

Theoretical Origin of Distinct Charges

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Dated: 04 October 2022

Abstract

It is deduced from Einstein's famous equation in relation to the rest mass-energy of particles that the phenomenon of the quantum arises at the Planck scale from the discrete granularity of energy. This revelation is utilised in conjunction with the paradigm that Nature transpires from absolute correlative hetero-solutions, where each solution is absolute minimal in substance but vast in potential, by introducing an absolute solution for the origin of distinct charges in which presents the composition of each quantum of energy possessing one of four fundamental charges. This solution then realises the minimal prerequisite for the formation of everything: particles, forces and interactive processes, such that Nature was presented with just one ingredient – energy – to construct and activate the universe.

PACS numbers: 21.10.Ft, 14.65.Bt, 14.70.Dj, 14.80.Hv

1. Introduction

*But by observing Nature and her laws. And this will lay
The warp out for us – her first principle: **that nothing's brought
Forth by any supernatural power out of naught.**
For certainly all men are in the clutches of a dread –
Beholding many things take place in heaven overhead
Or here on earth whose causes they can't fathom, they assign
The explanation for these happenings to powers divine.
Nothing can be made from nothing – once we see that's so,
Already we are on the way to what we want to know. [1]*

The paradigm that Nature transpires from absolute correlative hetero-solutions in which each solution is the most minimal and simplest, is illustrated by the three elementary fermions, comprising of the up and down quarks and the electron, as being the sole constituents in the formation of all atomic nuclei, atoms and molecules that has resulted in the enormous variety of chemistry, physical objects and hierarchical structures within the universe. This is again illustrated in the two-base pairing of nucleotides making up the DNA that codifies complex tertiary structures, which has resulted in the vast diversity of life on Earth. This paradigm is applied to ascertain an absolute solution involving the origin of distinct charges in which Nature must have utilised this inception in correlation with the other absolute hetero-solutions – ultimately, these simple inceptions are fundamental to all the complexity and diversity within the universe.

1.1 A fundamental principle of mass

Taking Einstein's famous equation in relation to the rest mass-energy of particles and in breaking it down into its components:

$$E_0 = m_0 c^2 = \frac{3V_0 \hbar^{-1/2}}{\mu_0 \epsilon_0} \quad (1.10)$$

where the mass-energy correlative element, c^2 , arises from the reciprocal of the product of vacuum permeability, μ_0 , and vacuum permittivity, ϵ_0 :

$$c^2 = \frac{1}{\mu_0 \epsilon_0} \quad (1.11a)$$

It remains that the rest-mass element is:

$$m_0 = 3V_0 \hbar^{-1/2} \quad (1.11b)$$

and accordingly, particle density is:¹

$$\rho_0 = 3\hbar^{-1/2} \quad (1.11c)$$

It will establish that particle density is relativistically constant. Particles' volumetric size – distinct or relativistic variant – is then determined by the quanta of energy carried as verified by Planck-Einstein formula $E = hf$:

$$V_0 f \rho_0 c^2 = hf \quad (1.12)$$

where \hbar and h are Planck constants and f = wave frequency. (This would question the notion of massless particles [2], but is not the purpose of this topic.) What is important is that 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.

Particle	Measured Rest-Mass (MeV)	Rest-Mass m_0 (kg)	Absolute Density ρ_0 (kg·m ⁻³)	Volume V_0 (m ³)	Calculated Radius $\sqrt[3]{3V_0/4\pi}$ (m)	Measured ~ Radius (m)	Rest Mass-Energy $E_0 = V_0 \rho_0 c^2$ (J)	Rest Mass-Energy $E_0 = m_0 c^2$ (J)	Particle Energy Density (J·m ⁻³)
<i>Photon, Neutrino, Gluon and Magnetic Monopole (Graviton):</i>	4.14E-21	7.3725E-51	2.9213E+17	2.5237E-68	1.8196E-23		6.6261E-34	6.6261E-34*	2.6256E+34
<i>Ditto, associated Dark Photon [3]:</i>	~ 8.40E-20	1.4974E-49	2.9213E+17	5.1258E-67	4.9647E-23		1.3458E-32	1.3458E-32	2.6256E+34
Electron:	0.5109989	9.1094E-31	2.9213E+17	3.1182E-48	9.0630E-17	9.0647E-17	8.1871E-14	8.1871E-14	2.6256E+34
Proton:	938.27205	1.6726E-27	2.9213E+17	5.7255E-45	1.1098E-15	1.1100E-15	1.5033E-10	1.5033E-10	2.6256E+34
Neutron:	939.56538	1.6749E-27	2.9213E+17	5.7334E-45	1.1103E-15		1.5053E-10	1.5053E-10	2.6256E+34
Up Quark:	2.3	4.1001E-30	2.9213E+17	1.4035E-47	1.4964E-16		3.6850E-13	3.6850E-13	2.6256E+34
Down Quark:	4.8	8.5568E-30	2.9213E+17	2.9291E-47	1.9123E-16		7.6904E-13	7.6904E-13	2.6256E+34
Top Quark:	1.71E+05	3.0521E-25	2.9213E+17	1.0448E-42	6.2947E-15		2.7431E-08	2.7431E-08	2.6256E+34

Key: [*Variant m, Theoretical*] - travel at c, Elementary, Composite

*[*Demonstrated at the Planck discrete unit (quantum) of energy, h, thereby, determines minimum particle rest-mass and size.]*

Figure 1: Sample of the particle zoo
(Numerical values: acquired data, [calculated results](#).)

As energy can neither be created nor destroyed, Eqn. 1.11a in conjunction with Eqn. 1.11c vindicates that the origin of the energy in Einstein's equation is in the vacuum wherein vacuum energy density is equivalent to $1/c$ J·m⁻³. It will deduce that the quantum arises at the Planck scale from the discrete granularity of energy where nothing is more fundamental. The perpetual existence of vacuum energy is to be regarded as eternal and infinite and, profoundly, the genesis to everything that exists.

¹ $3\hbar^{-1/2} = 2.9213 \times 10^{17}$ kg·m⁻³, which equates to a staggering 292 trillion t·m⁻³.

2. Composition of the vacuum

The definition of a vacuum as being void of anything is based on classical knowledge. Vacuum energy is, potentially, a missing consideration within quantum mechanics, where its inclusion may lead to identifying the correct interpretation and to eliminate the strangeness associated with the subject.

The phenomenon that discrete granularity of energy arises at the Planck scale within the vacuum is, in retrospect, the calculation associated with the improbable rest-mass of a photon, as supplied in figure 1 above. The discrete granularity of energy is composed of elementary granules – each a physical quantum of energy – and can be regarded at rest within the vacuum. The improbable rest-mass of a photon then serves to establish certain physical information but not the entire properties for a discrete quantum of energy. To ascertain a solution, pertaining to the quantum properties of energy that complies with the paradigm, as advanced in the introduction to being absolute minimal in substance but vast in potential, was by taking Eqn. 1.11a into consideration, regarding vacuum permeability and vacuum permittivity, as the prime indication for deducing such an absolute solution. This deduction is inferred in the axiom below.

Axiom 1: The composition of each quantum of energy consists solely of one of four fundamental charges: positive electrical charge, negative electrical charge, north or positive magnetic charge or south or negative magnetic charge.

Each quantum of energy of the four fundamental charges are realised as the minimal prerequisite for the formation of everything: particles, forces and interactive processes that exists in the universe. Nature did not choose these four fundamental charges, eternally present in the infinite granularity of energy within the vacuum, but presented Nature with just one overall ingredient – energy – in its entirety to construct and activate the universe. Debatably, what we conceive as ‘Nature’ is synonymous with vacuum energy, which is the originating and governing factor to reality and will ultimately be the starting point in a Theory of Everything.

The uniformity in the distribution of each of the four fundamental charges will result in the vacuum being neutral in charge, and is also applicable within energy in its many forms. This uniformity will mean that energy is a scalar field and, thereby, the quantum spin property of energy is presumably zero, which would classify the discrete fundamental charges as four distinct bosons.

As energy condenses into the formation of subatomic particles, fermions cannot be elementary particles as they are formed from quanta of energy. The quanta of energy, q_n , constituent in a subatomic particle is dependent on distinct rest-mass or relativistic variant size particles. For subatomic particles that has distinct rest-mass and moving at a velocity less than c :

$$q_n = \frac{\sqrt{(m_0 c^2)^2 + (pc)^2}}{h} \quad (2.10)$$

Whereas, for relativistic variant size subatomic particles moving at c , the quanta of energy are in direct correlation with the wave frequency: $q_n = hf$, as already established by hf in the Planck-Einstein formula. In the synthesis of mass-energy, the condensing of energy into subatomic particles is when the effect from the constituent quanta of a fundamental charge become substantially evidential in their accumulation in a point charge that extends in a surrounding field.

During the formation of a subatomic particle, the process of quanta of energy instantly condensing as with other examples extensive throughout Nature, is presumably by rotational accretion, which conceivably gives rise to the spin property of the formed subatomic particle.

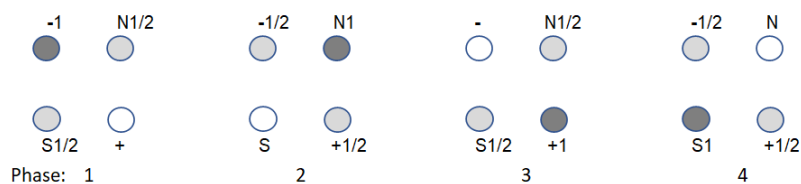
2.1 The constituent charges of fermions and bosons

It is reasonable to deduce that the constituents of electrons are condensates of quanta of fundamental negative electrical charge, and positrons are condensates of quanta of fundamental positive electrical charge (also applicable to the muon/antimuon and the tau/antitau). When corresponding leptons and antileptons attract each other, they combine and are annihilated in instantaneous vaporisation that returns their quanta of fundamental charges to the vacuum. The phenomena of like charges repelling and opposite charges attracting are discerned in respect to the discrete quantum of energy, to be reversed, which would explain why fundamental particles readily condense. From the above synthesis and annihilation, two rules are established that are prevalent to the condensed energy state.

Rule 1: *Homogeneous quantum of energy (like charges) attracts, whereas, heterogeneous quantum of energy (opposite charges) repels.*

Rule 2: *Annihilation of particles/matter is the neutralisation that occurs in the combining of equal quanta of opposite fundamental charges.*

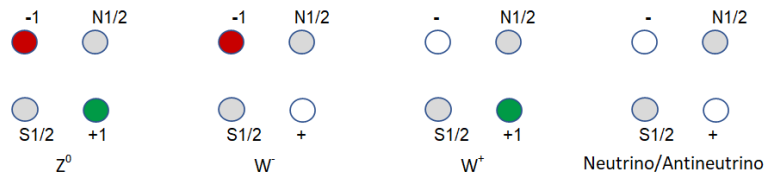
For magnetic monopoles to exist, their constituents will each be condensates of quanta of fundamental north or positive magnetic charge and of south or negative magnetic charge. The above rules will be compliant or explanatory to certain symmetries and conservation laws: in particular, mass-energy conservation. Externally, charged particles retain charge invariance meaning that charge is quantized as an integer unit regardless of the particle's quanta of energy, i.e., mass or relativistic motion. The constituent of the photon boson is requisite to incorporate the four fundamental charges, which should lead to neutralisation and, concerning rule 2, be unstable and self-annihilate. Therefore, within photons, the quanta of each of the four fundamental charges must oscillate as fractional charges (ranging between integer and zero charge):



Schematic 1: Quantum harmonic oscillation of fractional charges within photons

This harmonic oscillation of fractional charges within a photon will manifest in the photon's wave frequency, which is contingent on q_n regarding the photon's constituent quanta of fractional charges. When an electron, in the example, absorbs a photon, it gains the photon's energy by absorbing its constituent quanta of fractional charges, which are later emitted together when the electron emits the photon.

The pure condensates of each of the four individual fundamental charges for the electron, muon and tau, plus the positron antimuon and antitau, and magnetic monopoles will limit distinctness of constituent charges for the remaining leptons and bosons. These are provisionally determined as presented below.

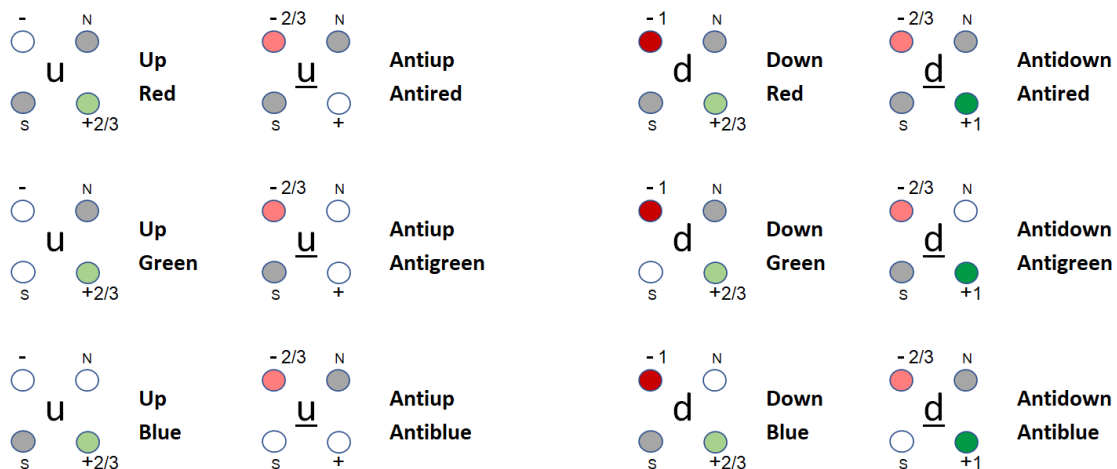


Schematic 2: The constituent charges of the W^\pm , Z^0 bosons and neutrino/antineutrino

The Z^0 boson will not produce a harmonic oscillation of inherent charges like the photon, hence why they are short-lived – as its own antiparticle. Likewise, the W^\pm bosons are each other's antiparticle. The neutrino and antineutrino flavours each possess magnetic charges in harmonic oscillation. Therefore, the distinction between neutrinos and antineutrinos are in their helicities (spin orientations). Their harmonic oscillation will likely extend to why they oscillate between flavours.

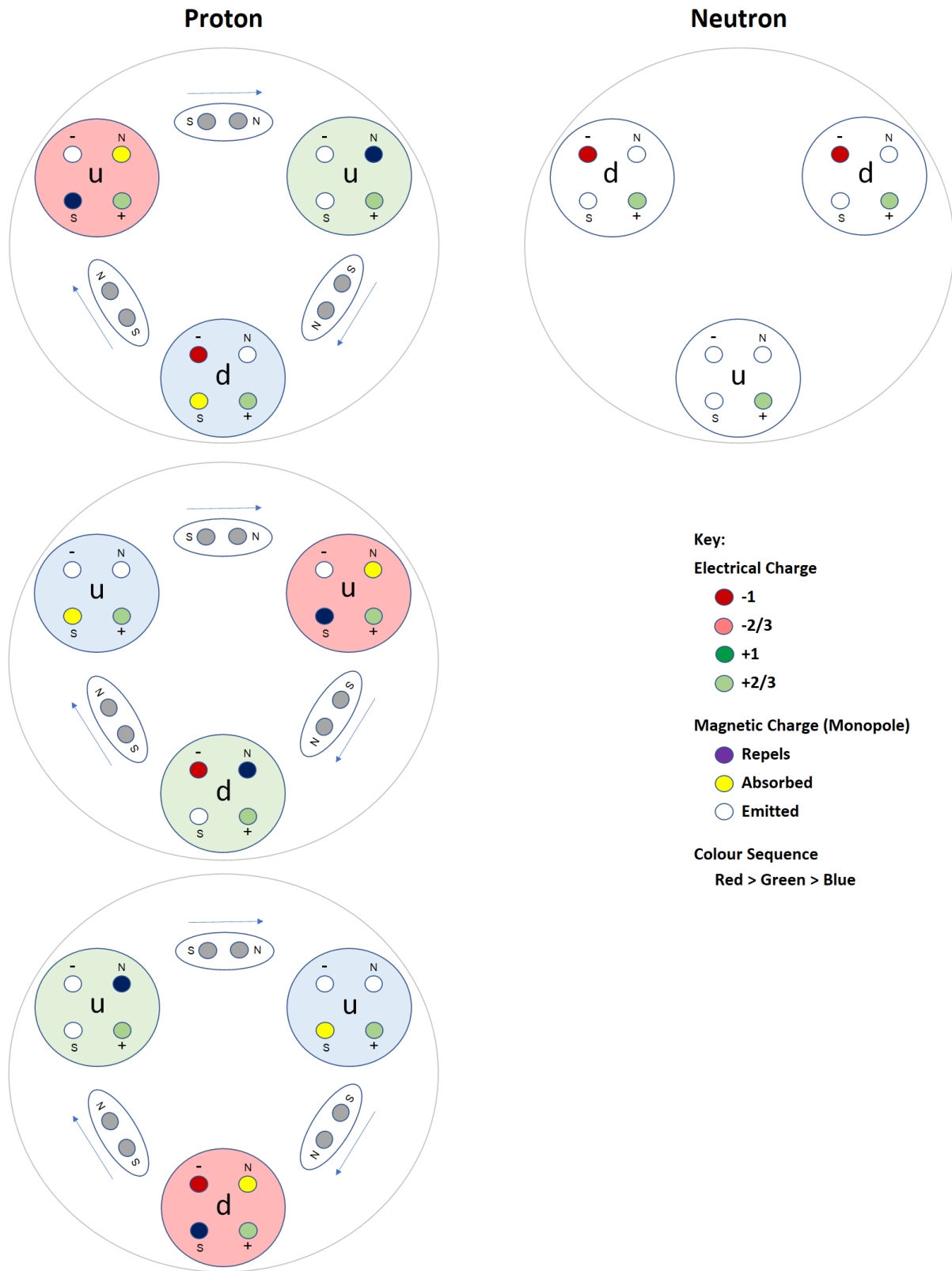
2.2 The emergence of colour charge

It is essential to ascertain the more difficult aspect in the emergence of colour charge, intrinsic to quarks and the strong nuclear force, from just the four fundamental charges. The remaining series of schematics is used to simplify in visual representations of this emergence and in the functioning of colour charge. After numerous attempts, there was only one rational outcome to this quest which is presented as a viable solution.



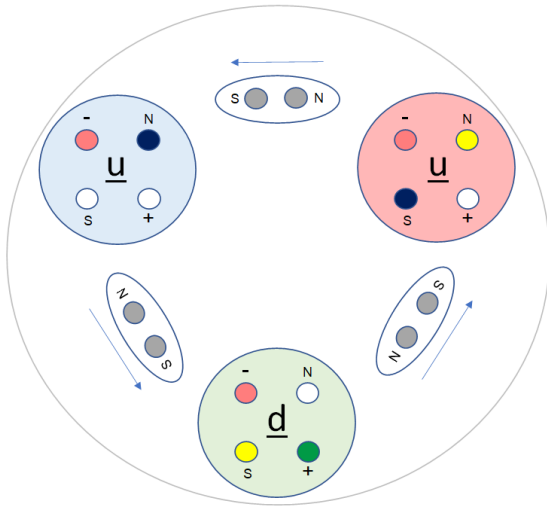
Schematic 3: The constituent charges of quarks

The deductions from this presented solution are that quark/antiquark flavours are determined by the constituent configurations of fundamental electrical charges and that the triple colour/anticolour charges are determined by the constituent configurations of fundamental magnetic charges (as to which configuration is attributed to a given colour charge is inconsequential). Therefore, the functioning of colour charge is driven by continuous changes to the constituent configuration of magnetic charges. These changes result from the interactions mediated by gluon bosons. This will ascertain from the deduction that the only charges gluons can contain are fundamental magnetic charges and, as opposed to the octet of different configurations of colour-charged gluons, there can only be one configuration comprising of both a north- and a south-charged magnetic monopole. As such, the fundamental neutral charge for a gluon is conserved together with their ability to interact with each other to form strings. Furthermore, gluons' magnetic charges cannot be in harmonic oscillation. Thereby gluons will have a limited lifespan and self-annihilate if inactive.

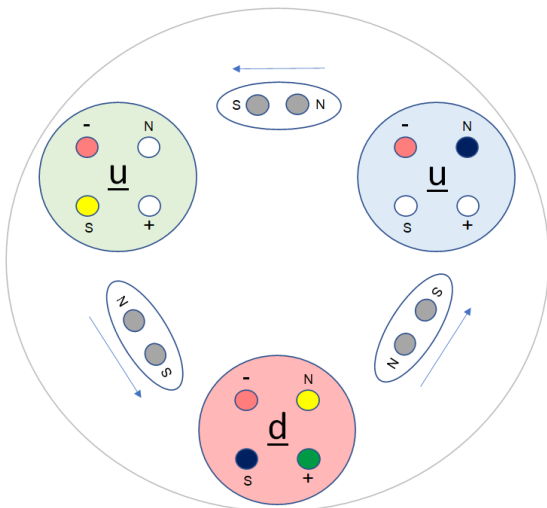
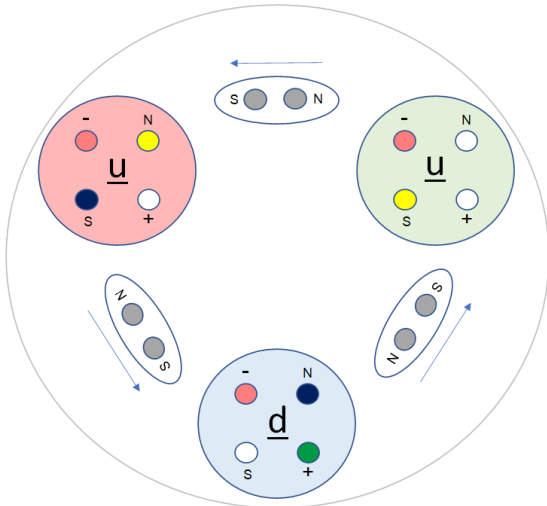
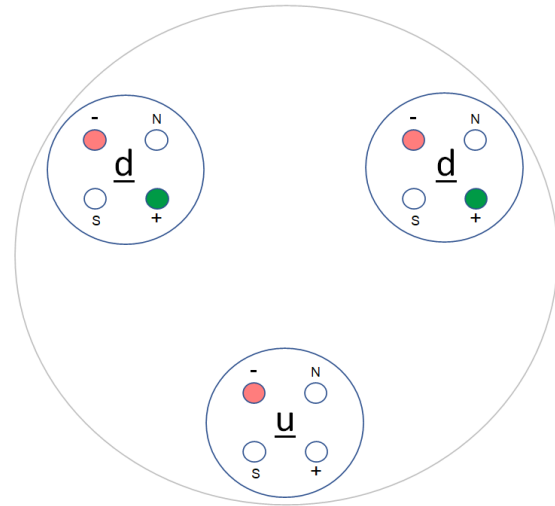


Schematic 4: The functioning of colour charge within nucleons

Antiproton



Antineutron



Key:

Electrical Charge

- -1
- -2/3
- +1
- +2/3

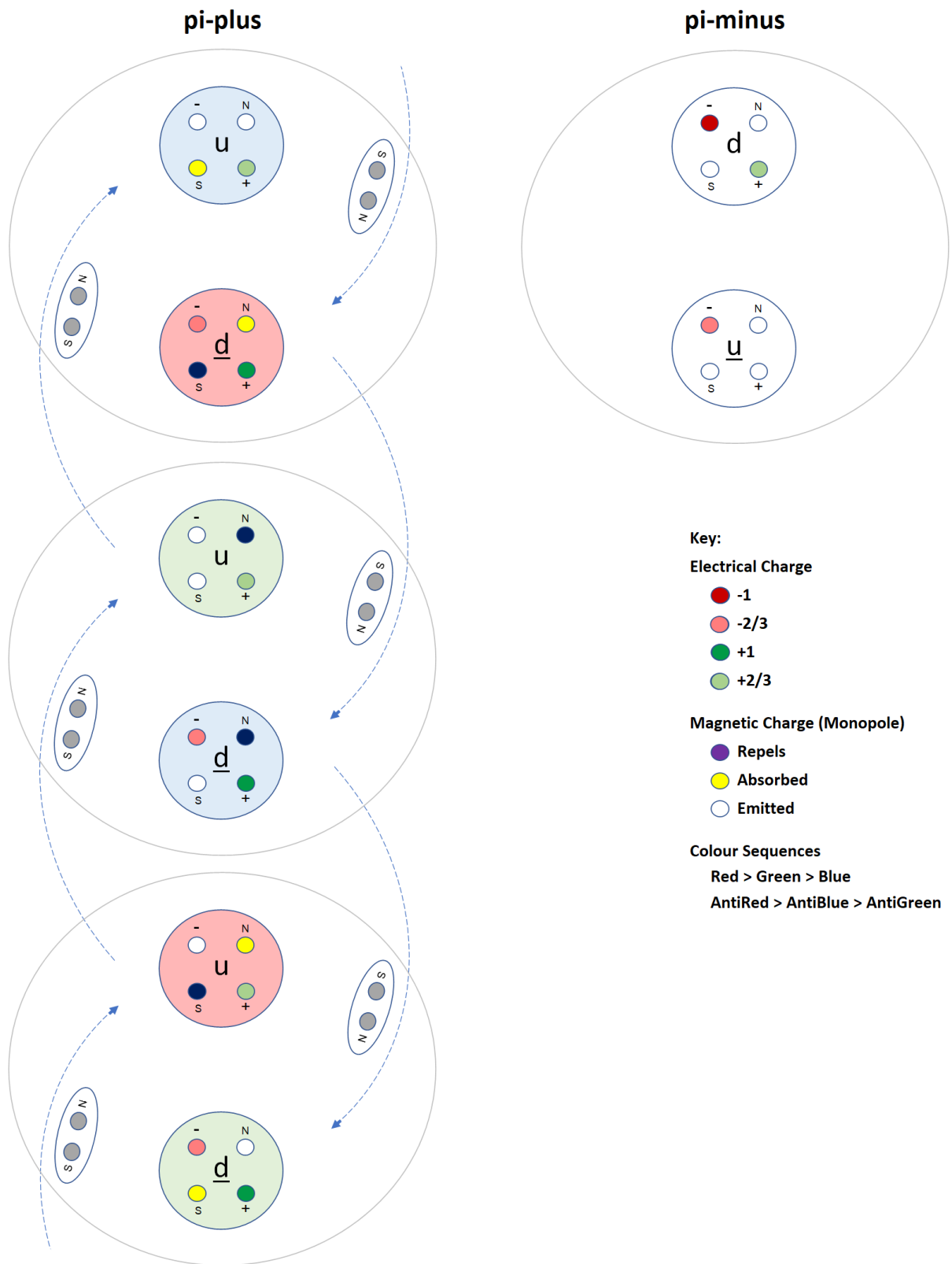
Magnetic Charge (Monopole)

- Repels
- Absorbed
- Emitted

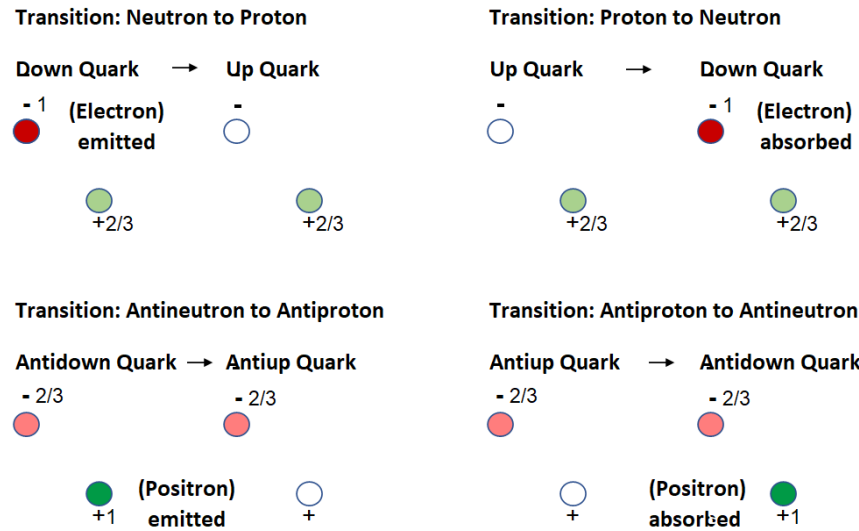
Colour Sequence

AntiRed > AntiBlue > AntiGreen

Schematic 5: The functioning of colour charge within antinucleons



Schematic 6: Example of the functioning of colour charge within mesons



Schematic 7: Nucleonic transitions via the weak nuclear force

As presented in the schematics, the quarks within nucleons, antinucleons and mesons obey the Pauli exclusion principle whereby two identical adjoining fermions (quarks) cannot simultaneously be in the same quantum state. In addition, the summing of all charges, including interactions by gluons within each nucleon, antinucleon, or meson, complies with the conservation of charge.

The potential and kinetic energy arising from the activity of quarks and gluons is not only verified as accounting for the mass of a composite nucleon but is also anticipated to produce vortices within that draws in vacuum energy, which is the source in fuelling the activity (in producing gluons). This influx of energy is conserved in the excess of magnetic monopole *gravitons* expelled from the nucleon (see Appendix A).¹ In effect, nucleons are the perpetual engines that not only drive but also govern, from the quantum level, the construction and formation of the cosmos.

3. Causation of relativistic effects

In Einstein's theory of general relativity, the phenomenon of space-time curvature explains the concept of gravitational time-dilation but not the concept of space itself, other than as a lattice of coordinates, and which are curved around the presence of a massive object. The subject of this paper, although still evolving, advances clarification to the concept of space in that vacuum energy is the physical medium. Unknown to Einstein at the time, this has the potential to alter the perspective regarding the causation of relativistic effects. This potential is demonstrated by outlining an explanation to the causation of space-time curvature in that the concentration of quanta of energy within a massive object will repel vacuum energy resulting in a reduction in density around the vicinity of the object, and this reduction diminishes in a radial gradient away from the object:²

$$V'_{E\rho} = V_{E\rho} \left(1 - \frac{2GM}{rc^2} \right) \quad (3.10)$$

¹ Also, will postulate that nucleons and antinucleons (in the formation of matter and antimatter) will indistinguishably interact with quantum gravity as a result of their equivalent emission of magnetic monopole *gravitons*.

² Furthermore, gives explanation to why the 1887 Michelson–Morley, and subsequent, experiments using their applied methodologies would fail to detect the existence of an 'aether' – regarding an unknown medium of space.

The electric and magnetic fields of the vacuum are respectively:

$$E = \sqrt{\frac{1}{c\epsilon_0}} \quad (3.11a)$$

$$B = \sqrt{\frac{\mu_0}{c}} \quad (3.11b)$$

from which $c = E/B$ and the magnitude of vacuum energy density is derived:

$$V_{E\rho} = \frac{1}{2} \left(\frac{B^2}{\mu_0} + \epsilon_0 E^2 \right) \quad (3.12)$$

The phenomenon of gravitational waves can again be explained in light of the new perspective. Whereby, the energy released during a catastrophic event, as it outwardly traverses the medium of space at the speed of light, causing the manifestation of waves from harmonic oscillating increase and decrease in vacuum energy density that result in length contraction/expansion.

Applying Eqn. 3.10 to the event horizon of a black hole results in $V'_{E\rho} = 0$. In general relativity, time is calculated to cease at this region: $t' = 0$ in the confirmation that gravitational time-dilation is proportional to the local intensity in the curvature of space. Whereby, the established union of space and time will infer that $V_{E\rho}$ is interchangeable with time, t , in Eqn. 3.10. Furthermore, in retaining unity with the physical medium of space it will forward for consideration that by initially expressing unitary time and length, together with the speed of light, by dividing each by c in t_0 , l_0 and c_0 respectively, then their restored proportionalities in relation to vacuum energy density are all interrelated:

$$\frac{c_0 t_0}{l_0} = \frac{V'_{E\rho}}{V_{E\rho}} c \quad (3.13)$$

The current explanation of why photons of any frequency are not emitted from black holes is due to black holes' gravitational strength. It can again be forwarded for consideration that the speed of light is not the consequence of gravity but as derived from Eqn. 3.13 is governed by the energy density of the vacuum.

Combining the above considerations to the fact that the energy of the vacuum is eternally positive and, accordingly, time will be eternal and, importantly, non-reversal. If the previous considerations are correct, then to preserve the constancy of physical laws, the energy density of the vacuum cannot deplete with the expansion of the universe and, consequently, would establish vacuum energy is not the dark energy associated with the expansion.

In no way is this an attempt to falsify Einstein's theory. On the contrary, the missing consideration of vacuum energy will produce a bridge between general relativity and quantum mechanics that then allows facilitation for a quantum theory of gravity.

Appendix A: Theoretical premise for quantum gravity

The theoretical premise is based on the reasoning that magnetic monopoles would emanate from non-confinement in QCD (in furtherance of [4]); as cause, the by-product of quark/gluon interactions. The effect would be continuous streams of oppositely charged magnetic monopole *graviton* particles expelled from nucleons in opposite directions along the axes of spin.¹ The natural pairing of nucleons in up/down spin orientations enable their streams of gravitons to self-organise into *gravity strands* of alternating charged particles, thereby initiating a gravitational force (see figure A.1). The force of attraction manifests due to continuous head-on attractions and annihilations 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 magnetised state) produce gravitons with the same charge flowing in the same direction, thereby instigating a magnetic force³ (see figure A.2). The gravitational and magnetic forces are normally distinct in that they retain non-interaction,⁴ whereas their interchangeability would formalise in unification: in Gravitomagnetic unified fields.

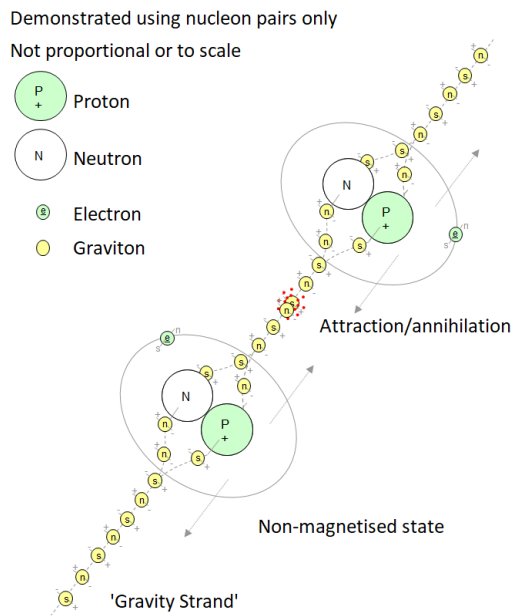


Figure A.1: Gravitational force

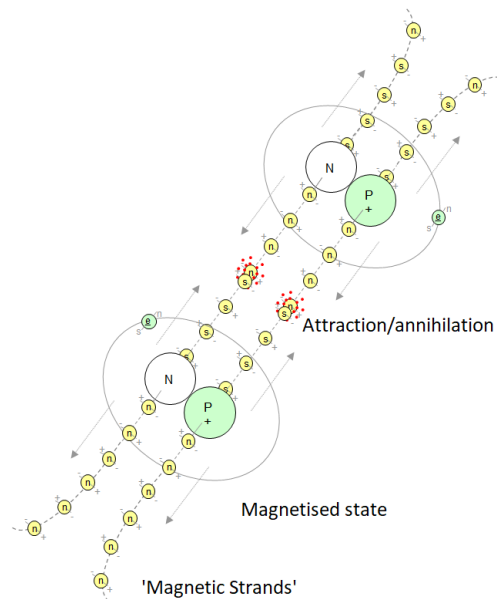


Figure A.2: Magnetic force

¹ It defines all forms of hadronic matter as the only sources of gravitons. This would attribute the mass of black holes to extremely dense quark-matter interiors. Correspondingly, neutron stars' sources of gravitons would originate from the neutron constituents of these stars. Gravitons' duality utilisation would thus 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 that gravitons are paired gauge bosons, comprising of a monopole and an antimonopole of opposite charges, which facilitates annihilation – releasing, if not initially, Dark Photons [3]. 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 produces plausibility that lines of magnetic flux, when made visible, are displaying monopoles with the same charge in traceable streams that curve progressively apart by their mutual repulsion (and where oppositely charged streams meet in head-on attraction/annihilation [5]). It can be deduced that the magnetic monopole will have an electric moment, enabling interaction by the interconnection of fields between magnetic monopoles in magnetic strands and electrically charged subatomic particles. In gravity strands, the overall effects of electric moments and magnetic charges are neutralised throughout the length of each strand with only the leading particle retaining a net surplus magnetic charge.

⁴ Exception arises within very powerful magnetic fields resulting in localise interference of gravity strand activity [6].

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(Also see <https://www.ru.nl/hfml/research/levitation-explained/diamagnetic-levitation/>)