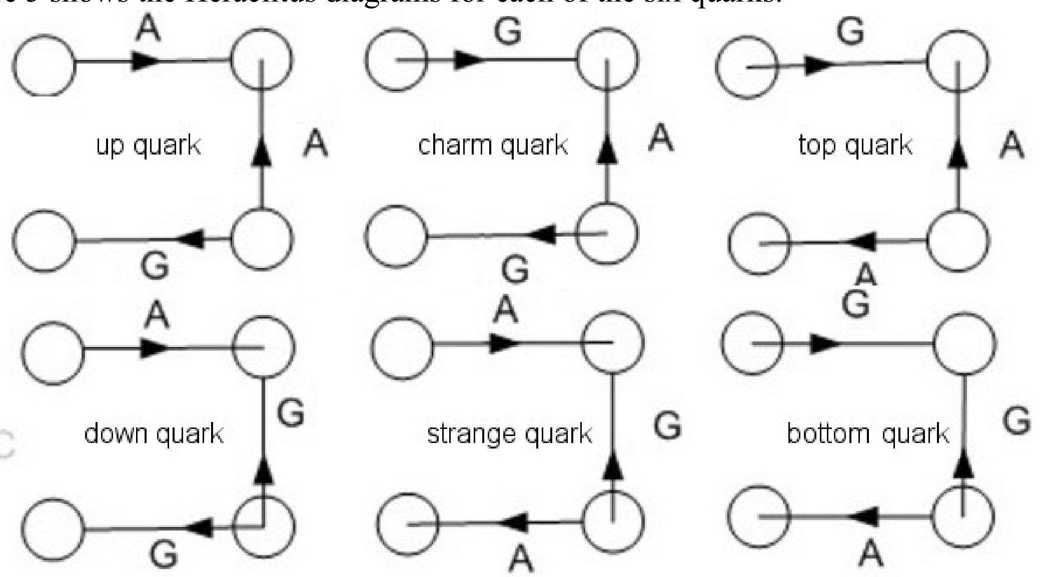

**Figure 5 Heraclitus diagrams of the six quarks.kinds of quark. Each quark consists of three quarkets. Other than the codons, AAA and GGD, the six quarks AAG, GAG, GAA, AGG, AGA, and GGA exhaist all possibilities formed from A and G quarkets., The lighter quarks are to the left of the diagram.**

### 3.4.2 Leptons

| | Leibniz Model Codon table | | | where ABS(spin) = 0.5 AND NOT Solidness = 3 AND NOT ( charge = 0 AND weakcharge = 0) | | | |
|---|---|---|---|---|---|---|---|
| Particle Name | Codon | Solidness | **Spin** | **Charge** | Weak Charge | Diffusion Index | Real Dyad |
| electron | CGU | 1 | 0.5 | -1 | 0 | 2 | A |
| electron muon | UGC | 1 | 0.5 | -1 | 0 | 3 | G |
| electron tau | UGU | 1 | -0.5 | -1 | 0 | 4 | U |
| neutrino | CAU | 1 | 0.5 | 0 | -1 | 2 | A |
| neutrino muon | UAC | 1 | 0.5 | 0 | -1 | 3 | G |
| neutrino tau | UAU | 1 | -0.5 | 0 | -1 | 4 | U |

**Figure 6 Table showing all codons wuth a Solidness less than three, A Spin of ½, and either a non-zero charge or "weak charge."**

Codons which fit the profile for leptons can be extracted from the database by a where clause that excludes the Solidness of three already considered as quarks. The other clauses in the where statement are that the spin be ½ and that the codon possess a non-zero charge or weak charge. The query only produces six candidates as shown in Figure 6. The codons have been ordered by charge and Diffusion Index. One has little difficulty in matching the six leptons of the Standard Model with the relevant codon as shown in the column on the far left of the table.

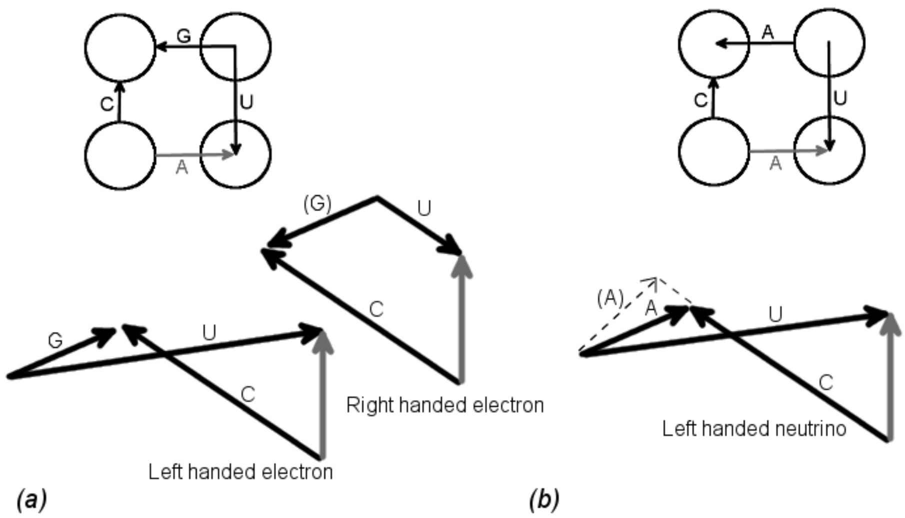


**Figure 7 (a) Heraclitus diagram for the electron neutrino and illustration of a left handed and right handed geometric variant. (b) The same for a neutrino but the two geometric variants have ths same chirality due to the uni-directionality of the timelike A dyad.**

Figure 7 shows the Heraclitus diagrams for the first generation electron and neutrino. For the electron, two variants are possible for the same Heraclitus diagram based on the conjugate of the spacelike G dyad. There are thus two geometric realisations of the CAU codon, one left handed and one right handed. In the case of the neutrino, the spacelike G dyad is replaced by the timelike A dyad. There is a second variant of the resulting CAU codon but, as illustrated, unlike the electron it will have the same handedness as the first. This construct is offered as an explanation for the lack of right-handed neutrinos in Nature. The same argument applies to the second and third generation leptons.

### 3.4.3 Bosons

To query the database for bosons the query used a where clause demanding a particle with integer spin and zero mass. The zero mass requirements were interpreted as a zero diffusion index. In other words, the codon must be closed with its two indistinguishable endpoints on a C-brane (a D-brane in String Theory). The return results of the and are shown in Figure 8. It returns what can be readily identified as the photon, the gluon, the graviton. and one unknown particle, possibly impossible. The graviton, according to theoretical speculation, should have a spin of two and a mass of zero. In the Leibniz Model database, there is only one entry that has a calculated spin of two. It also turns out to have a diffusion index of zero inferring that the codon is closed and of zero mass and so, the fit to a graviton is quite solid.

| | Leibniz Model Codon table | | where (ABS(spin) =0 OR ABS(spin) =1 OR ABS(spin) =2) AND Diffusion Index = 0 | | | | |
|---|---|---|---|---|---|---|---|
| Particle Name | Codon | Solidness | Spin | Charge | Weak Charge | Diffusion Index | Real Dyad |
| unknown | ACG | 2 | 0 | 0 | 0 | 0 | C |
| photon | AUG | 2 | 1 | 0 | 0 | 0 | C |
| gluon | CCC | 0 | 1 | 0 | 0 | 0 | C |
| graviton | CUC | 0 | 2 | 0 | 0 | 0 | C |

**Figure 8 How many particles in the Leibniz Model have integer spin and zero mass? The query returns four resukts which are easily identified as Hoggs boson, photon, gluon and graviton.**

### 3.4.4 Composites

How do simple codons combine to produce composite substances? It is here that we see a fundamental difference between the biorg and a monorg, the difference between the organisation of biological matter and the inanimate. In both case, composite substances are determined by sequencing of codons, For biological, the codon sequencing occurs as genetic material, one-step removed from the organised matter. There is no limit on the length of neither the sequencing nor the ordering. each codon. Each DNA codon has a determined orientation and codons are sequenced one after the other, all with the same orientation. The ordering of codons is not restricted by immediate chemical or physical considerations and so is free to express the semantics that will ultimately determine the dispositions and powers of the organism concerned.

For the monorg, in the absence of any transcription process, the codons directly express the elementary physical constituents of the organism. As such, the length of codon sequence is dramatically reduced to only three or even to just singletons. In addition, unlike biorg where sequencing takes place in a separate code, the codons cannot be sequenced one after another. This is for the same reason that the three dyads of a codon cannot be arranged head to tail. All dyads in the mix must be "now" dyads. Thus, in order not to violate FC, the only allowable sequencing of codons is that they be arranged on RGB triads, just as for their constituent dyads.

Figure 9 shows how a neutron and a proton can be constructed from a triad of codons arranged in an RGB configuration. Each codon is either an up or a down quark. Thus, according to the Leibniz Model, the "genetic" sequence for a proton is:

proton = AAG (AGG) AAG *(4)*

where the middle or green codon is enclosed in brackets to indicate its reversed orientation. According to the Standard Model, coding for a neutron involves one up and two down quarks. The Leibniz Model exposes more structure than the Standard Model resulting in the possibility of two different geometric configurations that give the same overall value of zero charge. Thus:

neutron = AAG (AGG) AGG or AGG (AGG) AAG *(5)*

Figure 9 shows the first of these possibilities. Thus, according to the Leibniz Model, there would be two kinds of neutron even though they would be difficult to distinguish, as they would each have the same ½ spin, zero charge, and same mass.

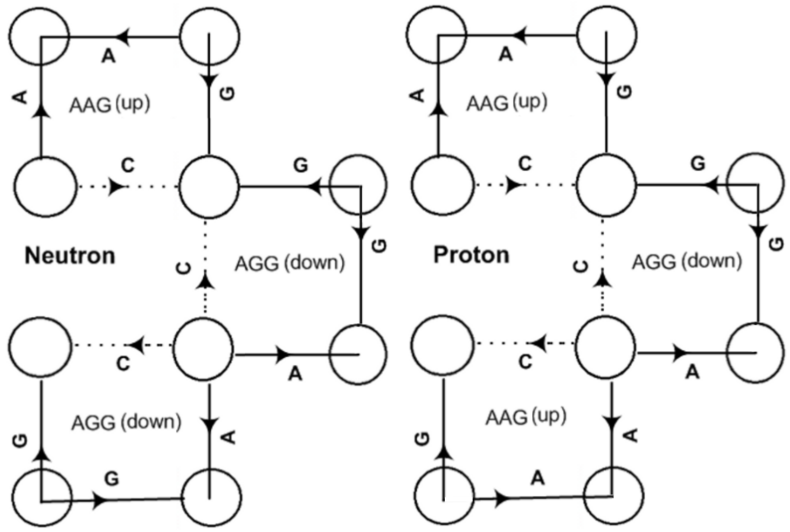


**Figure 9 The Codons of Codons for the Neutron and Proton.**

### 3.4.5 Delta Particles

The neutron and proton configurations of up and down quarks are not the only quark arrangements possible. In all, there are eight possible combinations. It is here that the Standard Model starts to get ugly in its explanations as it grapples with its dearth of underlying geometric structure. To the Standard Model, composites of quarks are merely collections. Thus a neutron is a bag containing one up and two down quarks arranged in no particular order. The two possibilities described in (5) are not distinguishable. Instead of eight possibilities of quark up and down combinations, the Standard Model can only come up with four. However, experiments show that there are not just two extra quark combinations than the proton and neutron but also four, namely the delta particles $\Delta^{++}$, $\Delta^{+}$, $\Delta^{0}$, and $\Delta^{-}$. The official explanation is that the short-lived delta particles all have spin of 3/2. The Pauli principle is applied to exclude the ½ spin **uuu** and **ddd** quark combinations that are replaced by the 3/2 spin particles $\Delta^{++}$ and $\Delta^{-}$ respectively made up of **uuu** and **ddd** quark combinations but with all quarks having the same spin orientation.

The Standard Model scenario conflicts with the Leibniz Model in two ways. First to have a three quark combination of up and down quarks with a total spin of 3/2 means that the quarks must all be oriented in the one direction. This violates the central FC tenant of the Leibniz Model that the arrangement must be in an RGB configuration. Spin 3/2 combinations might be possible but not with only up and down quarks. The other conflict is that such an leads to the biggest blemish of the Standard Model, that of fractional charge. Fractional charge, even as a theory fudge to make things fit, will not work in the Leibniz Model, as it would infer fractional charge for electrons as well as having no philosophical justification.

Provisionally ignoring any Pauli exclusion considerations and preceding mechanically, the Leibniz Model calculations for the outstanding five up and down quark combinations leads to results suggesting a natural fit to the delta particles. The only problem is that all of the charges have the wrong sign. The results are summarised in the generic code expressions below. To correct for sign, each expression has been enclosed in brackets meaning that the orientation of the codon structure has been reversed with respect to the implicit standard RGB orientation.

$\Delta^{++}$ = (AAG (AAG) AAG) *(6)*

$\Delta^{+}$ = (AAG (AAG) AGG) or (AGG (AAG) AAG) *(7)*

$\Delta^{0}$ = (AGG (AAG) AGG) *(8)*

$\Delta^{-}$ = (AGG (AGG) AGG) *(9)*

All of the above particles only have a spin of ½.

For a generic code expression without outer brackets, the corresponding codon structure will have the standard RGB orientation. We could say that such a configuration had a "North" charge whilst codon structure for an expression with outer brackets had a "South" charge. This North/South polarity could be considered yet another kind of "quantum number" *situs* like colour charge and would resolve any Pauli exclusion issues. We will tentatively call it the *compass situs*. The delta particles have a default compass charge of *South*.

## 4 Conclusion

The central task of this paper has been to develop Leibniz's vision of a simple universal geometric calculus, which could describe the form of natural things in a few letters. In modern times, we now know that biorg employ the four-letter genetic code for this purpose even though we do not yet understand the formal semantics involved. In this paper, we study substances that are bereft of any transcription process, the substances of the monorg. The underlying assumption is that, in order not to violate FC, the monorg would also be organised in accordance to the same code as biorg. The approach is supposed to be generic, without any recourse to empirical considerations. The author has tried as much as possible to live up to the generic ideal but from time to time has appealed to known empirical evidence as a helping guide.

The first question to answer concerns the ultimate elementary constituents and their fundamental properties. Relying on previous work by the author, the generic approach claims that there are only two elementary constituents, one of feminine gender and the other masculine. As to any properties that might distinguish these two entities, there are not any, as has been explained by the dialectics of *to-have* and *to-be*. The gender construct has a very ancient pedigree and forms the most profound part of this work.

The gender construct is advanced as the answer to Leibniz's view of a world "which is at the same time the simplest in hypotheses and the richest in phenomena." The underlying principle of such a world is that of FC, which demands non-dualism by forbidding any entity from being absolutely precedent or antecedent, The gender construct arises from this principle. A four-letter algebra can be constructed from the two genders leading to a family of 64 triadic colour coded codon structures. In this paper, the algebra was applied to the Particle Physics arena. Unlike the Standard Model, in the generic approach leptons, quarks, and bosons have internal structure based on these codons. Using very simple automated calculations, generic properties like spin, charge, and a generic indication of mass, were calculated from these structures and compared to the elementary particles of the Standard Model together with the theorised graviton and Higgs boson. Automated queries of a relational database containing the results provided perfect matches with the relevant sub-families of the 64 generic codons. Many of the more ephemeral less determined codon structures have no counterparts in the Standard Model. Such structures can be considered as candidates as undiscovered particles even though they may be extremely difficult to detect.

The practical results emerging from this work is that each of the elementary particles can be described by a simple triplet sequence of letters from the four-letter alphabet. The letters spell out an implicit spacetime geometric semantics. Composite structures such as the proton, neutron, and delta particles can be constructed from triplets of triplets. To account for the anomalies associated with the delta particles, the Standard Model resorts to fractional charges in order to work its way out of the intricacies. The fractional charge innovation is not necessary for the Leibniz model. A more natural and simple solution is proposed based on a new kind of "quantum state" tentatively called *latitude* with a *North* or a *South* charge.

The results of this paper provide support for Leibniz's view that the world is organised via a unifying principle expressible in terms of s simple but universal geometric algebra. Matter is not just dead matter; it is *organised* matter, the organisation expressible in terms of this generic algebra. Be it animate or inanimate matter, the same organisational principle applies together with its universal geometric algebra. As Leibniz envisaged, it is a geometric algebra without number.

## 5 Bibliography


Arthur, R. T. W., 2012. Leibniz's Theory of Space. *Foundations of Science,* Issue April.

Author, 2013a. The Science of Now.

Author, 2013b. The Whole Thing is a (now) Number.

Author, 2013c. The Universal Geometric Algebra of Nature (under review).

Bird, A., 207. *Nature's Metaphysics: Laws and Properties.* Oxcford: Clarendon Press.

Choi, S. & Fera, M., 2012. Dispositions. In: *The Stanford Encyclopedia of Philosophy (Spring 2012 Edition).* s.l.:s.n.

Corry, R., 2011. Can Dispositional Essences Ground the Laws of Nature?. *Australasian Journal of Philosophy,* pp. 263-275.

Forrest, P., 2012. The Identity of Indiscernibles. In: *The Stanford Encyclopedia of Philosophy (Winter 2012 Edition).* s.l.:s.n.

Goldblatt, R., 1987. *Orthogonality and Spacetime Geometry.* Berlin: Springer-Verlag.

Hestenes, D., 2001. Old Wine in New Bottles: A new algebraic framework for computational geometry. In: *Geometric Algebra with Applications in Science and Engineering.* s.l.:Birkhäuser.

Hildebrand, T., 2013. Can bare dispositions explain categorical. *Philosophical Studies (forthcoming ).*

Krauss, L., 2012. *A Universe from Nothing: Why There Is Something Rather than Nothing.* s.l.:Atria Books.

Leibniz, G. W., 1969 (1956). Philosophical Papers and Letters. In: *Philosophical Papers and Letters: A Selection.* 2nd Edition 1975 ed. s.l.:Reidl.

Leibniz, G. W., 1995. In: *La caractéristique géométrique.* Paris: Mathésis.

Mac Lane, S., 1998. *Categories for the Working Mathematician. Graduate Texts in Mathematics.* Second Edition ed. s.l.:Springer-Verlag.

Manicas, P. T., 1965. Aristotle, Dispositions and Occult Powers. *The Review of Metaphysics,* 18(4), pp. 678-689.

Mason, S. F., 1991. *Ciba Foundation Symposium 162 - Biological Asymmetry and Handedness.* Chichester, Wiley.

McManus, I. C., 2002. *Right Hand, Left Hand: The Origins of Asymmetry in Brains, Bodies, Atoms and Cultures.* s.l.:Harvard University Press.

Menzies, P., 1997. Dispositions. In: s.l.:Greenwood Press, pp. 87-90.

Risi, V. D., 2007. *Geometry and Monadology - Leibniz's Analysis and Philosophy of Space.* Basal - Boston - Berlin: Birkhäuser.