

<b>Unification Era</b>	<b>Symmetry Group</b>	<b>IVBs (Decay Path)</b>	<b>Type Field Vector Temp/Time/GEV</b>	<b>Charge</b>	<b>Era Role</b>
Planck Era; T.O.E. "Theory of Everything" (Gravity and Spacetime Unified with Light, Particles) Creation of Leptoquarks	Higgs 3; All Forces Unified; G2 (?) (Strings?) (Dimensions?) (Massive Particles) Gamow's "Ylem"	"Y" IVBs; Transform Primordial "Ylem" to Leptoquarks; Create and Destroy Leptoquarks	Graviton (Gravitational Force);  10(32) k; 10(-43) sec. (Big Crunch) 10(19) GEV	"Location" (gravitational charge); Negative Energy; Total Energy = 0; "Local" Mass Asymmetry	Gravity Provides Negative Energy; "Ylem"; Primordial Leptoquarks; Particle Mass; ?Inflation?
Leptoquark Era; G.U.T. "Grand Unified Theory" (Quarks Unified with Leptons) Asymmetric Leptoquark Decay; Creation of Matter, Hyperons	Higgs 2; Strong, E/W Forces Unified; SU(5) (Leptoquarks)	"X" IVBs; Transform Leptoquarks, Create and Destroy Matter and Baryons; Symmetry-Breaking; "Proton Decay"	Gluon (Strong Force);  10(28) k; 10(-35) sec. (Black Hole) 10(16) GEV	Color Charge; Total Color = 0; Partial Charge Asymmetry of Quarks	Asymmetric Decay of Leptoquarks Creates Matter, Hyperon "Singlets", Leptoquark Neutrinos; ?Dark Matter?
Hyperon Era; E/W Electroweak Union (Quarks Unified, Leptons Unified); Creation of Leptons, Alternative Charge Carriers	Higgs 1; E/W, E/M Forces Unified; SU(2), SU(3) (Leptons, Quarks)	"W" IVBs; Transform Hyperons and Heavy Leptons, Create and Destroy Alternative Charge Carriers (lepton, meson, neutrino)	IVB (Weak Force);  10(15) k; 10(-10) sec. (Supernova, Neutron Star) 10(2) GEV	"Identity" ("Number" Charge); Total "Number" = 0; "Identity" Asymmetry of Leptons	Creates and Transforms Leptons, Neutrinos, Mesons, Leptonic "Singlets"; Transforms Baryons
Atomic Era; E/M Electromagnetic Unification; Electric/Magnetic Fields Unified; Creation of Atoms, Space and History	"Ground State"; Spacetime Metric (Scaled by c, G); U(1) (Phase) (Light)	Photons; Transform E/M Fields, Space and Time; Create and Destroy Atomic Structure, Molecules	Photon (Electromagnetic Force); Temp. 2.7 K; Historic Spacetime; 13.7 Billion Yr. (Sun - Star) 10(-3) EV	Electric; Total Electric Charge = 0; 4th Dimension Asymmetry	Creates Space and Spacetime; Atoms; Metric Regulates "c", Vacuum Virtual Particle "sea"

"Multiverse": Non-dimensional "vacuum" source of undefined symmetric energy and creative potential - produces our 4-D universe as a quantum fluctuation of *no net energy or charge*, conserving energy, with "life-friendly" physical constants ("Anthropic Principle"). Balanced pos-neg (gravitational) energy and matter-antimatter charge symmetry. (Cosmos, Multiverse united). "Big Bang": Cosmos devolves from "Multiverse".

Information and Biological Eras evolve as ground state "rebounds" from entropy-driven cascade. Rebound is driven by symmetry conservation, negentropic gravity, and evolutionary forces, creating planets, stars, black holes, galaxies, "Big Crunch", heavy elements, chemistry, life, thought, experience, symbolic information.

## **Higgs Table No. I: Unified Force Eras or Symmetric Energy Levels of the "Big Bang"**

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### **Abstract**

We explore the hypothesis that there are 3 "families" or energy levels of the Higgs bosons and their associated Intermediate Vector bosons (IVBs), analogously to the three families or energy levels of the quarks and leptons. With its origin in the "Multiverse", our Universe apparently devolves (rapidly) downward in an asymmetric "Higgs Cascade" to the electromagnetic ground state, and evolves (slowly) upward again in a "rebound" driven by symmetry conservation (Noether's Theorem) toward the Multiverse or a state of pure electromagnetic radiation (light).

### **Unification Eras (or Symmetric Energy States) of the "Big Bang":**

#### **Force Unity Eras: Multiverse Era**

[Multiverse Era](#): A-dimensional, "vacuum" potential of undefined creative energy, producing infinitely (?) many energy-conserving Universes (with various and unique physical constants) via quantum fluctuations of *no net energy or charge*, one of which (constrained by the "Anthropic Principle") becomes our own. "Inflation" from a "false vacuum" state may be involved. Scalar Higgs particles, "Standard Model" symmetry groups, transformative IVB families, and field vectors of the four forces are listed for an entropy driven decay "cascade" through 4 successive levels of force unification. Major roles and productions of the eras are suggested. Unification eras correspond to a specific temperature (absolute degrees Kelvin) and time period (after time zero) of the "Big Bang" decay sequence (For table data see: Brian Greene: *The Fabric of the Cosmos*, P. 270, Knopf, 2004, and Frank Close: *The New Cosmic Onion* Taylor and Francis, 2007, page 196. For symmetry discussion, see : Ian Stewart, *Why Beauty is Truth*, P. 239-73, Basic Books, 2007). (*Creation of Universe*, "Big Bang".)

#### **Force Unity Eras: Planck Era**

3) [Planck Era \(quantum gravity era, primordial "Ylem" era\)](#). Y+, Y-, Y neutral IVBs, Higgs 3, - TOE unity (Theory of Everything): unified positive and negative energy ("Yin-Yang"). All forces unified.  $10(32)k$ ;  $10(-43)$  sec. Unified gravity, light, spacetime, and bound energy forms (primordial, electrically neutral leptoquarks). "Quantum gravity". Negative gravitational energy exactly balances positive energy of particles. Matter-antimatter symmetry. "Y" IVBs transform primordial elementary leptons ("Ylem") (produced by the energy of light, the structure of metric spacetime, and gravity) to primordial electrically neutral leptoquarks (essentially a trisected heavy lepton), creating particle mass. Decays to level 2 leptoquark era with separation of spacetime metric (including gravity) from primordial leptoquarks (due to activity of "Y" IVBs splitting leptons, and the entropic expansion and cooling of the Cosmos). This separation

may correspond to the "inflationary" era of Guth and Linde (?). Matter-antimatter annihilations. (*Creation of primordial leptons, leptoquarks, and particle mass.*)

### **Force Unity Eras: Leptoquark Era**

2) [Leptoquark Era](#).  $X^+$ ,  $X^-$ ,  $X$  neutral IVBs, Higgs 2, - GUT unity (Grand Unified Theory): unified quarks and leptons with separate spacetime and gravity. Strong and electroweak forces unified.  $10(28)k$ ;  $10(-35)$  sec. Entropy driven expansion and cooling of spacetime. Quark partial charges allow electrically neutral leptoquarks. " $X$ " IVBs compress and contain leptoquarks, allowing weak force decays with emission of leptoquark neutrinos. Asymmetric weak force decay of electrically neutral leptoquarks vs antileptoquarks produces level H1 Hyperon Era and matter asymmetry of Cosmos. (*Asymmetric creation of matter and single hyperons; leptoquark antineutrinos are "dark matter" candidates.*)

### **Force Unity Eras: Electroweak Era**

1) [Hyperon Era](#).  $W^+$ ,  $W^-$ ,  $W$  neutral IVBs, Higgs 1, - E/W unity (Electroweak Unification): hyperons, heavy leptons, and virtual particle "zoo" era. Weak and electromagnetic forces unified.  $10(15)k$ ;  $10(-12)$  sec. Matter dominated asymmetry. Leptons and quarks separate into unified lepton families and unified quark families. " $W$ " IVBs transform quarks into other quarks and leptons into other leptons (but not leptons into quarks). Hyperons and heavy leptons decay (via " $W$ " IVB family) to "ground state" proton, electron, and photon with emission of leptonic antineutrinos. Leptons, mesons, and neutrinos serve as alternative charge carriers for the decays of hyperons and heavy leptons, avoiding antimatter annihilation reactions. (*Creation of leptons, neutrinos, mesons - alternative charge carriers; creation of leptonic "singlets".*)

### **Ground State Era: Electromagnetic Era**

["Ground State" Atomic Era](#). Historic spacetime, bosons, leptons, hadrons - E/M unity (Electromagnetic Unification). History: currently 13.7 billion years after the "Big Bang"; temperature 2.7 K. Separate leptons, neutrinos, mesons, and baryons. Spacetime, light, and gravity remain unified, electric and magnetic fields remain unified. Virtual vacuum particle "sea". Photon separates from " $W$ " IVBs, creates and energizes space; gravity creates time from space, time creates history. Spacetime metric and photon are the ground state analogs of the Higgs and IVBs. Era of atomic matter, light, gravity, and historic spacetime. (*Creation of space, historic spacetime, and atomic matter; evolution of life.*)

The "Ground State Vacuum" also hosts virtual particle-antiparticle pairs, which are essential for maintaining an active connection between the electromagnetic ground state and higher energy electroweak transformations, for example, the transmutation of atomic nuclei in "radioactive" decays and element-building in stars. Both processes directly and continuously interact with the electromagnetic ground state, whereas interactions at the GUT and TOE energy levels are typically of one-time historic significance (creation of Universe, creation of matter). The "nucleon" is a remnant of the electroweak unification era that persists into the ground state of atomic matter due to strong force binding via the exchange of a virtual meson field.

### **Symmetry Restoration or "Rebound" Era**

[Ground State "Rebound"](#) Information, life, and consciousness Era. Driven by symmetry conservation, gravity, and biological evolutionary forces. Rebound begins with planets and Sun-like stars (ground state); continues through supernovas and neutron stars (level H1); galaxies (including quasars and black holes) (level H2); and cosmic collapse or "Big Crunch"

(level H3). *Creation of planets, stars, black holes, galaxies, the "Big Crunch", heavy elements, molecules, chemistry, life, experience, symbolic information.* (See: ["Nature's Fractal Pathway"](#).)

We have previously (and correctly) understood the gravitational rationale from the point of view of: 1) energy, entropy, and causality conservation (the gravitational creation of time from space, providing the temporal entropy drive and causal linkages of bound energy); 2) the point of view of symmetry conservation (the gravitational conversion of bound to free energy, as in stars); 3) the source of negative energy (balancing positive energy) in the "Big Bang". (See: ["Entropy, Gravitation, and Thermodynamics"](#)). The gravitational recapitulation of force unification and symmetry states (culminating in the "Big Crunch") allows us to understand the gravitational rationale from a new, fourth perspective embracing only the reunification of the four forces.

### **Links:**

#### **Unified Field Theory**

[Symmetry Principles of the Unified Field Theory \(a "Theory of Everything"\) - Part I](#)  
[Symmetry Principles of the Unified Field Theory \(a "Theory of Everything"\) - Part 2](#)  
[Principles of the Unified Field Theory: A Tetrahedral Model](#)  
[\(Postscript and Commentary on paper above\)](#)  
[Synopsis of the Unification Theory: The System of Spacetime](#)  
[Synopsis of the Unification Theory: The System of Matter](#)  
[Light and Matter: A Synopsis](#)  
[Global-Local Gauge Symmetries and the "Tetrahedron Model"](#)  
[Global-Local Gauge Symmetries: Material Effects of Local Gauge Symmetries](#)  
[The "Tetrahedron Model" vs the "Standard Model" of Physics: A Comparison](#)

#### **Weak Force, Intermediate Vector Bosons ("IVBs")**

[Section IV: Introduction to the Weak Force](#)  
[Section XVI: Introduction to the Higgs Boson](#)  
[The "W" Intermediate Vector Boson and the Weak Force Mechanism](#) (pdf file)  
[The "W" IVB and the Weak Force Mechanism](#) (html file)  
[Global-Local Gauge Symmetries of the Weak Force](#)  
[The Weak Force: Identity or Number Charge](#)  
[The Weak Force "W" Particle as the Bridge Between Symmetric \(2-D\) and Asymmetric \(4-D\) Reality](#)  
[The Strong and Weak Short-Range Particle Forces](#)  
[The "Higgs" Boson and the Spacetime Metric](#)  
[The "Higgs" Boson and the Weak Force IVBs: Part I](#)  
[The "Higgs" Boson and the Weak Force IVBs: Parts II, III, IV](#)  
["Dark Matter" and the Weak Force](#) [The Halflife of Proton Decay and the 'Heat Death' of the Cosmos](#)

#### **The Fractal Organization of Nature**

[Section III: Introduction to Fractals](#)  
[Section VIII: Introduction to General Systems, Complex Systems](#)  
[The Fractal Organization of Nature](#) (table)  
[Part 1: Microphysical Realm](#)  
[Part 2: Biophysical Realm](#)

[Part 3: Astrophysical Realm](#)

[Part 4: Metaphysical Realm - Intuitive Mode](#)

[Part 5: Metaphysical Realm - Rational Mode](#)

[Part6: The Fractal Organization of Nature \(summary\) \(text\)](#)

## **Information**

[Section VI: Introduction to Information](#)

[The Information Pathway \(text\)](#)

[The Formation of Matter and the Origin of Information](#)

[Nature's Fractal Pathway](#)

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