Theoretical principle model of forces

David W Gold

Torquay, Devon, England UK

Email: david.gold@scienceau.uk

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Abstract

A premise into different structural layers of Nature that descends from simplistic originating fundamental structures to the complexity of quantum strangeness realised an important requirement for the forces of Nature to be formulated into a fundamental structural representation. A methodological use of extrapolations, from a recursive pattern relating to unified fields' and previously unrealised periodic structures regarding the fundamental forces, resulted in the final model. This fundamental foundational viewpoint concludes in a powerful predictive tool that illustrates remaining gaps in our current knowledge and where advancement gained leads to the potential source and mediation of Dark Energy in its revelation as a fundamental force.

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1. Introduction

The apparent orderliness of Nature originates in hierarchical structural layers, formulating in fundamental structures that descend into functional structures; from fundamental to classical physics to quantum mechanics with its inherent strangeness.[2] The deeper into investigating these structural layers reveal more detail but come with it more complexity. This complexity arises from Nature's activity, measured through these functional layers, and in complying with basic laws, degenerate from predictability to an increasing reliance on randomness; the cumulative effect is the rich diversity within the universe. This is analogous to the two-base pairing of nucleotides that make up DNA, simplicity in the fundamental structure, which then formulates into complex functional tertiary structures that result in the vast diversity of life on Earth. Thus demonstrating the conceptualism that Nature moves from simplistic structures that become more complex as each layer of the structures are revealed. Simplistic originating structures, which emerge in recognisable patterns, symmetries or other properties, potentially evolve from logical deduction and in which

[1] This work is ongoing by evolving processes of development and enhancements in an open and transparent communication of continuing progress.

[2] The inherent strangeness reflects a problem within quantum mechanics where it is not fully understood and this is likely due to a missing consideration. Its inclusion would potentially remove the strangeness; in producing straightforward clarity in explanation. The underestimated role of the physical medium of vacuum energy, originating at the Planck subquantum hierarchical level, is a prime candidate for consideration.

any mathematical explanation will be supported at the functional levels. An example of this, in using deductive logic, Dmitri Mendeleev discovered a categorized pattern for the elements in producing the Periodic Table; a fundamental structure, then used as a predictive tool to signify undiscovered elements. Another example is the accumulative knowledge obtained from experimentally discovered particles that can be classified into types and where their properties reveal a simple basic order in which a categorical pattern becomes apparent. The fundamental structures of the examples given are interlinked. Liken to Nature's design specifications, different structures at the fundamental level will conclude in absolute (as in absolute simplest) correlative solutions and where the branches of functional structures are responsible, in increasing degrees, for the complexity and diversity within Nature.

2. A methodological approach to a comprehensive model of forces

Our present best description of the forces, emanating from numerous theories, includes quantum chromodynamics and quantum electrodynamics, are combined into an overall quantum field theory. Symmetries and especially gauge symmetries (where symmetry groups link the forces) are an essential component in this theory, without gauge symmetries the theory fails. Quantum field theory is incomplete in that it only deals with the strong, electromagnetic and weak forces and excludes the gravitational force in absents of a quantum theory of gravity. Even so, it has been an endeavouring achievement at this more detailed and complex functional level.

In my preceding paper 'Quantum Magnetodynamics of Gravity' [1], and should be read in conjunction with this paper, an assessment was given to the *quasi*-magnetic monopoles experimentally discovered in tetrahedral crystal structures of spin ices [3-4], conforming functionally to the theoretical particles as theorised by Paul Dirac to retain duality symmetry between the electromagnetic unified fields [5]. This serendipitously led to an association that existence of the graviton would constitute to magnetic monopole dual particles from which form theoretical 'Gravity Strands'; the *modus operandi* as to the *vera causa* of the gravitational force. This central premise readily developed; in consequence, realizing a solution for quantum gravity in perfect unity with *magnetic* and *electrical fundamental* forces (see Appendix A).

The conceptual foundation for quantum gravity has led to a realization of fundamental structures and by reinvigorating an existing paradigm (used by, among others, Dmitri Mendeleev); as a methodological approach to uncover such fundamental structures and from which deriving crucial knowledge. This paper applies this methodology to reveal an understanding of the forces of Nature from such a fundamental foundational viewpoint. Extensive contribution gained at the quantum level and supported by experimental scrutiny is aided by important revelation into the functionality of the gravitational and magnetic forces as presented in [1]. This combination provides supportive information necessary to perceive a comprehensive model of forces. Consequentially, goes beyond the current standard model insomuch that the inclusion of gravity is very much integral to formulating a 'Principle Model of Forces'. The attainment of this final model concludes in a powerful predictive tool that illustrates important gaps in our current knowledge in which became apparent at this simplistic fundamental structural level.

This paper is reliant on, but not conclusively, the degree of credibility for my presentation for quantum gravity, as forwarded in [1]. For this process to continue, then a degree of reliance is required but also becomes a two-way supportive process in respect of the submissions tendered by both papers.

3. Construction of the model

A graphical representation of the currently known forces is presented in figure 1.1, which includes the gravitymagnetic unified fields [1]. It should be noted at this stage as to the present incorrect classification of electromagnetism as a fundamental force. It is demonstrated that the magnetic and electrical forces are unified with other forces and, therefore, must remain classified as separate fundamental forces, making a total of five established forces of Nature: strong nuclear, gravitational, magnetic, electrical and weak nuclear. It is substantiated by deduction that magnetic monopole graviton massless gauge-bosons do not couple to the quanta of light, therein, leaving photon-coupling only with electrically charged particles [2].

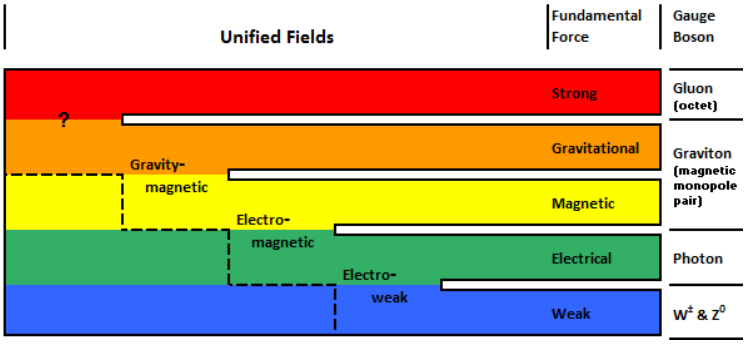

Figure 1.1: Current Model of Forces

The definition of unified fields (at low energies) is different aspects of two fundamental forces in perfect unity. At a critical high energy threshold, the two associated forces would, theoretically, merge into and act as a single force. In consideration at low energies, the gravitymagnetic unified fields are two different configurations of magnetic monopoles that distinguish the gravitational and magnetic forces; dependent on paired nucleons producing alternating charged magnetic monopoles in gravity strands or single/unpaired nucleons producing same charged magnetic monopoles in magnetic strands (see Appendix A). Magnetically charged monopoles will have an electric dipole moment across their axes of spin congruent with the established magnetic dipole moment of electrically charged particles that enable interactions by the interconnection of fields between magnetic monopoles, travelling in magnetic strands, and electrically charged particles; thus, generating the two different aspects of the electromagnetic unified fields. The positive and negative electrically charged $W^{\pm}$ gauge-bosons of the weak nuclear force are involved in the transition of photon gauge-bosons of the electrical force, and in nuclear decay or nucleosynthetic processes involving *charged-current* interactions in the transformation of electrically charged particles that establishes the two different aspects of the electroweak unified fields.

In figure 1.1, a recursive pattern immediately becomes apparent where consecutive forces result in unified fields. A crucial extrapolation can be applied as to Nature's intentional dual usage of fundamental forces, which must eventually extend throughout the model. The chronological order for the fundamental forces becomes set due to the unified fields' order of unity. The position for the strong nuclear force has significance and will become apparent. With retention in the order of the fundamental forces, taking each type and range into consideration, then in figure 1.2, a periodic structure, concerning the fundamental forces, is reviled. (Long-range refers to the ability of gauge-bosons, for the particular force, to transverse the entire universe.)

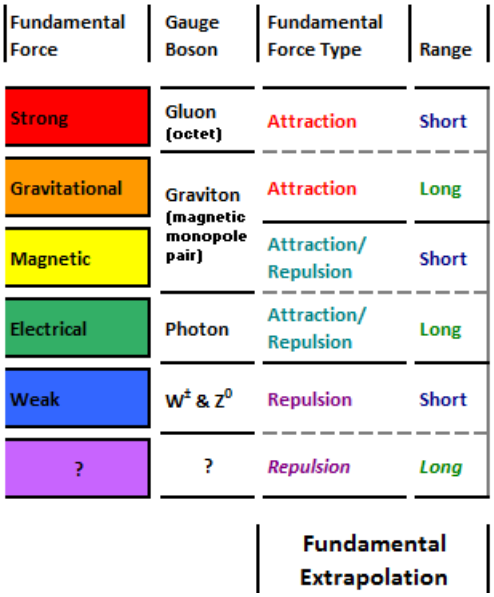

Figure 1.2: Periodic Structure of Fundamental Forces

It can be extrapolated from this periodic structure for fundamental forces that there is a missing long-range repulsion force. The only currently known force described by this missing force is Dark Energy, which is an inflationary force responsible for the current accelerating expansion of the universe and is supported by substantial observational data[1] [6-9]. Although the effect of this force is not directly experienced on Earth, the evidence for its existence is compelling and therefore must be considered as a fundamental force of Nature.

There are other theoretical references to a missing force of Nature. One such proposal, as forwarded by Justin Khoury and Amanda Weltman concerns a theoretical Chameleon force [11], proposed as an alternative to the Higgs field[2]. This alternative is again proposed in a theoretical Technicolor force [12] and is, interestingly, linked to quantum chromodynamics (the three colour charges of quarks within the strong nuclear force and hence the name for the proposed missing force). These theoretical forces, including the Higgs field, are expected to be linked to the weak nuclear force and interact with the $W^{\pm}$ and/or Z^0 gauge-bosons. This consensus for a missing force conforms to the extrapolation presented above. The Technicolor force is the most interesting proposition in that it is linked to both the strong and weak fundamental forces, and has significance relating to the final model. If, for the case of simplicity and to indicate functionality, the gauge-bosons of this Technicolor force were a coalesce of the three colour charges of the strong nuclear force (thus remaining compliant with the conservation of colour charge) each gauge-boson having an identical 'white' charge[3], where 'like' charges repel, would result in a repulsive force.

[1] Verified and announced in 1998 by the High-Z SN Search Team and confirmed by the Supernova Cosmology Project. $\Omega_m = 0.3$, $\Omega_\Lambda = 0.7$ in other words, the content of the Universe is accounted for by unexplained Dark Matter ~ 30%, Dark Energy ~ 60% and visible/dark baryon matter ~ 10% [6-7]. Subsequently, updated in 2003 by the WMAP team as Dark Matter ~ 23%, Dark Energy ~ 73% and visible/dark baryon matter ~ 4% [8].

[2] The Large Hadron Collider at CERN, in 2012, detected the theoretical Higgs bosons, which are postulated to endow elementary (not composite) particles with mass and as the participatory particles in a scalar Higgs field. (Note: Higgs bosons with spin 0 are not force carriers, so a Higgs scalar field is not a force.) [10].

[3] It can be considered that the colour charges of quarks are partial colour charges and a white charge is a full-colour charge in strength in exactly the same way as to the partial electrical charges of quarks.

These theoretical forces remain conjectural till the gauge-bosons, essential for the mediation of this missing force, are discovered experimentally. Nevertheless, this sixth fundamental force is required to complete the periodic structure and, therefore, is to be included in the model. For continuity and keeping to the current naming convention for forces, where the name reflects the functionality, this missing fundamental force will be referred to as the 'Inflationary force'. Due to the position of this inflationary force in the periodic structure, the previous recursive pattern for unified fields' is applied whereby the inflationary force is unified with the weak nuclear force. The inclusion of this new unified fields will be referred to as 'Weak-inflation' and rationalized in detail in due course.

The periodic structure for fundamental forces reaffirms the chronological position for the strong nuclear force. Furthermore, and in combination, is shown supported as a consequentiality of Dirac equations, which together advance an indication of feasible unification between the strong, gravitational and magnetic forces. Additional agreement by the recursive pattern for unified fields' will aggregate plausibility that the strong and gravitational forces are unified and, as such, will realize an additional new unified fields: referred to as 'Strong-gravitational'.[1] Further rationalization will be discussed in detail later. This completes the construction of a fundament model of forces, as presented in figure 1.3.

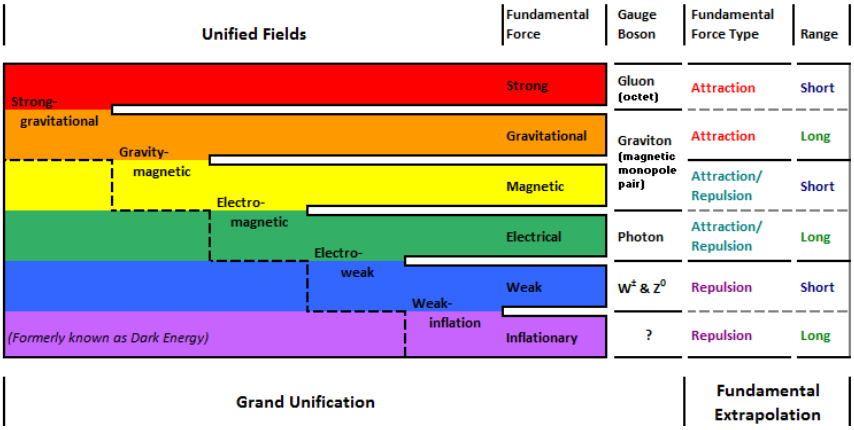

Figure 1.3: Fundamental Model of Forces

If we go back to the definition for unified fields concerning the electrical and weak nuclear forces, whereby they are unified as electroweak unified fields, the positive and negative electrically charged $W^{\pm}$ gauge-bosons of the weak nuclear force are involved in *charged-current* interactions in the transformation of electrically charged particles. The neutrally charged Z^0 gauge-boson, of the weak nuclear force, is involved in *neutral-current* interactions of neutrally charged particles, which, by inference, points to a potential secondary unification concerning the weak nuclear force with an alternative fundamental force and, somehow, this force will involve these neutrally charged particles. This secondary unification has now been affirmed by the model in identifying a missing fundamental inflationary force. At this stage, it should be noted that neutrally charged particles cannot themselves be responsible for a force unless this unification implies that these particles may not be so neutral after all. In that case, will give rise to a supposition that <u>all</u> particles must persist in a coactive state with relative fundamental forces.

[1] Unification between the strong and gravitational forces will emerge from QCD coupling in which magnetic monopole *gravitons* emanate from non-confinement in QCD (in furtherance of [19]) as a by-product of quark/gluon interactions within the strong nuclear force [1].

The periodic structure for fundamental forces is taken a step further by applying the same logic to the unified fields'. The outcome of this application produces a very useful deductive tool within a periodic structure for unified fields'. (The neutral unified fields types refer to the cumulative neutralizing effect with respect to oppositely charged particles; magnetic or electrical.)

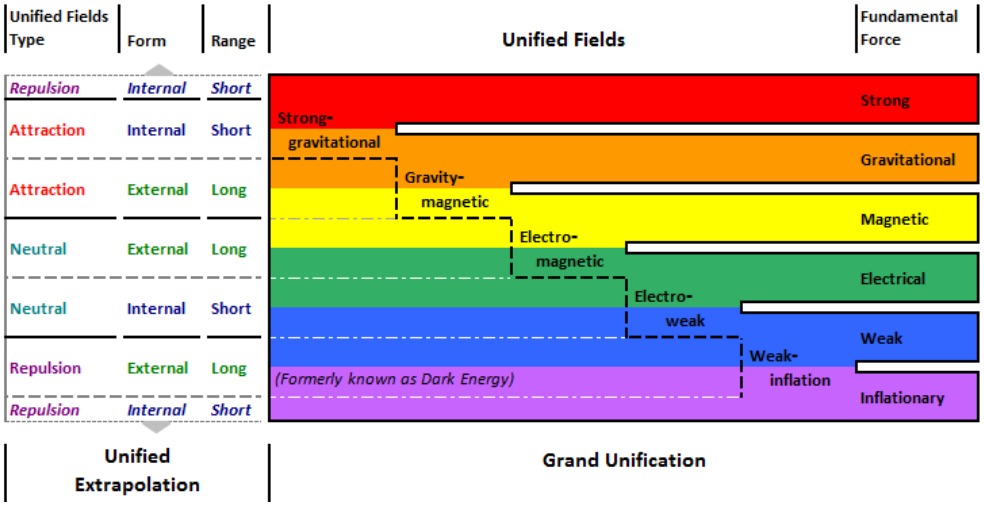

Figure 1.4: Periodic Structure of Unified Fields'

It immediately becomes apparent that in applying an extrapolation to the periodic structure for unified fields' produces a requirement for an additional repulsion unified fields that is internal and short in range. As this periodic structure only applies to unified fields', this cannot be due to another missing fundamental force. The only way to complete the periodic structure is to wrap-around the forces to form a cylindrical representation where the inflationary force is contiguous, and applying the recursive pattern for unified fields', is also unified with the Strong nuclear force and, as such, this new unified fields will be referred to as 'Strong-inflation'. Again, rationalization will be discussed in detail later. This then concludes in the Principle Model of Forces, as presented in figure 1.5.

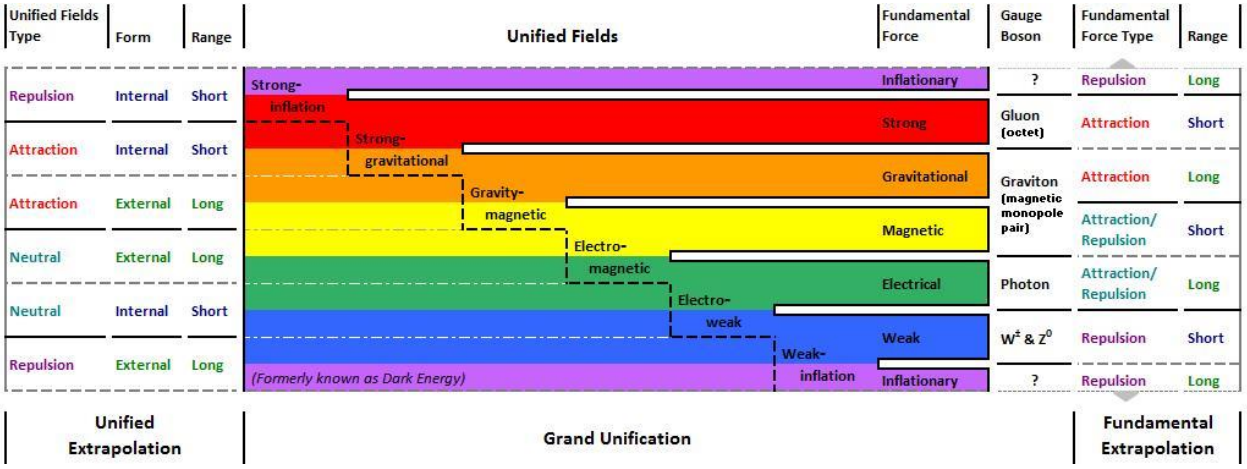

Figure 1.5: Principle Model of Forces

4. Discussion on extrapolated results

The corollary of extrapolations, from a recursive pattern concerning unified fields' and previously unrealised periodic structures, has resulted in the final model; in the fulfilment of the original premise. The model concludes in six fundamental forces of Nature: strong nuclear, gravitational, magnetic, electrical, weak nuclear and inflationary. In realizing the potentiality of the model as a predictive tool, it is essential to explicate these extrapolations from the viewpoint of substantiality and to the crucial implications concerning the new inflationary force and the new unified fields'; Weak-inflation (WI), Strong-inflation (SI) and Strong-gravitational (SG).

If we take up a preceding notion that neutrally charged particles may not be so neutral after all is now further strengthened. The model has established the unification of the inflationary force to both the strong and weak nuclear forces. Therefore, the colour charges of the strong nuclear force must be combinatorially connected with neutrally charged particles associated with the *neutral-current* aspect of the weak nuclear force. A proposition is then forwarded that neutrally charged particles (excluding photons) will carry a naturally occurring 'white' colour charge (and antiparticles an 'antiwhite' colour charge). Inherent to the inflationary force, the consequence of this would result in the ability for these particles to interact among themselves but denied interaction with any other of the fundamental forces. As 'like' charges repel, fulfils the repulsive aspect of the inflationary force; and in which the coupling strength of this force will be stronger than the gravitational force by an evaluated factor of ~1.43. This proposition will be further justified.

Originating at the Planck scale, as forwarded in various theories, the strength of gravitational attraction is predicted to be equivalent to electrostatic attraction [10, 13]. It has been established that this equivalence was prominent at the atomic scale [1]. Again in [1], as defined in the initial premise, all forms of hadronic matter will be the only sources of gravitons. It can be rationalized that for black holes to emit gravitons then the consistency of their interiors must allow quark/gluon interactions. Therefore, the most plausible explanation for their interiors would constitute to a quark-gluon *superfluid* plasma at absolute density [1] [2]. (An excellent paper, 'Physics of Strongly coupled Quark-Gluon Plasma', is presented by Edward Shuryak [14].) The unified extrapolation, presented in figure 1.5, shows that both SG and SI unified fields' are internal and short in range. It is therefore conceivable that both these unified fields' emanate as independent forces from within the very high energized quark-gluon plasma of black holes.

It would then create a tenability that these two forces are acting together within black holes analogous to the forces acting within stars where the repulsive energy, resulting from nuclear fusion, is counterbalanced by the attractive force of gravity. Within a black hole, SI would be a stored-up repulsive force in counterbalance with the SG attractive force. Thus explaining why the SG force does not overcome the degeneracy pressure of quark to create a singularity (as presenting an implausible entity where Nature's physical laws would break down, and all known forces in their current form will be prohibited, including gravity).

The major interactivity of the weak nuclear force is involved in nucleosynthetic processes occurring within stars as a consequence of nuclear fusion. The by-product of these processes is the emission of neutrinos, and together with the link presented by the WI unified fields, will consequently deduce nucleosynthetic active stars are the major sources of the inflationary force.

[1] It then implies that the quark-gluon plasma, and therefore black holes themselves, attain a mass density equivalent to atomic nuclei: 2.824×10^{17} kg/m^3. (This equates to πc^2, which is relativistically constant and therefore may be considered as an absolute density. See Appendix B: *A fundamental principle of mass*)

4.1 A postulation for neutrinos as mediators of the inflationary force

Vast quantities of neutrinos are produced as a by-product of the weak nuclear force interactions involved in nuclear fusion within all nucleosynthetic active stars [1] and indicate potentiality to a link between the inflationary force and neutrinos, even though initially appearing inoperable. In that a) neutrinos do not interact with matter, b) are neutral in charge and c) they are fermions as oppose to bosons; given there is no law in physics stipulating fermions cannot be mediators of a force. (Satisfying the Bose-Einstein Statistics for bosons would become meaningless regarding an inflationary force, which only needs to satisfy the Pauli Exclusion Principle related to fermions). On the affirmative side, the average energy density of the inflationary force in space (Dark Energy) would match as yet unobserved symmetry-breaking associated with the mass energies of neutrinos [16]. In ordinary circumstances, neutrinos pass through matter as though it did not exist. In the final nucleosynthetic phase of a dying star, being greater in mass than the Chandrasekhar limit (1.44 solar masses), the core density becomes dense enough to trap neutrinos, which then assist in the pending explosion of the star in a supernova [16]. The bulk of the energy released in the resulting supernova is carried away by neutrinos, whereas photon radiation, which includes the manifestation of a flash of light that can briefly outshine an entire galaxy, only amounts to less than 1% of the total energies involved [15]. This would imply a repulsive force involving these neutrinos resulting in a manifestation of the SI force.

Fundamental fermions, which are the constituents of matter, are electrons (electrically charged), quarks (electrically and colour charged) and neutrinos (colour charged? If this was the case, would evince symmetry between these fundamental fermion particles in compliance with Nature's symmetrical structuralism). The notion that neutrinos are colour charged is in accord with the previously presented proposition and used to construct the base upon which a postulation is founded. For neutrinos to carry a white colour charge (and antineutrinos an antiwhite colour charge), where 'like' charged particles repel, the postulation would then culminate in justifying that neutrinos constitute to gauge-fermions, force carriers, that mediate the inflationary force. [2] This would lead to an important conclusion, although remaining conjectural, in that the combination of the three fundamental fermions are symmetrically interlinked in the initial production of all the forces as presented in figure 1.5: Principle Model of Forces.

The instance of the core density of a dying star, where neutrinos become trapped, would substantiate a case for neutrinos constituting to the stored-up SI force within black holes.

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[1] The Sun produces ~2 x 10^{26} neutrinos every second [15], which is a vast number if it is considered there are, on average, 100 billion stars in a galaxy and approximately 350 billion galaxies amounting to ~3.5 x 10^{22} stars within the universe. All these stars produce vast quantities of neutrinos, and this has been going on continuously for most of the lifetime of the universe. The lifespan of neutrinos is expected to be stable so it can only be presumed, as there is no redundancy within Nature, Nature has intended a practical utilization for all these neutrinos. The gravitational force of stars will not impede radiation of neutrinos and is in compliance with [1], where concerning particles, only nucleons can have gravitational interactions; therefore, neutrinos cannot contribute, in any way, to Dark Matter.

[2] A further consideration is given to the potentiality that protons and neutrons will also carry a white colour charge to some degree of magnitude, as the coalescence of the different colour charges possessed by their inherent quarks. Any white charge field strength of these nucleons would be masked and overwhelmed by the strong nuclear force but still felt by neutrinos thus would conclude in explaining why neutrinos avoid (interact extremely rarely with) matter. Any white charge field strength of nucleons could also be applicable for the repulsive aspect of nuclear decay processes instigated by the weak nuclear force. This together with the postulation are supported in a paper on 'Evidence for Solar Influences on Nuclear Decay Rates' [17] involving neutrinos in potentially the first experimental detection as to the influence of Dark Energy (Inflationary force) experienced on Earth.

4.2 Self-regulatory processes

In [2], clarification is given to the substantial non-annihilated accumulative surplus of gravitons constituting to accumulative gravity strand activity that culminates in the heterogeneous nature of a Cumulative Gravitational force (formerly known as Dark Matter). Gravitational radiation (in the form of gravity strands radiation) from all hadronic matter within the universe including galaxies, galactic clusters and superclusters are all contributing to this cumulative gravitational force. Its presence will countervail the existence of an inflationary force in local vicinities, thereby enabling galactic clusters to stay together. The inflationary force's negative pressure on space acts like bubbles pushing matter out to the peripherals and, over a vast period, voids will become vast in size resulting in vast distances between galactic superclusters.

The initial deduction as to the major sources of the inflationary force, which emanates from all nucleosynthetic active stars, realized apparent awareness of proximity and opposition to sources of the gravitational force. This realization will lead to several major significances. Firstly, the opposing forces of the inflationary force and the gravitational force (and is more applicable on larger scales with the cumulative gravitational force) would manifest in an unrealised phenomenon. In which either force can gain dominants on occasions and continuing exchange of dominants would result in a 'self-regulatory process'; in a counterbalancing process between the two forces.

At the stellar scale of an individual nucleosynthetic active star, the inflationary force emanating from the star will have no observable effect within its local vicinity. The neutrinos radiating from the star will pass straight through any planetary system or interplanetary objects surrounding the star and thereby these objects will remain unaffected by the inflationary force and retain full gravitation interaction with the star. The inflationary force influence within binary star systems will have a more profound effect and will be discussed later.

At the galactic scale, explanation of the self-regulatory process emanates from the dependents upon the ratio between matter densities to star densities within a galaxy. With a low ratio of stars, then the cumulative gravitational force would be dominant, causing interstellar gas/dust to be drawn closer together whereby initiating the birth of new stars. The resulting increase in the inflationary force, contributed by these new stars, counteracts the dominance of the cumulative gravitational force. On the other hand, if the ratio results in a high density of stars, particularly in star clusters, the inflationary force would be dominant gradually increasing the distance between stars till equilibrium is reinstated with the cumulative gravitational force. It can be surmised that a galaxy only remains stable if it can achieve a continuing balance between matter and star densities and therefore must be finite[1]. This is analogous to the well understood self-regulatory process that takes place within stars between the repulsive energy of nuclear fusion and the attractive force of gravity where this balancing process is again finite.

[1] A diminishing cycle occurs within a galaxy. The abundance of hydrogen, and the lesser abundant helium, very gradually dissipates from star-forming interstellar gas/dust clouds; replaced with higher proportions of heavier elements distributed by supernovae of dying stars. With increasing amounts of heavier elements in star-forming gas/dust clouds, new stars will then form with proportionate shorter life spans, releasing increasing heavier elements in their supernovae. Till the only elements available for new star-forming will be iron and above, which, not allowing nucleosynthesis to start would culminate in the end of star production. Dominance by the cumulative gravitational force would have occurred before this final stage, due to the reduced inflationary force, signifying that the galaxy will collapse in on itself in a central supermassive black hole. (An event unlikely to have happened so far within the present age of the universe except, potentially, with certain dwarf galaxies.)

4.3 Inflationary force in binary star systems

If the inflationary force is an effective self-regulatory to the cumulative gravitational force within galaxies (and then its continued propagation in the expansion of the universe) would infer that the inflationary field, emanating from an individual star is likely to be proportionate to the star's magnitude, and in most cases, will be stronger than the star's gravitational field. Therefore, a star's externally attractive and repulsive forces would both be effective at the same time resulting in a net dominance of the stronger force and is only applicable in relation to the interactivity between nucleosynthetic active stars. It would establish why the greatest majority of effectual stars within galaxies naturally stay or move apart and do not collide or combine. All non-nucleosynthetic hadronic matter such as black holes, neutron stars, white dwarf stars, planets etc. do not produce, and therefore remain unaffected by, the inflationary force and hence interact only via the full strength of the gravitational force (including full gravitational interaction with stars).

All stars created from collapsing interstellar clouds in star-forming regions of galaxies will result in about two-thirds forming binary pairs or more complicated systems. The inference continues in that, due to the inflationary force strength, most stars in companion systems will progressively move apart with age. In a paper by R. J. White and A. M. Ghez [18] they specify that companion stars in young binary systems range from 10 to 100 AU distances apart (AU = 149.6 million km) and, interestingly, in older binary systems the companion stars are further apart, ranging up to ~1,000 AU. Although it is not fully evidential as to binary stars moving apart with age, which requires more comprehensive support from observational data, the initial indications remain positive. (In the case where extensive observational evidence does already provide positive support is in the fact that, in every incident when binary stars move close enough together to where material is extruded by mass exchanging transfer, at least one of those companion stars is a non-nucleosynthetic stellar remnant, i.e. a white dwarf star, neutron star or stellar black hole.)

Figure 2 is a rudimental demonstration of how differential in the gravitational and inflationary force strengths would cause two nucleosynthetic active companion stars in a binary system to move apart, and this differential greatly diminishes with increase separation.

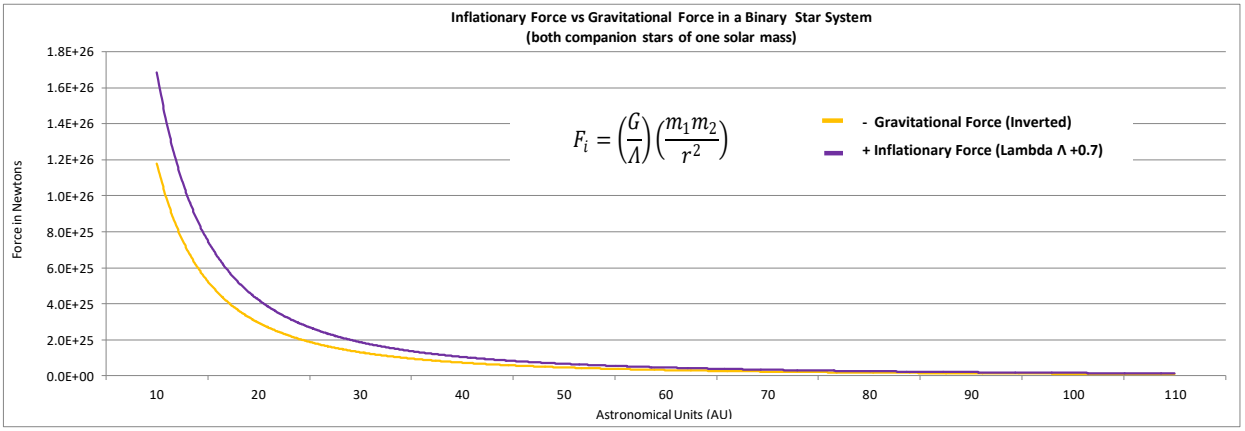

Figure 2: Inflationary Force vs Gravitational Force in a Binary Star System

5. Consequentiality as to the fate of the universe

Attainment of the final model leads to surmise that as the majority of the stars come to the end of their lives within a galactic supercluster, which as previously stated, would be at vast distances from any other superclusters, the production of the inflationary force will have greatly diminished in this local vicinity. The cumulative gravitational force would then become the dominant force causing all matter within the supercluster to produce an accelerating collapse in on itself that finalizes in an isolated Big Crunch. The termination culminates when the momentum of the final matter, drawn into one central evolving gigantic black hole, causes its sudden gravitational collapse and is counteracted by an immense upsurge in the SI force; the resulting rebounding force or 'bounce' manifest in a Big Bang. Instantaneously followed by the violent release of gauge-*fermions* (neutrinos) stored up in the SI force[1] thus accounting for super inflation, this tremendous exponential expansion (lasting ~10^{-32} seconds) will maximize when the separation between gauge-*fermions* reach minimal repulsive interactions. Due to gravitational influence, inflation will increasingly decelerate in this region of space, allowing the evolution of another universe to begin till when galaxies form and the production of the inflationary force recommences and expansion, in due course, resumes. The phenomena described several events that involve self-regulatory processes and, importantly, in establishing why super inflation was limited (crucial if galaxies are eventually to form). The asymmetry between the inflationary force and the gravitational force, which manifested in the expansion of the universe, is ultimately conserved during entropy phase transitions of individual big bangs.

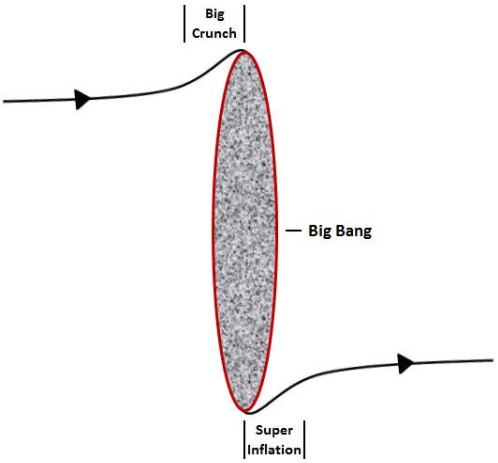

Figure 3: Entropy Phase Transition

Our universe is still relatively young, and its expansion will continue to accelerate, driven by the inflationary force. Existing galactic superclusters, those still forming and those yet to form will all be 'seeds' for future individual big bangs. The distances involved between multiple universes, created from separate big bangs, will be immensely vast and where either neighbouring universes recede apart at a combined speed faster than the speed of light or, if potentially remaining visible, will likely appear indistinguishable to a very faint distant galaxy. Endeavours in comprehensibility will ultimately conclude in that space and time, together with vacuum energy, are infinite and eternal and that the entropy of space will, overall, always remain constant.

[1] Quarks and gluons of the SG force are also released as energy, where the energy that ensues from the Big Bang converts into the creation of the next generation of matter. Whereby, forwards a notion that the currently known three generations of particles may be an indicator of the evolution of our present universe as a third-generation universe.

6. Summation on self-regulatory processes

The realization that self-regulatory processes occur naturally and such phenomena could conceivably extend throughout Nature's activities. If this were the case, would, in turn, resolve the enigma surrounding 'fine-tuning'; in explaining the physical constants in the laws of Nature that appear critical in different aspects and a requisite for the existence of life. An example of this is, as part of quantum chromodynamics, the magnetic force plays an essential equilibrating role to electrical forces within quark-gluon plasma [14]. It is therefore plausible that these equilibrating roles extend to the strong nuclear force and beyond. In that, it extends to the organized states of matter arising at the quantum level. It is shown in [1] that, at the quantum level, the strength of gravitational attraction, which is relational to matter densities and the kinetic motion of atoms, is in equilibrium with repulsive electrostatic forces. This would then reinforce the case of naturally occurring self-regulatory processes that will extend to all hierarchical scales of Nature.

It could ultimately answer such questions as to if there is a self-regulatory evolutionary process involved with successive big bangs? String/M theory proposes a multiverse consisting of 10^{500} plus universes, each with different configurations of physical constants and only in very rare instances produce the prerequisite configuration for a universe to be compatible for life. These are likely to be the only universes able to form galactic superclusters, which will produce the 'seeds' for the next generation of universes in successive big bangs in which physical constants will be replicated by conservation of information. At least, the formation of black holes, during the life of a universe, is an essential requisite for potential evolutionary progression; otherwise, the evolutionary progression fails with no further replication. This would then create the notion that Nature replicates successful evolutionary strategies at different hierarchical levels.

The import from substantiation for self-regulatory processes would be the precursor to a 'Theory of Everything'. The point of origin, in such a theory, would likely arise from the uniformity of vacuum energy as the foremost fundamental regulatory source to everything that exists in our universe and in potential multiple multiverses. (Envisage as like galactic structures, but at an increase hierarchical level and scale, where a comparable galactic structure is a multiverse.)

7. Conclusion

In attaining the Principle Model of Forces has culminated in conjecturally establishing the inflationary force (formerly known as Dark Energy), as a new fundamental force of Nature, and in the extension to unified fields'. It is reasoned that the new SG and SI unified fields' manifest as independent forces that are in counterbalance within black holes. The major sources for the inflationary force, as the constituent of the new WI unified fields, originate from the by-product of weak nuclear force interactions within all nucleosynthetic active stars. The inflationary force, responsible for the current accelerating expansion of our universe, is again reasoned as to its involvement in self-regulatory processes concerning galactic systems.

A proposition has been forwarded that once thought of neutrally charged particles (excluding photons) would instead carry a naturally occurring 'white' colour charge (and antiparticles an 'antiwhite' colour charge) inherent to the inflationary force; and in which the coupling strength of this force will be stronger than the gravitational force by an evaluated factor of ~1.43. Neutrinos would then carry this white colour charge and were postulated as the mediatory gauge-fermions of the inflationary force.

Appendix A: *Theoretical 'Gravity Strands'*

Premise: Rationalises that magnetic monopoles would emanate from non-confinement in QCD (in furtherance of [19]); as cause, the by-product of quark/gluon interactions. The effect will be continuous streams of oppositely charged magnetic monopole '*graviton*' particles expelled, in correspondingly opposite polar directions, from nucleons' nuclei along their axes of spin.[1] Nucleons will naturally pair together as a consequence of their continuous streams of gravitons self-organising into 'strands' of alternating charged particles, whereby initiating a gravitational force (see figure A.1); hence the name 'Gravity Strand'. The force of attraction manifests from continuum head-on attraction and annihilation of alternating pairs of oppositely charged gravitons.[2] Single/unpaired nucleons (or paired nucleons where protons' spin orientations readily invert in response to an electrical or magnetic field or magnetized state) will produce same charged gravitons flowing in the same direction, thereby instigating a magnetic force[3] (see figure A.2). The gravitational and magnetic forces are normally distinct in that they retain non-interaction[4], whereas their interchangeability will formalize in unification: in Gravitymagnetic unified fields.

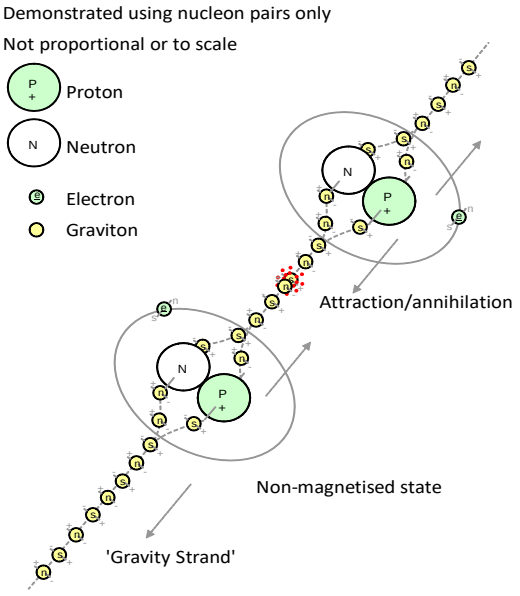

Figure A.1: Gravitational Force

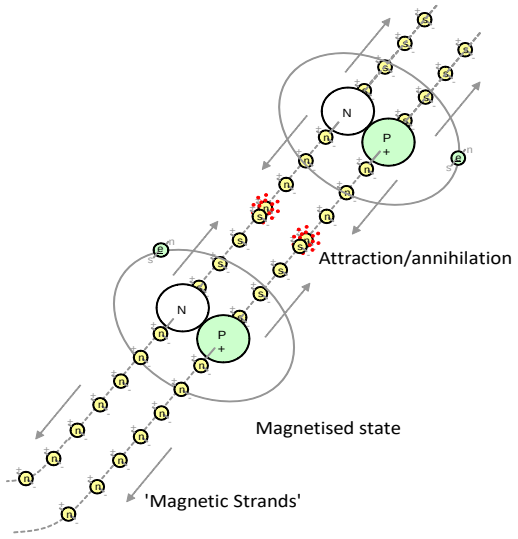

Figure A.2: Magnetic Force

[1] It defines all forms of hadronic matter to be the only sources of gravitons. It will quantify the masses of black holes to extremely dense quark-gluon plasma interiors. Correspondingly, neutron stars' sources of gravitons are limited to the neutrons constituent in these stars. (Gravitons duality utilization will then go on to explain both the very strong gravitational and magnetic fields of these compact cosmic objects.) Regarding particles, only nucleons (as the only stable hadron particles) can have gravitational interactions to the exclusion of all other subatomic particles.

[2] It infers gravitons are paired massless gauge-bosons comprising of monopole and antimonopole of opposite charge, which facilitates annihilation. Head-on attraction/annihilation of leading particles, in converging gravity strands, exposes the next pair of oppositely charged particles in continuation of the process. The pulling force generated by the leading particles is transferred via each opposing strand formation to the source objects.

[3] It is deduced that the magnetic monopole will have an electric moment, enabling interaction by the interconnection of fields between magnetic monopoles, travelling in magnetic strands, and electrically charged subatomic particles. (In gravity strands, the overall effects of electric moments and magnetic charges are neutralized throughout the length of each strand with only the leading particle retaining a net surplus magnetic charge.) It is plausible that lines of magnetic flux, when made visible, are displaying same charged monopoles in traceable streams curved progressively apart by their mutual repulsion (and where oppositely charged streams meet in head-on attraction/annihilation).

[4] Exception arises within very powerful magnetic fields resulting in localize interference of gravity strand activity [20].

Appendix B: *A fundamental principle of mass*

Taking Einstein's famous equation for mass-energy in relating to particles and breaking down the mass element into its components of volume and density:

$$E = mc^2 = V\pi c^4 \tag{B.0}$$

where the mass element is: [1]

$$m = V\pi c^2 \tag{B.1}$$

and therefore, density is: [2]

$$\rho = \pi c^2 \tag{B.2a}$$

or alternatively:

$$\rho = \frac{\pi}{\mu_0 \varepsilon_0} \tag{B.2b}$$

It establishes particle density is relativistically constant. Volumetric size, distinct or relativistic variant, of particles, is then determined by the energy carried as verified by the Einstein-Planck formulation:

$$Vf\pi c^4 = hf \tag{B.3}$$

where h = Planck constant and f = wave frequency. (This would question the notion of massless particles, but is not the purpose of this topic.) What is important is the densities of particles are identical and invariant, thereby inferring density has reached a finite universal limit: an absolute density or, to be more specific, the limit to which energy can be concentrated, where, as a consequence, energy has condensed into the manifestation of mass. The significance of Eqn. B.2b would deduce that, as energy cannot be created or destroyed and therefore must have an origin, the origin to energy is in the vacuum wherein vacuum energy density = $1/c$ J/m^3 and, as such, must be eternal and infinite: profoundly, it will be the genesis to everything that exists.

[1] Used to ascertain electron radius = 9.166 x 10^{-17} m and proton radius = 1.122 x 10^{-15} m.
[2] πc^2 = 2.82352 x 10^{17} kg/m^3 = 282,352 billion t/m^3

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