Table of Forces (Columns) and Energy States (Rows) (Simple Table #1)

4 Forces of Physics --->		Electromagnetism	Gravitation	Strong	Weak
Below: Comments on the Energy State Rows:		**FORCES**			
Free Energy, Light: electromagnetic radiation; space; symmetric energy; virtual particles; symmetry-breaking; (reprising the "Big Bang"); (incurring the debt); Spatial Energy Forms; (row 1)	**E N E R G Y S T A T E S**	Light: $E = h\nu$ (Planck); Intrinsic Motion "c"; All Charges = 0; Symmetric Free Energy ("c" gauges Light's entropy drive and "non-local" distributional symmetry); Non-local, Acausal, Atemporal Energy	Space; Created by Light's Entropy Drive; Conservation/Entropy Domain of Light; Light's "Interval" = 0; The Spatial Metric; Gravitational Negative Energy and Entropy; Total Energy = 0	(virtual) Composite and Sub-Elementary Particles; "Ylem"; Fractured Leptons; Quarks; Gluons; Particle-Antiparticle pairs; Leptoquarks; Neutral Particles; Particle Symmetry Total Charge = 0	(virtual) Elementary Particles; Neutrinos; Leptons; Leptoquarks; Particle-Antiparticle Pairs; Higgs (Mass Gauge); Intermediate Vector Bosons; Symmetry-Breaking: "Higgs Cascade"; Real Particles
Bound Energy: matter; history; asymmetric energy; massive real particles (consequences of row 1 symmetry-breaking); raw energy conservation; (down payment), "pay now"; Temporal Energy Forms; (row 2)		Mass: $E = mcc$; $h\nu = mcc$; (Einstein-deBroglie); Matter, Momentum; Asymmetric Bound Energy Carriers; Charges > 0; Local, Causal, Temporal Energy; "Lorentz Invariance" Special Relativity	Gravitational Creation of Time from Space; Historic Spacetime; Conservation/Entropy Domain of Information; Mass Interval > 0; Metric Asymmetry; ("intrinsic motion T" is bound energy's entropy drive); Relative Motion; General Relativity	Mass Carriers; Quarks, Mesons, Baryons, Nucleons; Atomic Nucleus; (elements); Whole Quantum Charge Units	Alternative Charge Carriers; Leptons, Neutrinos: Electron Shell; (atoms); Higgs and IVBs Mass Scale; Elementary Particle Invariance
Charges: quantized symmetry debts (carried by particles of row 2); symmetry (charge) conservation; (mortgage, credit), "pay later"; Symmetry Carriers; (row 3)		Electric Charge: (4 - dimensional asymmetry = time) (vs 3-dimensional spatial symmetry); Quantum Mechanics; Magnetism; Charge Invariance	Gravitational Charge: "Location" Charge; "Location" Asymmetry of Bound Energy; Warped Metric; Compound Conservation/Entropy Domain of Free and Bound Energy; ("G" is the entropy conversion gauge)	Fractional Charges: Color Charge (quantum - mechanical fractional charge asymmetry); Quark Confinement; Flavor Charge (least bound energy, nucleon "isospin"); "Yukawa Binding"	"Number" or "Identity" Charge: Neutrinos; (neutrinos are "bare" identity charges); ("anonymity" asymmetry - distinguishable elementary particles)
Force Carriers, Field Vectors, Bosons: (produced by charges of row 3) (symmetry restoration via the conversion of bound to free energy); (retiring the debt); Symmetry Conservation/ Restoration Cycles; (row 4)		Photons; Exothermic Chemical Reactions; Matter-Antimatter Annihilation Reactions ("Big Bang" and Suppression of Virtual Paticles)	Gravitons: Stars, Quasars; Nucleosynthetic Pathway; Black Holes; Hawking's "Quantum Radiance"; Gravitational Conversion of Mass to Light	Gluons, Mesons: Fusion, Nucleosynthesis; Proton Decay	Intermediate Vector Bosons (IVBs: W, Z, X); Fission, Radioactivity; Particle and Proton Decay
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This table may be read like an English paragraph. **Row one** recapitulates the the creation of matter in the "Big Bang". The universe begins with light, free electromagnetic energy - a perfectly symmetric form of energy. The role of gravity at this stage is to provide sufficient negative energy to counterbalance the positive energy of the "Creation Event", such that the cosmos is born from a state of zero net energy and charge. The intrinsic motion of light (which is the entropy drive of light) creates space, the expanding and cooling entropy/conservation domain of free energy. The interaction of high-energy light with the metric structure of spacetime creates virtual particle-antiparticle pairs of primordial leptoquarks (leptoquarks are primordial leptons broken into three subunits, the quarks). (See: "The Particle Table".) Symmetry is maintained so long as there are equal numbers of particles vs antiparticles. Row one ends with symmetry-breaking of the primordial leptoquark pairs and the production of single (matter) baryons and leptons by the action of the Higgs boson and the weak force Intermediate Vector Bosons (IVBs). (See: "Table of the Higgs Cascade".) (Although leptoquark particle-antiparticle pairs are produced in equal numbers, electrically neutral antimatter leptoquarks apparently decay at a slightly faster rate than their matter counterparts.) The sub-elementary quarks carry fractional charges necessary to the production of electrically neutral leptoquarks, allowing the neutrals to live long enough to undergo asymmetric weak force decays. These decays should also produce leptoquark neutrinos, which are "dark matter" candidates. (See: "The Origin of Matter and Information".)

In **row two** we find the massive matter products of row-one symmetry-breaking. Row two conserves the raw energy of row one. Atomic matter is an alternative, asymmetric, local, temporal, causal, bound form of electromagnetic energy. Mass is the conserved form of light's raw energy; time is the conserved form of light's entropy drive (intrinsic motion); charge is the conserved form of light's symmetry. "Velocity c" gauges the invariance of the "Interval" and causality, including "Lorentz Invariance", the covariance of space and time in Einstein's Special Relativity. Gravity creates time by the annihilation of space and the extraction of a metrically equivalent temporal residue (General Relativity); the intrinsic motion of time goes on to produce historic spacetime. (See: "The Conversion of Space to Time".) Time is a necessary dimensional parameter for massive objects because of their relative motion and causal relations. (See: "Entropy, Gravitation, and Thermodynamics".) Atoms are composed of two classes of particles, the mass-carrying quarks and the charge-carrying leptons. Gluons are necessary to confine the fractionally charged quarks to whole quantum unit charge combinations. (See: "The Strong Force: Two Expressions".) Leptons are necessary as alternative charge carriers for the massive quarks, balancing their charges in place of antiparticles, thus avoiding annihilation reactions. Electrons are alternative carriers of electric charge, neutrinos are alternative carriers of the weak force "identity" charge. The elaborate weak force Higgs and IVB mechanism is necessary to reproduce *single,* invariant elementary particles anytime, anywhere. Elementary particles created today must be the same in every respect as those creatd eons ago during the "Big Bang". It is the creation of *single* invariant elementary particles that is the difficulty posed to and overcome by the massive mechanism of the weak force. (See: "The Higgs Boson and the Weak Force Mechanism".) (See also: "Identity Charge and the Weak Force".)

Row three exhibits the charges carried by the massive matter particles produced by symmetry-breaking in row one. Row three conserves the symmetry of row one. *The charges of matter are the symmetry debts of light*. Noether's Theorem states that the symmetry of light must be conserved, no less than the raw energy of light. Charge conservation = symmetry conservation. Charge conservation allows the symmetry of light to be carried into the time dimension where it can be stored in an alternative form (charge) and repaid at any future time through annihilation with an appropriate anticharge - thus returning the material system to the symmetric state of light which originally created it. Gravity pays the entropy-"interest" on the symmetry debt of matter by creating a time dimension (via the annihilation of space) in which matter's charges can be

stored and eventually repaid. (Gravity pays the energy-"principle" on matter's symmetry debt in row 4.) The spatial expansion of the cosmos is reduced as gravity annihilates space and converts the spatial entropy drive of light into the historical entropy drive of matter.

Each of the four forces of physics is produced by a charge which can be traced to a broken symmetry - a "symmetry debt" of light. This is the conceptual unification of the forces: they all represent symmetry debts of light (including gravity, which is both a symmetry and an entropy debt of light). (See: "The Double Conservation Role of Gravity".) Electric charge is due to light's broken dimensional symmetry (2- and 3-dimensional symmetric space vs 4-dimensional asymmetric spacetime); gravity is due to light's broken spatial distribution symmetry (light's broken "non-local" symmetric energy state), plus light's broken symmetric entropy drive (light's intrinsic motion), both gauged by "velocity c", and both broken by the local, immobile, undistributed mass-energy of matter. The strong force color charge is due to the fractional charges of the quarks, which threaten the quantum currency (whole quantum charge units) of the symmetry debts themselves. The weak force is due to light's broken "anonymity": all photons are alike, but elementary particles are not and therefore have an "identity" charge (AKA "number" charge) (neutrinos are "bare" identity charges). Magnetism is a "local gauge symmetry" expression of the electromagnetic force which protects the invariance of electric charge in relative motion. Analogs of magnetism's local gauge function in the other forces include the covariance of time and space ("Lorentz Invariance") protecting causality, velocity c, and the "Interval" (gravity); quark confinement by gluons, protecting unitary quantum charges (strong force); and the massive weak force IVBs, protecting elementary particle invariance. (See: "The Tetrahedron Model of the Unified Field Theory".) (See also: "Local vs Global Gauge Symmetry in the Tetrahedron Model".)

In the **4th row** we list the payment modes of light's symmetry debts by the 4 forces - forces are the demand for payment of the symmetry debts held by the charges of matter. Row four repays all the symmetry, energy, and entropy debts incurred by symmetry-breaking in row one. Payments include partial as well as complete payments. In the electrical force we have exothermic chemical reactions and matter-antimatter annihilation reactions; in the gravitational force we find numerous astrophysical forces converting bound to free energy, culminating in Hawking's "quantum radiance" of black holes. As high-energy gravity repays its symmetry debt (converting mass to light), gravity reverses the effect of its own low-energy reaction, which paid matter's entropy debt (by the conversion of space to time). This reversal reduces the total cosmic gravitational field (due to mass reduction), allowing the spatial expansion to recover a portion of its original acceleration (observed recently as the "acceleration" of the cosmos due to "dark energy"). Gravity pays the energy-"principle" of light's symmetry debt through the conversion of bound to free energy, as in the stars. The vanishing of gravity as mass is converted to light is the vital clue regarding gravity's symmetry-conserving role in the natural economy of today's universe - the force vanishes only when its conservation role is accomplished. In the strong force we have fusion and the nucleosynthetic pathway of stars, and ultimately proton decay; and in the weak force we find fission, radioactivity, contributions to the nucleosynthetic pathway, and particle and proton decay. Presumably "dark matter" also participates in some type of symmetry conservation cycle. "Dark matter" may consist of leptoquark antineutrinos. For more details, see: "Symmetry Principles of the Unified Field Theory".

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