Introduction to the Higgs Boson Papers (Part II)

John A. Gowan

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Abstract

I had been blocked from understanding the Higgs role and mechanism through thinking there was only one Higgs boson; the dam burst when I realized there could be more than one Higgs. Suddenly I saw how the various Higgs bosons could serve as a selection mechanism to define, organize, and "gauge" the energy levels or symmetric energy states of several other processes I had known about for some time, such as the compression of the quarks by the "X" IVBs to produce "proton decay", and the creation of leptoquarks by an even higher energy process involving the splitting of primordial charged leptons by "Y" IVBs to produce both electrically charged and neutral leptoquarks. It all fell into place once my mind was opened to the possibility of multiple Higgs bosons, one each to "gauge" or scale the stages of the decay sequences of the cascade. Here was the natural conservation role for the Higgs I was seeking. The quantization of the Higgs and IVBs is necessary to ensure the invariance of the *single* elementary particles they produce. No matter if this was not the exact same role posited for the Higgs in other sources; given the ambiguity in the technical jargon and explanations I had encountered, it was close enough to satisfy.

Gravity and Mass - "Metric" Particles

All the IVB families work by compression, differing mainly in the intensity of the pressure they can apply, according to their mass and specific Higgs energy density level. The "Y" IVB is seen only during the initial moment of the "Big Bang", or the final moment of the "Big Crunch". Perhaps the most interesting feature of the H3 level is that this is the energy level at which gravity joins the other forces in a final full symmetry. But like the IVBs, gravity also works by metric compression or contraction; the IVBs are compressive metric particles and gravity is a contractile metric force. Clearly, in the joining of gravity with the "Y" IVBs of the H3 energy density level, we have the phenomenon of quantum gravity, a "metric particle" of enormous density. Gravity and the "Y" IVB make common cause: gravity, the metric, light, and particles are all joined in the final full symmetry of quantum gravity at the H3 Planck energy density level. It is at this H3 level that:

1) the primordial elementary leptoquarks are created/composed with three subunits (the quarks) by the "Y" IVBs (by splitting primordial charged leptons, and/or by assembly from the ambient "quark soup"); 2) particles acquire mass or bound energy (from the doubly compressed metric); 3) the metric and particles impress their characteristics upon one another. This is why the baryon looks like a miniature 3-dimensional cosmos, complete with internal "sticky light" composed of a massless boson field traveling at velocity c (the gluons). This may also be why we have 3 spatial dimensions and three energy tiers of quarks and leptons.

This H3 level primordial "Ylem" is an extremely peculiar state of energy, unlike anything we are even remotely familiar with, because the gravitational field, which contains negative energy exactly balancing the positive electromagnetic energy, is fully contained within the particle itself, not dispersed throughout a spacetime external to the massive particle (since none yet exists). Therefore, the particle contains equal amounts of positive and negative energy within itself, which separates into two components only as H3 decays to H2. During the decay to the H2 symmetry state, the positive component of energy condenses as the particle's rest mass, while the negative component of energy becomes the particle's external gravitational field. The quarks are formed before this separation between particle and gravitational metric takes place, and the particles and quarks are simultaneously imbrued with mass by the enormous compressive forces of the combined "Y" IVBs and the gravitational metric. The unification of gravity with the "Y" IVB is the realization of the union of Quantum Mechanics and General Relativity - "quantum gravity". The decay from the H3 to the H2 energy level (the separation of the gravitational metric field from the leptoquark particle field) may also include the "inflationary" era (?) of expansion envisioned by the theories of Guth and Linde.

The "Y" IVBs create electrically neutral leptoquarks as well as electrically charged leptoquarks, much as a "W" IVB can create a neutron from a proton, producing leptoquark neutrinos as well as other alternative charge carriers in the process. (Leptoquark neutrinos are not produced unless a single leptoquark is actually destroyed.) Leptoquarks may be produced by assembly from the components of a quark "soup", or by "splitting" primordial, massive, charged leptons. In either case, creating electrically neutral leptoquarks is the role of the "Y" IVBs. The neutral leptoquarks are "sent down" to the H2 level, where, due to their (relatively) long life, they are susceptible to the asymmetric weak force decays of the "X" IVBs, producing the baryons of our matter-only universe. It is in these decays that leptoquark antineutrinos are produced, balancing the "hidden" number charge of the baryons. (See: "The Origin of Matter and Information".)

All three families of IVBs are simply representative samples of the dense metric of the Cosmos at a particular force-unification energy level or symmetric energy state of the unfolding, evolving, and cooling (entropy driven) "Big Bang", and each is enabled to perform its particular transformation role by virtue of that fact - it performs whatever transformations are typical of its force-unification energy state or symmetry level - as gauged by the Higgs scalar bosons. The role of the Higgs is to ensure the uniformity of the IVBs and their products, identifying and quantifying the proper energy level for each family of IVBs, such that all elementary particles produced by the IVBs have the same mass whenever and wherever they may be created in the Cosmos. The role of the IVB is to perform transformations appropriate to its specific energy density level or unified-force symmetric energy state. The role of the Higgs boson is to ensure that the IVB is at the proper energy level, or in the correct symmetry state or unification realm for the transformation/creation task at hand. It is because of these careful, quantized, methodical steps that we find ourselves in a conserved material Universe whose components work together - all its parts are in a seamless harmony of interaction and communication - despite its asymmetric condition, consisting only of matter with no corresponding antimatter component.

Rationale for the Weak Force

Why is all this weak force mechanism and hierarchy necessary? Only because the Universe and the weak force is producing asymmetric "singlets" of matter, that is, isolated baryons and leptons of matter that have no antimatter partners with which they can annihilate, cancel their charges, and return to the perfect symmetry of

the light which created them. In the absence of antimatter annihilation partners, the complex and quantized weak force "machinery" is necessary so that energy and symmetry conservation may be fulfilled in an asymmetric Universe composed only of matter. "*The charges of matter are the symmetry debts of light*", and not until the last charge has been canceled will the Universe cease in its relentless quest for symmetry conservation and the fulfillment of Noether's Theorem.

Electrons (or any elementary particle) created today must be exactly the same as elementary particles created yesterday, tomorrow, or eons ago during the Big Bang. The weak force ensures this necessary uniformity by revisiting, via the Higgs scalar and the "W" IVBs, the energy density or symmetric energy state in which electrons and certain other elementary particles were first created, and where their identities are merged. In this regard, the "W" IVBs are "time machines", reprising the high density metric of the "Big Bang" era in which elementary particles originated.

The highest level of symmetry and force unification involves the entire Cosmos, as it is unified with the "Multiverse". The "Multiverse" is here conceived as the collection of all possible Universes, and our particular life-friendly Universe is but one (electromagnetic) subset of these manifold possibilities. It is in the initial distinguishing act, the separation of our Universe from the Multiverse, that the arbitrary values of the physical constants of our life-friendly Universe are determined. These values include such physical parameters as c (the electromagnetic constant), G (the gravitational constant), e (the value of electric charge), and h (Planck's energy constant), among others (including the magnitudes of the several Higgs boson masses and the weak force asymmetry parameter). There is no explanation for the life-friendly values of these physical constants. They are simply arbitrary, random values of one special (life-friendly) universe among the infinitely (?) many possibilities available to the creative energies of the "Multiverse". The "Anthropic Principle" determines the life-friendly values of the physical constants of our universe, because obviously we could live in, experience, and wonder about no other.

The only restriction I can imagine upon the creation of Universes by the energy and activity of the "Multiverse" is that, as in our case, a Universe initially requires no net energy or charge for its creation, and must be able to conserve whatever energy subsequently emerges, if, as in our case, the components should separate into positive and negative halves (positive electromagnetic energy vs negative gravitational energy).

We should finally note that the three energy levels of (hypothetical) Higgs bosons and IVB families are mirrored by the three energy levels of (demonstrated) quark and lepton families. Thus there is "precedent" in the other particle families for this structural and mass hierarchy in the "metric" particle families, even though the "precedent" is itself without explanation. Possibly the "precedent" is related to the 3 dimensions of space either as some sort of fractal resonance, or as a direct reflection of metric structure impressed upon particles at the H3 level of force unification. However, we do have an explanation for the three energy levels of the Higgs and IVBs in the "phase transition" symmetry levels of a hierarchy of force unifications, progressing from "ground state" atomic matter upward to the final symmetry of the "Multiverse". Curiously, as noted earlier, these force-unification symmetric energy states are also reprised in a "rebound" series or parallel hierarchy of gravitationally bound astrophysical states: planets, stars, black holes, and the "Big Crunch". It is because these force-unification symmetric energy states occur at a specific, invariant energy density that they can be represented and accessed by a quantized particle of specific mass-energy such as the Higgs or IVB.

The Birth of the Cosmos

The only way our Universe can be born as a quantum fluctuation from the Multiverse is if its total energy = zero, and its total charge = zero. These criteria can be met through the negative energy of gravitation, and the balancing charges of matter vs antimatter. (See: "The Origin of Matter and Information.)

Initially, when our Universe separated from the Multiverse, it was composed of equal parts matter and

antimatter, and the negative energy present as gravitation was equal to the positive energy contained in all the particles and other forms of electromagnetic energy. Presumably, our Universe in this primordial symmetry state differed from the "Multiverse" only in the specific "life-friendly" values of its physical constants. This is the perfect symmetric energy state of H3, the conjoining of gravity and the spacetime metric with the "Y" IVB family and the other forces and particles. The decay of the H3 state we attribute to an entropic instability. In any case, the "Y" IVBs, aided by gravity, create primordial charged and neutral leptonic elementary particles with three subdivisions ("leptoquarks"). Particles acquire "metric mass" or "bound electromagnetic energy mass" at this critical transition, when gravity, the spacetime metric, the "Y" IVBs, and the leptonic primordial particles (with their nascent quarks) are all fused into a single substance (Gamow's "Ylem").

Because the particles and the gravitational spacetime metric are conjoined when the quarks are formed, particles and the metric share some characteristics. This is why the baryons: 1) appear to be fractured leptons, with partial charges that exactly add up to leptonic charges; 2) appear to be miniature universes, with an internally contained massless field of "sticky light" moving at velocity c - the gluons. In addition, the three families of quarks and leptons may also be a fractal reflection of the 3 spatial dimensions (the physical result of the fusing of the metric with particles during the H3 full-symmetry Planck Era). Finally, the quark "triplet" may be the consequence of the primordial leptonic subdivisions fracturing, aligning with, or otherwise organizing themselves along the "cleavage planes" of the three spatial dimensions (with the help of the "Y" IVBs).

Following the creation of the primordial leptoquarks - and perhaps because of it - the gravitational metric separates from the particles, in the sense that it becomes external to the particles, rather than wholly contained within them. The gravitational metric field remains centered on particles, however, as the gravitational metric must have a central focus (where the field sums to zero) to balance its own energy accounts. In this separation, all the positive energy remains with the electromagnetic energy forms, and all the negative energy remains with the gravitational metric, but the two remain exactly balanced in magnitude, despite their physical separation. This separation of field and particles and "spontaneous" decay from H3 to H2 energy levels may correspond to the "inflationary" era of Guth and Linde, as noted earlier.

In the subsequent H2 state (the Leptoquark Era), we find the "X" IVBs mediating the asymmetric decay of electrically neutral antileptoquarks, while their leptoquark partners escape to become hyperons (heavy baryons), as their quarks expand to reveal their conserved and stabilizing color charge (leptoquark antineutrinos produced in these reactions are candidates for "dark matter"). Only electrically neutral particles could undergo such an asymmetric weak force decay, which is the reason why the quarks have to be formed in the beginning if matter is to be produced in the end. The partial charges of quarks can be arranged to produce electrically neutral composite leptoquarks and baryons (such as the familiar neutron), whereas the elementary leptonic spectrum, the electron, muon, and tau, are all electrically charged. Can a super-heavy lepton exist higher in the energy profile of the leptonic particle spectrum? Yes - it is precisely the leptoquark, produced by the combined action of all the forces and the "Y" IVB, in both electrically charged and neutral forms. The origin of the asymmetry in these neutral "X" IVB decays is unknown. It is evidently a property of the "X" IVBs (similar asymmetries are known in the "W" IVBs), but I have also seen the opinion that it is a consequence of the 3-family structure of the elementary particles. During the annihilation reactions between leptoquarks and antileptoquarks, all are destroyed and converted to photons except for one surviving (neutral) leptoquark per ten billion matter-antimatter particle pairs. (See: "The Origin of Matter and Information".)

The "Accelerating" Universe

As the Universe evolves, its content of matter is slowly converted to light by various processes, especially in the stars and quasars. Photons are perfectly symmetric energy forms and have no associated gravitational field. Moving at velocity c, photons are "non-local", and as such cannot provide the necessary center for a

gravitational field. (See: "'Dark Energy': Does Light Produce a Gravitational Field?".) Consequently, the total gravitational field of the Cosmos is slowly diminished, producing the impression that the Universe is actually expanding at an accelerating rate. If "dark matter" exists, and also is slowly being converted to light in accordance with the universal symmetry conservation laws, this will only add to the total effect. The "repulsive drive" of the so-called "dark energy" of the Cosmos is therefore here interpreted as simply the "rebound" of spacetime as its total gravitational field is diminished by the universal conversion of bound to free energy.

A potential problem with this explanation is this: if gravity is a form of energy, then by energy conservation it should not be possible for gravity (or gravitational "negative energy") to simply vanish. However, we are treating gravity as a form of charge, a symmetry debt acknowledging the non-local distributional symmetry of light's energy, which is obviously broken by the local concentrations of mass-energy in immobile, undistributed, bound forms of electromagnetic energy (atomic matter). Symmetry debts and charges can indeed vanish, when they are paid in full. The gravitational charge or symmetry debt is satisfied, paid, or discharged when bound energy (mass/matter) is completely converted to free energy (light). This is the fundamental reason why the negative energy of gravity is so strange and unlike other forms of positive energy: gravitational negative energy is the binding energy of a charge, expressed in metric, dimensional, or inertial terms. (See: "A Spacetime Map of the Universe.")

The Miracle of Mass

When we think about the fact that we find in nature two different paths for the creation of the same particles, one symmetric and due to the operation of the electromagnetic force (the creation of particle-antiparticle pairs), and one asymmetric through the weak force, we can readily appreciate that these two forces might be joined in the "electroweak unification", and additionally, that the world we live in is apparently of a very special type. For if we can explain the creation of particles by the weak force, then we cannot understand how the electromagnetic force also manages the same feat - excepting for a most remarkable "given" characteristic of the spacetime metric - its ability to create particles from light or pure energy. This latter must be the more primitive condition, from which the weak force acquires its ability to create invariant, single particles.

We can understand that the weak force operates in special circumstances, because it only creates "singlets", isolated particles without antiparticle "mates", and so must recreate the original conditions of energy density in which such particles were first produced during the "Big Bang". The constraint of universal mass invariance among elementary particles whenever and wherever they may be created is the reason why the massive Higgs boson and IVBs of the weak force are necessary, even to create the lowly electron and/or its neutrino. We can also appreciate that the mass of the "W" IVBs, which we think of as highly condensed and bound spacetime metric (in fact, as a representative sample of the original symmetric energy state of the primordial electroweak force unification era), may be necessary to create and hold invariant even the tiny mass of the electron. But we also see that electrons (and quarks in mesons) are readily created in particle-antiparticle pairs by the electromagnetic force without the help of the massive IVBs. So apparently the IVBs (and the Higgs) are necessary not to create particle mass, but only to *ensure the invariance* of elementary particle mass, due to the special circumstances of "singlet" creation, in which particles cannot be balanced and referenced against antiparticles.

However, both the weak and electromagnetic forces create particles from a common source, the spacetime "vacuum" or Heisenberg-Dirac metric "zoo" of particle-antiparticle pairs. We must credit this common source of "virtual particles" - the universal "vacuum" metric of spacetime - as the reason why these two different forces can create identical particles via different pathways. Thus when all forces combine to produce leptoquarks at the H3 energy level, the capacity to produce both leptons and quarks is already contained within the compressed metric structure. It is this structural potential (whose ultimate purpose is energy and symmetry conservation in both spatial and temporal realms) that is organized by the "Y" IVBs into charged

and neutral leptoquarks. (See: "The 'W' IVB and the Weak Force Mechanism".)

We understand charge as a temporal solution to the problem of symmetry conservation (during the conversion of spatial light (free electromagnetic energy) to temporal matter (bound electromagnetic energy)), and mass as a solution to the problem of energy conservation during the same conversion/transformation. Gravitation is likewise the solution to the problem of entropy conservation/conversion, transforming the intrinsic motion of light (the spatial entropy drive of free energy) to the intrinsic motion of time (the historical entropy drive of bound energy). All three processes are obviously linked during the conversion of massless, chargeless, timeless, non-local and gravity-free light with intrinsic (entropic) spatial motion "c", to massive, charged, local, gravitating bound energy with intrinsic (entropic) historical motion "T".

We can understand the creation of charges (and spin) in particle-antiparticle pairs readily enough, because charges are always created in self-canceling or balancing pairs that sum to zero. But the creation of mass is not so readily comprehended, because there is no "antimass": both particle and antiparticle carry positive quantities of mass. Nevertheless, matter and antimatter will annihilate each other completely due to their opposite charges, restoring the metric and "non-local" distributional symmetry of the light which created them. *The charges of matter are the symmetry debts of light* - Noether's Theorem.

But what is mass and how is it created? It seems that mass, in most cases (including such exotic particles as the IVBs of the weak force), is just a bound form of light or electromagnetic energy mixed with the spacetime metric, usually associated with some form of symmetry-conserving charge and spin. When the "W" IVBs create "singlet" particles they are, through their mass, recreating a primordial condition or symmetric energy state of the spacetime metric (the electroweak force unification era), and when the electromagnetic force creates massive particle-antiparticle pairs, it does so in the current spacetime metric of the ground state electromagnetic force unification era. The spacetime metric is always involved in one way or another or one form or another in the creation of massive particles, and quite obviously no massive particle has ever been created outside the boundary or regulating presence of spacetime.

While we can invoke plausible rationales and roles for the IVBs and the Higgs particle in the case of "singlet" particle creation (the necessity for universal invariance in the mass/energy parameters of elementary particles), in the case of the creation of particle-antiparticle pairs by the electromagnetic force (or its derivative, the strong force), we can only invoke the special properties of spacetime itself. Spacetime has the ability, and indeed the propensity, to convert free forms of electromagnetic energy (light) into bound, massive forms (particles), carrying various charges, spin, time, and gravitation as the several conserved forms of the energy, symmetry, and entropy of light. It is simply one of the "given" ("anthropic") special properties of our universe, that its spacetime metric will assume both free (spatial) and bound (temporal) (wave and particle) forms of electromagnetic energy. Time and gravitation are part of the special entropic properties of our dimensionality (part of its conservation mechanism) which permits the existence and ready creation of massive, quantized, particulate, temporal, and conserved forms of electromagnetic energy from spatial, free forms of electromagnetic energy. It is this fundamental duality in the expression of its electromagnetic energy content by our Cosmos which permits our material existence and experience - spatial light and its temporally conserved form, matter.

Of course the ability to form particle-antiparticle pairs is not unique to the electromagnetic ground state energy level, but exists at all energy levels of the force unification hierarchy (because the spacetime metric exists in some form at all energy levels). In the ground state, this ability has been reduced to a "virtual" residue or potential, a fleeting reminder of past glories, which nevertheless may be called upon or awakened at any time by a sufficient application and concentration of energy. The creation of particles or bound energy forms by the interaction of light (free electromagnetic energy) with the spacetime metric or Heisenberg/Dirac "vacuum" remains among the greatest miracles of nature, a "given" or "anthropic" property of our Universe which may remain forever unexplained. (Possibly there is some sort of dimensional or topological

entanglement or "knotting" between electromagnetic energy and the spacetime metric - as in the theory of "strings".)

Direct interaction between our electromagnetic ground state and the electroweak force unification energy level occurs in radioactive decay and element-building in stars, through the participation of virtual particle-antiparticle pairs in the nuclear transformations which characterize both processes. Because of our dependence upon solar energy, we have a special connection to the electroweak energy level through daily experience, a familiarity we do not enjoy with processes typical of the higher Higgs energy levels (such as proton decay or the creation of quarks). (The weak force is crucial to element-building in stars because protons must be converted to neutrons (via the "W" IVB) before strong force fusion can take place.)

The role of virtual particle-antiparticle pairs in the transformation of atomic nuclei via the "W" IVB family level is a fine example of the practical effect of electroweak unification. Our electromagnetic ground state maintains contact with higher force-unification energy levels via its retention of the ability to create any particle-antiparticle pair or weak force boson of any Higgs level, given a sufficient input of energy. Thus the importance of the presence of virtual particle-antiparticle pairs in the electromagnetic ground state Heisenberg/Dirac "vacuum" of spacetime can hardly be overestimated. Without them the Sun itself would be extinguished and element building in stars would cease. Contact between the electromagnetic ground state and higher force-unification energy levels would be limited to gravitational interactions, such as in and surrounding black holes.

It must be understood that the Sun is not itself an example of the electroweak force unification era or energy level. However, the "W" IVBs are such examples, and because the Sun (and other stars) provide a superabundant locus for "W" IVB activity (due to element-building and the transformation of nucleons in their cores), stars can at least be seen as connections to, if not gateways between, our electromagnetic ground state and the next higher symmetry realm or energy level of electroweak unity (the "W" itself is such a gateway). The same can be said for the radioactive elements and minerals. Interestingly, whereas the lodestone's mysterious "lines of force" provided clues to the electromagnetic unification, radioactive minerals' mysterious "rays" provided clues to the electroweak unification. Indeed, the electromagnetic and electroweak eras are well connected, as the transformation of nucleons involves the crucial participation by particle-antiparticle pairs from our electromagnetic ground state "vacuum", as well as the massive IVBs and Higgs of the electroweak energy level. (See: "The 'W' IVB and the Weak Force Mechanism".)

Our Sun represents a closed symmetry circuit, but only at the electroweak energy level, which means the Sun is limited to the creation and destruction of leptonic matter (although it can also transform quarks and baryons). Hence a neutron star is the (macroscopic) end state of this electroweak conversion or symmetry conservation circuit. To go further, we must climb to the next energy level at which baryons themselves can be created or destroyed, the GUT or leptoquark force unification energy level, represented in our ground state spacetime by black holes and proton decay (in the same sense that the Sun and radioactivity represent contact with the electroweak era). Proton decay (in my view) is commonplace inside black holes, converting quarks, baryons, and the internal mass of black holes to gravitationally bound light. Outside black holes, in the phenomenon of "Hawking radiation", we once again find that particle-antiparticle virtual pairs of our electromagnetic ground state vacuum are crucially involved in another higher level "gateway" to, or connection between, the several force unification energy levels (or symmetry eras) of the Cosmos. Hence while the Sun radiates at the gateway to the electroweak unification era, the black hole radiates (supernovas, quasars, and Hawking's "quantum radiance") at the threshold to the GUT unification domain, and the Big Bang radiates (now seen as the 2.7K cosmic background radiation) at the entrance to the TOE and Multiverse unification realm. Our Cosmos is a fully connected whole, even with respect to its evolutionary history. We live indeed within a "Uni-verse".

References

Gross, Politzer, Wilczek: *Science:* 15 October **2004** vol. 306 page 400: "Laurels to Three Who Tamed Equations of Quark Theory."
Mee, Nicholas: *Higgs Force* The Lutterworth Press 2012
Close, Frank. *The Infinity Puzzle*. 2011. Basic Books.
Sean Carroll: *The Particle at the End of the Universe*, Dutton, 2012
Guth, A. 1997. *The Inflationary Universe*. Helix Books, Addison-Wesley, Inc.

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