OVERVIEW Of THE SYSTEM

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Our universe probably began as an offshoot or "bud" of the "Multiverse"; the latter, as usually envisioned, is truly eternal and infinite, the "scientific" (or "rational") substitute for typical metaphysical notions of "God". The "given" physical constants of our universe which cannot be derived from first principles (such as the value of "velocity c"), find their origins quite naturally in the Multiverse. All else (in the abiotic realm) can be explained through general considerations of energy and symmetry conservation (Noether's Theorem), or, in the biotic realm, by Darwin's Theory. It is to be noted that in a truly infinite Multiverse (or one that is otherwise "sufficiently large"), difficulties associated with probability/improbability and time (or lack thereof) simply do not apply. The only limitations that would seem to restrict productions from the Multiverse are due to certain conservation laws (Energy, Entropy, Charge, Causality, etc.).

We associate four basic or "cardinal" attributes/characteristics with the concept of either "God" or the "Multiverse": Energy, Information, Conservation, and Creativity. These furthermore describe a state or plenum of superabundant supply of any measurable thing or parameter (such as atoms, planets, stars, galaxies, metrics, energy, etc.).

Space and history are entropic domains (expanding, cooling, aging, decaying) serving energy conservation for free and bound forms of electromagnetic energy (light and matter). Spacetime is a compound entropic domain serving both free and bound forms of electromagnetic energy simultaneously; space is created by the intrinsic motion of light but spacetime is created by gravity. "Velocity c" is a state of symmetry, on one hand vanishing the asymmetric dimension of time, on the other hand maintaining the causal integrity of the universal metric (Einstein's "Interval"). Gravity is a negentropic spacetime force arising from the intrinsic motion of time (time is an alternative entropy drive necessarily associated with any form of bound energy). Gravity creates time from space and vice-versa. Gravity transforms the expanding entropic domain of space and light (free electromagnetic energy) into the alternative expanding entropic domain of history and matter - and the reverse (as in stars). The gravitational constant G regulates the metrical transformation of space into time and vice-versa, per unit of mass (Gm). History is a necessary (for reasons of energy conservation) alternative entropic domain for mass because bound energy cannot move with intrinsic (entropic) motion "c", and therefore cannot participate in light's expanding spatial entropic domain. Mass moves with "intrinsic" (entropic) historical motion "T" instead, the metric and entropic equivalent of spatial "velocity c". Hence time flies but diamonds are forever. Gravity withdraws space from light's entropic domain to create time, funding matter's historic entropic domain at the expense of space.

Space is gravitationally annihilated at the center of any mass, where it is converted to a metrically equivalent temporal component (recall that "space" is really "spacetime"). Time escapes at right angles to space (via its "intrinsic", entropic motion), into the alternative entropic conservation domain of history, in the process pulling more space into the center of mass, where it is again annihilated to produce yet another escaping temporal unit, etc., etc., etc. The process is reversed in stars where both mass and space are annihilated, producing light, space, time, and spacetime. These, and the following, are some of the concepts necessary for the development of a

"Unified Field Theory". (See also: "A Spacetime Map of the Universe".)

The positive energy of our universe is balanced by its negative gravitational energy, and the universe is overall charge neutral, as it was from the beginning. The Multiverse is therefore not diminished by the creation of our universe (this will be a restrictive requirement for the creation of any universe from the Multiverse). The creation of our Cosmos is evidently due only to the positive force of the Creative Energy resident in the Multiverse. Our universe is grossly asymmetric in that it consists of matter only, its original antimatter complement having been destroyed by the matter-antimatter annihilation explosion that was the "Big Bang". This primordial asymmetry is necessary for our universe to exist at all (otherwise it would be only photons), and is the single most significant fact of our existence, having the most explanatory power (including the origin of quarks, gluons, neutrinos, the relationship between leptons and quarks, dark matter, time, gravity, charge, etc. - see: "Table of the Higgs Cascade".) *The charges of matter are symmetry debts of light*.

Matter-antimatter particle-pairs bear strictly opposite charges (of every kind) solely to allow them to annihilate each other, returning to the all-symmetric state of light from which they were created. For this reason the charges of either particle or antiparticle (in isolation) are referred to as symmetry debts of light - debts which are held forever by the principle of charge conservation until such time as they are fully paid by reunion (and annihilation to light) with their appropriate anticharge. (See: Noether's Theorem regarding symmetry conservation, of which charge conservation and particle-antiparticle pair creation and annihilation are preeminent examples.) The unification of the "four forces" is found through the unity of their charges (field vectors) under Noether's Theorem - they all (including gravity) represent symmetry debts of light. (See below.)

Black holes exist as the final resolution of the primal asymmetry ("original sin") of our "matter only" universe. Protons are destroyed at the central singularity of black holes (via "proton decay" and the "X" IVB?), returning the "baryon number charge" of the universe to its original value of zero. "Hawking radiation" can then finish the job and transform the entire asymmetric mass of the black hole to all-symmetric light - in final and complete satisfaction of Noether's Theorem of symmetry conservation. ("Baryon number charge" is balanced in the present universe by heavy leptoquark antineutrinos, the probable source of "dark matter".)

"Dark energy" is gravitational in origin, arising from the destruction of both mass and its associated gravitational force in stars and other astrophysical phenomena/processes (including black holes) that convert gravity-producing mass to non-gravity-producing light. The universe expands faster as its gravitational energy content is reduced (via the aforesaid universal symmetry-conserving forces which convert mass to light). The acceleration of cosmic expansion is the observational evidence that light, moving freely in space at "velocity c", does not produce a gravitational field.

The "leptonic spectrum" consists of the electron, muon, tau, and probably the leptoquark, in ascending order of mass. There is a (nearly massless) neutrino associated with each massive lepton, and taken together with their antiparticles, this leptonic family contains the only known truly elementary particles. Furthermore, because the leptoquark is the source of all the quarks, (and therefore the source of all mesons and baryons), the leptonic spectrum provides the foundation for the entire material (atomic/elemental) content of the cosmos - stars, galaxies, humanity. This is sufficient reason to select the Leptonic Spectrun for special attention in our overview of a "Theory of Everything": what is the "Leptonic Spectrum"?

It seems fairly obvious that the leptonic spectrum is some sort of resonant or harmonic series, in this case a series created by the interaction of two fundamental forces, the electromagnetic and weak forces, as they engage one another at successively greater energies. The neutrinos are the evidence of the presence of the weak force. The electromagnetic force provides the energy (and electric charge) for the mass of the particles (e=mcc), while the weak force provides their *identity* in the form of a "hidden" charge. In other words, the weak force differentiates the nodes of the resonant series (neutrinos are explicit, "bare" identity charges). Hence we have an energy field interacting with an *information field* to form the elementary particles of our universe, with the most basic information "bit" the identity charge, carried in its free, bare, and explicit form by neutrinos. The massive leptons themselves carry identity charges in "hidden" form; these hidden charges are always balanced by free neutrinos/antineutrinos. That this is as it must be is seen upon consideration of the problem of conservation: these particles (and the energy they contain) cannot be conserved unless they have (at least) an identity. (For example, annihilation with an antiparticle will require (at a bare minimum) opposing identities for the participants. Likewise, replication of a particle (or antiparticle) will require an identity.) Some will see an analog of the human "soul" in the identity charges of leptonic elementary particles.

Only the truly elementary particles (the massive leptons) have associated neutrino identity charges; quarks have none, as they are actually *sub-elementary*, and baryons/mesons have none (*that are as yet known*), as they are compound particles composed of quarks. However, I presume that (a single species of) leptoquark neutrino/antineutrino provides an identity charge for all baryons and the quarks they contain, but these have yet to be seen (because "proton decay" has yet to be seen). As noted earlier, the leptonic spectrum and their associated neutrinos are of special interest because they provide the absolute "bedrock" of our material universe - including humans. Also noted earlier - heavy leptoquark neutrinos/antineutrinos are the probable source of "dark matter".

While the electromagnetic field is reasonably well known, the nature of the information field provided by the weak force is mysterious and still being explored, but we can see immediately that its basic rationale is conservation. Each node of the electroweak resonant series is associated with an "IVB" (Intermediate Vector Boson - the massive field vector of the weak force), which is a necessary "gatekeeper" or catalyst for the interaction of these two forces during the production of a massive (single) elementary particle. The function of the massive IVBs is to regulate or "gauge" the energy of interaction to the same high level in which these particles were originally produced, ensuring that all elementary particles (of a given species) are absolutely identical, wherever or whenever they may be created. This is another conservation function of the weak force, encompassing both energy and symmetry, and circumventing the enervating attrition of the entropic expansion of both space and history over the evolutionary aeons of the cosmos. The Higgs boson evidently sets the gauge for the electroweak IVBs, thus (indirectly) determining the masses of elementary particles in our spacetime domain. However, there may well be yet more massive "Higgs-type" bosons that regulate higher energy interactions of the very primitive universe (before the entropic expansion of spacetime), such as the "X" IVB regulating "proton decay" and the asymmetric origin of our "matter-only" universe, and the "Y" IVB
regulating the production of electrically neutral leptoquarks. (Note that while both the "X" and "Y" IVBs are hypothetical (and far beyond the energy range of our largest accelerators/colliders), either they or something like them must exist to explain/produce the present state of our universe.)

Life is the means whereby the universe comes to know itself, explore and enlarge its creative powers and experience (perhaps in an ever-expanding fractal iteration). Life is the rationale for the existence of our universe; life is an emergent capacity inherent in the atomic structure of the cosmos (from the information

field of the electroweak force expressed through the Periodic Table of the Elements), and will spontaneously arise given suitable environmental conditions. The origin of life is not a random process, but follows a 4x3 fractal algorithm beginning with the carbon atom and ending with RNA/DNA. This is why life arose so quickly on our planet and means that life is common throughout the universe. The only real question is how common are technological civilizations like our own and how long they last. We are the masters of technology, but not of ourselves, and may well destroy our civilization through uncontrolled greed, aggression, ego, selfishness, and simple stupidity. The nuclear genie cannot be put back in the bottle and may extinguish every civilization that eventually discovers and releases it - a true "killer app" hidden in the information field of the Periodic Table. It may prove to be the "K-T comet" that destroys our species, depositing a thin radioactive layer in the geological record for the edification of (any?) future archaeologists.

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POSTSCRIPT:

The 4 asymmetries associated with the charges of the "4 forces of physics": are:
1) **Electric Charge** - the asymmetry of our "matter-only" universe. The antimatter which should exist to balance the electric charges of matter was all annihilated during the "Big Bang". Long-range electric charges are fundamentally intended to allow particles of matter and antimatter to find each other in space and annihilate, restoring the symmetry state of the light which created them. Light is the field vector of electric charge, in this case protecting its own symmetric energy state.

2) **Color Charge** (Gell-Mann strong force) - the asymmetry of fractional charges. Color charges permanently confine quarks to whole quantum units of charge, preventing fractional charges (of several kinds) from making charge conservation impossible. Color charge is a short-range force which grows stronger as the quarks (within a baryon) separate from one another, increasing the threat to whole-charge unity, but relaxing as those quarks come together, reducing the threat to unitary quantum charge and hence charge conservation. This is just the behavior we would expect if an elementary lepton were somehow fractured into three parts, but required to maintain a facade of whole quantum unit charge to the outside world. This is in fact what happened to the "leptoquarks" during the earliest moments of the "Big Bang". This charge is peculiar to baryons/mesons, is carried by "gluons", and does not affect the larger world beyond quarks. A secondary form of the strong force binds protons and neutrons in compound atomic nuclei and is carried by mesons (Yukawa strong force). The Yukawa strong force, which is based on a "least energy" principle of configuration binding, can be broken by supplying sufficient energy; the Gell-Mann strong force, which is based instead upon the symmetry principle of whole quantum unit charge conservation, cannot be broken.

3) **Identity Charge** (weak force) - the asymmetry of identity vs the anonymity of photons. All photons are alike, but elementary particles can be distinguished from photons and between leptonic species (electron, muon, tau, leptoquark, antiparticles, and neutrinos). The massive leptons carry "hidden" identity charges which are always balanced by (nearly massless) neutrinos/antineutrinos. Neutrinos are the explicit, "bare", free form of identity charge, balancing the "hidden" charges of the massive leptons. Neutrino mass is still unknown, but may be as little as one-millionth that of an electron. The mass of leptoquark neutrinos, however, which balance the hidden charges of baryons (protons, neutrons, etc.), may be quite large, and are suspected as the source of the mysterious "dark matter". Identity charge is necessary to enable

conservation/replication/annihilation/recognition of elementary particles. "Identity" is the most fundamental charge of the weak force information field leading to the Periodic Table of the Elements.

4) **Gravitational Charge** ("location" charge - gravity) - the asymmetry of undistributed mass-energy vs the symmetry of photon energy distributed everywhere in space simultaneously. Gravity involves both a symmetry debt (concentrations of mass energy) and an entropy debt, or defect/deficit. It is this combination, in addition to its extreme weakness, that makes the long-range gravitational force so difficult to understand. First, the symmetry debt: When massive particles are created in a light-filled space (as during the "Big Bang"), they break a fundamental spatial/energetic symmetry:

1) All points (locations) in a light-filled space are equivalent, there is nothing to distinguish one location from another. This symmetry is obviously broken by the intrusion of a massive immobile particle, whose whereabouts can be distinguished from all other locations in the vacuum of space, even if that "vacuum" is filled with photons. Furthermore, the energy of photons is distributed equitably throughout the spatial domain, due to intrinsic motion "c", which vanishes the time dimension and the spatial dimension in the direction of motion (length or distance). Hence the photon has forever to go nowhere, the basis of its "infinite" motion/speed and hence the even distribution of its energy everywhere, simultaneously. Obviously, this symmetry of energy distribution is broken badly by the non-moving, massive particle whose energy content (e=mcc) is concentrated in a single location.

It is indeed interesting to see how spacetime itself reacts to this broken symmetry, as the gravitational field, from all other locations in space, points directly to the center of mass of the offending particle, in effect shouting: "Here it is - the asymmetry in our midst!" As if this were not enough to get your attention, the gravitational field will actually carry you bodily to the particle and "rub your nose in it". The reason why is that gravity is urging you to pay the symmetry debt, and if you were an appropriate particle of antimatter, you would indeed annihilate with your antipartner, return to all-symmetric light, and the symmetry debt would be paid and the offending particle with its undistributed concentration of mass-energy would vanish. From this we see that gravity acts as a "fail-safe" backup symmetry-keeping system, in case electric charge - the primary symmetry-keeping system - should for some reason fail to do its job.

However, since all the antimatter was annihilated during the "Big Bang", gravity cannot perform its "fail-safe" mission, at least not right away. Gravity will get the job done in the end, but it will require time and Hawking's "quantum radiance" of black holes. The great thing about symmetry debts is they may be repaid on any schedule, so long as their permanence is guaranteed by the law of charge conservation, and there exists a time dimension in which these debts can be held or "stored". The gravity we feel on our planet is a case in point: weak planetary gravity is simply paying the "interest" on matter's symmetry debt, creating a time dimension in which the debt can be held until it will be "retired" or paid in full (as by annihilation with antimatter). In stars, strong gravity actually "pays down" the mass principal of the symmetry debt by converting bound to free energy, that is, mass to light. In this latter case, both symmetry and entropy debts are "paid down" simultaneously.

2) The entropy debt/defect of mass and gravity:
Space filled with photons (such as existed after the "Big Bang") is expanding at "velocity c" due to the intrinsic, entropic motion of light (photons).
A massive particle, however, has no intrinsic spatial motion and hence cannot participate in the expanding and cooling entropic spatial conservation domain of light. Entropy, however is not an optional function of energy, it is the bedrock of energy conservation. Space is expanding due to the intrinsic (entropic) motion of

the photons because entropy demands that it do so. Photons cannot help moving and expanding because that "intrinsic" (entropic) motion is built into them, part and parcel of their energy endowment. The conservation function of entropy is to prevent the same energy from being used twice to do the same work (forbidding the "perpetual motion machine"). Somehow, this entropy defect of the non-moving massive particle must be rectified - the particle must be given an entropy domain which is the equivalent of the photon's expanding space. Nature gives the massive particle an entropy domain by providing it (at birth) with a time charge/dimension, a one-way moving dimension which creates history, the temporal analog of space, and an entropic domain for non-moving massive particles, the equivalent of space for photons. Hence we have space as an entropic conservation domain for free forms of electromagnetic (EM) energy, and history as an entropic conservation domain for bound forms of EM energy. Spacetime (created by gravity) functions as a combined entropic conservation domain for both free and bound forms of EM energy.

Massive particles are born (created) as 4-dimensional particles, because they are born with a time charge (gravitational "location charge"), which accommodates their need for an entropy domain. The intrinsic historic motion of the time charge, which is the analog of the intrinsic spatial motion of the photon, creates an historic entropic conservation domain for the massive particle, the analog of the photon's spatial entropic conservation domain, in which massive particles can age and decay and otherwise suffer the enervating attrition of time. Photons are two-dimensional, with their "intrinsic" (entropic) motion ("velocity c") creating a 3-dimensional spatial conservation domain; similarly, massive particles are three dimensional, with their "intrinsic" (entropic) motion ("velocity T") creating a 4-dimensional historic conservation domain. The one-way intrinsic motion of time (which is required by causality, energy conservation, and entropy) is at right angles to all three spatial dimensions, into the historical realm, and is the reason why time can function as a "location" charge in space. The intrinsic motion of time pulls space along with it, creating the spacetime flow of a gravitational field. *A gravitational field is the spatial consequence of the intrinsic motion of time*. Because space cannot enter the one-dimensional historical time line, space self-annihilates at the gravitational center of mass, revealing a metrically equivalent temporal component, which immediately travels into history, pulling more space behind it, etc., forever. Time and gravity induce each other, somewhat as electric and magnetic fields induce each other. The active principle of gravity's "location" charge is time itself. (See: "A Description of Gravity".)

We have to ask what is gravity driving at? What will satisfy it? What will make it vanish? When is the gravitational charge ("location") cancelled, the gravitational symmetry debt repaid? In the case of electric charge, we know the answers to these questions, and they must be similar in the case of gravity, on the assumption that all charges are symmetry debts. Electric charge seeks antimatter, seeks anticharge, seeks annihilation to fully repay its symmetry debt and vanish. Antimatter will satisfy the gravitational symmetry debt too, but it is in short supply due to the Big Bang annihilation asymmetry. Lacking antimatter, gravity remains unsatisfied, persisting in its apparently insatiable quest to consume more and more matter. The first success (in terms of symmetry conservation, or debt repayment) of this search is with stars, when enough matter and gravitational force are concentrated in one place to induce nuclear fusion and convert some mass to light, partially repaying the gravitational symmetry debt ("location charge") because light, having intrinsic motion "c" (unlike immobile matter), is symmetrically distributed throughout its entropic spatial domain (simultaneously everywhere). The progression goes from stars to supernovas to white dwarves, to neutron stars, and finally ends at black holes. All condensed matter stages before the black hole are partial - always the baryons remain, due to the stubborn conservation of "baryon number". But the black hole solves even this hard nut (this is just why black holes are required), for with "proton decay" taking place at the central singularity, the black hole is filled with nothing but light (note that light inside a black hole is bound energy with a specific location and so in this case (as in atoms) produces a gravitational field). "Hawking Radiation"

finishes the job, completely evaporating the black hole, mass, and gravitational field alike, converting them to free light in complete satisfaction of Noether's Theorem and repayment of the gravitational "location" symmetry debt and charge.

As gravity increases its grip, there is a steady progression of condensed matter states, gradually replacing the electromagnetic entropy domain of space and light with the gravitational entropy domain of time and matter. Gravity takes over all the functions of the other forces, replacing their field vectors with its own. First the electron shell is collapsed in the white dwarf, then the electrons are crushed into protons forming a neutron star, finally the black hole condition is reached, the final triumph of the gravitational entropy domain of matter and time over the electromagnetic spatial entropy domain of space and light. The triumph is this: in the black hole, light stands still and matter moves with "intrinsic" (gravitational) "velocity c" - the exact reverse of the electromagnetic entropy domain. Matter and antimatter are reunited again via the mechanism of "Hawking Radiation" and the gravitational symmetry debt is repaid via matter-antimatter annihilation. The black hole condition is what gravity is driving at, because only through the black hole can baryons be destroyed, either by "proton decay" at the central singularity, or by "Hawking Radiation" (matter-antimatter annihilation) at the event horizon. The black hole is black because the gravitational temporal metric has completely replaced the electromagnetic spatial metric. Only then is gravity "satisfied" and its symmetry debt fully repaid. See: "Nodes of the Gravimetric Series".

However, even the black hole keeps producing gravity, and why not? It still represents a huge concentration of undistributed, immobile mass-energy (as seen from the "outside"), even though (as seen from the "inside") that debt has been paid via the establishment of the 100% gravitational metric and the vanishing of the electromagnet metric - clocks stop, meter sticks shrink to nothing, photons stop while massive particles move with intrinsic motion "c" (because g = c at the event horizon), etc. So is the debt paid or not? Looking from the "outside", no; looking from the "inside", yes. The problem is really just the "slow pay" of the black hole - it takes practically forever for a large black hole to "pay up", even though the "deal is signed and sealed". So until such time as the "deal is actually delivered" (the debt is really retired from the perspective of the outside observer and universe - via Hawking Radiation), the black hole will continue to produce a gravitational field. Even so, because time stops at the event horizon, Hawking Radiation is not slow at all *in the reference frame of the black hole,* but actually appears to be an instantaneous matter-antimatter explosion. Finally, it turns out that the "slow pay" of black holes has a beneficial effect in terms of symmetry-conservation for the "outside" universe: during matter's "death spiral" into a black hole, as much as 40% of its mass can be converted to light, a rate of conversion far higher than for any other astrophysical process (other than matter-antimatter annihilation itself).