

Alternative Charge Carriers and the Higgs Boson: Part II

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Abstract

A functional class of particles, the "Alternative Charge Carriers" (ACCs), is recognized as characteristic of the Electroweak domain and the Weak Force Intermediate Vector Bosons (IVBs).

We live in a universe dominated by electromagnetic energy. Atomic matter is only a bound form of light, as shown by matter-antimatter annihilations, the conversion of mass to light by the Sun and stars, high energy particle collisions at CERN, Fermilab, etc., and the equations of Einstein, Planck, and deBroglie ($E = m c^2$, $E = h \nu$, $h \nu = m c^2$).

In this paper we are interested in the origin of baryonic matter and its subsequent fate (baryons are heavy nuclear particles composed of three quarks, like our "ground-state" protons and neutrons). Of special interest is the role of the Higgs boson and the weak force IVBs (Intermediate Vector Bosons, the field vectors or force carriers of the weak force). We envision the origin of our universe as a pulse of light (free electromagnetic energy) emanating from a Multiverse (not unlike the Genesis creation story). The Multiverse essentially serves as a "scientific" or rational version of an absolute, universal, creative Deity. "Multiverse" (as I use the term) refers to the domain of all possible universes, of which the "set of all possible electromagnetic universes" may comprise but a single energetic "genus". We use the concept of the Multiverse to afford a "rational" explanation for the "Big Bang" origin of our universe and its many "life friendly" physical laws and delicately balanced constants.

We know that free electromagnetic energy (light) exists in two forms: 1) a pure 2-dimensional transverse wave form of radiant energy traveling freely in spacetime with "intrinsic" (entropic) motion "c"); and 2)

a "virtual particle" form composed of pairs of matter/antimatter particles (such as electron/positron virtual pairs) which incessantly form, then annihilate each other in a symmetry-conserving cycle (Heisenberg/Dirac virtual particle-antiparticle pairs). In the early high-energy universe, these matter/antimatter particle pairs were "real" rather than virtual.

Light is the most symmetric form of energy known, having no mass, no time dimension, carrying no charges, having no location in spacetime (light is "non-local" and a-causal), and [producing no gravitational field](#) (when in free flight). Because real (rather than virtual) particles have an asymmetric (one-way) time dimension, carry mass and hence produce a metric-warping gravitational field which identifies their spacetime location (particles are "local" and causal), and furthermore carry various charges, particles represent an asymmetric form of bound electromagnetic energy. Hence when light is converted into particles - as happened during the "Big Bang" birth of our "matter-only" universe - there results an enormous reduction in the symmetry of the energy so converted. According to "[Noether's Theorem](#)", the symmetry of electromagnetic energy must be conserved no less than its total energy, so there are numerous conservation consequences to such a conversion: *The charges of matter are symmetry debts of light.*

Matter/antimatter annihilations are symmetry conserving/restoring, returning the asymmetric, bound particle form of energy to the symmetric free wave form (light) which originally created it. Free electromagnetic energy is able to exist in two forms (wave and virtual particle pairs) only because the essential symmetry of light is maintained via continuous matter/antimatter annihilation of the virtual pairs.

It is easy to see that the potential for manifestation exists within these two forms of electromagnetic energy, especially in the high-energy early universe when the particle-antiparticle pairs are real. Furthermore, it is easy to see that the symmetry of light and its constantly forming and annihilating particle/antiparticle pairs must somehow be broken if the Cosmos is to manifest in terms of elementary particles, atoms, planets, stars, galaxies, life, etc. During the "Big Bang", the potential to create baryonic matter from high-energy light was realized, probably through a weak force asymmetric decay involving electrically neutral "leptoquarks" ([a leptoquark is the heaviest member of the "leptonic spectrum"](#)), in which anti-leptoquarks decayed faster than leptoquarks, leaving the latter to become the baryons of our "matter-only" universe.

[I suggest a \(speculative\) pathway](#) in which high-energy electrically neutral leptoquarks decay asymmetrically via the weak force "X" IVBs to produce the hyperon/baryon excess of our "matter only" universe. This pathway also addresses the relationship between leptons and quarks (quarks are derived from split, primordial, heavy leptons (= leptoquarks)), and the conservation of baryon "number" charge via leptoquark antineutrinos, suggesting the latter constitutes the mysterious "dark matter". The reason for the "three families" or energy levels of particles (as in electron, muon, tau) is also discussed in terms of the production of sufficient numbers of electrically neutral leptoquarks to create the quantity of matter (galaxies) we observe. However, the actual mechanism of the asymmetric decay of primordial electrically neutral leptoquarks remains a mystery: (why do anti-leptoquarks decay faster than leptoquarks?).

In this paper we are interested only in the fate of baryons (including "hyperons" or heavy baryons) after the asymmetric events of the "Big Bang" have produced the matter excess of our universe (including a leptoquark antineutrino excess - the presumed mysterious "dark matter" complement). We are born into a world of baryons (the protons and neutrons of the Periodic Table of the Elements), and live in the

electromagnetic (chemical) "ground state" of the electroweak domain. The electroweak domain includes the nuclear energies of the Sun and stars, whereas biological life is possible only in the chemical energy domain of the atom's electron shell, and the gentle gravitational embrace of planets like Earth.

Of course our "matter only" cosmos constitutes a universal state of asymmetry ("original sin"), which has major consequences for our material world - the charges and forces of matter for instance, including local (stationary/causal) mass, time, and gravitation (death and taxes). The universal drive to restore the symmetry of our matter-only universe is its primal motivating force - matter's eternal search for antimatter (via electric charge and gravity).

The charges of matter are symmetry debts of light. These symmetry debts must be maintained in full force until they are repaid completely, but symmetry debts (in the form of conserved charges) have a singular virtue (from a human perspective), in that they give the universe a time/historical dimension (buy now, pay later), whereas energy debts are not so forgiving (buy now, pay now - as in the case of virtual particles). *The important concept of "Information" in the Cosmos* (which exists primordially as "charge" and manifests crucially and spectacularly in the Periodic Table of the Elements), may be seen as nothing less than matter's guide and road-map back to antimatter and the symmetry of light. "Information" would appear to be the rational concept closest to our intuitive notion of "spirit", and Information is also a conserved property in physics.

Elementary Particles

There are only three known massive elementary leptonic particles (electron, muon, tau), although a primordial fourth (the leptoquark) probably existed at the very beginning of the Cosmos. These massive leptonic particles exist in an energy series, with the electron the lightest and the (putative) leptoquark the heaviest. I refer to this series as the "leptonic spectrum" of elementary particles - many other particles (neutrinos, quarks) are derived from this primitive spectrum, which is obviously some sort of "harmonic" series. The massive leptons are accompanied by the (nearly) massless neutrinos, a separate, matching neutrino for each species of massive lepton. Neutrinos serve as "Alternative Charge Carriers" ("ACCs") for the *identity charges of the massive leptons*. The neutrino identity charges are how we know the leptonic spectrum is truly elementary - the sub-elementary quarks have no associated neutrinos. (Leptoquark neutrinos encoded the primordial leptoquark number charge before the quarks separated from one another, and hence now encode baryon number charge, which subsumes the partial number charges of the quarks.)

It is a remarkable fact, little appreciated, that every electron in the universe (and there are a lot of them!) is exactly like every other - and likewise all other elementary particles are identical (within type) one to another. How is this accomplished - not only eons ago but yesterday, today, and on into the indefinite future; and in reactions producing *single* leptonic particles, not just particle/antiparticle pairs? Obviously, some universal regulatory mechanism is at work, keeping the universe simple and precise, at least in terms of its elementary particle content. Establishing ("gauging") and maintaining the uniformity of the "particle metric" is the (very necessary) regulatory role of the Higgs boson and the weak force IVBs. Every electron must be able to "swap out" with every other electron, no matter when or where it was created, and similarly for all other elementary particles (within type). While "swapping" is a symmetry-maintaining interaction, the same considerations apply to annihilation reactions with anti-particles, the ultimate symmetry-conserving interaction. The uniformity (within type) between all elementary particles is a universal symmetry embedded within the even greater *asymmetry* of our "matter-only" universe, and it is apparently due to the regulatory action of the Higgs boson, its associated IVBs, and the *weak force creation/transformation mechanism generally*.

The regulation of decays and interactions among and between baryons is due to the action of the weak force IVBs (Intermediate Vector Bosons) and their agents, the Alternative Charge Carriers (ACCs). The IVBs access or "sample" the ACCs within the Heisenberg-Dirac virtual particle domain of spacetime (leptons, neutrinos, mesons), and use these to regulate baryon interactions (such as hyperon decay, or neutrons decaying into protons, or the reverse). (See: "[The "W" IVB and the Weak Force Mechanism](#)".) Carbon atoms (nuclei) created in our galaxy today are the same as those created in any other galaxy or cosmic era, because the Higgs boson, the IVBs, and the ACCs are the same everywhere and everywhen. The Higgs boson is the same universally because it marks the convergence of the weak and electromagnetic forces, a universal constant. The convergence of these two forces allows movement and identity, and hence the possibility of conservation for the charged leptons. Leptons cannot exist by themselves, however, because they cannot escape their own matter-antimatter symmetry (and consequent annihilation). For that, the quarks and the strong force must be added to the mix ([via leptiquarks](#)), as the partial charges of the quarks present the possibility of electrically neutral particles (such as the neutron), which can live long enough to undergo [asymmetric weak force decays](#).

Because baryons (composite particles consisting of three quarks like protons and neutrons) are massive (heavy), they produce a [significant gravitational field](#) which, because it is universally attractive ("warping" the spacetime metric itself), builds all the megastructures of the Cosmos (planets, stars, galaxies, etc. - see: the [gravimetric series](#)). In the stellar furnaces (and supernovas), all the elements of the Periodic Table are built (of baryons) and dispersed. Hence baryons control both the mega- and the micro-architecture of the universe, and because they also control the electron shell structure of atoms (via the positive charges of protons), they are the foundation of the [Information Pathway](#) leading to life and consciousness. In addition to our life depending upon the cooler and gentler chemical regions (hydrogen bonds, etc.) of the electromagnetic ground state within the electroweak domain, we also depend upon the gentler gravitational conditions near the bottom of the gravimetric series (planets with atmospheres). Life is both precious and fragile. (Of course, we also depend (for heat and light) upon the high-energy nuclear reactions of our sun - safely removed 93 million miles.)

Gravity, as a negative energy "well", also profoundly affects baryons in stars (where they combine to build the elements of the Periodic Table), and in the "condensed matter" states of white dwarfs and neutron stars, and ultimately in black holes, where baryons finish their extraordinary journey through the Cosmos, having built not only the planets, stars, and galaxies, but life itself. Baryons return to light through "Hawking radiation", which, because time stands still in a back hole, is an explosive event from the perspective of the black hole's "event horizon".

Postscript II:

The huge, anomalous masses of the IVBs and the Higgs boson (80, 90, 125 proton masses) tells us that these particles are not part of our ground-state electromagnetic world, not even part of the domain of our atomic nuclei, at least not in their normal ground state. The IVBs must come from an earlier, much more primitive era, smaller, hotter, and far more energy-dense than our own, probably only a few micro-moments removed from the "Big Bang", during the time when massless, free electromagnetic energy (light) was somehow being converted to massive, bound particles of electromagnetic energy ([leptons](#), [quarks](#), [leptiquarks](#)). How this was done [remains a mystery](#): massless, a-temporal, 2-D photons with intrinsic/entropic spatial motion "c" were converted to massive, temporal, 4-D particles with no intrinsic spatial motion but with (in compensation) an intrinsic/entropic motion in time. Whatever this conversion mechanism may be, it operated only in the very early universe at very high temperatures and energy

densities. However, a (virtual) remnant of this early conversion force can still be found today, making real transformations and creating/destroying *single* elementary particles from the virtual particle "sea" by the mediation of electroweak IVBs (W^+ , W^- , Z neutral).

People find it hard to believe that the Higgs or IVBs are real particles or part of an actual mechanism; but that is because these particles are not in fact "real" today - they were "real" ages ago in the early universe. The Higgs and its associated IVBs are only virtual particles and processes today - although they still cause real transformations. (They can be made real again today, but only if we supply them with enough energy in our big "atom smashers" - recreating their original environment.) Very early in the history of our universe, the Higgs emerged to define our electroweak domain, with its IVBs and associated ACCs and other EW particles - following on from even earlier domains, earlier and other Higgs, and earlier and other IVBs, which had created baryons and leptoquarks and our [matter-only asymmetric cosmos](#). All these choices were constrained by conservation considerations: these are the particles, forces, charges and fields which can be conserved - returned to the light and Multiverse which created them. We don't see the Higgs anymore, because its work was done in the very early universe, even before the IVBs appeared. We need only go back as far as the IVBs (in virtual interactions) to perform nuclear transformations. The selection (by the Higgs) of the electroweak convergence energy and its associated IVBs predates any less massive particles, and we just don't need to see them anymore in our ground-state EM universe - their work has already been accomplished (unless a nuclear transformation is required, or a new *single* elementary particle needs to be minted).

The huge masses of the Higgs and IVBs reprise the energy-density of the early Cosmos, even before the time the ACCs were first being created. The Higgs "gauges" and recreates the electroweak "symmetric energy state", the energy at which the weak and electromagnetic forces converge. At this energy, all lepton species are merged into a single leptonic "genus", and likewise, the quark species are merged into a single quark "genus". These two "genera" do not mix at this level - they mix only at the next higher (earlier) level, the level of the "GUT" or "Grand Unified Theory", where the strong force joins the electroweak force in a three-way convergence. (See: "[The Higgs Boson and the Weak Force IVBs](#)"). The IVBs are able to make identity transformations among the elementary leptons and quarks because individual species identity is fluid within the generic "symmetric energy state". Today, (virtual) IVBs, because of their similar mass-energy, are able to access this "vacuum" particle pool and take what they need to effect (real) transformations. These IVB-mediated interactions essentially connect the early with the modern-day universe, ensuring that every electron (for example) created today is identical to those created eons ago in the "Big Bang" - maintaining a necessary and universal symmetry among elementary particles (within type). The same mechanism that made the first electrons makes electrons today. This is how the entropic forces of 14 billion years of spatial and historic expansion, cooling, and decay are circumvented.

Postscript III:

In a financial analogy describing the function of the weak force transformation/creation mechanism, the Higgs boson is like the top official of a government mint, deciding what coins will be struck, using what metals and what images, and in what denominations and weights. The IVBs are like the heavy currency presses; and the virtual particle "zoo" of spacetime is the mint warehouse where the raw materials and the dies for the presses are stored. A heavy IVB accesses a significant part of the energy regime of the Higgs domain (because of their similar masses), specifically that energy density at which the particle it seeks to replicate was first created. The mint warehouse supplies the IVBs with the proper weight of raw material for the particle it will stamp out - the same material and weight that created the first particle of

its type, and that will also create the last. The heavy IVB reproduces the primordial energy density of the universe when the required particle was first created, and finds therein a virtual particle (the "die" from the spacetime "particle metric" or "mint warehouse") of the original type and energy to exactly reproduce the particle it seeks. By this means (the invariant mass or energy-density of the IVBs, plus the invariant particle "zoo" of the spacetime "vacuum"), the universal and necessary symmetry (sameness) among elementary particles is maintained throughout the eons of the Cosmos.

1) The ultimate function of the Higgs boson is therefore to provide an invariant source of particles of a given type and energy (the "Bureau of Standards" role). This is possible because the Higgs is a scalar boson marking or "gauging" the confluence of two natural forces, the electric and weak. This convergence will be at the same energy everywhere in the universe and for all times. Furthermore, because the Higgs itself is a particle, or form of bound energy, it is impervious to the entropic expansion of the universe over time, and its energy-density can be well defined (quantized). The Higgs simply sets a universal standard to which the IVBs must rise. (The IVBs must have the correct mass-energy to fish in the Higgs virtual particle "sea"). In turn, the IVBs supply universally invariant (single) elementary particles to reactions, transformations, and other interactions they mediate. It should be reasonably obvious, from the standpoint of energy and symmetry conservation, why all elementary particles (of a given type) must be identical. Electrons produced today (for example) must be able to seamlessly exchange places with those created eons ago during the "Big Bang", or annihilate at any time or place with an ancient positron (antiparticle) .

2) The true function of the IVBs is to extract *single* particles (the ACCs) from the Higgs virtual "sea" ("warehouse"), and provide them as needed to the reactions/interactions (the daily commerce) of the material content of the Cosmos, not only as it (quickly) cascades from the "Big Bang" to its ground state, but also as it (slowly) seeks to repay the symmetry debt engendered by its matter-only condition ("original sin"). Nature, in [obedience to Noether's theorem](#), spontaneously converts asymmetric massive, bound forms (particles) of electromagnetic energy to symmetric massless free forms (light) - the ongoing work of the stars and our life-sustaining Sun. (See: "[The 'W' IVBs and the Weak Force Mechanism](#)"; See: "[The Higgs Boson and the Weak Force IVBs](#)"; See: "[The Solar Archetype](#)"; See: "[A Theory of Everything: A General Systems Perspective](#)".)

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